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International Conference on Oral Rehydration Therapy [ICORT] -  
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AGENCY FOR INTERNATIONAL DEVELOPMENT  
WASHINGTON, D.C. 20523

January 29, 1986

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Am.  
1/31

Dear Dr. Measham:

This is a belated letter of thanks and congratulations for your participation on the ICORT II Technical Advisory Committee. In my judgment this was the best organized and implemented A.I.D. conference I have ever attended. This is a real feat when one considers the complexity of the total affair, including the fact that it was sponsored by a number of organizations and that inputs to the conference came from various bureaus within the Agency.

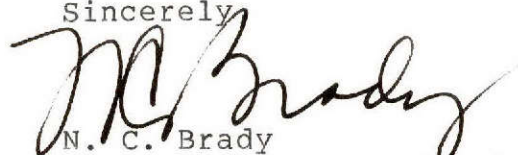
I am sure that all the participants were equally impressed. Not only did they gain a great deal of information, they had an opportunity to show others what they were doing and to tell us what they thought needs to be done in the future. To them this was probably more important than that which they learned.

Attached you will find the closing ICORT II remarks made by A.I.D. Administrator, M. Peter McPherson. Working together, we hope to meet the goal of reducing death due to diarrheal dehydration by two million in the year 1990. Given the critical role you play in this field, we urge you to share this speech with fellow colleagues to help achieve this goal.

ICORT II produced many new issues and challenges for us in the coming years. I look forward to working with you in our effort to improve the survival of the world's children.

Please accept my wholehearted congratulations for a job well done.

Sincerely



N. C. Brady  
Senior Assistant Administrator  
for Science and Technology

Enclosure:a/s

## INTERNATIONAL CONFERENCE ON ORAL REHYDRATION THERAPY - ICORT II

## Closing Remarks

Peter McPherson, Administrator  
Agency for International Development  
December 13, 1985

We have come to the end of an extraordinarily successful meeting. 1200 participants from some 100 countries have shared their knowledge and experiences. And yet, you -- the public health leaders assembled here -- are only a fraction of the literally millions of health workers, volunteers and parents who carry the ORT banner.

At ICORT I, I think it is fair to say that we reached scientific consensus about ORT. At ICORT II from all I've seen and heard we have taken a leap forward and achieved a consensus for action.

Dr. Merson has summarized the key points of the meeting and Mr. Grant has raised some important points. I'd like to highlight just a few.

1. You have said here that ORT has changed the face of health care delivery. You have applied your best creative energies and developed innovative solutions to some incredibly difficult problems.
2. You have said that ORT has led health care out of the clinics and into communities and homes. We know now that new communications and marketing techniques can revolutionize the delivery of health services. We now see the importance of political and community mobilization.
3. You have shown how the private sector can play a pivotal role.
  - For example, private voluntary organizations have mobilized their volunteers to educate and train health care workers and parents.
  - Private business is playing a big role, producing and distributing oral rehydration salts. Developing countries now lead the world in ORT production, in part due to these private sector efforts.
  - Private practitioners and pharmacists have endorsed ORT in country after country and have shown how critical their involvement is.

4. You have proven that dramatic results can be achieved -
  - when the key elements are in place and,
  - when governments are committed to success.
5. We have also learned that ORT by itself is not enough.
  - We have two principal thrusts for our child survival activities: ORT and immunization. These are the engines that can drive primary health care to the far reaches of every country. They are the foundation on which a sustainable health system can be built to deliver other critical interventions such as birth spacing and nutrition.
  - To quote Dr. Mahler, "ORT and immunization go hand in hand, complementing one another - one curative, one preventive; one immediately life-saving -- one potentially life-saving."

Now it is time to look to the future.

Many of you in this room are returning to your countries where mortality rates are painfully high, where malnutrition is ever present, where epidemics of cholera persist, poverty abounds and resources are scarce. You came to this conference because you know about ORT and wanted to know more. You came because ORT offered you an opportunity to improve the health of your people.

Your efforts and your enthusiasm give hope that the global objectives set for ORT by the World Health Assembly can be achieved. The objectives set a few years ago for 1989 were: 50% access to ORT; 35% use of ORT in children below age five; and a 25% reduction in deaths associated with diarrhea. When these targets were set, few thought they could be achieved. Even now it will not be easy.

But this conference has convinced me that we can do it and do even more.

I propose that we translate these targets and stretch them and stretch ourselves.

- We should strive to make ORT accessible to virtually every child who needs it by 1990.
- We should seek 45 percent use of ORT by 1990, and
- Finally, we should achieve a common goal of preventing two million deaths from diarrheal dehydration in 1990. Or, in laymen's terms, two million lives saved from death due to diarrhea.

Now, in order to achieve these targets, knowledge of the correct use of ORT is essential.

The World Health community has set ambitious targets to achieve universal immunization by 1990. Along with that effort, it makes sense to reach these same parents and children with the message of ORT. We need to instill in them this knowledge, so that they know how to use ORT, and use it effectively.

If we are to achieve the goal we have set forth, it is reasonable to expect that we must instill knowledge of the correct use of ORT in 80 percent of the parents of children at risk. This 80 percent target will be a helpful tool in tracking progress for some programs. However knowledge is not the goal itself. Our primary goal is reduction of deaths.

Again, our primary goal is to reduce death due to diarrheal dehydration by two million in the year 1990.

To achieve this goal, each of us must give our very best effort. Further, each country must make its contribution in keeping with its resources and its own goals.

Some countries, such as Egypt, have achieved outstanding results as we have heard these past three days. We know that dramatic results are possible. Countries which have achieved those high levels, however, must set a goal to sustain these results - and even improve upon them.

The challenge for countries just beginning, or who haven't achieved such results with their program, is to set their own targets and apply their resources to achieving them.

Each donor must do its share and so must the private sector. ORT is low cost relative to the number of lives which can be saved. Private channels for distribution can further reduce the cost of programs. AID, for its part, intends to continue very substantial funding for ORT. In 1985 we provided \$35 million for ORT, up from \$15 million only three years before. We will continue our record of maximum contribution.

There are other vital steps to achieve the goals I have discussed here today:

- We will need to close the gap between access and effective use of ORT. We need to teach, to train and to promote so that those who have access, use ORT, and use it correctly.

- We'll need to improve donor coordination, especially on the country level. In this way donor efforts can reinforce one another and contribute to real progress toward country targets.
- A key to better donor coordination lies in the developing countries themselves. Each of them must take the lead in pulling donors together behind their country plans. Plans with clear goals and divisions of responsibility are critical to mobilize resources and to efficient implementation.
- The World Bank, UNDP, UNICEF, WHO and other donors who provide major health assistance in a particular country have an important responsibility to ensure donor coordination.
- Finally, we will need to continue our close communication on technical issues. We urge you to organize country and regional meetings to forge plans and share experiences and are prepared to help as appropriate. To that end, if it is desired and warranted, AID would be happy to host an ICORT III. We would, of course, want to consult with our co-sponsors, bilateral donors and developing countries. At this time, the situation is not clear, but we stand ready as needed.

We have ambitious goals and a global vision. ORT can lead the overall development of health care. It shows that worldwide coverage of essential health services is in fact possible. And - by reaching into every home and community - ORT can catalyze the very process of development.

We have a goal. I believe we know what is needed to achieve it. Each death we prevent will help us reach our global target. Each health worker, each program manager and every country has a crucial role to play.

If we accomplish this, together we can write one of the great chapters of human history.

###

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Proceedings of the  
**International Conference on  
Oral Rehydration Therapy**

June 7-10, 1983  
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Agency for International Development  
In Cooperation with ICDDR/B, UNICEF and WHO

**ICORT**

**ICORT**

**Proceedings**

1983

Karen Lashman Hall

*Proceedings of the*  
**INTERNATIONAL  
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*on*  
**ORAL REHYDRATION  
THERAPY**

**JUNE 7-10, 1983  
WASHINGTON, D.C.**

Sponsored by the United States Agency for International Development with the cooperation of International Center for Diarrhoeal Disease Research, Bangladesh, United Nations Children's Fund, and the World Health Organization.

**Office of Health**

**Bureau for Science and Technology**

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Washington, D.C. 20523

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## FOREWORD

As Administrator for the Agency for International Development, it was a great privilege for me to be able to host, in cooperation with the World Health Organization, the United Nations Childrens Fund, and the International Centre for Diarrhoeal Disease Research, Bangladesh, the International Conference on Oral Rehydration Therapy (ICORT) held here in Washington, D.C. from June 7-10, 1983. It is a credit to all conference planners, support staff, and participants themselves that such a distinguished group was assembled to focus attention on a simple, inex-

pensive and practical intervention, Oral Rehydration Therapy (ORT), which could save the lives of up to 5 million children each year. ICORT was a very effective forum for ORT information exchange and these proceedings are an important step in sharing this wealth of knowledge worldwide.

I urge all to take full advantage of this valuable material in the development of future successful ORT programs.

M. Peter McPherson

*Administrator*

*Agency for International Development*

## ACKNOWLEDGEMENT

The International Conference on Oral Rehydration Therapy (ICORT) was by all measures a remarkable success. It succeeded in capturing the support of the international health community for a simple and inexpensive but effective health intervention, Oral Rehydration Therapy (ORT), a germane technique for the health conditions and resources of the world today. Its impact was made on over 600 ICORT participants from over 80 countries, including the Vice President of the United States, the Honorable George Bush. ICORT has indeed greatly advanced the acceptance of ORT as an effective tool in the armamentarium of primary health care.

The ICORT program participants came from both the developed and developing world and, though they reflected the diverse views that prevail in stimulating the wide utilization of ORT, they were unanimous in their basic support for this life-saving measure. Their presentations were excellent and showed considerable expertise in the speeches as well as in the discussions that followed.

A.I.D. and, particularly, its Administrator, Mr. M. Peter McPherson, took the lead in sponsoring ICORT, but it could not have been a success without the assistance of the principal cooperating agencies, namely, the International Center for Diarrheal Disease Research (ICDDR/B), the United Nations Childrens Fund (UNICEF), and the World Health Organization (WHO). All three of these agencies played a major role in the planning of ICORT and their staffs fully participated in the conference, including a major speech by

Dr. William Greenough, Director of ICDDR/B, and keynote addresses by Mr. James Grant, Executive Director of UNICEF, and Dr. Halfdan Mahler, Director General of WHO. Their contributions were essential to the high level of the presentations that prevailed at ICORT.

Special thanks are due to many people in A.I.D. who worked extra hours over a long period of time assisting in the organizational and logistical support for ICORT. It is not possible to name all these individually but special mention must be made for Molly Hageboeck, Mary Beth Allen, John McEnaney and Robert Clay.

The members of the ICORT Technical Advisory Committee deserve special mention. Over a 10-month period, they contributed their time and effort to organize the curricula, select the participants, and monitor the individual sessions to assure quality, continuity and minimize repetition and duplication. The high level of technical competence of the speakers and the excellence and professionalism of the presentations was ensured by the work of this committee, and in particular, the session monitors.

Final thanks should be given to Dr. Richard Cash and his staff at the Harvard Institute for International Development (HIID) for their work in editing these Proceedings.

Clifford A. Pease, Jr., M.D.

*Chairman*

*ICORT Technical Advisory Committee  
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## PROLOGUE

With over six hundred participants from over eighty countries, the ICORT conference was a testimony to the international health community's recognition of the seriousness of diarrheal disease, the value of oral rehydration therapy, and the commitment to primary health care. Initiated by the Agency for International Development, the conference was cosponsored by the International Center for Diarrhoeal Disease Research, Bangladesh, the United Nations Children's Fund, and the World Health Organization.

The conference focused on oral rehydration therapy, an important treatment for diarrhea. The seriousness of diarrhea cannot be over-emphasized: one out of every ten children born in developing countries dies from the effects of diarrhea before reaching the age of five. That ORT can significantly reduce the mortality rate — some estimate up to 70% — is a major breakthrough for primary health care.

Oral rehydration is the quintessential example of how excellent laboratory investigation, well-conducted clinical studies, and careful field observation can lead to the development of appropriate, effective therapy. The lesson of this experience should not be lost; the strong support of basic science for the development of clinical trials, for clinical application, and for multidisciplinary field investigation involving such fields as anthropology, sociology, and economics is necessary for further advancements in health care.

Many of the papers presented at the conference demonstrated the effectiveness of ORT. Participants agreed on the best formula for ORT in terms of electrolyte content and in the need for an international commitment to the expanded use and implementation of ORT.

Conference participants described the problems they had encountered in implementing oral therapy programs. These problems suggested the need for further research. Possible areas of investigation include (1) improving the solution through the addition of glycine, other amino acids, or cereal based substrates; (2) developing methods for teaching ORT; and (3) investigating better methods of program evaluation. Innovative approaches to informing the public about the use and benefits of oral therapy were also discussed.

The sharing of experience and the pooling of information were among the most valuable outcomes of the ICORT program. Conference participants came to recognize that problems are shared among many different programs and nations, and that informal dialogue, such as that at ICORT, provides information about alternative approaches. Participants exchanged ideas and addresses, pledging to keep each other abreast of their ORT research and implementation efforts.

The co-sponsorship of the forum by many organizations was also a positive aspect of ICORT, for it indicates that a multiplicity of organizations are committed to ORT. The ICORT conference closed with a strong call for action, to attain in the next ten years near universal availability of oral rehydration therapy. The consequence of this would be a clear reduction in mortality secondary to diarrheal diseases.

*Note:* In reviewing the papers, the editors have tried to develop a consistent style and have used a common set of abbreviations and terms to make the proceedings as readable as possible. We have always tried to maintain the substance and meaning of every paper. A number were translated into English, and it is possible that the exact spirit and meaning may have been somewhat lost in translation. Any errors in the papers themselves are the responsibility of the editors.

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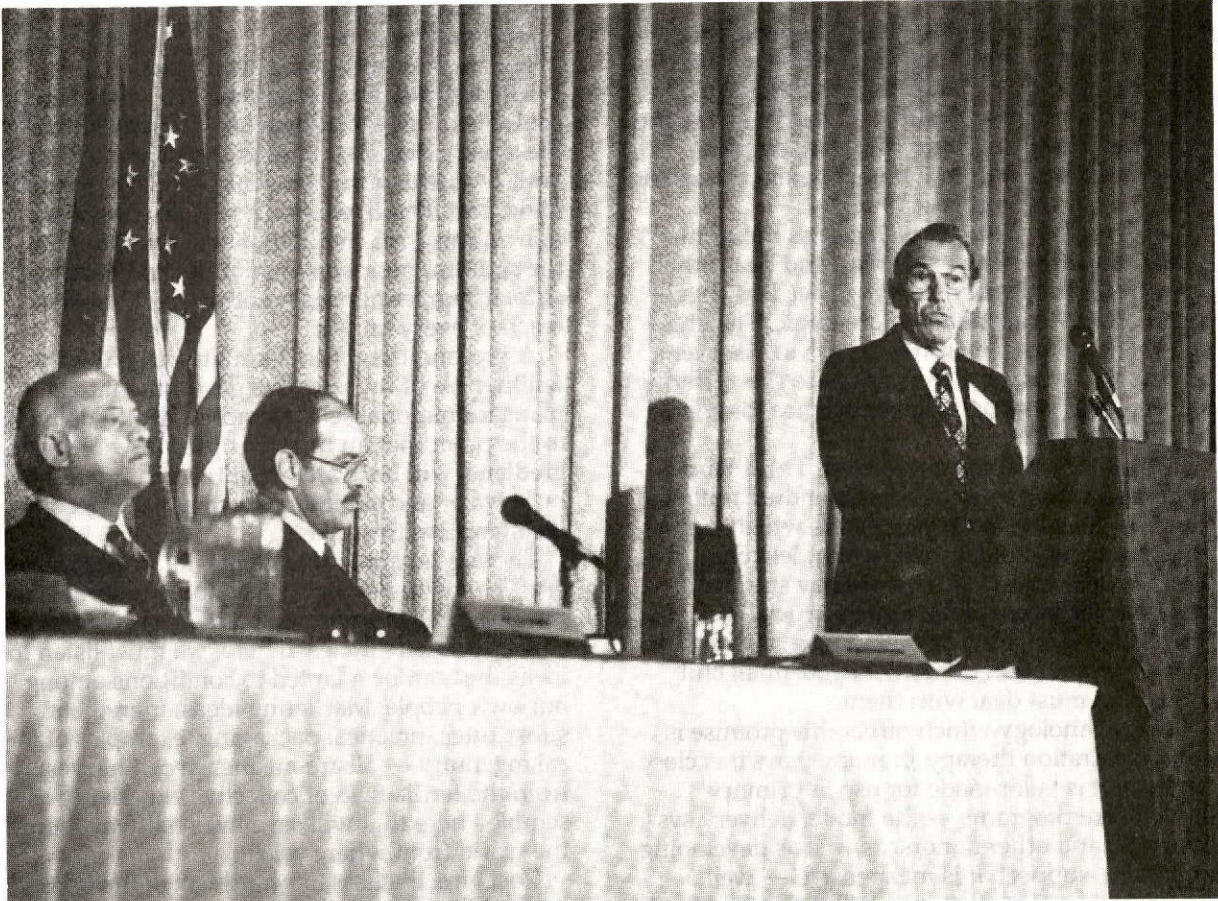
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## SESSION ONE

### *Inaugural Session*

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*Opening Session (L to R): Mr. A. A. Muhith, Minister of Finance and Planning, Bangladesh; Mr. M. Peter McPherson, Administrator, Agency for International Development, USA; Dr. H. Mahler, Director General, World Health Organization*

The International Conference on Oral Rehydration Therapy opened with top governmental officials and heads of the major international health organizations calling for a commitment to increasing access to oral rehydration therapy. That such individuals chose to address the conference is itself a statement of the importance of oral rehydration therapy. Agency for International Development Administrator M. Peter McPherson, Vice President George Bush, Health and Human Services Secretary Margaret Heckler, and International Center for Diarrhoeal Disease Research, Bangladesh, Director William Greenough welcomed conference participants. World Health Organization Director General Halfdan Mahler and UNICEF Executive Director James Grant described the promise of ORT for effective control of diarrheal diseases and the protection and survival of children.

## INAUGURAL SESSION

*Chairperson: MR. M. PETER McPHERSON  
Administrator  
Agency for International Development  
Washington, D.C.*

Welcome to the International Conference on Oral Rehydration Therapy. It is an honor for me to officially open this conference of distinguished scientists and officials from throughout the world.

In the next seventy-six hours, eighty-one persons from thirty-one countries will lead us toward the goal of applying a simple and effective technology to one of the scourges of mankind which is holding tenaciously to societies in the developing countries of the world.

Even though we differ culturally, linguistically, and politically, together we represent a formida-

ble pool of knowledge and experience. Despite our differences, we are a unified group of anxious and concerned men and women who know that, somehow, a remarkable advance in modern medical science is falling far short of its potential to save the lives of literally millions of children in the developing world — children who fall victim to diarrhea each year.

We will be told that this tragedy need not occur, but the toll continues. We will be reassured that the technology exists today which can be used at the primary health care level — even the household level — to save the lives of one-quarter of the children who die before the age of five, but the toll continues.

It is precisely because we possess the technology to alleviate the suffering and death that the grim statistics of diarrhea in the less developed countries are all the more tragic. The challenge laid before this conference is to discover a means to transfer the technology to the suffering or, as someone said, “take the science to where the diarrhea is.”

The statistics are grim, indeed. Third World children suffer more than five hundred million bouts of diarrhea each year, bouts which aggravate malnourishment, cost health delivery systems large portions of their already strained budgets, afflict small bodies at a crucial time in physical and cognitive development, and debilitate the population of mothers and small children who must deal with them.

The technology which offers this promise is oral rehydration therapy. In many ways it is close to ideal. It is tailor-made for use in primary health care programs — the model delivery system AID and other donors, as well as developing countries, support. It is inexpensive — well within reason for most poor villagers and health budgets of developing countries. It is easily administered by village health workers and parents alike. It is a broad-spectrum treatment for dehydration regardless of the type of infection and regardless of the age of the patient. There are no exotic ingredients. An effective formula can be made from ingredients found in the kitchens of village households. No sophisticated equipment is required to administer it. And persons who administer it need only minimal training. Whether it will reach the millions of children who will depend on it depends, to a great extent, on us.

We have at hand the means to reduce significantly the incidence of dehydration death in the case of cholera — that dread and ancient horseman that is still with us — and in the more persistent, death-dealing endemic diarrhea that is part of daily living in less developed countries. We have caused mortality rates to plummet in the West, largely through the use of intravenous replacement. In New York, in the first year of this century, 5,600 children died in their first year as

a result of diarrhea. Sixty years later, only half a hundred died in New York, but 3,400 perished in Punjab.

The fact that we have the knowledge to prevent the dying gives to this conference a sense of urgency.

What are the barriers to global delivery of oral rehydration therapy?

Cost and commitment.

Let me first say a word about cost.

The formula for the oral rehydration solution contains relatively inexpensive ingredients, but the sheer numbers required, plus the packaging and/or instruction that ensures quality control, make cost effectiveness a necessary consideration. Wanted is a method of delivery that puts the sodium, potassium, chloride, and bicarbonate, in proper portions, within the financial reach of every family.

A precondition of that ambitious goal is the willingness of that family's government to lay plans for national self-reliance in health delivery to the point that an uninterrupted flow of the ingredients will be available until such time as pure water and sanitation decrease the need for the symptom treatment.

There is no applicable global method of delivery. The treatment must be adapted to local conditions, local environment, and local custom.

As we listen and learn here, we must listen for ideas that can be adapted to conditions among our own people. Marketing ideas, ingredient substitutes, practical packaging, examples of local ingenuity — all are means we can harvest from the fertile field of collective experience assembled here that will save lives halfway around the world from where we sit.

Cost effectiveness is a hard fact of life and death. Never mind that the consideration of cost should be irrelevant to preserving life — it is relevant to the child who is now dying because we have not yet fully developed a cost-effective way to deliver oral rehydration therapy to his or her village. Surely that is part of the sense of urgency that hangs over this conference.

The second barrier to more widespread use of oral rehydration therapy is commitment.

Commitment, I believe, will follow communication — true communication that will convince governments in less developed countries of the humanitarian and practical dictates of the oral rehydration therapy program, and communication that will persuade the mother in the remote village that the treatment will save her child discomfort, illness, even life itself.

It is ironic that, in this age of communication, we should have a problem with communicating. Live video flashes instantly across the world. Many of us here, when we return to our various offices, will be able to direct-dial our colleagues around the world. Typesetting and printing are done by computer.

But communication demands more than hardware — it demands the software of listening and understanding. "I hear you," in modern slang doesn't just mean the registering of sound waves — it means "I understand — I know where you're coming from — I've been there."

It is up to us to do this kind of communicating.

There are those present who have to convince their governments to greater commitment. There are those present who have to communicate their own dedication to their neighbors. Some of us need the communication of this conference to rekindle our enthusiasm for the cause of world health, whether that cause be based on economics, self-interest, sympathy, or downright old-fashioned, do-gooder instincts.

We have to reach *under* suspicion and *over* distrust. We want to reach beyond political and cultural differences and around language barriers. We want to reach into the circles where the mothers live and communicate the knowledge we have that can save their children from debilitation and death.

Programs to educate lay people to deliver emergency health care have been successful in varying degrees. Artificial respiration, CPR, the Heimlich Maneuver — these campaigns save lives every day in the West. But still people die because no one is around with the knowledge when it is needed.

Communication with the poor and isolated is a thousand times more difficult, and they are the audience for the oral rehydration therapy message. So, we hope for much, but we expect less, and we know that every percentage decrease in the Third World infant mortality rate is a small victory.

We all mourn alike for lost children; some of us have seen their dying; each of us can bring to the challenge before this conference a unique outlook.

Perhaps, from your particular angle of vision, you will spot something the rest of us cannot see. An idea, a solution, an approach we have not yet tried.

I know you will learn fact and method, history and procedure, alternatives and evaluation, in the course of this conference. I hope we can also provide a climate for inspiration and an atmosphere in which dedication can thrive.

The ingredients for such a meeting of minds and purpose are here.

I know you will make the most of it.

## WELCOMING REMARKS

GEORGE BUSH

*Vice President of the United States*  
Washington, D.C.

I am very pleased to be able to be with you on this first day of the International Conference on Oral Rehydration Therapy.

It is devastating to realize that five million children die every year from dehydration. Even as we talk today, the number grows: nearly six hundred every hour. This leading cause of infant and child mortality around the world cannot be ignored.

The situation is particularly distressing since we know that a very simple technique, oral rehydration therapy, offers the world a solution to this critical health problem. The simplicity of the technique is its magic. By just mixing sugar, water, and salts, parents in the most remote corners of the world can prevent the death of their children from dehydration.

Yet this simple and affordable live-saving technique is not yet available and accessible to all of the children for whom it could mean the difference between life and death. The task of finding ways to broaden the use of oral rehydration therapy — to which so many of you are dedicating the days and months ahead — is a vital one.

For most of history, parents have brought their children into the world expecting that some of them would die from uncontrolled childhood diseases. Our grandparents and their peers raised families with this fear. Today, in America, the chances that one's children will die from such diseases are very low. Yet we are not satisfied. For all of the world's children should be born with strong chances of living full and productive lives.

This Administration, through the Agency for International Development, our host today, and through its sister organizations, under the Department of Health and Human Services, is committed to the broad and full application of oral rehydration therapy.

America is proud of its role in supporting the International Center for Diarrheal Disease Research in Bangladesh which brought this therapy into existence. We are committed to working with UNICEF and the World Health Organization to bring oral rehydration therapy to everyone's attention.



A medical breakthrough has been achieved, yet much remains to be done. The task of finding ways to make this breakthrough available for every child in the world is a challenge I am confident this conference can begin to meet.

As a world we are very close to making this the century of good health for children. Your dedication and perseverance can make an important difference.

On behalf of the children of the world, I wish you the best and look forward to your success.

## WELCOMING REMARKS

THE HONORABLE MARGARET M. HECKLER  
*Secretary of Health and Human Services*  
Washington, D.C.

It gives me special pleasure, on behalf of my department and my government, to welcome all of you to this international conference. We are here on what sounds like an esoteric mission: to discuss the remarkable potential of "oral rehydration therapy" and its importance to the health of infants and children throughout the world.

But the words "oral rehydration therapy" shouldn't, for a single minute, confuse or confound laymen. For those three scientific-sounding words mean nothing less than *life* for millions of the world's children.

We come here to celebrate and to dedicate:

—to celebrate the scientific advances of recent years that give new hope for millions of children every year;

—and to dedicate ourselves to making that hope a reality.

The significance of the problem we address is beyond doubt. More than 500 million episodes of diarrhea afflict infants in developing countries each year. And each year, some *five million children lose their lives to these diseases.*

In Europe, and North America as well, diarrhea is the sixth most common cause of death among small children. For children in the United States, acute diarrheal diseases account for 15% to 20% of all acute illnesses and 7% of all hospital admissions. This is a problem that faces all of us. There may be regional variations in occurrence and seriousness, but the problem of diarrheal diseases is one that all our countries share.

This subject is the focal point of an extraordinary chapter in the history of science and public health. It's a story that is not widely enough known or understood. It bears telling and retelling. It is especially instructive for those of us who are interested in the application of science to the problems of mankind.

This story begins with cholera. It involves the splendid, painstaking work that many of you have done in so many different parts of the world. And it leads to the development of oral

rehydration therapy and its application to the broader problems or other diarrheal diseases.

The end of this story is still to be written. But with this conference, and with the dedication that I know all of you bring, there is every reason to believe that the final chapter will live up to our highest hopes.

The story can be picked up at the turn of the century, when mortality due to cholera was a horrendous 60%. Then, two scientists — one in Calcutta and the other in Manila — developed methods of intravenous therapy that reduced mortality dramatically to 20%.

Treatment of the disease remained relatively unchanged until the middle of the century, when work in Egypt and Asia produced a more refined understanding of the fluid loss in cholera and changed the methods of intravenous therapy. This further reduced mortality for cholera to less than 1%.

In 1959 came the crucial discovery in India of the cholera agent which acts directly on the small intestine and causes the deadly losses of fluid. And in 1962, scientists in Manila established the crucial role of oral glucose in the absorption of sodium and water.

The use of oral rehydration therapy on a large scale was demonstrated in Dhaka and Calcutta in the later 1960s, when hundreds of cases of cholera were managed under field conditions during a rural epidemic.

And then, in 1971, confronted by a massive epidemic during a refugee crisis, the Johns Hopkins group in Calcutta treated 3,700 patients over a period of eight weeks in a make-shift hospital using intravenous and oral rehydration. Their work kept the mortality rate at only 1%. Theirs was one of the first large-scale uses of prepackaged materials for oral hydration. And the cost of materials in making up 50,000 liters of fluid was only about \$750. This clearly represented a breakthrough in the potential for treatment.

Finally, in this short list, there were the findings that bridged the work between cholera and the other diarrheal diseases. And in terms of the number of people involved, these are much more important than cholera.

There was the critical discovery in the early 1970s in Dhaka and Calcutta that noncholera diarrheal diseases could also be treated with the oral rehydration therapy developed for cholera.

And finally, there were the observations that diarrhea is a serious contributor to malnutrition in small children and that oral rehydration can play an important role in this most basic problem.

The impact of these findings was underscored by an editorial in the respected British journal, *Lancet*, in 1978. *Lancet* stated that the discovery of the role of glucose in accelerating the absorption of salt and water was potentially the most impor-

tant medical advance in this century.

During these years of research progress, a strong coalition of interest was forged between the governments and scientists of many nations as well as the international organizations. I am proud that the United States played an important role in that process.

The key decision-makers in the United States — in both foreign assistance and biomedical science — did not waver in their belief in the scientific and humanitarian value of continued and intense research on the problem of cholera and other diarrheal diseases. That clear vision has been fully justified: our investments in research on the cholera problem, which were made even though *that* disease had not crossed our domestic shores for decades, paid off with dramatic results.

This resulted not only in the saving of tens of thousands of lives from treatment of cholera — it also brought the still-expanding benefits that flow from prevention and treatment of other diarrheal diseases. In addition, it continues to deepen our understanding of fundamental biological mechanisms.

WHO, UNICEF, AID, and other agencies are playing an extremely important part in applying and extending these findings, including how oral rehydration therapy can best be incorporated into broader health services, and, fully as important, how to prevent diarrheal diseases from occurring.

In closing, let me return to history for a moment. We are told that one of the great turning points in this field came when cholera erupted and spread from India into Europe and North America. The spreading of that plague ended the isolation of the West from that dreadful disease. Another turning point was the entry of modern biomedical science into research on the cholera problem, followed by the extension of treatments to other diarrheal diseases.

Let me suggest that our presence here today marks a third historic turning point: the broad application of the findings of science in this field to the public health. Science has given us a detailed understanding of the diarrheal diseases and an important new tool to deal with them. That tool has a special value, because it can be put in the hands not only of health workers, but also of families and communities the world over.

Our task is to be sure we understand how to use it, to adapt its use to the needs and resources of local populations, and, ultimately, to see that it has worldwide application.

There remain important questions for our scientists to address. But we have already traveled a long, uphill road and can look back with satisfaction and pride to see how far we have already come. The next turn of history will judge us by how well we have used our ever-increasing knowledge for the benefit of children all around

the world.

I wish you every success in this conference. My government and I will be at your side in the job still to be done when this conference is finished.

## WELCOMING REMARKS

DR. WILLIAM B. GREENOUGH III  
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On behalf of the ICDDR,B I would like to welcome you to the International Conference on Oral Rehydration Therapy. The story of oral rehydration therapy is the best example I know of what can happen when science is applied to a major health problem, a problem which, in this case, was long neglected because it affected individuals devoid of a political constituency — mainly children in developing countries.

Health is very much determined by where and how one lives. Diseases have a particular context which cannot be understood unless research is done at the locality where diseases take their toll. The discovery of ORT resulted from scientists, with up-to-date technical knowledge of the biomedical sciences, studying diarrhea patients over prolonged periods where such illnesses were common. For the discovery to be possible, an institutional setting was required where scientists from many countries and many disciplines could sustain the research thrust against diarrheal diseases. The establishment of the Cholera Research Laboratory in Dhaka, Bangladesh provided this setting. The results of this research have thus far been very promising. But even though ORT represents a major accomplishment, the job of controlling diarrheal diseases has only begun. ORT is continuing to evolve: we now know, for example, that home solutions made from rice and perhaps other cereals will improve ORT and will make the therapy even more accessible to poor people in their homes.

The process of alleviating health problems in special geographic settings is not unlike the process required by agricultural research. Sustained research on crops, research which has relied on current technology and has been undertaken by institutions located where crops are grown and adapted, directly benefitted food-poor areas. The first use of such an approach in the health field, in the form of the Cholera Research Laboratory/ICDDR,B, has now borne fruit and indicates that an approach to health problems similar to what helped to produce the "green revolution" may be overdue.

In the last twenty years, I have spent equal time in two countries, the United States and Bangladesh. I am happy that these two countries

recognized the need for and decided to promote sustained health research by creating and supporting first the Cholera Research Laboratory and then the ICDDR,B. Both countries can take pride in the results of this ongoing effort, which has given birth to ORT and to many other advances in knowledge about diarrhea. Many of you have been in Dhaka, and I hope more of you will work with the Centre.

I also would like to recognize the role of my home institution, Johns Hopkins University, which has permitted a focus on diarrheal illnesses that has allowed faculty to work on the problem for prolonged periods where the problems exist.

One of the Centre's distinguished alumni, Dr. Jon Rohde, coined the phrase, "Taking science to where the diarrhea is." I believe that the story of oral rehydration therapy underlines the importance of this concept and the necessary partnership that must exist between scientists and health researchers from many countries, developed and developing.

## ADDRESS

DR. HALFDAN MAHLER  
*Director-General*  
*World Health Organization*  
Geneva, Switzerland

It is commonplace to state that disease knows no boundaries. Well, diarrheal disease does. In the developed countries it has become a mere sporadic nuisance, mainly due to mishandling of food in the course of mass catering. But in the developing countries it remains a major public health problem, particularly in infants. It is a symbol of underdevelopment and a prominent factor in the poverty equilibrium. By that I mean the pernicious combination of unemployment and underemployment, the scarcity of material goods, low level of education, primitive housing, poor sanitation, malnutrition, affliction by disease, and social apathy.

The lasting answer to that poverty equilibrium lies in the genuine human development of the people trapped in it. I am referring to the process of social and economic development that leads to increased productivity and is accompanied by adequate nutrition for every member of the family, including not only infants and children, but also pregnant and lactating mothers, with breastfeeding as the acceptable pattern. Social and economic development of this nature also implies better housing, better hygiene around the home, enough clean water to make the home decent to live in, safe drinking water and excreta disposal facilities for every family, as well as a decent level of community hygiene,

waste disposal, and the control of flies. I will not bore you with a dissertation on how health both contributes to social and economic development of this nature and is, in turn, enhanced by that development. We have demonstrated on many occasions, not the least at the renowned International Conference on Primary Health Care in Alma Ata, that health and socioeconomic development go hand in hand.

I humbly submit that, if the developing countries could succeed in extricating themselves from the poverty equilibrium, the developed countries would gain as much as them. Charity creates dependency; lasting charity creates lasting dependency. If the developed countries continue to give alms, they will be confronted by beggars forever. As long as the developing countries remain enslaved in the chains of poverty and disease, the developed countries will remain enslaved with them in a Gordian knot of highly wasteful donor and recipient relationships. But if they provide enlightened support — and by that I mean support that fosters the initiatives of the developing countries themselves to build up their own economies and ensure their own social progress — if they do that, there is hope that in the not too distant future the developing countries will move forward on their own with a minimum of external assistance and a maximum of mutually beneficial cooperation.

But to succeed in doing that, their people must have a reasonable level of health. Social and economic progress cannot take place when masses of infants die from diarrhea — four to five million a year in the developing countries, or, in other words, one death every five to ten seconds. Social and economic progress cannot take place when children are too enfeebled by malnutrition and disease to derive the full benefit of school education. Social and economic progress cannot take place when adults are so riddled with disease that they are too weak to realize their economic and intellectual capacities, and when they cling to the tenuous security of producing more children so that some will survive and sustain them in their old age — alas, only to repeat, in turn, the old vicious circle. High birth rates and high infant mortality rates resulting from diarrhea, acute respiratory infections, and other killing infectious diseases are surely an extremely primitive and inefficient way of arriving at a so-called demographic balance. I say "so-called," because a state of affairs that saps human energy and leads to further impoverishment and dependency can hardly be called a balance. So all who are interested in the demographic future of this world must surely devote their energies to changing the indecent state of affairs I have just described.

How could that state of affairs be changed? I repeat my conviction that the developing coun-

tries could start breaking out of the poverty equilibrium through improvements in the health of their people at a cost they could afford, if they received appropriate support from the international community. And I repeat my conviction that it is in the enlightened self-interest of the developed countries to help the developing countries to do so and thus start to move along the road to genuine economic independence. You may well ask, could such potential self-interest be aroused in these times of economic recession? I submit that it is precisely in times like this that support leading to greater economic independence of the developing countries is most needed on both sides and, therefore, most enlightened.

Yes, there is much talk these days about the world economic recession, including talk at the highest levels. The truth of the matter is that the vast majority of people in the less-developed countries suffered from underdevelopment, even when the affluent countries were at the height of their economic growth. But at the same time, there can be no denying that the developing countries have become the *innocent* victims of the negative economic fallout of the affluent countries. This has made it even more difficult for them to organize their health systems along the lines they agreed to when they adopted the policy of "Health for All By the Year 2000" — unanimously — together with the developed countries; and when they did so on the basis of the principles enshrined in the Declaration of Alma Ata; and when they adopted — unanimously — developing and developed countries alike — a Global Strategy for attaining the goal of "Health for All."

What does the "Strategy for Health for All" consist of? Well, among its main thrusts are the development *by country* of national health infrastructures, starting with primary health care, for the delivery of countrywide programs that reach the whole population, and including referral-level support. The essential elements of primary health care remain as they were defined at Alma Ata. I shall not repeat them here as such, but I should like to point out how most of them relate closely to the issues we are discussing at this conference. I shall start with the first element — public education on health matters. This is the key to one of the main pillars of the kind of health system advocated in the Strategy for Health for All, and that is individual and community involvement and responsibility. Let us look at that in relation to the control of diarrheal diseases. It implies, first of all, that communities should understand what causes these diseases. I am not referring to the names of the microorganisms involved. I am referring to the environmental and socioeconomic conditions. Armed with this knowledge, they will be in a better position to know how to deal with these

causative factors and will be better motivated to do so.

Proper nutrition is the second in the list of essential elements of primary health care and is highly relevant to the control of diarrhea, particularly as part of maternal and child care. Equally relevant are safe water and basic sanitation. Immunization against the major infectious diseases strengthens the resistance of the child's body to toxic intestinal invaders. The prevention, control, and treatment of locally endemic and other common diseases are certainly of relevance wherever diarrhea is a public health problem, and the provision of essential drugs is, of course, crucial for ensuring the availability of oral rehydration salts. So the prevention, control, and treatment of diarrheal diseases are intrinsic parts of many elements of primary health care, and, in consequence, the control of diarrhea is an admirable rallying point for the development of primary health care in general.

Another pillar of the Strategy for Health for All is multisectoral action. With regard to diarrheal disease control, I will mention only by way of example the combined action of the health sector and such other sectors as those for rural development, agricultural development, water resource development, periurban development, and education.

Yet a third pillar is the use of appropriate technology, and by that I mean technology that is scientifically sound, that is acceptable to those on whom it is used and to those using it, and that can be afforded by the people concerned. Regarding appropriate technology for the control of diarrheal diseases, I have already referred to the various environmental, economic, social, and educational measures that in the long run could reduce the problem in developing countries to as minor a one as it is in developed countries.

Treatment technology has undergone a breakthrough in recent years with the advent of oral rehydration therapy, and I take this opportunity of paying homage to those who developed this unusually simple, yet very highly effective, therapy. If used correctly, it can reduce the diarrheal death rate in infants by more than 50%. So it certainly does qualify as an outstanding lifesaver. Because it is so dramatically effective in preventing infant deaths and reducing the intensity of their diarrhea attacks and thus has nutritional benefits that are important for the long-term growth and development of the child, it could be a very useful entry point for convincing parents of the importance of all the other elements of primary health care that are relevant to the control of diarrheal diseases and to their health situation in general. It could also be a useful entry point for convincing communities as a whole of the importance for them of assuming greater responsibility for their health and taking

the necessary action in all the sectors concerned.

I hope I have been able to convince you that a combination of social action, infrastructural development, and the use of appropriate technology is needed for effective control of diarrheal diseases. And in mentioning infrastructural development, I would like to emphasize in particular the training of health workers, not only to be able to apply the measures required to control diarrheal diseases, but also to be able to influence individuals, families, and, indeed, whole communities to adopt the longer-term measures required for the ultimate control of this group of diseases, and to guide them in the best ways of doing so.

I have dwelt at some length on the *proper* place of oral rehydration therapy in any scheme for diarrheal disease control through the pursuit of a broader strategy for health development that forms part of socioeconomic development. I have done so because I would not like to leave you with any illusions. Neither the international distribution of packets of oral rehydration salts nor its production in developing countries will, by themselves, have any effect on diarrheal disease control; just as I have never seen any proof that the mere distribution of packets of condoms had any effect, by itself, on population control, in spite of beliefs to the contrary that were held in many circles not so long ago.

Moreover, even if potentially available measures are sufficient for preventing, controlling, and treating a great deal of diarrheal disease if only they are properly applied, research must continue to ensure that they *are* properly applied. I mean by that operational research in countries by countries to make the most of what is available or potentially available. Other kinds of research are required to develop better measures, for example, to improve oral rehydration therapy in two different ways. One of these is the search for simpler rehydration solutions that can easily be prepared in any home, and the other is the search for more efficient rehydration solutions, such as through glycine fortification. If the findings of that kind of research are just around the corner, I am afraid the development of effective vaccines and drugs against the common microorganisms involved will take much longer. And even when they have been developed, they will only be widely useful if adequate health infrastructures for using them are developed at the same time, and if these include a proper logistic system and the suitable training of primary health care workers.

Let me conclude by saying that the collective policies for attaining an acceptable level of health for all through primary health care have been well defined and agreed to by almost every country in the world. They apply to diarrheal disease control no less than to other health problems. I

am afraid there are no magic shortcuts other than the application of these policies by all concerned — first and foremost by developing countries themselves. But they also have to be applied by their international partners — by bilateral agencies like the United States Agency for International Development, by the World Bank, the World Health Organization, by United Nations bodies like the United Nations Children's Fund, the United Nations Development Programme, the United Nations Fund for Population Activities, and the United Nations Environmental Programme. Yes, UNFPA, too, should grasp the long-term demographic implications, and UNEP should see the opportunities for down-to-earth — literally down-to-earth — environmental improvement.

I submit that all these national and international bodies could best use their resources to help countries to help themselves through the adoption by them of measures that are appropriate for them, as defined by them, and that will contribute to their genuine socioeconomic development. After all, it is the countries of the world that decided collectively in WHO to pursue the Global Strategy for Health for All. I have called that strategy a social contract for health. As signatories to this contract, it is the countries of the world that have the responsibility for carrying it out in the way they decided collectively.

## **THE ORT OPPORTUNITY: PUTTING CHILDREN AT THE FOREFRONT OF ACCELERATED PRIMARY HEALTH CARE**

MR. JAMES P. GRANT

*Executive Director*

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New York, New York

Less than six months ago, the Secretary-General of the United Nations declared:

Innovative and cost-effective action [can] demonstrate that even in times of acute financial strain for social services and international cooperation, it is possible for the world to take imaginative steps to heal some of the most tragic wounds of underdevelopment and poverty. I appeal to national leaders, to communicators, to health care workers and to concerned institutions and individuals to support [such efforts].

Assembled here today from many countries are representatives of national leaders, communicators, health care workers, and concerned institutions and individuals to discuss what is possibly the most important of the imaginative steps referred to by the Secretary-

General. I am very pleased that the Government of the United States has taken this initiative to advance the understanding and application of oral rehydration therapy, and I am especially pleased that the United Nations Children's Fund and the World Health Organization, on behalf of the United Nations system, have joined with the International Center for Diarrhoeal Disease Research, Bangladesh, as co-sponsors of this conference with the United States Agency for International Development. This international conference, of course, stands as but the latest example of the historic support provided by the United States Government in the battle against diarrheal diseases — a battle in which the Agency for International Development has been a valiant ally with ICDDR,B, WHO, UNICEF, the United Nations Development Program, the World Bank, and many other organizations and institutions — as well as governments — which are represented here this week.

### **Children in growing peril**

We meet here in Washington as children around the world — humanity's most precious asset — face increasing peril after several decades of slow but significant improvement in their well-being, symbolized by the unprecedented near-halving of infant mortality rates in low-income countries over recent decades. The worst economic setbacks since the 1930s do not augur well for the hundreds of millions of children already trapped in the day-to-day silent emergency resulting from the conjunction of extreme poverty and underdevelopment which contributes so greatly to the death and disability toll which each afflict more than 40,000 small children every day.

Economic depression has had three major impacts on children. Disposable family incomes fall sharply, with disproportionately severe consequences for poor people and their children. Government budgets for social services — particularly those affecting young children, including nutrition, health, and education — are often the first to be cut back. And national and international levels of development assistance stagnate as a consequence of the restrictive budgetary policies adopted by industrialized countries. All this continued through the past year, with some variations between and within regions, although, generally, the poorer the region, the more severe the impact of these forces.

Despite the welcome first signs of an economic recovery appearing in the United States, most indications are that the worldwide recovery may be relatively shallow in the mid-1980s and that significant beneficial impacts on many low-income countries and families will be long delayed. It is now clear that, in the absence of special measures to accelerate health progress signifi-

cantly, millions more children and mothers in low-income areas are likely to die in the decade ahead than was thought likely at the start of the 1980s.

Unfortunately, *special action to protect the situation of children and poorer families trapped in urgent silent emergencies has generally remained the exception, rather than the rule. The world community must change that rule*, just as it has changed the rule over the past thirty-five years with respect to disaster. The positive world responses to the "loud emergencies" in recent years in Lebanon, Kampuchea (Cambodia), and the African Sahel are a far cry from the "turning away" responses to such earlier disasters as the Bengal famine in 1943 and the famine in Ireland one century earlier in which millions died.

Perhaps the only happy note in these dark times which impact so severely on children is that the restrictions imposed by the world recession have stimulated the search in several countries and among many international and national development assistance institutions for innovative solutions and for more cost-effective use of resources.

This meeting on promoting oral rehydration therapy is a concrete reminder that the key to our effectiveness in improving the condition of children in these dismal circumstances, when we are prudently urged to accept that the financial resources available to us are limited in amount, is a refusal to accept a limitation upon what we can achieve with those resources.

### **New hope in dark times**

It was with this thought in mind — how to achieve much more from just a bit more — that in late September, 1982, UNICEF invited a group of experts drawn from international agencies (WHO, the World Bank, WFC, FAO, USAID, UNU, IFPRI) and nongovernmental groups involved in improving the lives of children to meet at our New York headquarters. We examined the experience of national and international efforts to improve nutrition and primary health care in many countries, particularly measures intended to reduce the high infant and child mortality rates which characterize so many poor communities.

We saw that the increasing attention to community-based services and primary health care in the past ten years was the correct approach, and particularly so in this era of limited financial resources. Very importantly, we recognized that there are elements of the primary health care strategy — including oral rehydration therapy — which are particularly ripe for an extra thrust at this time and which, properly managed, could contribute greatly to converting from rhetoric to reality the year 2000 goal of "health for all" as it applies to children. We saw that the potential of

PHC could be enhanced and accelerated by combining recent developments in the social and biological sciences in several related fields. To do so would provide a new opportunity for bringing about a major change in the health and nutritional situation of hundreds of millions of children which is economically feasible and can be achieved in a relatively short span of years, even in a period of economic duress. In short, we saw the potential for a health "revolution" in many countries of Asia, Africa, and Latin America that is as momentous for children in the decade ahead as was the Green Revolution for increasing grain production in many countries of Asia in the decade from the late 1960s.

We realized that the "state of the art" in several critically important problem areas is really quite advanced. The key *technical* ingredients needed for a concerted campaign to reduce both child mortality and morbidity are even less costly than most have thought. A serious commitment to the application of these cost-effective techniques by governments and people in the context of a primary health care strategy could so improve the health of millions of children that it would reduce disabilities and deaths among children in most developing countries (*each* now exceeding 40,000 daily) possibly by at least half before the end of this century — and in many countries, within a decade — as well as slowing population growth.

We drew in large part on the experience of earlier work supported by the WHO, the ICDDR,B, UNDP, and the World Bank and other multilateral institutions, bilateral assistance agencies (including, notably, USAID), and nongovernmental organizations, as well as UNICEF's own thirty-six years of field experience. Our attention focused increasingly (though not solely) on several basic problems responsible for the majority of all children's deaths and on four simple approaches which have become integral elements of the primary health care and basic services activities which many of us have been promoting for some time. These techniques in themselves cost very little; they are particularly suitable for tackling malnutrition-related infections and communicable diseases which take their heaviest toll among children; and they greatly increase the self-reliance capacities of low-income families. Special attention was also given to family spacing of births and food supplements which would also contribute significantly to improving the health of children and further reduce deaths, but these measures are either more difficult, as with birth spacing, or entail greater financial cost, as with food supplements.

None of these measures — growth surveillance, rehydration therapy, breastfeeding and better weaning, and universal immunization — is new. They have for many years been integral

parts of health care programs. In many ways, however, either the technology by which they are applied is recently enhanced, as with oral rehydration and more heat-stable vaccines for immunizations, or our appreciation of their value is newly strengthened, as with breastfeeding and growth surveillance.

Two additional factors which are distinctly new in recent years — and highly significant in terms of the potential use of these techniques for saving children's lives — are *an idea* and *a circumstance*.

The "*idea*" concerns primary health care with its emphasis on community participation, self-reliance, prevention, cost effectiveness, and use of paraprofessionals and appropriate technologies — the certification of its legitimacy and sensibility by the international community, as particularly articulated at Alma Ata in 1978, and its growing acceptance by health care professionals and government health authorities in most countries.

The "*circumstance*" is the increase in recent years in social organization and in the capacity to reach a far greater number of low-income people. This is exemplified not only by the multifold expansion of health clinics and the widescale training of health auxiliaries, but also by the tremendous growth in the number of private, religious, and governmentally sponsored organizations reaching low-income families, particularly those involving women; the increase in literacy, including notably young mothers; and the phenomenal spread of transistor radios and other communications media. This evolving network of social and administrative infrastructure, reaching right down to and involving the village level, provides countries with dramatic new potential for spreading knowledge of these approaches among the poorest in their societies, if national and international leaderships will give high priority to responding through all available channels to these new low-cost primary health care opportunities.

It is this three-way combination — *the improved techniques and technologies, the increased acceptance of the primary health care approach, and this new capacity of social organization for reaching low-income families* — which we believe could, if the world wanted it, save a high proportion of the children's lives now being disabled and lost and improve the health of hundreds of millions more.

This was the message which UNICEF incorporated in its third, and most important, annual State of the World's Children Report, "New Hope in Dark Times," which was released in mid-December and which prompted Secretary General Perez de Cuellar's appeal "to all men and women of goodwill."

### **Making "the possible" a reality**

This opportunity for accelerated progress for the protection and survival of children is possible if:

*If* governments embrace this opportunity for accelerating primary health care as national commitments implemented through national efforts, at the highest level in each country and commanding the participation and cooperation of all relevant government sectors;

*If* the international development cooperation community commits its efforts — as is represented by this Conference — to promoting appreciation of the opportunity and making available the resources to help countries to act;

*If* the campaign is joined in each country by a vast array of those media, institutions, organizations, and private enterprises which can provide or become the service delivery systems necessary to extend this opportunity to the poor and the remote;

*If* planners and implementers constantly remember that this opportunity for a Child Health Revolution will only succeed in the long term if it is integrated with other ongoing efforts so as to be self-sustaining over the years; and

*If* the ultimate essence of the endeavor is to make people more self-reliant to take care of themselves and their children and to be dependent not solely on medical care institutions or government bureaucracies for their health, but on resources and basic services in their own families and communities.

For the first "*If*," we have some good indications that more than a few developing country governments are moving toward implementing these opportunities for accelerating the use of the primary health care concept which they have all endorsed formally. As you can note in the booklets which we have available summarizing reactions to *The State of the World's Children, 1982-1983*, the endorsements and commendations from many presidents, prime ministers, kings, health and planning ministers, and other authorities from both developing and industrialized countries indicate promising support among national leaders. In a number of countries, the stage is already being set for the kind of broad national commitment — led by the chief of state of government, and integrating the roles of ministries of health, development planning, finance, education, communications, and others — which is absolutely essential in order to accomplish a significant early improvement in the health and survivability of children. The success of such an endeavor requires the mobilization and commitment of a wide variety of sectors in addition to the ministries of health. This means not simply "lip service," but a willingness to allocate resources and energies to achieving this goal. And that requires the involvement of a very wide organized spectrum which can only be gener-

ated by genuine political commitment at the highest possible level.

For the second "*If*," I think we see here on this podium a representative partnership of the necessary actors from the international development cooperation community. We see a bilateral aid agency — USAID — prepared to provide financial resources and to incorporate these ideas within its own program. We see a research facility — ICDDR,B — developing the specific technologies. We see a world professional authority — WHO — establishing the standards and proposing the policies. And we see a people-to-people cooperation agency — UNICEF — with a unique dual capacity to capture the imagination and support of the external world while it carries on its technical and financial support for services with the governments of developing countries and at the immediate community level.

I think we have seen that this team is in good working order and well on its way toward fulfilling its responsibilities. The statement by the President of the United States a few weeks ago, endorsing a range of the techniques now available to us, provides fairly convincing authorization to USAID. And I am aware that a Joint Resolution has just been introduced in the United States Congress to underscore further the American commitment. Moreover, the booklet which I mentioned on the state of the world's children includes the supportive statements of leaders from such other major developed countries as the United Kingdom, France, and Sweden. The ICDDR,B is pressing forward with its invaluable research work on oral rehydration therapy. The Joint Committee on Health Policy of the Executive Boards of WHO and UNICEF endorsed this program as a means of accelerating primary health care in these dark times, and this commitment was further affirmed by the World Health Assembly and the UNICEF Executive Board meetings last month.

I would particularly like to call your attention to a joint statement on "The Management of Diarrhoea and Use of Oral Rehydration Therapy" which has just been issued by WHO and UNICEF, which further illustrates the strong partnership between our two organizations in pursuing this opportunity.

For the third "*If*," the active involvement of the media and private organizations, we are also seeing signs of a significant response including some very creative concepts of what is possible and necessary. In this respect, UNICEF and others are attempting to enlist the active and organized support not only of the traditional nongovernmental partners in development assistance, but a broad array of other potential participants. You can see, again in the booklet, a sampling of the very enthusiastic response of the world's press. The opportunity for a children's



health revolution is one of the most widely reported international news stories — other than of war or violence — of recent decades. I believe this illustrates the potential that we have to capture genuinely the attention and support of the shapers of world public opinion and policy, as well as the imagination and involvement of the public itself. But to do so we must both dare to articulate effectively the opportunity and establish, through such measures as this conference, that the opportunity can be realized if adequately supported.

The role of religious organizations can also be particularly effective in providing the essential information and motivation as well as service delivery networks which reach the poorest and most remote communities. As an example, we are in the midst of a very positive dialogue with the Holy See, which has already cited the potential role which could be played by priests and nuns in tens of thousands of parishes around the world. As *L'Osservatore Romano* reported just last month (9 May 1983):

The Holy See gave its assurances that the entire Catholic aid network organized in the various countries of the world, and especially in the developing nations (a network which not only involves an enormous financial contribution, but above all a valuable disinterested gift of many human lives), will lend its maximum support to these important simple proposals to improve the health of hundreds of millions of children.

The role for a broad array of other national mass organizations, including women's groups, political parties, labor unions, youth movements, and service bodies (such as the Red Cross) is, of course, self-evident.

I am also hopeful that we will be able to involve the private sector more deeply in the very appropriate marketing and delivery role which it can play. Despite the fact that the essence of a technique like oral rehydration therapy is the low cost of its application and thus a low profit margin, there is every reason to believe that proper marketing can produce a considerable demand for the product. There are, after all, hundreds of millions of cases of diarrhea annually and tens of millions of families who would buy low-cost ORS packets if they were readily available. Hence, the marketing of an item like ORS by the private sector so that the packet is available in every village and urban slum, along with matches, batteries, and other low-cost consumer essentials, is not only a desperately needed public service, but potentially a profitable enterprise in its own right.

It is perhaps especially interesting to note that UNICEF is engaged in a dialogue with a number of companies with demonstrated marketing

skills on their potential involvement in advancing the understanding and availability of ORT as well as other major elements. We are establishing in New York a consultative group of transnational corporations, which I met with just the other day, to discuss the opportunities available to them and other companies to ally them in this cause.

The fourth "If," on the necessity of integrating such opportunities as oral rehydration therapy with other programs so that they are not just one-shot, short-lived campaigns, is important to remember because this is a prerequisite not only to their becoming self-sustaining, but also to their very successes in achieving universal coverage. Oral rehydration therapy will never be practiced by more than three-fourths of the families unless it is endorsed and used by the health care system; it is built into primary school and nonformal education programs; the packets are widely distributed commercially; etc. Furthermore, it is the integrated use of several programs together that provides the greatest synergistic potential — where the whole is greater than the sum of the parts, or "one plus one plus one equals not three, but five." Thus, the largest UNICEF-assisted oral rehydration program — in Indonesia — is associated with nutritional surveillance using growth charts, all of which is piggy-backed on a nationwide, village-based structure originally established with support from USAID to promote family planning, to which mass immunizations has just been added, with each activity advancing the success of the others.

The final "If," on making people more self-reliant, is, of course, the most important. The final "if" is people. This opportunity can only be realized if the people for whom it is intended understand how real it can be, want to make it real, and are *enabled* to make it real.

That is at once the essential ingredient, but also the result of mixing the other ingredients. A family or a community cannot be self-reliant unless that family or community has access to the resources which make self-reliance possible. The availability of ORS packets which mothers can buy at relatively low cost and prepare at home makes those mothers far more self-reliant than mothers dependent on intravenous treatment in an often remote and expensive medical facility; and those mothers who can make oral rehydration therapy from household ingredients are more self-reliant than those mothers who must depend on buying the packet. And, of course, a mother who breastfeeds her baby for at least several months, has access to safe water, knows enough to see to it that hands are washed, and therefore is able to avoid dehydration in the first place, is still more self-reliant.

It is in this that we reach the essence of our

struggle. After all, in specific terms we are not trying just to manage diarrhea, but to avert it. We are not trying just to provide techniques to restore health, but to protect health. And it must also be understood that we are not trying to make poor children healthier through increased dependence on welfare, but through increasing the *self-reliance* capability of their families. There is a difference in that. Self-reliance means, in our terms, to integrate all people within society and to commit the collective resources of that society to assuring that all its members are able to address their own needs while and by participating in that society and contributing to it.

If our ultimate accomplishment is anything less than that, we have dealt only with the symptom and not with the disease. The scientific breakthrough that made oral rehydration therapy possible is, to quote Britain's *Lancet*, "potentially the most important medical advance of this century." But it can be far more than a medical advance. Properly used, this low-cost cure for the killer of millions of children each year can, especially if used with other elements of the pri-

mary health care strategy which are ripe for an extra thrust at this time, be the opener — the key — to accelerating a broad range of primary health care activities. Taken together, these activities — including nutritional surveillance, oral rehydration, breastfeeding and better weaning practices, immunization, family spacing, food supplements, and health education — will contribute tremendously not only to the health of hundreds of millions of children, but to the increased self-reliance of untold millions of mothers and families.

The opportunity which we have is not without difficulty, nor can it be pursued independently of other activities. But it has captured the imagination and support of a very large world constituency and promises a significant impact not only on poor children themselves, but also on the overall context of the environment within which their futures and that of their families will be determined. That is not an opportunity which we can afford to neglect.

This is potentially a most important conference. UNICEF is pleased to be associated with it.

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SESSION TWO  
*Diarrheal Diseases —  
A World Problem*

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*Informal Discussion* (L to R): Dr. J. Azurin, Minister of Health, Philippines; Mrs. E. Sullesta, Coordinator of the National Task Force for the Control of Diarrheal Disease, Philippines; Dr. del Campo, Pediatrics Association, Philippines; Dr. John Briscoe, Assistant Professor, University of North Carolina, USA

This chapter, based on the second session of the conference, includes papers by Dr. Dhiman Barua, Mr. A. M. A. Muhith, Dr. Norbert Hirschhorn, and Dr. Michael Merson. Dr. Dhiman Barua traces the history of the development of intravenous fluid therapy and oral rehydration therapy from the 1830s, when the effect of the severe diarrhea of cholera on hemoconcentration was first recognized, through the many scientific observations that led to the demonstrations in the 1960s that oral rehydration therapy was effective, to the present recommendation that ORT be part of all primary health care activities.

Mr. A. M. A. Muhith examines "The Impor-

tance of Health and, More Specifically, of Diarrheal Diseases for the Economic and Social Development of the Developing Countries." Noting that diarrhea is a "scourge" which can be brought under control by the use of oral rehydration therapy, Muhith argues that the maintenance of nutrition after treatment depends upon such factors as agricultural production, sanitation, health education, etc. The process of development must be all-embracing if "Health for All By the Year 2000" is to be realized.

"Oral Rehydration Therapy: The Scientific and Technical Basis" is discussed by Dr. Norbert Hirschhorn. After describing the process by which ORT was developed, Hirschhorn explains

how oral rehydration therapy works to reduce mortality from diarrhea. ORT, Hirschhorn states, is two therapies, rehydration and continued feeding. A next step for ORT research is to find a formula for an enriched oral rehydration solution that will slow stool flow at the same time as it rehydrates the child.

In "The Practical Application of ORT," Dr. Michael Merson summarizes the findings of recent studies of oral rehydration therapy which have demonstrated the success of this treatment, the utility of sodium and potassium in the WHO-recommended formula for oral rehydration solution, and the results of the use of home-made sugar and salt solutions. He discusses the efficacy and safety of oral rehydration therapy. WHO's Control of Diarrhoeal Diseases Program is extensively discussed in terms of its objectives, strategies, and progress to date. The CDD program is clearly beginning to have a worldwide impact.

## INTRODUCTION TO SESSION TWO

DR. DHIMAN BARUA, *Consultant  
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All of us interested in oral rehydration therapy can learn many important lessons and find encouragement from the history of the evolution of intravenous fluid therapy. In an era when cholera was being treated with strong purgatives, emetics, and forced venesection, the idea of putting fluids into the veins was suggested by a chemist named Herman to his physician colleague Jechrichen in the Institute for Artificial Mineral Waters of Moscow in 1830. The first to examine the blood of cholera patients, Herman based his recommendation on his finding that blood loses its fluidity into the stools and vomiting. Despite Herman's important insight, however, Jechrichen's only patient died after receiving three ounces of fluid.

Shortly thereafter, in 1832, William O'Shoughnessy, an Irish physician, after careful examination of the blood and stools of cholera patients, described fairly accurately the essential chemical pathology of cholera and recommended the injection of warm water containing some oxygenized innocuous salts into the veins. By mid-May of that year, Dr. Thomas Latta of Scotland put O'Shoughnessy's recommendation into practice. As only five out of the fifteen cases treated survived, he had to face severe criticism; however, the *Lancet* upheld this outcome as a favorable result, as these five patients had been

saved from an almost certain death. Shortly thereafter, the cholera epidemic subsided, Latta died, and O'Shoughnessy transferred to India and became interested in other subjects. Though cholera pandemics continued to invade Europe and the USA during subsequent decades of that century and cholera became the greatest killer of all the bacterial diseases, none of the eminent scientists or physicians of those days gave any further consideration to intravenous fluid, but went on recommending purgatives, emetics, opium, brandy, tannic acid enemas, etc.

It was only during the last decade of the century that Sir Leonard Rogers, working in Calcutta, succeeded in gaining general acceptance for intravenous therapy for cholera and reduced the mortality rate by about 50%. Shortly thereafter, Dr. Sellard, working in the Philippines, demonstrated the advantage of adding bicarbonate to intravenous fluids. A rational therapy for cholera began in 1911-12, when Sir Leonard accepted the finding of Dr. Sellard and recognized the need to include potassium. But mortality still remained high.

Although there were many advocates of isotonic saline and some of hypotonic saline, Sir Leonard preferred to use hypertonic saline solutions. It was only in 1958, after careful studies by the U.S. Navy Medical Research Unit-2 (NAMRU-2) in Bangkok, that the use of isotonic saline became the rule for treatment of cholera. Thus, it took nearly 130 years for intravenous fluid therapy to become universally accepted as the most effective tool, even though the original observation was scientifically correct.

The history of the use of oral fluid as folk remedy for dehydration in diarrheal disease is probably as long as the history of this group of diseases itself. While the concept of oral rehydration is not new, its introduction as a scientific medicine is. In 1964, Captain R. A. Phillips (who was Director of NAMRU-2 in Egypt, NAMRU-3 in Taiwan and then of the Cholera Research Laboratory, now the International Centre for Diarrhoeal Disease Research, Bangladesh), a great scientist who contributed more towards understanding and solving the problem of cholera than any other scientist in recent times, published the initial observation that glucose mediated enteric absorption of sodium and water remain intact even in severe cholera, thus paving the way for establishment of the scientific basis of oral rehydration. Young scientists working in Dhaka and Calcutta shortly thereafter confirmed his findings and demonstrated the effectiveness of oral rehydration, first for the maintenance of rehydration in severe cholera cases after initial intravenous rehydration, and later for total management of mild and moderately severe cases of cholera and noncholeraic diarrhea in adults and children in hospitals.

The first papers on successes with this therapy were published in 1968; beginning in 1969, the World Health Organization made it a point to include the subject of oral rehydration in all its training courses and training documents and publications on cholera and acute diarrheas. Two important papers on oral rehydration therapy were published in the WHO *Bulletin* in 1970. Despite its definite advantages, numerous institutions were reluctant to adopt oral rehydration therapy, but WHO supported training courses succeeded in establishing oral rehydration as a routine practice in many institutions. WHO courses are continuing to serve this important function. The WHO *Public Health Paper* No. 40 on "Principles and Practices of Cholera Control," published in 1970, included a chapter on oral rehydration with the formulations used at that time. In a WHO seminar in 1972 the current formula, which is most suitable for the management of all diarrheas in all ages, was developed. The dramatic results of oral rehydration therapy in the management of cholera and other acute diarrheas in the war-refugee camp near Calcutta in 1971 served as an additional stimulus for WHO activities in this field.

To help meet the demand created by its training and promotion activities, WHO in 1969 stimulated a commercial producer of pharmaceuticals in Geneva (VIFOR) to start producing sachets of oral rehydration salts. The first lot was produced in 1970 under the trade name of "Choloral," a name soon changed to "Bucohydral" when the demand for the packets increased with the realization that the salts could be used for management of all types of diarrheas. On receipt of requests for a supply of intravenous fluid to combat cholera epidemics, it became a common practice for WHO offices to provide large quantities of ORS sachets along with a small volume of intravenous fluids. A WHO guideline was prepared and distributed freely with supplies of ORS sachets to entail proper use of oral fluid for cholera and pediatric diarrheas by paramedical workers. When this guideline was eventually published in printed form in 1976, the *Lancet* commented, "The WHO booklet takes the therapeutic technique a further step towards the primary health worker and the patient."

With the availability of ORS in sachets, WHO was better able to work with its Member States in increasing their capability to provide better treatment to reduce case-fatality and panic, and thereby to lessen the emphasis given to mass vaccination. During the 1970s, thirty to forty-three countries reported cholera every year to WHO, many of whom received WHO assistance.

VIFOR stopped the production of ORS sachets when UNICEF started, with the technical collaboration of WHO, to stimulate their production and to distribute them in 1975. Since then, UNI-

CEF has provided millions of ORS packets every year to Member States.

The crucial factor in obtaining wide acceptance of oral rehydration as a tool for primary health care was the result of two WHO field trials in the Philippines and Turkey in 1975, which demonstrated for the first time that a peripheral health worker, after some training, can successfully treat diarrhea cases at home and thereby prevent diarrheal-related death and malnutrition. These observations, which have since been confirmed repeatedly by other studies, served to convince national public health administrators that oral rehydration therapy could be applied in their countries *now* at a cost that they could afford. They also realized that strategies for morbidity could also be developed and implemented around this strategy for mortality reduction.

This conversion led the World Health Assembly in 1978 to adopt a resolution (No. 31.44) urging WHO in partnership with UNICEF and in collaboration with other international and bilateral agencies to develop a program for the control of acute diarrheal diseases. This resolution has helped immensely in the expansion of WHO and UNICEF activities for diarrheal diseases control, with the generous help of other international and national agencies, and we look forward to hearing further details in this and in subsequent sessions of the conference.

## THE IMPORTANCE OF HEALTH AND, MORE SPECIFICALLY, DIARRHEAL DISEASE FOR THE ECONOMIC AND SOCIAL DEVELOPMENT OF THE DEVELOPING COUNTRIES

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When I was first informed about the invitation to this conference, I thought that my association with the International Center for Diarrheal Disease Research, Bangladesh and its previous incarnation, the Cholera Research Laboratory, must have prompted the sponsors to remember me. I also wondered if they were not trying to recognize the special place of Bangladesh in the development of oral rehydration therapy. I gathered later that I was required to put some lay input into this sociomedical conference. I have been asked to speak on the importance of health, and especially diarrhea, in the social and economic development of the Third World. I am, in-

deed, greatly honored to be here today and especially for being given the privilege of speaking to this distinguished gathering.

Economic and social development is a composite process: it is a multifaceted program. Lives should not only be saved from premature death, but the quality of life should be good. The development process aims at full utilization of a nation's potential of human and material resources for living a better life. It seeks to make life a little more comfortable and a little more meaningful.

So you want to provide the people of your nation with some education, good health, two square meals a day, a place to rest with some ease and comfort, and then perhaps some recreation. You get involved in the process of producing more goods and services for ministering to the needs of your citizens. In this process, no single activity is enough. Mere universal education will not do. Simple health for all is not sufficient. Self-sufficiency in the production of foodgrains is not the end of it all. Establishment of good housing units alone will not work. All these objectives and more have to be pursued simultaneously. You have to watch out for population growth, lest all the gains are eaten away by new mouths. You have to make sure that there are enough jobs for all, lest there is social instability created by people without income. The development process is, indeed, all-embracing. Even for improvement in health conditions you need expansion of basic education, provision of sufficient food and drinking water, facilities for sports and recreation, and harnessing of science and technology.

The economic and social environment is an important determinant of health conditions and practices and, in its turn, is also dependent on health conditions. The system of disposal of excreta, for example, or dietary habits, income levels of families, supply of good potable water, or availability of the quantum and kinds of food largely influence the incidence of diarrheal diseases. Again, the incidence of diarrhea, in its turn, will have an impact on the capabilities of the labor force in the productive process.

In 1978, health planners and technicians gathering for the International Conference on Primary Health Care in Alma Ata made a clarion call for "Health for All" by 2000 A.D. It was thought that "a level of health that will permit people to lead a socially and economically productive life" should be attained by all communities. The conference also reaffirmed that "health which is a state of complete physical, mental and social well-being and not merely the absence of disease or infirmity is a fundamental human right." It further declared that "the existing gross inequality in the health status of the people, particularly between developed and developing countries as well as within countries is

politically, socially and economically unacceptable." These lofty ideas were not mere platitudes. The state of human knowledge easily permitted such affirmation or declaration. Since that time, there have been further advances in the capability of man to overcome health problems, as this conference bears testimony. Oral rehydration therapy secured international acceptance about a year after the Alma Ata conference, and it holds out immense possibilities for obliterating diarrheal mortality.

What, indeed, is meant by "health for all"? Perhaps it can best be explained with reference to concrete facts. Let us visualize the situation in a specific country, Bangladesh, which represents one of the worst cases in health care. In this country, 140 out of 1,000 children die before the age of five. There are 93 million people, and the crude birth rate (CBR) is about forty-one, while the crude death rate (CDR) is sixteen. Life expectancy is only forty-seven years. There is a doctor for 10,000 people, a hospital bed for 4,500, and a medical assistant for 130,000 people. We spend a little over \$1.00 per capita per year for health. By the end of the century, if we can bring infant mortality to fifty, the CBR to twenty, and the CDR to ten, we shall consider ourselves successful in our development program. We want at that time one hospital bed per 1,500, one doctor per 3,000, and one medical assistant per 30,000 people. These are not ambitious targets, but they are extremely difficult to achieve. There are difficulties in mobilizing financial resources, in securing the necessary manpower, and in getting the appropriate organizational and institutional backup.

Where does diarrheal disease fit into this equation of development and health for all? Diarrhea is believed to take a toll each year of about five million lives of children under five in the developing world. Though exact statistics would be difficult to find, analysis of several studies carried out in various parts of the globe suggests that about one-fourth of infant mortality in the developing countries is accounted for by diarrheal diseases. Each year, a child in the Third World has over two episodes of diarrhea, and those who survive suffer from malnutrition and other disabilities. Diarrhea is one of the oldest persisting diseases. Originally flourishing only in the Indian subcontinent, it became a worldwide phenomenon especially after the great Russian epidemic of 1923-32. No other bacteria has caused as much death in the world as cholera in an eighty-year period of the last century.

Today, in the developed world, the infant mortality rate is approximately ten to fifteen out of every thousand. In the developing countries, diarrhea alone takes away twice as many lives. This disparity in living conditions underscores the relationship between development and diar-

rhea. In Bangladesh, of the 140 children who die out of every thousand born, twenty-five die due to diarrhea and another twenty die due to malnutrition; and malnutrition may be due in some cases to diarrhea. Merely as an agent of death in depriving children of the bliss of life, diarrhea is monstrous in our society. The capacity to work of many adult persons is greatly impaired by diarrheal diseases. But this is a scourge which can be brought under control in a fairly short period of time. Oral rehydration therapy can be an effective control program that will obtain more results than mere elimination of diarrhea. It will help the process of education of people, research in science and technology, adaptation of appropriate technology, and conservation of resources.

It is believed that, in ancient times, oral rehydration was practiced in Bangladesh. But the contact with medical technology of the post-Industrial Revolution put the practice into disuse. When cholera became a world scourge in the early nineteenth century, rehydration therapy gave way to other forms of treatment. Only recently intravenous saline therapy received recognition, and the seeds of the oral rehydration process were sown again. In the late sixties and early seventies, this therapy was widely experimented in Bangladesh and West Bengal of India. The logic of the transformation process was very simple. Since the facilities of intravenous injection cannot be taken to the doorsteps of the victims, an alternative method must be found to provide fluids to the sick body. It seems that we have traversed the full circle. The ancient village practice is coming back, and even the indigenous preparation of the fluid holds out hope. Starting with glucose and saline mixture, we are moving towards "lobon gur," or the broth of salt and raw sugar.

Universalization of oral rehydration therapy still has to cross a lot of hurdles. The various problems associated with its widespread application, however, have a familiar ring. They are identifiable virtually in any development activity:

—The barriers of age-old prejudices and time-honored traditions have to be broken. Presently, fluids and nutritive foods are prohibited during diarrheal episodes. This cultural condition, ingrained by centuries of tradition — at least two centuries, in the case of my country — has to be demolished. Housewives, in particular, have to be persuaded to accept the new treatment. Basic education as well as extension programs are important for this purpose.

ORT must represent cost-effective and appropriate technology. An ORT package still costs eight cents, and six packets are needed per child per year. This represents about half of the per capita expenditure on health in Bangladesh. Cheaper mixtures must be found; broth of cere-

als, salt, and raw sugar provide an interesting option. Air-tight packets certainly do not represent appropriate technology. But an indigenous mixture, with its positive effects on program popularity, has the associated problem of lack of scientific precision. WHO and UNICEF have mounted a successful program, but they must move forward to find more cost-effective and more appropriate technologies.

ORT is usually administered by the mothers. In communities where most mothers are uneducated and bound by superstition, how do you train them to mix the fluid and administer it in the right doses? The Menoufia program in Egypt and the Bangladesh Rural Advancement program in Bangladesh are bold and imaginative efforts, but will their widespread replication succeed? In many areas, such as Nepal or the Maldives, the supply of potable water will present problems in the home preparation of fluids, even if the skills are successfully disseminated.

ORT can be very successful in preventing death due to acute diarrhea. In most areas of India and Egypt where ORT has been intensively tried, the mortality rate has been reduced by 60% to 80%. In Matlab Thana of Bangladesh, which is an experimental station of ICDDR,B, effectiveness is total. But the maintenance of nutritional level after treatment of the diarrheal condition depends on the availability of adequate diet and on food habits. In that area, any achievement is a matter of more comprehensive planning efforts. Effective action requires larger development programs relating to agricultural production and health education. Success in ORT cannot, alone, remove the debilitating effects of diarrhea on community health.

Finally, service delivery is a moot issue in all health care programs. Planning for the community as well as coverage of the members present formidable problems. But these problems are not unique to diarrheal disease control and can be said to be endemic in the development process as a whole. Planning is essentially a centralized process, but when you plan for vast masses scattered in habitations not neatly linked together, you have the problem of (a) local-level planning on the basis of felt needs and (b) implementation of the plan that calls for mass motivation and participation. Prescriptions have been known for decades, but in the political process of most developing countries they do not work. Devolution of government, local-level planning, and decentralization of the development process are good slogans that strike at the roots of central governmental authority of sovereign nations and, therefore, are relentlessly resisted. A change of heart is direly needed in this respect. I should hasten to add that we seem to be making some successful maneuvers in our country in this effort.

Development means betterment of living conditions and improvement in the quality of life. Good health is basic to both of these goals, and good health, in turn, depends on the betterment of living standards. Diarrhea is a major problem in the developing countries. Its control and elimination are a core concern of the development process. Again, its control and elimination also depend on progress in the development process. Improvements in education, agricultural production, water supply, sanitation, or housing will have salutary effects upon the incidence of diarrhea.

As I was coming to this conference, I was told by one of my staff that the conference itself reflects the failure of the development process. It demonstrates the incompetence of man, despite his awe-inspiring command over science and technology, to eliminate the need for ORT. Diarrheal disease is not new, and its prevention is not so difficult. We have dedicated a decade to water and sanitation. We have called for "health for all" in two decades. But can these declarations be made good, and can these promises be kept? We must obliterate the disgrace of diarrheal diseases, and for that we have the know-how. We need to apply ORT intensively, and we need to improve upon the technology. But this is only an intermediate stage, for ultimately this therapy should become needless. Improved water supply, good sanitation, and adequate food should render diarrheal disease a thing of the past. Economic development cannot permit the demeaning condition of mortality and morbidity due to diarrhea.

In concluding, I would like to compliment the sponsors of the conference for focusing attention on one of the commonest diseases in the developing world that takes the largest toll of human lives. They deserve our congratulations once more for trying to popularize a low-cost and appropriate therapy for this common disease.

## **ORAL REHYDRATION THERAPY: THE SCIENTIFIC AND TECHNICAL BASIS\***

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When a child has diarrhea it loses body fluids -- mainly essential minerals and water -- and becomes dehydrated. So mix up some salts and sugar in water, and feed the solution to the child, as much as he/she will take until the

child is no longer dehydrated, and diarrhea has slowed down or stopped. Make sure the child continues to take food or breast milk.

This is oral rehydration therapy, and it seems so simple (compared, say, to manipulation of genes or artificial hearts) that one may wonder what science has had to do with ORT, or why we need continue scientific studies on ORT. Many older physicians, nurses, or mothers have protested, "This is nothing new, we have been practicing ORT for years." Some of the great clinicians wrote about ORT thirty to forty years ago -- Darrow, Harrison, Chatterjee. But this is precisely the point: they wrote about using ORT, but did not know how ORT works (nor, to be fair, could they have then), and so there was no further development or spread of their anecdotal experience until some decades later. Even today, when we fail to understand and use the scientific approach, we continue erroneous or wasteful methods of therapy; actually, this is the case in all fields of medicine and public health.

Not everyone who practices ORT must be a scientist, but the spirit of inquiry and joy of discovery which suffuses science may be shared by all. The spirit of inquiry is present in five stages:

1. *Observation* -- using all one's senses to capture events and think about them: it was noticed that children with dehydration drank the oral rehydration solution vigorously and greedily and, when nearly hydrated, slowed down and often went to sleep.

2. *Measurement* -- taking one's observations and gauging some values on scales of time, length, amount, and degree: children who drank oral rehydration solution at will tended to drink close to what their initial deficit was, as measured by intake, output, and change in body weight.

3. *Creative hypotheses* -- thinking through the implications of a measured observation and asking interesting questions: who can choose more closely the correct amount of fluid for rehydration, the dehydrated child or the physician?

4. *Testing, experimenting* -- within the ethical boundaries of conduct, designing, with proper statistical force and safeguards against bias, a test of the hypothesis: in certain situations, children freely drinking oral rehydration solution became hydrated faster and reached better fluid and mineral balance than those on intravenous solutions controlled by physicians.

5. *Application* -- using the results of scientific testing for the widest possible benefit. It is as Jon Rohde and Robert Northrup have written, "taking science where the diarrhea is." Human information must be shared across all political and other boundaries.

The data and information I will present in this paper have gone through several of these five stages of scientific inquiry.



ORT developed from two streams of inquiry, if I may use a liquid metaphor. The first established what dehydration actually meant, how it related to the clinical picture of the dying child, and what was needed to reverse the situation. Believe it or not, this line of inquiry has taken nearly eighty years to come to satisfactory resolution. The second line, still ongoing, is the discovery of how the intestinal tract handles the movement of salts, nutrients, and water between the body and the outside world.

The picture of the dying child is hauntingly familiar. The baby has lost about 10% of its weight in fluid. This amounts to one liter of fluid in a ten-kilogram child, or about a quart in a twenty-two pound baby. Now the child has hollow, sunken eyes; its pulse is feeble or absent; its breathing is deep and rapid; the skin, when pinched, tends to remain dented and inelastic; the abdomen may be distended; urine has ceased to flow; the mouth is parched; the eyelids do not quite shut properly; there are no tears. Dry as the child may be, vomiting and watery diarrhea persist nearly to the end, and this stage may be reached in as little as ten to twenty hours after onset of illness.

Virtually all these signs are due to loss of salt, water, potassium, and sodium bicarbonate, all essential ingredients for life. Most of the loss is in the watery stool, and some, especially in the case of potassium, is from the urine. Regardless of the cause of diarrhea (rotavirus, cholera, *E. coli*, etc.), or whether in Baltimore or in Bengal, once the child reaches these clinical signs the amount of loss of water and minerals is roughly the same (Table 1). This is fortunate in a way, because the replacement therapy may be uniform and does not require us to know which specific microbe is doing the mischief. Incidentally, while the loss of potassium is of the same magnitude as that of sodium, the body stores of potassium are several times larger. So replacement of sodium is more urgent and also helps conserve potassium.

Although the extreme case I have portrayed is present in 1% to 2% of all bouts of diarrhea, it is sobering to realize that with very few visible signs of dehydration beyond thirst, the child may have already lost 5% of body weight, half-way to death, in as little as five to ten hours. By the time parents become alarmed, there may be only a few hours left in which to find competent help. The majority of children who die, however, do linger for two to three days: they have received some fluid, probably of dubious value, by mouth or intravenously; the diarrhea may have slowed a little if various medicines are tried. But by this time the parents may have exhausted their money or the skills and resources of the local practitioner, and the nearest hospital is miles away. The child needs fluid therapy: effective, affordable, trustworthy, nearby.

But we learned about ORT only after we knew how to apply intravenous therapy. Beginning in the mid-1940s, diarrhea research centers in Dhaka, Calcutta, Manila, Cairo, Baltimore, and Taipei proved that intravenous solutions containing sodium chloride, potassium chloride, sodium bicarbonate (or lactate or acetate) in a well-determined combination could be given rapidly so that severely dehydrated children could, Lazarus-like, be resuscitated within two to four hours. Lives are saved by the use of a polyvalent solution, administered quickly with the correct proportion of ingredients. ORT is successful foremost because of this principle, first discovered for intravenous therapy. And we must still rely on intravenous fluids if the child is so severely dehydrated that it cannot drink at all. With this principal exception, what then makes ORT preferable to the intravenous route?

—It can be given by persons with little formal education, even in the home.

—It needs no sterile equipment.

—It is inexpensive (a boon, incidentally, even to well-equipped hospitals).

—It is safer and, under most circumstances, more effective.

—In a pinch, a less-effective formula can be prepared at home from table salt and table sugar (sucrose).

—It allows parents to participate in the care of their children.

—It is comforting to the child and to the parents.

Let us now consider the second stream of inquiry that led to the development of ORT: how the intestine handles salts and water.

"What a piece of work is man," given form by skeleton, powered by muscles, coordinated and programmed by a chemical-electric skein of nerves and brain, nourished and defended by a red liquid distantly related to the primordial sea. The intestine is but a hollow tube connected to the outside world at both ends, the core around which the rest of the body is wrapped. The intestine does many things, but its prime job is to take food, break it into basic molecules that are usable by the body's cells, and transport these molecules across the one-cell-thick lining that separates inside from out. To digest food, it seems necessary to increase the surface area of the tube by multiple folds on the surface of the tube and by fingerlike projections from these folds, called "villi," which carry multiple digestive enzymes at or near their surface. If the surface area is much reduced, as occurs in the disease called "sprue," key nutrients and vitamins are not absorbed. It also seems necessary to suspend the particles in liquid and let digestive enzymes do their chemical work. The ultimate source of the digestive liquid is the blood stream, from which the intestine abstracts and

secretes salty water, free of blood or serum. Secretion of salts and water seems largely to be the function of the youngest cells in the lining, called the "crypt cells," and is controlled by a marvelously organized sequence of enzymes, minerals, and small chemical messengers which "know" just when to turn the flow on and off. Infectious agents which cause diarrhea are able to turn the cell mechanisms for secretion to a fixed "on" state until new cells replace the infected ones, usually in two to four days, or until the microbes and toxins are cleared out by the defense mechanisms of the body.

It has been estimated that the intestine of a healthy adult secretes one hundred liters — 264 U.S. gallons — or more of fluid each day; amazing, of course, but, given the total surface area of two million square centimeters (the size of a ball-room carpet seventy by thirty feet), one hundred liters represents but one drop per square centimeter per day. Since the well nourished adult body contains only forty-five liters of fluid altogether and the adult would die if just seven to ten liters were permanently lost, there must be a rapid, certain mechanism to put the digestive fluid back into the bloodstream nearly as quickly as it is secreted. In what is surely one of the neater bits of engineering, the very molecules produced by the liquidy digestion are the ones that help transport the salts and water back across the intestinal cell, from there to return to the inner pools of body fluid. The molecules that work this way are principally glucose, the simple sugar derived from starch or table sugar; galactose, a component of milk-sugar; and amino acids and peptides, the products of protein digestion. Each of these molecules combines with sodium, probably in close to a one-to-one ratio, and these dyads cross the cell membrane, perhaps by linking in a menage-a-trois to carrier protein molecules anchored in the membrane. Water is pulled along by osmosis, and other minerals (potassium, bicarbonate, more sodium) follow along, caught up in the stream, as it were. Most of this absorption appears to take place in the upper, more exposed regions of the villi, so that if there is extensive damage to villi from, say, viral diarrhea, oral rehydration may fail: failure occurs in about 5% to 10% of seriously ill children.

What is rather elegant about this system is that glucose, amino acids, and peptides seem to enter the cell linked to sodium, but each class of molecules joins with different carrier molecules or finds separate entrances specific to each. One predicts that if one adds an amino acid — glycine, say — to glucose in an oral rehydration solution, more fluid will be absorbed than if glucose or glycine are used alone. This is just what happens, and, as you shall hear shortly, this phenomenon promises a major advance in oral

rehydration therapy. But for the moment, let us leave the alimentary canal and return to the child.

The formula for the oral rehydration solution was originally devised to combat epidemic outbreaks of cholera in which both adults and children are affected and where lifesaving intravenous fluids are scarce. The salts are packed in flat aluminum foil packets, paid for and stockpiled by UNICEF, ready for shipment to any country on demand. The formula, often referred to as the "WHO formula," was originally devised as a compromise between what adults needed and children could tolerate. The composition, however, is more inspired than that suggests (Table 2). The amount of salt is sufficient to replace sodium and water losses in severe dehydration (Table 1), although adults may need to drink extra amounts. Glucose at 2% is optimal, as many studies suggest that water is best absorbed when glucose and sodium are in the ratio of one-to-one, and glucose does not exceed a concentration of 2½%. Potassium deficit is only partially met by this formula because it is unsafe to completely replace losses so fast, but initial replacement must be started quickly (some suggest increasing the replacement rate). Acidosis is corrected much faster with bicarbonate than without. This formula has proved surprisingly versatile in the treatment of hundreds of thousands of children and adults, with documented success in 85% to 95% of cases, under the following range of situations:

- in persons who are able to drink;
- in malnourished children and the well nourished;
- in bacterial and viral causes of dehydrating diarrhea;
- with serum sodium levels as low as 110 milliequivalents per liter to as high as 165-extremes immediately threatening to life;
- with severe derangement of the blood alkaline-acid balance to the acid side (a condition called acidosis);
- in tropical climates and Baltimore winters;
- with no visible dehydration up to loss of body fluid equivalent to 10% of body weight.
- with voluminous, continuing loss of diarrhea, up to 10 milliliters per kilogram body weight per hour.

Even vomiting does not bar success except in a few instances; in fact, vomiting decreases in direct proportion to the degree of rehydration with ORT. What makes ORT so versatile, in addition to its balanced formula, is that most children drink as much oral rehydration solution as is offered up to nearly the amount of which they are deficient. When they are hydrated, or nearly so, they seem to lose their taste for the fluid; then they either fall asleep, or cry for food.

Crying for food: we must think of ORT as

more than simply rehydration with a solution of salts and sugar. ORT also means restoration, quickly, of a normal diet. It is now well established that a principal cause of malnutrition in children of the Third World is repeated episodes of diarrhea. The reasons are several and interactive:

—children lose their appetite for food because of salt and water loss and acidosis;

—children are often made to fast when they have diarrhea, sometimes for several days, because it is feared that food makes diarrhea worse;

—potassium loss may make muscle tone too weak for eating and digestion;

—when a child is ill, anxiety and restlessness burn up calories from the child's own stores of fat and protein (which may be already seriously depleted);

—diarrhea and fasting independently damage digestive enzymes in the intestinal tract, leading to malabsorption and loss of food that is eaten.

—with each serious bout of diarrhea, a child loses weight and may never catch up to its potential for growth and good nutrition.

In well-designed studies in the Philippines, Iran, Turkey, India and Panama, ORT appeared to protect against acute weight loss with an episode of diarrhea when the parent was also encouraged to continue to feed the child despite the diarrhea. Breast milk, soft foods and porridges, even fish and fruit and breads were advised. ORT restores a child's appetite within a few hours, so suddenly this advice made sense to parents. The protective effect was most apparent in those already undernourished, and in those with repeated episodes of diarrhea, and protection seemed to last several months. But, of course no food, no protection.

We do not know exactly how ORT works to protect nutrition, but we observe regularly that rapid restoration of fluid and mineral balance restores appetite. Potassium may play a key role here; there is also an intriguing possibility, based on studies of adults who go without food, that the glucose in ORT may help restore or protect intestinal digestive enzymes. The parent certainly finds feeding the child more acceptable, and the child becomes more settled.

Oral rehydration therapy is, thus, two therapies: rehydration and continued feeding. ORT has already been proved to reduce mortality from diarrhea. It would be an amazing achievement if ORT could also reduce the prevalence of malnutrition.

This hope leads me to consider an impending development in ORT. Often, parents' and physicians' prime concern is to stop the diarrhea, and until they see otherwise, they do not believe that rehydration is the first order of business. ORT does not stop diarrhea, which generally runs its

own course of a few days; we spend a lot of effort getting that point across. Perhaps we soon will have the means to slow stool loss even while rehydrating the child.

You will recall, back in the alimentary canal, that the different breakdown products, or metabolites, of digestion (sugars, peptides, amino acids) linked up to sodium and promoted salt and water absorption through different gates in the intestinal cell membrane. There is now sufficient evidence that if we combine these metabolites in a single oral solution, we not only rehydrate but can actually decrease the total loss of stool. Peptides and amino acids are particularly necessary in the combination because they act on absorption all along the small intestine, whereas the action of glucose is more confined to the upper portion. Absorption of peptides and amino acids are also far less susceptible than glucose to damage by diarrhea. So the next step is to develop an enriched ORT, one that combines salt, potassium, bicarbonate, glucose or a simple starch, and peptides or a simple protein. Here are some expected advantages of such a formula.

—Diarrhea is lessened.

—With less diarrhea, there will be less waste of nutrients in regular food, and possible more protection of intestinal enzymes.

—Common local foods, already familiar to parents, may be adapted to form an enriched ORT.

Early studies with such a formula are encouraging. We look forward now to a burst of research to define its optimal composition, the range of severity of illness it can be used for, its advantages over the WHO solution and food given separately, its cost and distribution. We will need to consider, also, how we can enlist parents to prepare and use an enriched ORT at home.

Where does all this take us? From a global public health view, it is possible that ORT is nothing more than a palliative until research produces effective antidiarrheal vaccines. Now, sadly, for many children, ORT merely postpones death. Optimists among us hope ORT programs will enable people to trust other health services, such as family planning, to encourage better nutrition and hygienic practices, to improve the health worker's morale, and to help achieve "Health for All."

We hope these hopes prove true; they need testing. But little can be advanced, I believe, as long as nations fail to make human welfare the first priority.

This brings me full circle to the beginning of this paper.

The international agencies sponsoring this conference have done a lot for our children. They support research; they supply services and tech-

nicians; through a generous network of information they link scientists from Boston to community health workers in Bangladesh; but most of all they demonstrate that the global village exists: in helping our neighbor's child survive we establish our common humanity.

**Table 1**

**AVERAGE WATER AND SALT LOSSES IN SEVERE DIARRHEA OF A 10-KILOGRAM CHILD BEFORE TREATMENT**  
(milliequivalents)

	Water	Sodium	Potassium	Chloride
Infant diarrhea Baltimore	1.1L	90	100	80
Child cholera (Calcutta)	1.0L	120	70	100

**Table 2**

**COMPOSITION OF THE "WHO FORMULA" FOR ORAL REHYDRATION SOLUTION**

<i>Grams per Liter Solution</i>	
Sodium Chloride	3.5
Sodium Bicarbonate	2.5
Potassium Chloride	1.5
Glucose	20
<i>Chemical Concentration in Millimoles per Liter Solution</i>	
Sodium Chloride	90
Bicarbonate	80
Potassium	30
Glucose	20
	111

**THE WHO DIARRHOEAL DISEASES CONTROL PROGRAM: THE PRACTICAL APPLICATION OF ORAL REHYDRATION THERAPY**

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The global problem of diarrheal diseases, their effects on development, and the scientific basis of oral rehydration therapy have been described in earlier presentations. This paper will confine itself first, to reviewing certain aspects of oral rehydration therapy that have encouraged many developing countries to embark on national pro-

grams for diarrheal disease control, and second, to describing how these programs are being implemented with the cooperation of the World Health Organization.

**Application of oral rehydration therapy**

The loss of weight from acute diarrhea can produce death within a few hours if rehydration therapy is not provided. ORT represents a means of treating dehydration in infants, children, and adults and of preventing it from becoming a threat to life.

Three aspects of ORT have to be considered in evaluating its potential importance as a priority primary health care intervention — its efficacy and safety, its delivery, and its relationship to other aspects of diarrheal management.

*Efficacy and safety of ORT.* There is now clear evidence that ORT can be used to treat dehydration from diarrhea due to any etiology in all age groups.<sup>1</sup> The initial experience with ORT came about in most countries in Asia and Africa as a result of the seventh pandemic of cholera, which began in 1961, spread widely in the early 1970s after it entered West Africa, and by 1983 had affected ninety-two countries. Cholera, however, is relatively rare in infancy, and there are now known to be some twenty-five bacterial and viral causes of acute diarrhea other than cholera. The more important of these include enterotoxin-producing and invasive bacteria and rotavirus — the agent most frequently responsible for serious cases of acute diarrhea in infants. Numerous studies have conclusively established that ORT is also effective for treating dehydration from diarrhea due to all of these agents.

*Delivery of ORT.* In considering delivery of ORT one has to consider: first, what can be done in the home — that is, what the mother should do when diarrhea starts; second, what the role of the village health worker should be, and what skills, knowledge, and supplies he/she must have to deliver ORT; and, third, what skills, knowledge, and supplies are required for staff working in health centers and hospitals.

WHO and UNICEF have recently published a joint statement which presents a recommended approach to ORT delivery.<sup>2</sup> This approach consists of early therapy in the home with appropriate household solutions, use of oral rehydration salts for treatment of dehydration at health centers and hospitals and, in so far as possible, by village health workers, and the provision of backup support with intravenous (I.V.) therapy at larger health centers and hospitals. In expanding on this approach it is appropriate first to consider the use of ORS, since this is the area where there is the most knowledge and experience.

In 1971 WHO and UNICEF adopted, as a universal rehydration solution, a single ORS formulation containing only the essential

electrolytes and glucose, the latter serving primarily as a carrier molecule to transport sodium across the intestinal barrier. This formulation (sodium chloride 3.5 g, sodium hydrogen carbonate [sodium bicarbonate] 2.5 g, potassium chloride 1.5 g, and glucose 20.0 g, to be dissolved in one litre of water) was believed to be suitable for both *rehydration* and *maintenance* therapy — that is, for the correction of existing water and electrolyte deficits and the replacement of ongoing abnormal losses of electrolytes due to continuing diarrhea. It was recognized that during maintenance therapy there would be a need to provide the normal daily fluid requirements as well, especially in infants. The formulation was not considered to be optimum for infants or adults, but rather to be both highly safe and adequate to meet the needs of *all* age groups so as to simplify the delivery of ORT. The sodium, potassium and bicarbonate contents of the solution are intermediary between those lost in the diarrheal stool of children and adults with cholera and non-cholera diarrhea.

One issue of concern to pediatricians has been whether the solution's 90 mmol/l sodium concentration is too high for use in infants, especially neonates. However, clinical studies have demonstrated that ORS, when used to treat dehydration in neonates, does not usually result in hypernatremia, even in those infants with above normal serum sodium concentrations at the onset of treatment.<sup>3</sup>

Some questions have also been raised about the need for bicarbonate and potassium in the ORS solution. That both of these are essential was recently demonstrated by Clements, et al. in Honduras,<sup>4</sup> where dehydrated infants receiving a solution without bicarbonate were slower to achieve normal serum bicarbonate levels than those receiving ORS solution. Rapid correction of acidosis is undoubtedly of advantage in order to avoid the complications associated with it, and probably results in a more rapid improvement of appetite. An even more impressive result of the same study was the confirmation that dehydrated infants receiving a solution lacking potassium had prolonged hypokalemia compared with those receiving ORS solution. Prolonged hypokalemia is associated with a number of complications, including fatal cardiac arrhythmias, and, like acidosis, is a condition that can be avoided by use of the balanced ORS solution. The importance of giving potassium to dehydrated infants is probably the major disadvantage of the use of plain salt and sugar solutions for the treatment of dehydration.

It is now known from experience in many countries that ORT using ORS solution can be readily implemented in health facilities. The consensus of pediatricians is that it is easiest to instruct mothers to administer the solution using a

cup and spoon. If the child is too tired to drink in this way, one can successfully use a nasogastric tube, providing one takes care to avoid abdominal distention.

One of the most striking demonstrations of the impact of ORT in a hospital setting is the study of Ashley, et al. in Jamaica.<sup>5</sup> Prior to the introduction of ORT, 55% of all cases seen at Bustamante Children's Hospital were given IV fluids as compared with only 4% after ORT had been implemented. A similar large decline in the use of IV fluids with implementation of ORT has been observed in hospitals in other countries — such as Bangladesh, Haiti, India, Philippines, and Tunisia — and has been associated with not only a significant decrease in the cost of treatment, but also a reduction in diarrhea case-fatality rates. In almost any setting, 95% of diarrhea cases seen at hospital facilities can be successfully treated with ORT. This does not mean to say that IV fluids are not necessary. In fact, they are not only necessary, but are vital for the treatment of patients who cannot drink, are in a stupor or coma, or have intractable vomiting.

An advantage of ORS is that it can be packaged so that its use can be easily extended to the periphery. The use of ORS packets by village health workers has been shown in research settings to have a significant impact on diarrhea mortality. A recent demonstration of this was the study conducted by Mobarak, et al. in rural Egypt.<sup>6</sup> In this study, the use of ORS in the home and in all the health facilities in the study area resulted, in a six-month period, in a 50% decline in diarrhea mortality and a 40% decline in overall mortality. Of considerable interest is the fact similar results were obtained in the study cells where salt and sugar solutions, either home-prepared or prepackaged, were used in the home *and* ORS was available at all treatment facilities..

In summary, ORS solution is safe and effective for the treatment of dehydration in all age groups, can lead to a significant decline in the use of IV fluids and case-fatality rates in hospitals and health centers, and can have an impressive impact on diarrhea mortality when extended to the periphery by village health workers.

This discussion of ORS would not be complete, however, without a reference to the important recent studies in Calcutta<sup>7</sup> and Dhaka,<sup>8</sup> which have evaluated the efficacy of a concentrated rice powder solution to which sodium chloride, sodium bicarbonate, and potassium chloride had been added for the treatment of dehydration. In the Calcutta study, the efficacy of a solution made from cooked (roasted) rice powder was compared in dehydrated infants with the standard ORS solution and an ORS solution to which glycine had been added. Both the rice-based ORS and the ORS containing glycine re-

sulted in a 40% decrease in stool output through the course of treatment, as compared with the standard ORS solution. The most probable reason for this dramatic effect is that both the starch and the glycine are able to carry more sodium across the intestinal epithelium, thus promoting increased absorption of fluid in the intestine. As one would predict, with lower stool losses the rice-based ORS and glycine ORS groups required 40% less fluid intake as well.

These studies indicate that it might be possible to achieve a significant decrease in stool output and fluid needs during diarrhea by using a rehydration solution that enhances fluid absorption in the intestine. The use of a rice-based solution has the theoretical advantage of increasing access to ORT, but has two potential constraints — first, the preparation of this type of solution requires a much greater educational effort directed towards mothers than that needed for the simple mixing of an ORS packet; and second, the solution is palatable for only six to eight hours after its preparation, as it ferments rapidly. In any event, the development of starch-based ORS solutions is a research area deserving the highest priority.

In comparison with the use of ORS, there is less knowledge and experience with promotion of early home therapy for diarrhea treatment. It is expected that intensive promotion of such therapy by health and other workers will result in fewer cases developing dehydration and a further reduction in diarrhea mortality. The study by Mobarak, et. al.<sup>6</sup> is perhaps the best example of this, but other studies are needed to confirm and clarify the extent of this expected impact.

The approach toward home remedies adopted by WHO and UNICEF recognizes two main options: (1) the use of fluids and foods *already* available in the home, such as rice water and carrot soup, which are often prepared using boiled water so that they are safe to drink; or (2) the use of household salt and sugar solutions consisting normally of white sugar and cooking salt. It must be borne in mind that almost all home remedies lack the sodium bicarbonate and potassium chloride that are contained in the ORS formulation and therefore are not ideal for the treatment of dehydration. However, they can be used in situations where ORS is needed but is not available.

There have been a number of studies examining the different methods advocated for the preparation of salt and sugar solutions. The "pinch-of-salt and scoop-of-sugar" technique is the simplest and has been most successfully used by the Bangladesh Rural Advancement Committee (BRAC) program in Bangladesh. The main problem in this approach is that the amount contained in a pinch or scoop may vary in different societies according to mothers' ways of using fin-

gers in cooking as well as the quality and type of the salt and sugar being used. Use has also been made of household spoons and glasses, but this has given rise to a similar problem due to the considerable variation in their size, even in the same community. To help ensure greater accuracy in preparing these solutions, plastic measuring spoons have been specially developed; however, difficulties in their local manufacture and distribution have tended to limit their use. A general constraint in the use of salt and sugar solutions, no matter what mixing method is used, is the lack of availability and/or high cost of salt and sugar in some countries.

These constraints in the use of salt and sugar solutions are mentioned to call to attention the need to be sure that the approach that is promoted for use in the home for early rehydration therapy takes into account such factors as cultural practices, the food normally used in the home, the price and availability of salt and sugar, the ability of mothers to prepare the solution accurately, the presence of standard measurement utensils, and the outreach of the health delivery system. These factors must all be considered in deciding whether to advocate a special salt and sugar solution or an existing preparation already available in the home, such as carrot soup, for use as early home therapy.

*Other aspects of clinical management.* For ORT to achieve its maximum benefit other diarrhea management practices must complement it.

The routine use of antidiarrheal drugs widely promoted in some countries for the treatment of diarrhea must be discouraged. The role of antibiotics should be confined to treatment of: *cholera*, for which tetracycline is still the drug of choice; *shigellosis*, for which a number of antibiotics, such as ampicillin and trimethoprim/sulfamethoxazole, may be used; and *amoebiasis* and *giardiasis*, for which metronidazole is the preferred drug.

The management practice which is of greatest importance is the replacement of calories lost during the diarrhea episode. The nutritional consequences of diarrhea are well known and include decreased intake of nutrients due to anorexia or mistaken withholding of food, the loss of nutrients in the feces due to malabsorption, and increased catabolism due to infection. In fact, it is recognized that of all the infectious diseases, diarrhea, along with malaria and measles, has the greatest impact on the growth of infants and young children.

In the mid-1970s, WHO-sponsored studies in the Philippines<sup>9</sup> and Turkey<sup>10</sup> showed that children who received ORT for diarrhea and whose mothers had been educated to resume feeding early on in the course of the illness, had a greater monthly weight gain than those in a control group in which there was no intervention. These

and other studies have led to the following recommendation for nutritional management of acute diarrhea:

- patients must not be starved;
- breastfeeding or other diluted milk feeds should be resumed as soon as rehydration is complete; and
- other foods should be reintroduced as soon as the appetite returns, using foods that are locally available, energy-rich, and preferably high in potassium.

In the long run it is as important to follow these practices as it is to administer ORT in diarrhea patients.

### **The WHO Diarrhoeal Diseases Control Program**

To estimate the magnitude of the diarrheal disease problem globally, WHO recently undertook a review of the medical literature and summarized the results of twenty-four longitudinal studies that had been conducted over the past three decades in twenty-two countries.<sup>11</sup> As a result of this review, it was estimated that in children under five years of age in Africa, Asia, and Latin America (excluding China), there were in 1980 up to one billion diarrhea illnesses, resulting in 4.6 million deaths. As expected, this study showed that the highest incidence and mortality rates were in the first two years of life.

Since 1978, WHO has been collaborating with its Member States in the development and implementation of national diarrheal disease control (CDD) programs. The stimuli for the implementation of CDD programs by many countries have been (a) the commitment of Member States to the implementation of primary health care (of which CDD programs form an integral part); (b) the recognition that diarrheal diseases are responsible for a high proportion of childhood morbidity and mortality and are a major contributor to malnutrition; (c) the heavy demand that these diseases place on health facilities and thus on national health budgets; and (d) the recent knowledge learned about diarrheal diseases, in particular the finding that in most diarrheas dehydration can be safely and effectively treated and prevented with ORT. Also, many new viral and bacterial agents had come to be recognized as causes of diarrhea; consequently, there is now a better understanding of the pathogenesis of acute diarrhea and the intestinal immune response which offers possibilities for the development of new vaccines and drugs.

The WHO CDD Program has as its immediate objective the reduction of mortality due to acute diarrheal disease. The longer-term objectives are the reduction of morbidity from these diseases and associated ill effects, particularly malnutrition, in infants and young children. The Program is also promoting national self-reliance in

the delivery of health and other essential services for the control of diarrheal diseases.

The WHO Program has two components: a *health services* component and a *research* component.

*Health services component.* In this component, WHO is cooperating with Member States in the implementation of national CDD programs which have the following strategies:

- improved clinical management of acute diarrhea, emphasizing ORT and proper feeding during and after diarrhea, to reduce diarrhea mortality;

- promotion of proper maternal and child care practices, particularly breastfeeding, proper weaning, and good personal hygiene; and improvement of environmental health practices, to decrease diarrhea morbidity; and

- improved diarrhea surveillance and epidemic control measures, to decrease both mortality and morbidity.

For the case management strategy, most countries are adopting the approach described earlier — namely, the widespread distribution and use of ORS in fixed facilities and by village health workers for the treatment of dehydration, and the promotion of an appropriate method of preparation of household solutions for the prevention of dehydration.

The maternal and child health and environmental health strategies for the prevention of diarrhea are promotion of (a) exclusive breastfeeding for the first four to six months of life and continued breastfeeding up to at least two years of age, and the addition of locally available semisolid foods, especially energy-rich items, from the age of four to six months; and (b) the use of clean water for drinking and protection of the supply; proper hygiene, especially handwashing; hygienic food preparation; construction, maintenance and proper use of latrines; and proper garbage disposal and fly control.

Successful implementation of the latter strategy will depend to a large extent on the achievements of the International Drinking Water Supply and Sanitation Decade, which has the far-reaching objective of providing safe water supplies and sanitation for all by 1990. There is no doubt that if the activities of the Decade are successfully implemented, they will have an impact on diarrheal disease incidence. However, to attain a significant improvement of health it is not enough simply to construct water and sanitation facilities; a concerted effort has to be made at the same time in health education to motivate families, and especially children, to change life-long habits and practices that favor the transmission of diarrheal disease.

WHO is cooperating with Member States in a number of areas in the implementation of na-

tional CDD programs. Particular importance is being placed on the need to develop a comprehensive plan of action for such programs which contain well-defined objectives, strategies, targets and activities, and a plan for evaluation. The initiation of such a plan involves an analysis of the diarrheal disease problem, a commitment on the part of the health authorities to make diarrheal disease control a part of country health programming, the appointment of a national coordinator or manager for the program, and, in many instances, the creation of an interministerial group to coordinate the activities of the health and other ministries involved in diarrheal disease control.

As of December 1982, fifty-five countries had prepared plans of operation for national CDD programs; and in thirty-eight of these, programs were already operational. In thirty countries, steps had been taken to initiate the local production of ORS.<sup>12</sup>

Another important area in which WHO is cooperating with Member States is that of training. A total of 109 countries have so far participated in the Program's training courses for senior-level national program managers; and technical training courses, mainly on ORT, have been held in over fifty countries. In thirty countries, regional and national training centers have been established which are providing training primarily in clinical management, but also in laboratory and epidemiological aspects of diarrheal disease, for senior-level staff who will subsequently themselves train national staff at the regional and provincial levels. The Program is also producing training materials and supporting their development in local languages in many countries. In addition, it is helping to develop revised curricula for medical and nursing schools.

Dissemination of information on diarrheal diseases is a priority activity which is assured through (a) *Diarrhoea Dialogue*, a newsletter published by the Appropriate Health Resources and Technologic Action Group (AHRTAG) Ltd., U.K.; (b) the publication of an annotated bibliography on oral rehydration therapy by PAHO;<sup>1</sup> (c) the distribution of periodic bibliographies on acute diarrheal disease prepared by the U.S. National Library of Medicine and the International Children's Centre, Paris, France; and (d) the distribution of other documents and publications relating to the activities of the Program.

Another area of activity is collaboration with countries in the preparation of health education and information materials for health workers and the lay public.

As mentioned above, CDD programs are already underway in many countries, and some are beginning to show promising results. WHO is cooperating with such countries in ensuring that their programs are properly evaluated. One

method of evaluation is the use of cluster sample morbidity and mortality surveys.<sup>13</sup> So far, thirteen of these surveys have been conducted in eleven countries, the results of which indicate that on average in children under five years of age there are three diarrheal episodes per year per child, an annual overall mortality rate of 16 per 1,000 children, and an annual diarrhea-associated mortality rate of 5.8 per 1,000 children. These surveys have thus found that 32%, or one-third, of deaths in children under five are due to diarrheal disease.<sup>12</sup> The Program is also collaborating in the conducting of comprehensive program reviews which have so far been undertaken in four countries.

*Research component.* The research being supported by the Program includes both health services (or applied) research on the best means of delivering ORT and other control strategies in national CDD programs, and *biomedical* research to develop new vaccines, drugs, and laboratory tests. As of May 10, 1983, the Program was supporting 181 research projects, seventy in the area of health services research and 111 in the area of biomedical research. These 181 projects are being carried out in sixty-three countries, two-thirds of them in developing countries.

The health services research includes studies to investigate different approaches for the delivery of ORT at village and family level, to define the etiology of acute diarrhea under different ecological and cultural conditions, to determine ways of promoting breastfeeding and the preparation of safe, locally available weaning foods, and to define traditional beliefs and practices regarding diarrheal disease.

The biomedical research on clinical management includes studies to increase the understanding of the pathophysiology of diarrhea caused by different agents, to improve and simplify rehydration therapy, and to define appropriate approaches to feeding during and after diarrhea. It also includes the development and testing of new and existing antidiarrheal drugs.

The biomedical research also includes study of bacterial and viral diarrheas which is primarily oriented towards the development of simplified diagnostic tests and new vaccines.

The Program has set targets which it hopes can be achieved by the end of this decade. If these targets can be attained by 1989, there should be 50% of diarrhea cases under five years of age with access to ORT, 35% of cases receiving ORT, and 1.5 per 1,000 fewer diarrhea deaths annually.

It should not be forgotten, however, that ORT can never be a panacea for all diarrheal diseases. At least 10% to 20% of diarrhea deaths are known to be due to dysentery and result not from dehydration, but from the dreaded complications of this disease, especially seizures, per-



forated bowel, and malnutrition. In addition, there are other diarrheas (especially chronic diarrhea) which are not well understood, but which are known to kill many children, especially in areas of Africa. Some of these diarrheas are associated with measles and malaria, and more research is needed to determine their exact cause and whether or not the diarrhea is a part of or a secondary complication of the measles or *Plasmodium* infection.

To conclude on an optimistic note, one can do no better than quote the example of Costa Rica, a country which has achieved a remarkable decline in diarrheal disease mortality over the period 1930-80.<sup>14</sup> It is the hope of WHO and of the entire international health community that similar declines will be achieved in many other countries in the developing world before the year 2000. This will require both sound planning and strong management of national CDD programs and their implementation through the primary health care approach. It also demands a firm commitment on the part of governments to implement such programs and the concerted action of bilateral and multilateral agencies to support national efforts. ORT is a potentially powerful tool that can dramatically reduce a serious public health problem in infants and young children in the developing world. However, its impact will be felt to the fullest extent only if the highest priority is given by governments to its implementation. WHO will continue to cooperate fully in this worldwide endeavor.

## REFERENCES

1. *Oral Rehydration Therapy: an Annotated Bibliography*. 2nd Edition. Washington, D.C.: Pan American Health Organization, 1983.
2. *The Management of Diarrhoea and Use of Oral Rehydration Therapy*. A Joint WHO/UNICEF Statement. Geneva: World Health Organization, 1983.
3. Pizarro, D., Posada, G. and Mata, L. "Treatment of 242 neonates with dehydrating diarrhea with an oral glucose-electrolyte solution," *J. Pediatr.* 102(1) (1983):153-6.

4. Clements, M. L., Levine, M. M., Cleaves, F., et al. "Comparison of simple sugar/salt versus glucose/electrolyte oral rehydration solutions in infant diarrhea." *J. Trop. Med. Hyg.* 84 (1981):189-94.
5. Ashley, D. E. C., Akierman, A., and Elliott, H. "Oral rehydration therapy in the management of acute gastroenteritis in children in Jamaica." In F. Holmes, J. Holmgren, M. H. Merson, and R. Mollby, eds., *Acute Enteric Infections in Children. New Prospects for Treatment and Prevention*, 389-94 (Amsterdam: Elsevier-North-Holland Biomedical Press, 1981).
6. Mobarak, A. B., Hammamy, M. T., Gomaa, A. I., et al. *Strengthening Rural Health Delivery Project* (51 pages). Cairo, Egypt: Ministry of Health Rural Health Dept., Diarrhoeal Disease Control Study, May through October 1980; available through Columbia, Maryland: Westinghouse Health Systems, Inc.
7. Patra, F. C., Mahalanabis, D., Jalan, K. N., et al. "Is oral rice electrolyte solution superior to glucose electrolyte solution in infantile diarrhoea?" *Arch. Dis. Child.* 57 (1982):910-12.
8. Molla, A. M., Sanker, S. A., Hossain, M., et al. "Rice-powder electrolyte solution as oral therapy in diarrhoea due to *V. Cholera* and *E. coli*." *Lancet* 1 (1982):1317-19.
9. International Study Group. "A positive effect on the nutrition of Philippine children of an oral glucose-electrolyte solution given at home for the treatment of diarrhoea. Report of a field trial by an international study group." *Bull. Wld. Hlth. Org.* 55 (1977):87-94.
10. Egemen, A. and Bertan, M. "A study of oral rehydration therapy by midwives in a rural area near Ankara." *Bull. Wld. Hlth. Org.* 58(2) (1980):333-8.
11. Snyder, J. D. and Merson, M. H. "The magnitude of the global problem of acute diarrhoeal disease: a review of active surveillance data." *Bull. Wld. Hlth. Org.* 60 (1982):605-13.
12. *Third Programme Report, 1981-1982*. WHO/CDD/83.8, 1983.
13. *Manual for the planning and evaluation of national diarrhoeal diseases control programmes*. WHO/CDD/SER/81.5, 1981.
14. Mata, L. "Diarrhoeal diseases — how Costa Rica won." *WHO Forum* 2(1) (1981):141-5.

\*This presentation is dedicated to Dr. Robert A. Phillips, pioneer in the modern development of therapy for cholera and ORT for diarrhea and former director of the Cholera Research Laboratory (ICDDR,B), Dhaka, Bangladesh.

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SESSION THREE

*Management of Diarrheal  
Diseases — Practical  
Considerations*

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*Informal Discussion* (L to R): Archbishop M. Francis, President of the Liberian Development Foundation, Liberia; Dr. Katherine Elliott, Scientific Editor, *Diarrhoea Dialogue*, England; Dr. Lincoln Chen, Representative, Ford Foundation, India

The papers presented in Session Three deal with practical considerations in the management of diarrheal diseases. They examine the use of oral rehydration therapy in the home and the community, at the first level of health services, and in the hospital setting.

In "Therapy Begins At Home," Dr. Jon Rohde stresses the importance of the mother's role — and of the father's participation as well — in the administration of oral rehydration therapy. According to Rohde, early rehydration at home is the only practical means of achieving widespread health coverage and, thereby, of reducing mortality rates from diarrheal diseases. Rohde

discusses the education of mothers in oral rehydration therapy and examines the attitudes of the medical establishment which sometimes interfere with this education. Asserting the need for simpler rehydration solutions, he urges further exploration into possible "home remedies" that can be easily prepared in the home.

Dr. Arnfried Kielmann describes recent efforts to introduce oral rehydration therapy in local communities in Egypt. Although rural Egypt has a well-developed health system, diarrheal diseases account for two-thirds of all deaths of preschool children. Citing studies conducted to determine the most effective means of prevent-

ing these diarrhea-related deaths, Kielmann concludes that dehydration can be effectively prevented through early administration of a sucrose/salt solution and that mothers can be taught the techniques of diagnosis and early management of diarrheal disease. It is emphasized that, to have a truly effective program, oral rehydration solution must be readily available in the home.

Echoing both Rohde and Kielmann, Dr. Raymond Krzysko notes that the mother is usually the first person to diagnose the diarrheal disease and is, therefore, the best person to initiate and manage treatment. Although oral rehydration therapy using the WHO-recommended formula for the oral rehydration solution is optimal, the number of diarrhea episodes in Southeast Asia far exceeds the number of ORS packets available. To increase health coverage, Krzysko calls for a supplementary strategy for mild-to-moderate cases of dehydration.

After the introduction of an oral rehydration program in Guatemala, the use of oral rehydration solution in the home increased; and both the use of health services for the treatment of diarrhea diseases and the childhood mortality rate from diarrhea diseases decreased. Dr. Aaron Lechtig explains that community participation in Guatemala's oral rehydration program permitted almost total coverage of the target population and may therefore be an alternative approach for countries where central production and distribution are not feasible.

How to go about "Bringing ORT to the Community Level" is the subject addressed by Dr. Richard Cash. The introduction and use of ORT must be predicated on an integrated approach that is adapted to the particular factors present in each community. A home-based program using sugar and salt, for example, may not always be appropriate if there is ready access to packets and clinics. Cash examines the factors to consider in shaping a health care system and presents case histories which depict the need to adapt to local situations. For effective program dissemination, as many groups as possible should be trained in oral rehydration therapy.

Dr. Marilyn Nations examines the role of traditional practitioners in the use of ORT and ways to involve them in therapy. She notes there are different terms that are used by the local population to describe diarrhea, and unless these terms are utilized, the true incidence may not be recognized.

The use of oral rehydration therapy can substantially reduce hospital costs and lead to a marked reduction in mortality, states Dr. Dilip Mahalanabis. Describing "ORT As Used in the Hospital Setting for Both Inpatient and Outpatient Care," Mahalanabis considers various aspects of ORT use, including its use with

neonates with hypernatremic dehydration and its administration in both inpatient and outpatient settings. Noting that the WHO-recommended formula for oral rehydration solution does not reduce the magnitude and duration of diarrhea as compared to intravenous-treated controls, Mahalanabis discusses other possible formulas which may be more effective. The use of glycine in ORT has been examined and results of earlier work have been confirmed. Glycine reduces the duration of diarrhea and the volume of ORS needed.

Dr. Daniel Pizarro describes a study in which thirty-five infants with hypernatremic dehydration were treated with "slow" ORT with deficits replaced over a twelve-hour period. These infants were divided into two groups, with one group given a glucose/electrolyte solution followed by plain water and the other group given the glucose/electrolyte solution alone. Pizarro reports that preliminary results of this study encourage further consideration of slow oral rehydration for infants with hypernatremic dehydration.

Viewing the role of the hospital in the management of diarrheal diseases from historical, functional, programmatic, political, and motivational perspectives, Dr. David Nalin asserts that a hospital-based referral system is an essential ingredient of a complete diarrheal disease control program. He suggests how to implement a pilot oral rehydration program in a hospital, how to overcome the initial skepticism of resistance of the medical staff, and how to institutionalize the program once it has won acceptance.

Whereas most of the ICORT papers discuss oral rehydration efforts in developing countries, Dr. Bradley Sack examines the use of oral rehydration therapy in hospitals in developed countries. A study conducted in two hospitals in the United States and one hospital in Panama found that oral rehydration therapy was effective with hospitalized children. Sack examines both the advantages and the disadvantages of using oral rehydration therapy in developed countries.

## **THERAPY BEGINS AT HOME**

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Of the 1,000 million or more episodes of acute diarrhea occurring among some 300 million young children in the world this year, five million will lead to death — five million fatalities, almost one-third of all childhood deaths, from a disease that we have known how to treat effectively for decades. Of course, early aggressive in-

travenous rehydration would avoid perhaps four million of these deaths, but is it practical? Can we deliver this proven technology to 1,000 million cases a year, wherever they are? Who is to know at the outset, when a child just has a belly-ache or the seemingly mild "runs," that he will go on to be that one in two hundred to die? "Run to the doctor or health center? Don't be foolish, all kids have diarrhea now and then." Imagine the cost of treating each episode! Even at \$5 per patient, the average cost at the International Center of Diarrhea Disease Research, Bangladesh (ICDDR,B), where efficient diarrhea treatment is their main business, it would cost \$5,000 million annually. This figure is roughly twice the total government health expenditure of all sixty-seven low- and middle-income countries, almost twice the entire amount of external assistance to health programs throughout the world today. We simply cannot afford it.

But the five million deaths appear a small problem next to the 1,000 million cases. Fatal diarrhea is a relatively rare occurrence amidst the constant onslaught of repeated diarrheal episodes which, in the aggregate, interfere with the child's growth and development. We are all familiar with the erratic growth patterns so clearly presented on "Road to Health" graphs by Leonardo Mata. He has demonstrated the devastating effect of repeated infection inexorably carrying the child along what would be better described as the "bumpy road to death." Intervene in any one episode and mortality is averted temporarily, but sooner or later, another episode or another disease will kill. We must recognize that diarrhea is a recurrent disease and that avoidance of mortality in any one episode will not necessarily change the mortality perspective for a child who, with continually deteriorating nutritional state, reduced immune capacity and continued exposure to an insalubrious environment, will eventually succumb to one or another episode of diarrhea or perhaps another unsuspected "minor illness."

Mortality may be only one in two hundred, but diarrhea is *never* a minor illness. Each and every one of the 1,000 million episodes per year must be treated aggressively, not only with rehydration, in order to survive, but far more critically with food — until full nutritional recovery leads to improved health. As long as diarrhea is considered simply a disease, a medical condition to be treated by the health system, we will continue to fail. Diarrhea is a nutritional disorder and we alone simply cannot manage 1,000 million cases; it is not practical.

Faced with these facts, I see only one practical solution to the management of acute diarrheal disease in the world today: mothers. Each mother cares for her child, is constantly present, and can take immediate action, provided she un-

derstands and has the means. There can be no question about her motivation or willingness to do so. During this presentation I will attempt to show that using common domestic fluids, early rehydration at home by mothers is the only affordable and practical means to decrease fatality rates, to reduce the nutritional impact of a given episode of diarrhea, and to reverse the synergistic spiral of diarrhea and malnutrition leading to millions of deaths each year. I will contend that our attitudes towards diarrhea management, categorizing it as a medical condition requiring medical care, must give way to broad acceptance that diarrhea management is part of child-rearing and, like nutrition, is predominantly the responsibility of the mother. By considering diarrhea as a nutritional disease and recognizing that the replacement of losses *must include* calories, protein, or, in simpler terms, "good food," the repair of nutritional deficits will become an integral part of our diarrhea treatment strategy. Proper attention by mothers to nutrient replacement and convalescent feeding will break the diarrhea-malnutrition cycle, converting the "bumpy road to death" into the "road to health."

Furthermore, I will discuss recent evidence that a simple mixture of nutrients provided in a rehydration solution results in better fluid absorption than the standard glucose ORS, reducing fluid losses and shortening the duration of diarrhea. The optimal solution may well turn out to be, as our grandmothers said, chicken soup, rice water, or a close relative of these.

Finally, I will discuss practical considerations to reach mothers and involve them fully in this global strategy for child health. Drawn from experiences reported to me from throughout the world, I will allude to many approaches which will be presented in considerable detail during this conference. I shall only attempt to lay the groundwork, upon which my colleagues will build the undeniable case that only mothers can pave the Road to Health.

*First, the reduction of case fatality rates from diarrhea:* Until recently, medical care in health facilities or hospitals was provided by overworked staff who had great difficulty in providing the constant care needed by an acutely sick child. The health worker was expected to assess the child's needs and provide appropriate interventions, such as intravenous fluids and medication, as well as necessary dietary therapy. Under the best of conditions, mortality approaches zero with intravenous fluids alone. But these conditions rarely hold. It was in the overworked, understaffed bush hospitals of Asia and Africa that an appreciation for the role of mothers was discovered, as they became the *de facto* nurses assuming the care for their children under the direction of trained health workers. With the discovery of oral rehydration therapy, it became not

only possible to replace most intravenous solutions with resulting cost savings, but was also apparent that the mother could respond in a much more individualistic fashion to the rehydration needs of her child on a twenty-four hour, constant care basis. ORT made rehydration by mothers a practical reality. The reduction in hospital mortality to less than 1%, dependent upon the introduction of oral rehydration salts, is, to a large extent, related to the improved individualized care given to each child by his own mother, made possible by the introduction of this rehydration method. But I will leave the detailed story of the critical role of mothers in health centers and hospital care to the other speakers in this session.

Next, by moving oral rehydration beyond the hospitals and health centers into the community, it is closer to the patients in their homes and can therefore be provided earlier and with higher coverage. This was first demonstrated dramatically during the cholera epidemic afflicting the Bangladesh refugees in some 1,200 encampments along the border during the 1971 Liberation War. Family members were taught to rehydrate cholera cases simply by matching the estimated stool losses with fluid to drink. Remarkably, mortality fell below 3% in one large area using ORT, while in the fixed health facilities using IVs, 15% and 20% mortality was not unusual. In northeast Thailand, in Haiti, in Papua New Guinea, and in India, diarrhea mortality has fallen as health systems have extended availability of ORT covering into the community using village health workers, volunteers, or supply posts for ORS packets. But in Menoufia, Egypt, household distribution of ORS packets did not change the reliance of health professionals on ineffective drugs, nor the habit of mothers to withhold food and fluids from sick infants. Rehydration was not begun early at home, and mortality remained high. Packet distribution alone is not enough. Only where careful individual instruction, ready availability of packets, and professional support and backup have been provided, diarrhea death rates have declined. In both rural Bangladesh and Cairo, community ORS packet distribution projects have resulted in a 50% to 75% reduction in diarrhea deaths. It can work.

But the logistic problems and the expense of distribution systems for packaged ORS continue to deny the high coverage necessary to provide treatment to 1,000 million cases a year. Today, some fifteen years after the initial demonstration of the effectiveness of ORT, fewer than fifty million packets are being produced throughout the world per year, meeting the needs of far less than 5% of diarrhea cases. These packaged solutions must be used in a more efficient way. The community-level ORT post must itself be consid-

ered a referral point — therapy must begin at home.

By initiating fluid replacement in the home in all cases of diarrhea, some 90% of cases (900 million episodes) will recover in a short period of time without further intervention. For those 10% (100 million episodes) who continue, in spite of home rehydration, beyond four or five liquid stools or into a second day of illness, self-referral can occur to a community level packet distribution post where a health volunteer may assist the mother, demonstrating the use of packaged ORS and assessing the need for more professional care for her child. Those few children, perhaps 1% of the total (only ten million episodes in all), appearing to have severe diarrhea or unable to drink adequate fluid to offset continuing losses will be referred to the formal health system in a timely way before the state of dehydration becomes life threatening.

The challenge, of course, is to identify this 1% of cases before it is too late to provide effective treatment. For if the mother does nothing until the case is obviously severe, mortality remains high even when such cases arrive at an effective treatment facility. In the Rehydration Unit at the University Hospital in Haiti, mortality is now 1/1,000 cases presenting with moderate dehydration, but remains 120/1,000 in those children presenting with severe dehydration and shock. To be effective, the mother must begin intervention *before* dehydration. The key is, of course, the mother — her willingness to accept even the first sign of diarrhea as an important problem, and her ability to respond to it immediately in the home and then seek help in a timely manner for those few cases who will need referral.

Can mothers be depended upon to properly make and use home dehydration solution? Numerous publications and reports, many from investigators in this audience, attest that, when properly taught, mothers can recall and reliably prepare an adequate homemade rehydration solution. More than one and a half million mothers in Bangladesh, almost all illiterate, have been taught to make sugar/salt solution mixing a hand scoop of crude unrefined palm sugar, a three finger pinch of coarse sea salt, and drinking water in a common household vessel. Objective monitoring of a sample numbering over 50,000 of these mothers shows that 98% of mothers remember and can prepare an acceptable rehydration solution. This ability is retained when examined three, six, and even nine months later. In Indonesia, a plastic spoon was designed and widely distributed to assist mothers in the recollection of the right quantities of materials and as a reminder to encourage them to make the solution at the first sign of diarrhea. The solution made by these mothers, monitored

up to twelve months after initial instruction, was more accurately prepared than those made from packaged solutions.

There are surely reports where inaccurate mixing or reluctance to use home solutions have led to failure. Problems in measuring the proper quantity of water are often greater than that of the salt and sugar. Even when properly mixed, the solution must be given early and in adequate quantity. There are certainly many steps where the approach can fail. But it appears to me that these failures reflect more the inadequacies of the teaching approach than the abilities of the mothers. In Haiti, during the early months of 1983, almost one-half of mothers bringing babies to the rehydration unit had initiated fluid treatment at home. The rate of severe dehydration in these children was only 3% compared to 22% among those who did not start fluid at home. Two years previously, home therapy was unknown. Properly taught, mothers *can* and *will* make solutions that are both safe and effective. We do need to know far more about how to motivate them to use these solutions. In my experience, when they really understand what they are doing and why, when they know what to expect and when to seek help, mothers provide the best, most timely and effective rehydration possible. The clinical facilities then need only handle the few most severe or unusual cases. Mortality reduction becomes both manageable and affordable.

But what will this do for the second problem, the negative impact of diarrhea on the nutritional state and general health of the child?

There is now good evidence that certain traditional rehydration fluids appear to have distinct advantages over the glucose and electrolyte mixture discovered in a laboratory and now widely available in packages in health systems around the world. Glucose, a sugar substrate for the absorption of sodium, cannot be used in high concentration, for its osmotic effect will exacerbate the severity of diarrhea. However, starch from any source is a long chain of glucose molecules having virtually no osmotic activity. Glucose derived from the hydrolysis of starch, one molecule at a time, stimulates the absorption of fluid and electrolytes from the intestinal lumen, both rehydrating the patient and reducing the fluid that would eventually pass out in the feces. Starch mixtures, particularly from rice powder, have now been shown to be equally or even *more* effective than the scientific glucose solutions.

Fifteen years ago, as a researcher at the Cholera Laboratory, I guffawed along with my scientific colleagues at the common practice by Bengali mothers of treating cholera with rice water. Today we hear about the group rediscovering rice water. Let me not romanticize traditional practices. Had they been ideal, we would not

have had the deaths, but we can learn from them — to seek out the workable and scientifically sound elements of traditional practices.

Of even greater interest is the additional effect of other nutrients which also increase the rate of absorption of salts and water. Amino acids, the building blocks of proteins, are absorbed through a number of independent pathways, each of which facilitates the transport of salts and water into the body. Addition of amino acids or small predigested protein particles leads to even more rapid absorption, more effective rehydration, and, notably, a reduction in stool volume. Even the small amount of protein in rice powder may account in part for the improved effectiveness of the solution over standard ORS. Herein may lie the answer to the problem that most severely impedes the acceptance of oral rehydration — continuing stool losses. For if an optimal nutrient mixture can reduce diarrhea, it will be a popular remedy indeed. The precise composition of such a nutrient electrolyte mix needs urgently to be defined.

Careful exploration in each society will be needed to determine the most scientifically appropriate, culturally acceptable, and affordable household fluid mixture with which to start therapy at home. Breast milk is, of course, an excellent solution. While its protective effects are well recognized, I wonder if we have really fully explored its potential in the therapy of diarrhea. Clean, nutritious, and widely available to the age group of highest risk, six to twenty-four months, we need only to find ways of further increasing quantity on demand. Increased frequency of suckling during illness has already been documented. The additional milk rehydrates and nourishes as well.

While we can give an unqualified endorsement to breast milk, further investigation of potential home solutions are needed before they can be widely recommended. The studies of rice starch have used finely ground flour carefully stirred into hot water to facilitate dissolution. Preparation requires time, patience, and fuel. The solution becomes undrinkable within six to eight hours. Other starch or liquid nutrient mixes are even less well studied. Nonetheless, I remain confident that appropriate home remedies are out there waiting to be discovered, more widely used, and integrated into our therapeutic schema. Rice water, carrot soup, broths, or others may provide effective, cheap, believable, and universal antidotes to the world's biggest killer.

Of equal importance to rehydration, and even more often neglected, is attention to feeding during convalescence, that brief period of a few days following illness when a recovered child has an increased appetite and will take even more food than normal. The phenomenon of catch-up growth or growth spurt following illness has

been well documented for cases of severe malnutrition, endocrine disorders, and overwhelming systemic infection. While it is not yet well understood, such increased growth rate is possible in the immediate days following acute illness, provided adequate additional food is available. Growth two, three, or even four times normal can make up for weight losses incurred during illness and bring the child back to his normal growth curve. This requires frequent feeding with readily digested foods administered throughout the day, almost as if on a prescription. But the opportunity is a brief and fleeting one. The small food supplements provided in most nutrition programs are just not enough. From 150% to 200% of Recommended Daily Allowance for three to five days is needed to capitalize on this growth potential. It appears that targeted use of food supplements providing intensive feeding for only several days following diarrhea may be a major intervention strategy in the nutrition-infection interaction. Food is an integral part of the oral therapy strategy – without it we accomplish little more than a delay in mortality. With food comes the prospect of improved health and quality survival.

All of this depends on the critical understanding and willingness of mothers to treat every diarrhea episode in her child as important, with early and aggressive use of appropriate fluids and nutrients available to her in her home. How do we reach the mother? How do we penetrate the ignorance and misinformation surrounding diarrhea? How do we work together?

First, it is *our* ignorance more than that of mothers that has led to failure, our ignorance of how they perceive illness and health, of causality and reasonable responses. Diarrhea is often not considered an illness, not life threatening, but a healthy cleansing of the body. Fluids cause more diarrhea; intestines need a rest; food cannot be digested; and so on. Only by understanding their concepts, beliefs, and practices can we tailor our communication approach to build upon what mothers know, a better understanding and acceptance of the whats and whys of diarrhea management. Too often what we say just does not make sense.

Mothers, on the other hand, need to understand some facts, too: *what* diarrhea is, *how* it leads to malnutrition and occasionally death, *why* fluid and nutrients given by mouth save lives, *how* extra feeding for even a few days hastens recovery. We cannot expect blind acceptance of our instructions which, more often than not, fly in the face of every tradition and logical response they know. We need to listen to and understand each other.

Second, is our attitude towards mothers. We must recognize each mother for what she is: the person most vitally concerned about her child's

health, but, even more, a valued and important member of the health team. We must treat her as other health workers, informing her in an appropriate and respectful way. She must see for herself and learn by experience, as all of us have done in this field. Our approach must therefore be a collegial one, addressed to her capacity, but constantly involving her in the active learning process. It is the mother who must treat her child, whether in the hospital, in the health center, outpatient department, community, or home. We must demonstrate in a patient and effective fashion the precise activities that we expect from her and assess, as we do during the training of any other health worker, her understanding and capability of accepting and carrying out these skills. Competency-based experiential training is the key. The classical approach of haranguing mothers in a crowded, noisy, hot waiting room with an unfocused and boring lecture is no substitute for the personal approach and demonstration of how the mother should handle diarrhea in the home.

Third, it may come as a surprise to many of us caught up in the enthusiasm for the role of mothers that fathers are often intimately involved in the decisions affecting child-rearing, especially during illness. From the Bangladesh Rural Advancement Committee (BRAC), we will hear that although Bangladesh mothers could clearly recall the proper formula for mixing home sugar/salt solution, only following special efforts to inform fathers about early home rehydration was the treatment widely accepted and used. Let us not forget that in some societies men still have a role in decision making.

Fourth, is our approach to information dissemination. Modern communication techniques are used throughout the developing world to sell useless and often even harmful products. These same techniques, in the hands of skilled professional marketing experts, can introduce behavioral change leading to widespread adoption of the home oral therapy strategy. In The Gambia and Honduras, following well-established market research procedures, culturally sensitive messages were widely disseminated through a variety of mass media. Knowledge and use of oral rehydration rose from less than 3% of mothers to over 50% in one year.

Social marketing is a complex process, much more than a few billboards and a radio jingle. As professionals in health, we must appreciate the unique professional qualities required of our colleagues involved in mass marketing, calling upon experienced firms to assist us. Together, we must start with a comprehensive understanding of presently held beliefs and practices in order to assure the communication strategy is believable and acceptable in a given cultural context. We must be precise and clear about the product or

message that we are trying to sell, building on what is known and believed, and changing accepted approaches only when they are unequivocally harmful. We must neither belittle nor ignore traditional culture or wisdoms. We must present our product in a believable and attractive way, convincing people that the home approach to rehydration and nutritional therapy for diarrhea is in no way a second-class therapy, but is rather a first-class response to the biggest threat to health in the world. It is, in fact, the only workable response, and its elements must be clearly understood by all. We must not oversimplify — the ORT approach is a comprehensive *home nutrition strategy*. Rehydration with appropriate nutrient mixes, early refeeding, and added attention to nutrition during convalescence are all integral parts of the oral therapy message without which we can expect little more than attenuation of the deaths occurring from diarrhea.

We must be sure that we have a consistent message, one that is reinforced in a coordinated way at all levels of our system. Somehow we must demonstrate to our doctors and nurses that ORT is technically effective. We must bury this strange, unfounded, yet deep-rooted belief among medical professionals, of resting the gut — resting gut rapidly atrophies, enzyme levels fall, absorption worsens. Yet in the so-called “advanced medical centers” of the United States, children continue to be exposed to the costly and unnecessary risks of intravenous infusions, while intestinal mucosa atrophies under the strict doctors orders of NPO (Nothing by Mouth). Until the medical profession understands, accepts, and practices oral therapy, can we expect others to embrace it? Where these professionals have been bypassed, failure has been almost universal. From Haiti, Indonesia, Jamaica, Costa Rica, and others, we will hear the important role that doctors can and must play to make the “mother strategy” a success.

From academic centers of excellence to remote rural villages, appropriate information dissemination requires understanding of the target audience, careful development of communication tools, and, throughout, a consistent oral therapy message. This involves a comprehensive strategy extending from retraining of health professionals to effective use of mass media. Properly used, social marketing techniques can reach all mothers with consistent, believable, attractive, and do-able messages, backed up by the medical profession.

Finally, it is necessary for our health planners and administrators to recognize that they alone cannot reach the majority of mothers and their children today nor in the foreseeable future. We must accept an intersectoral approach in which we become managers, involving in the planning, outreach, and monitoring process all of the existing diverse systems which already reach into the

lives and homes of our populations. Schools at all levels, religious institutions, and social groups must be involved from the outset. We must present the oral rehydration message in a way that will promote the aims and objectives of each sector. In schools, oral rehydration and nutritional therapy have been effectively presented to teachers in lesson plans aimed at science, reading, social studies, and even mathematics. Religious leaders in Indonesia participated with the Department of Health in a thorough analysis of Islamic texts showing that the holy works support the concepts of early attention to the sick child, of added food, of proper breastfeeding, and of intensive mothering. Carefully formulated in a guide to religious leaders, the mosques now play a role in disseminating the message.

In many countries, the commercial sector has already far surpassed the Health Department in making packaged rehydration solutions available in the most peripheral areas of the country. The supply and promotion of such routes should be encouraged, as their outreach far exceeds that of most health systems. Commercial sales and promotion are self-financing and inherently responsive to the demands of the community. Local marketing firms are already skilled at culturally appropriate approaches to the communities in which they work. We must mobilize these professional resources to help us if we seriously expect to reach those 1,000 million cases each year.

In conclusion, we must adapt the formal health system to the home rehydration strategy rather than the reverse. We have been building the system from the top down, in the typical wisdom of medical professionals; we have been carrying out our experiments and, in a carefully controlled manner from laboratory conditions, learning many of the principles that the best of mothers have known for generations. It is now time to reorganize our strategies in every country, to reach out and involve that group of health workers who are on duty twenty-four hours a day, who are intimately concerned and totally committed to the patient in their care: the mothers of the world. With the proper understanding, guidance and encouragement, they can assure that all cases of diarrhea will receive immediate effective attention: rehydration and feeding. By skillful and sensitive use of modern social marketing techniques and a true intersectoral mobilization of existing resources, we can get the message across. Our health system should stand ready to back up mothers in those few cases where their actions require further professional care. At all levels, it is the mother who will remain the key health worker and will hold the ultimate responsibility not only for the vast reduction in mortality, but also for the universal improvement in child health resulting when, for every case of diarrhea, therapy begins at home.



## CONTROL OF DIARRHEAL DISEASE IN THE COMMUNITY\*

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When I was asked to discuss Jon Rohde's paper,<sup>1</sup> I prepared myself to provide a critical review, that is, to point out its strengths and weaknesses. Since I find myself agreeing with virtually everything he has said, I wish to spare you my repeating his findings and, instead, tell you about an effort undertaken by the Ministry of Health of Egypt to control the high number of preschool child deaths from diarrheal disease.

Rural Egypt has an extremely well-developed health service infrastructure. Eighty-five percent or more of rural Egyptians have to walk no further than five kilometers to reach the nearest health facility. All governmental facilities, centers, and units are staffed by at least one physician and two or more nurses. Why, then, did diarrheal disease account for about two-thirds of all preschool child deaths and for nearly 80% of child deaths during the hot summer months? Based on our earlier experience from Narangwal, North India, we know that there are a number of important factors that interplay in and contribute to a diarrheal death.<sup>2</sup> These are:

1. *Failure of disease recognition.* Families, as a rule, do not take an "ordinary" bout of diarrheal disease seriously unless it is accompanied by other symptoms, such as fever, vomiting, or blood in the stools.

2. *Wrong dietary behavior.* Once diarrhea has been recognized as such, mothers tend to curtail food — and especially liquid — intakes.

3. *Treatment delay.* Families usually wait too long before their (by now seriously ill) child is taken to the health professional for treatment.

4. *Inappropriate medical treatment.* Even when mothers have taken their sick child to the health professional, there is usually some further delay before the child receives definitive treatment, or the treatment itself is inappropriate.

We soon learned that these same factors prevailed also in rural Egypt. Within the "Strengthening of Rural Health Delivery" (SRHD) project, a diarrheal disease control study was undertaken that could ultimately serve as a model for diarrheal disease control for all of rural Egypt. As such, the methodology employed had to address these factors and, considering that three of these were under the direct control of mothers, had to be simple, readily accessible, and, above all, cheap.

Using Narangwal data,<sup>3</sup> every preschool child may be expected to suffer on the average from five episodes of diarrheal disease per year, each lasting four days. If we were to follow WHO's

recommendations for the treatment of diarrheal disease, to use one package of oral rehydration salts per day, we figured that we would require close to seventy million packets per year to cover all of rural Egypt's preschool population effectively. In 1980 Egypt produced and imported only a total of five million packages. Availability of prepackaged ORS hence clearly seemed to be a major constraint to an ORT program then and, in our opinion, was to remain so for at least the next few years. Aside from the problem of providing such a staggering amount of ORS were additional (foreseeable) problems of storage and timely distribution to those in need. Having decided, as Jon Rohde did, "to put treatment where the diarrhea is," that is, into the home, we wanted to introduce a treatment regimen that, if possible, would be independent of outside supply and not require costly ingredients and utensils. From our previous experience in Narangwal on a somewhat limited number of children, we had found that early *prevention of dehydration*, through use of a homemade sucrose/salt solution, had resulted in a significant decrease in diarrheal disease mortality. We now needed to compare the effectiveness of this "home remedy" in preventing diarrheal deaths to that of a balanced electrolyte solution containing potassium and bicarbonate.

### Experimental design

The investigation consisted of six experimental cells with a total of close to 29,000 children between the ages of one month and less than five years. Of these six cells, two served as controls, four as input cells. Main inputs consisted of:

1. Health education of families on diarrheal disease recognition and management, and especially on how to prepare and administer ORT. It was provided in the course of routine home-visiting and at public meetings.

2. Training of health facility staff in ORT.

3. Making ORS available in unlimited quantities to health facilities ("Oralyte") and to mothers resident in ORS-distribution villages.

In villages where the homemade sucrose/salt solution was used, mothers were instructed to take one-fourth level teaspoon of salt (approximately 40 mmols of sodium) and five teaspoons of sugar per liter of water, and to supplement the child's diet with foods rich in potassium, such as orange and tomato juices, mashed banana, etc. In the villages where prepackaged sucrose/salt ORS were distributed, one package, when dissolved in a liter of water, provided approximately 60 mmols of sodium. Specific experimental inputs into the study cells as well as their respective child populations are shown in Table 1.

At regular intervals household surveys were held to collect birth and death statistics, to determine maternal knowledge of and practice with ORT, and to sample home-prepared/diluted ORT

**Table 1****INPUTS INTO STUDY CELLS**

<i>Study Cell</i>	<i>No. of Children in Cell</i>	<i>Experimental Inputs</i>
Control-1	4,400	Unchanged (present) Governmental Health Services. Ministry-of-Health-Introduced ORT Program carried out since 1977.
Control-2	6,018	Health facility staff made aware of importance and method of ORT. "Oralyte" made available to all facilities in unlimited quantities.
"Oralyte" home distributed	6,875	"Oralyte" distributed to all households on monthly basis. Health education in homes and public places (e.g. mosques) at regular intervals. "Oralyte" available ad-lib to home-visiting nurses and at facilities.
"Oralyte" through commercial channels	7,073	"Oralyte" available at all village shops and pharmacies at subsidized price. Remainder of inputs as above.
Home prepared sucrose/salt hydration fluid	2,023	Hydration fluid prepared by mothers from home supplies of sugar and salt. Remainder of inputs as above.
Prepackaged sucrose/salt ORS home distr.	2,461	Sucrose/salt commercially premixed, prepackaged and distributed to all homes on monthly basis. Remainder of inputs as above.

fluids for sodium content. In all but Control-1 health facilities, records were kept on children seen for diarrheal disease, listing, inter alia, their presenting signs and symptoms as well as the treatment regimen employed. All deaths among the study population were analyzed by specially trained physicians as to cause of and events leading to death through means of a "verbal autopsy" within ten days of the event.

**Results**

The study ran from May 1 through October 31, 1980, and bridged the annual peak of diarrheal incidence in rural Egypt. Household survey results showed a significant increase in maternal knowledge on the correct preparation and administration of ORT fluid over the period of implementation. "Oralyte" consumption was greatest where it was freely distributed to mothers and least in the Control-1 villages, as shown in Table 2. Where home-prepared or prepackaged sugar/salt solution was used for ORT, 1.2% of children coming to the clinic presented with signs and symptoms compatible with hypernatremia (0.4% each with periorbital edema and generalized edema, 0.3% with convulsions). In villages where "Oralyte" was the mainstay of home treatment, 1.0% had periorbital edema, 0.8% had generalized edema, and 1.5% presented with convulsions.

Both absolute and diarrhea-specific mortality rates in children one month to less than five years of age were determined over the six-month period. The former were compared in each cell to the corresponding death rates over the preceding

**Table 2****"Oralyte" Consumption Per 100 Children Months**

<i>Study Cell</i>	<i>No. of Packages</i>
Control-1	0.7
Control-2	3.0
"Oralyte" home distributed	56.5
"Oralyte" through commercial channels	21.0
"Home-prepared sucrose/salt hydration fluid	6.0
Prepackaged sucrose/salt ORS home distributed	4.3 (86.8)*
All Cells	17.6 (25.0)**

\*The number in brackets denotes consumption of prepackaged sucrose/salt ORS.

\*\*Average rate of all prepackaged ORS ("Oralyte" plus sucrose/salt) consumption in study.

four years (1976 through 1979). Overall, diarrhea-specific child deaths during the study period accounted for 79% of all child deaths. Child deaths were fewest in those villages where mothers had immediate and ready access to ORT, either because they prepared the solutions from household supplies or ORS had been freely distributed to them. These results are shown in Table 3.

In a last analysis we determined the cost of our services per preschool child up and beyond

that encountered in the Control-1 villages and then determined the cost per averted child death using the death rate in Control-1 villages as reference. Cost of services was lowest in the Control-2 villages and highest in the two cells where the prepackaged ORS was distributed to the homes. The cost per averted death was lowest in

a sucrose/salt solution.

2. Mothers can be taught and delegated diagnosis and early management of diarrheal disease. They are the only ones who will routinely provide 24-hour care for their children.

3. For the treatment regimen to be effective, ORS must be readily available in the home.

**Table 3**

**DEATHS OF CHILDREN ONE MONTH TO FIVE YEARS  
May through October 1976/79 and 1980**

Study Cell	Child Deaths One Month to Less Than Five Years of Age					
	1976/79			1980		
	No. of Children	No. of Deaths	Rate	No. of Children	No. of Deaths	Rate
Control-1	7,719	150	19.4	4,400	76	17.3
Control-2	20,318	436	21.5	6,018	113	18.8
"Oralyte" home distributed	25,600	483	18.9	6,875	77	11.2
"Oralyte" through commercial channels	7,736	154	19.9	2,073	35	16.9
Home prepared sucrose/salt hydration fluid	29,601	523	17.7	7,023	72	10.3
Prepackaged sucrose/salt ORS home distributed	9,194	215	23.4	2,461	23	9.3
All Cells	100,169	1,961	19.6	28,850	396	13.7

**Table 4**

**ADDITIONAL COST OF PROGRAM PER CHILD BEYOND THE ROUTINE HEALTH SERVICES PROVIDED IN CONTROL-1; AND COST PER DEATH AVERTED BY EXPERIMENTAL CELL.**

Study Cell	Cost* of Program Per Covered Child	Cost Per Death Averted
Control-2	0.16	483.5
"Oralyte" home distributed	0.57	73.0
"Oralyte" through commercial channels	0.42	216.1
Home prepared sucrose/salt hydration fluid	0.30	36.5
Prepackaged sucrose/salt ORS home distributed	0.61	89.0
All Cells	0.38	70.3

\*In Egyptian pounds; 1 LE Equals Approx. 1 US \$.

those villages where mothers prepared the oral rehydration fluid from home supplies of sugar and salt and highest in the Control-2 villages. These results are shown in Table 4.

**Conclusions**

From among the certainly large number of conclusions one could draw from the study and its results, let me mention but four that we considered most important.

1. Prevention of dehydration can be done quite effectively through early administration of

Providing it only to health facilities or even to the village community through commercial outlets clearly was not good enough.

4. Our experience showed ORS requirements to be around nine packets per child per year, based on the average of ORS consumption ("Oralyte" plus prepackaged sucrose/salt) in those villages where it was freely distributed to homes. This number is lower than what we had originally estimated, but considerably larger than the five million packages that were available for rural Egypt's then 34 million preschool children.

## REFERENCES

1. Rohde, Jon. "Taking the Treatment Where the Diarrhea is." Paper presented at International Conference on Oral Rehydration Therapy, Washington, D.C., June 1983.
2. Kielmann, A. A., et al. *Malnutrition, Infection, Growth and Development in the Children of Narangwal*. Washington, D.C.: World Bank Publication, forthcoming.
3. Kielmann, A. A., and McCord, C. "Home Treatment of Childhood Diarrhea in Punjab Villages." *J. of Trop. Ped. and Environ. Hlth.* 23(197) (1977).

## EARLY HOME TREATMENT OF ACUTE DIARRHEAS: A NECESSITY OF A NATIONAL DIARRHEAL DISEASES POLICY

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Acute diarrhea in children aged less than five years, and specifically in those less than two years, is a priority health problem in South East Asia. Acute diarrhea is among the first two causes of morbidity and mortality, matched only by acute respiratory infection as a leading cause of death.

In the majority of cases of diarrheal disease, children die from dehydration, with only a small percentage dying from other complications. The main strategy, therefore, in preventing death is the prevention, the management, and the treatment of dehydration. In this connection, crucial questions arise which should be answered by the national Diarrheal Disease Control policy:

- When should treatment for dehydration commence?
- Who generally diagnoses the diarrhea episode, and who should be responsible for treatment?
- Where should the case be managed?
- How can the diarrhea dehydration syndrome be prevented and treated?

There are three facts that should be taken into account when responding to these queries.

1. The experience and the research of the South East Asia Diarrheal Diseases Control Program (SEA CDD) reveal that there is no distinct day/night pattern in the occurrence of the diarrhea episode. Approximately 50% of cases present their symptoms during nighttime and 25% during times when health facilities are inaccessible, even if they are within the area of responsibility. Only 25% of symptoms are diagnosed at a time when any kind of health facility is easily available. The predominant pattern of primary health care in South East Asian countries

is such that at any point in time, about 18% to 40% — or an average of 30% — of children have access to a health facility. All existing health facilities, excluding traditional healers, herbalists, and private practitioners, are equipped with standard ORS packets enabling the coverage of about 14% of needs (as per 1982).

2. In 98% of cases, the diagnosis of diarrhea is made by mothers or family members, irrespective of the severity of symptoms (by WHO criteria) that occur at the onset of the disease. The great majority are mild or mild-to-moderate cases. Some, however, are more severe.

3. An effort is made by the policy makers that oral rehydration therapy should be given to all cases diagnosed as acute diarrhea. Another effort is made that preferably or only ORS, based on standard WHO-approved formula, should be given to most or all of these cases.

Given these facts, which are the most feasible, operationally justified actions?

### When?

Oral rehydration must be initiated *immediately* after the mother recognizes the episode of acute diarrhea. The timing of treatment is crucial to the prevention of the progress of dehydration and, subsequently, to symptom severity, complications development, and referral.

### Who?

Operational research findings and field practices indicate that in 82% of cases, mother/caretaker is the *first contact* person who initiates home care, and she initiates this care before seeking further advice. Her action may be correct in 30% to 60% of cases. In a limited number of cases, not necessarily severe ones, the village health volunteer, community health worker, family health worker, traditional healer, or private practitioner is the alternative first contact person initiating treatment. Usually, these people are referral links.

### Where?

In 82% of cases, due to operational reasons (timing of disease onset, accessibility to services, environmental factors, mother's occupation with home work, etc.), treatment of the diarrhea can only be initiated and managed *at home, irrespective of the severity of symptoms*. Most diarrhea episodes are mild or mild-to-moderate, with some of them switching very rapidly to moderate-to-severe or severe stages. This indicates that the mother should commence the treatment of oral rehydration at the home dwelling.

### How?

The question of how the diarrhea dehydration syndrome can be treated and prevented is the most difficult question to answer in operational

terms, although technically it is a fairly easy question to resolve, since the management strategy for dehydration prevention and treatment is well defined. The National CDD Program, in its attempt to solve this question, faces a number of issues. Is it feasible for ORT to be initiated at home by mothers? If so, should this be through administration of ORS (WHO-based formula), through homemade or available fluids including sugar/salt solution prepared by the mothers themselves, or both?

The ORT based on standard ORS (WHO formula) would be the best choice. However, it has significant constraints in terms of cost and limited availability. Only thirty million ORS packages per year are at the disposal of the countries of the South East Asia Region (SEAR) whereas about 200 million episodes of diarrhea occur per year, of which the majority need incomplete ORT with salt/sugar solutions and other homemade, available fluids. Sixty to eighty million need complete ORT based on the WHO-ORS formula. Because the potential for rapid production increase in forthcoming years for the latter is low, a supplementary strategy that could be applied to all mild or mild-to-moderate cases is needed. Thus the early home care with available fluids and, in certain conditions, with sugar/salt solution is an attractive option. Studies carried out in Bangladesh, Nepal, and Southern India have confirmed that any homemade, available solution given to the child with initial symptoms of diarrhea (without/some dehydration) alleviates the cause of diarrhea. Research is now underway in Thailand, in West Bengal Province of India, and other countries to define the magnitude of

the impact of this treatment on severity and referral.

Mothers, if properly trained and subsequently supervised for a reasonable period of time and if equipped with the simplest possible, reliable, home-available scales, can prepare sugar/salt solutions effective in dehydration prevention and treatment. Such programs are now developing in Bangladesh, Maldives, and parts of India and Indonesia; and Thailand and Nepal are considering their introduction.

It is obvious, however, that a proportion of cases should be treated with the full WHO-ORS formula from the inception of the disease. The number of such children still needs to be precisely defined for each national program. Observations and guesses state that this group might constitute approximately 20% to 30% of all acute diarrheas. It is also obvious that some limited number of acute diarrheas present severe symptoms of dehydration within a few hours of their first observation. About 2.8% of all newly diagnosed cases fall into this category. These cases need I.V. rehydration and supportive treatment.

Based on these observations, Regional CDD Programs in SEAR and most National Programs have adopted a three-tier policy for comprehensive management of cases of acute diarrhea in children under five years of age.

The introduction of the three-tier diarrhea management policy needs to be approached comprehensively in field conditions. Intensive health education of mothers and/or family members is required to achieve their acceptance of home cure, to increase their skills in preparing home fluids (sugar/salt specifically), and to

**Table 1**  
**CASE MANAGEMENT POLICY OF SEARO FOR DEHYDRATING DIARRHEA**

<i>Severity of Symptoms</i>	<i>Proportion of Cases</i>	<i>Type of Management (Priority Ranking)</i>	<i>Treatment initiator and Procurer (Priority Ranking)</i>
Mild Mild/moderate	Large	<ul style="list-style-type: none"> <li>• Home care with available fluids</li> <li>• Sugar/salt solution, if mother probably taught</li> <li>• Standard ORS, if available</li> </ul>	Mother/FM,* VHV, TH, H, CHW
Moderate Moderate/Severe	To be defined (for each country separately)	<ul style="list-style-type: none"> <li>• ORT with standard ORS</li> </ul>	*CHW, HCW, PP, TH, Mother
Severe	Very small	<ul style="list-style-type: none"> <li>• iv rehydration supportive therapy</li> <li>• ORT with ORS</li> </ul>	Health Institutions Mother

\*FM = Family Member; VHV = Village Health Volunteer; TH = Traditional Healer; H = Herbalist; CHW = Community Health Worker; PP = Private Practitioner; HCW = Health Center Worker

heighten their awareness of referral if home treatment fails. Intensive in-service training for community health workers, village health volunteers, traditional healers, herbalists, private practitioners, and health center workers is needed. Those personnel are the second-contact persons in the management process. The referral system needs strengthening; the production of ORS needs to be increased; and the production of packets for individual use and the introduction of bulk/large quantity preparations for use in settings where numerous cases are treated needs to be promoted. The logistic system in ORS distribution down to PHC level needs improvement. Finally, periodic monitoring of the performance of staff involved in ORT and the supervision of home-care components by competent field health workers is required.

Further development and refinement of this approach to efficient management of cases of acute diarrheas in children might speed up a decrease in mortality and hasten the "Health for All/2000" objective of the overall improvement of health conditions in our countries.

## **SINAPS EVALUATION: RESULTS OF COMMUNITY DISTRIBUTION OF ORAL REHYDRATION SALTS IN GUATEMALA \***

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In our experience, three factors are crucial to ensure success in the community distribution of ORS:

1. Adequate information, training, and supervision of the mothers with continuing positive reinforcement of their motivation;
2. Continued support from health professional personnel, in particular, adequate treatment and follow-up of referrals; and
3. Appropriate supply of ORS to cover all households on a regular basis.

Thus, isolated "vertical" campaigns may have a very limited impact unless they are designed within the context of a coherent, regular primary health care approach to ensure continuity to the process. What follows is a description of a community distribution intervention in which attempts were made to fulfill these main requisites.

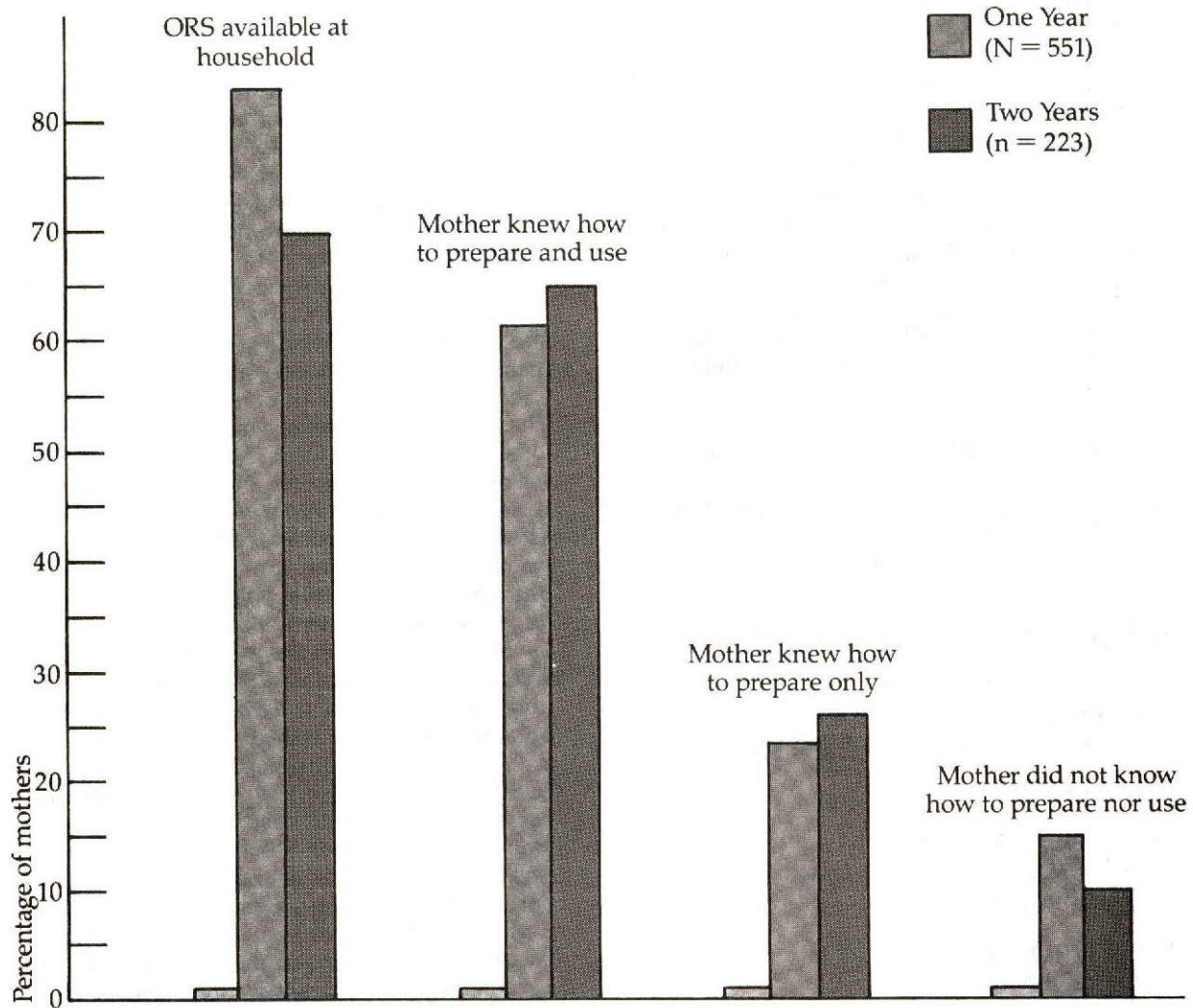
ORS were distributed at household level by 377 community voluntary health workers called health promoters to a population of 68465 inhabitants as part of the routine operations of SINAPS, a primary health care system in the eastern part of Guatemala.<sup>1</sup> In this population, dehydration due to diarrhea is a main cause of infant and childhood mortality. Because ORS were not regularly available in adequate amounts in the country, a simplified formula<sup>2</sup> was developed for local production by health centers and distribution by health promoters.<sup>3</sup>

All health personnel were trained in local production, household distribution, and education to mothers on how to use ORS. For this purpose, specific guidelines, training, and information materials were developed, including posters, for wide information to the community on ORT.<sup>4</sup> These materials were designed to be relevant to local beliefs and customs. A first step in the process of motivating parents focused on alerting them to the dangers associated with diarrhea. Then, information on oral rehydration treatment was provided. This information, built upon traditional beliefs on household treatment, reinforced positive motivation and was accompanied by delivery of ORS to the mother. Each family received a package of six 250 ml bags per child under five years of age. This volume was selected because of the wide availability of glasses of this size. It also limited unnecessary wastage of ORS. Simple, printed material on how to prepare and use ORS was also delivered and carefully explained to the mother. The health promoter was close to the mother to provide advice and support the first time she started ORT for her child with diarrhea. In this way, mothers gained awareness and understanding of ORT and easily became believers and active promoters of ORT.

Data in Figure 1 indicate that before the intervention the availability and knowledge of ORS were about zero. Though ORS were available at the pharmacies, sales were very low (equivalent to less than 25 ml per family per year) because of extremely high costs (\$0.60 to \$2.00 per liter) and no commercial advertising. One year after the intervention, 83.7% of the families with children under five years of age had ORS available at home. About two-thirds of the mothers knew how to use ORS, an impressive result in these populations. Of the rest, two-thirds knew how to prepare the solutions, but not how or when to use it, and the other third did not know how to prepare or how and when to use the ORS delivered to them.

Data in Figure 2 indicate that the use of ORS at home increased notably from less than 1% to more than a third of the cases of diarrhea in the first year after the intervention. Additional data indicated high rates of consumption, rising to 57% and 83% of delivered ORS during the first

**Figure 1**  
**AVAILABILITY AND KNOWLEDGE ON ORS**



1 - The figures for baseline are assumed to be around zero percent. (See text).

and second years, respectively, after the intervention. Data in the same Figure 2 indicate that use of drugs from the pharmacies and use of health facilities for treatment of diarrhea were reduced considerably, a decrement persisting two years after the intervention. The reduction in use of services for treatment of simple diarrhea occurred in spite of an overall increase of 9.1% in use of services during the same time period. Therefore, though the implementation of the primary health care system stimulated the demand for health services, the household distribution of ORS and massive education campaign reduced specific utilization of services for treatment of diarrhea. Data in Figure 2 also indicate a decrease in child mortality in the target population to half of the baseline figures. Wide availability and consistent use of ORS by the mothers may have contributed to this impressive decrease in mortality. However, additional data is required to ver-

ify the consistency of this decrement, since yearly fluctuations in mortality are not unusual in a population of this size (n = 68465).

The main advantages encountered with this approach of local production and community distribution of ORS were:

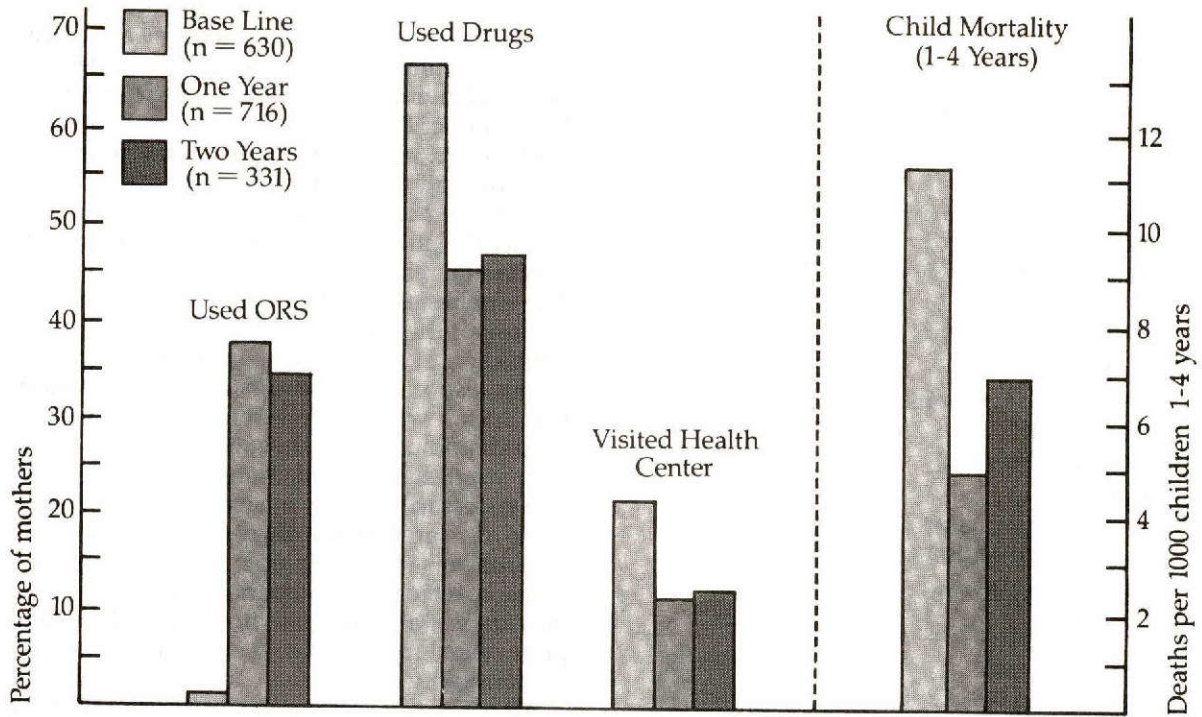
1. Self-sufficiency at the health center level to provide ORS to all families within usual budgetary constraints of health centers in Guatemala. In this way the SINAPS health centers were not affected by severe problems in central production and distribution that made ORS unavailable in the rest of the country.

2. Community participation in prevention and treatment of a major health problem, a factor that allowed for almost total coverage of target population within routine activities of health center personnel.

At the same time, the increment in number of production centers represented a major complica-

FIGURE 2

WHAT DID YOU DO THE LAST TIME YOUR CHILD HAD DIARRHEA?



Changes were statistically significant ( $\chi^2 = 296.7$ ;  $df. = 2$ ;  $< .01$ ).

The question refers to children under five years old with more than two consecutive days of diarrhea.

tion for standard quality control procedures. To solve this problem, quality control was radically simplified. It was found that routine weighing of random samples of packages of six bags and control of the amount of potassium chloride used for each day's production provided most of the information required for supervision. Production rates were about three hundred bags per worker per day. Rates of deterioration were low: 3% of a sample of bags after fifteen months of storage under usual working conditions that included rough handling and rodents. However, most of the ORS produced were distributed within one month of production.

The capital cost of setting up local production was \$550 per production unit, while variable costs were 1.5 cents per 250 ml bag. Total additional costs required to implement this model were 47 cents per capita per year, or about 0.2% of the per capita budget of the Ministry of Health of Guatemala.

Because of these characteristics, this approach may become a suitable alternative for those countries where central production is not feasible. It can also be appropriate as a temporary alternative to supply ORS while central production develops and becomes adequate to satisfy demand for wide availability at the family level.

Appendix 1

BASIS TO ESTIMATE COST OF HOUSEHOLD LEVEL DISTRIBUTION OF ORAL REHYDRATION SALTS IN SINAPS

(U.S. dollars)

A.1	Fixed cost production unit	\$550.00
A.2	Average health district population	10,000 inhab.
A.3	Fixed cost per capita over five-year period —	1.1 cents
	$550.00 / 5 \times 10,000$	
B.1	Variable cost per bag (250 ml)	1.5 cents
B.2	Number of bags per child under five per year (six bags per episode, two deliveries per year)	12 bags (3 lts)
B.3	Cost in bags per child per year	18 cents
B.4	Cost in bags per capita per year	3.6 cents
C.1	Total additional cost (A.3 + B.4)	47 cents



C.2 MOH budget per capita per year (Guatemala)	\$20.00
C.3 Percentage of per capita MOH budget	0.235%

**Appendix 2**  
**SUMMARY OF SINAPS**  
(Population: 68465)<sup>1</sup>

	<i>Before</i>	<i>After</i>
1. Immunizations		
Pregnant Women* <sup>1</sup>	—3	65%
Children 0-4 yrs* <sup>2</sup>	58-70%	80-98%
2. Availability of ORS (% use)*	—3	84% (38%)
3. Malnourished persons in treatment (detection coverage)	—3	100% (60-84%)
4. Mortality:		
Childhood (1-4 yrs)*	11.4	4.9
Infant (0-11 months)	55.0	51.1
5. Use of contraceptive methods*	12.4%	21.6%
6. Cost <sup>4</sup> : First year		\$0.99
Subsequent years		\$0.72

\*P < .05

<sup>1</sup>As of September 1982: 377 health promoters and 226 folkmidwives. Attendance to training meetings: 86-91%.

<sup>2</sup>They include DPT, Measles, Polio, and BCG for children; and Tetanus Toxoid for pregnant women.

<sup>3</sup>Exact figure unknown, but assumed to be almost zero.

<sup>4</sup>Net additional cost per capita per year.

## BRINGING ORAL THERAPY TO THE COMMUNITY LEVEL

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The key to the reduction of deaths from diarrhea is that the individuals with this disease have ready access to effective therapy. By reducing cost, by simplifying preparation, and by making therapy less dependent on highly trained personnel, oral rehydration therapy has increased access. And ORT is clearly effective when used correctly in the appropriate situation.

We are continually striving for ways to increase access to care while maintaining maximum effectiveness. You have just heard about one approach to maximizing access: the introduction of oral therapy into the home, with the targeting of mothers as the primary health care

providers.

The arguments for home-based care are compelling: treatment is taken where disease occurs so that there can be immediate intervention; and the mother is directly involved in the child's care, thus educating her for subsequent episodes of illness and giving her a sense of control over the health of her family.

There are arguments against home-based care, however, and they cannot be dismissed. The further one gets from the health establishment, the greater the potential for mistakes in the preparation of oral rehydration solution and in its use. The emphasis on home-based care resulted in less use of the complete formula, a situation which some have viewed as potentially dangerous, especially if the patient has heavy purging. Even if women can be taught how to prepare and use ORS, they may not use it properly. No study has yet demonstrated that education necessarily results in effective use. Lastly, some have argued that there are potential political problems in placing too much emphasis on home-based care. If mothers are defined as providers of all care, government and the health professional may absolve themselves of responsibility.

All of these objections can be dismissed, however, if professional health care providers are directly involved at the periphery. In addition to providing primary care, health workers are a backup to mothers in those areas where home-based care is important. Backup facilities should be available for children or adults who do not respond to ORS or are heavy purgers. The mother gains confidence from knowing that health care providers are available to answer questions about the use of ORS. And if health care personnel are actively involved in ORS therapy, they are more likely to become supporters of its use.

The concepts needed to use ORS are often the opposite of established practices. Giving fluids and food to the diarrhea patient are counterintuitive to many. ORT programs can be easily discredited by bad results caused by improper use or uninformed, even hostile, health care providers. The likelihood of bad results can be minimized by appropriate training of these health workers. A truly effective community-based system, then, depends on the proper mix of home-based care and care provided by practitioners in the field or in fixed facilities.

I do not believe in an either/or situation: home-based or clinic-based, mothers or practitioners. A system must develop an integrated approach: integrated between home and practitioner, diarrhea and other aspects of primary care, therapy and prevention, health and other development activities. And all approaches at the community level must be adapted to the local situation.

I would like to examine, then, those factors that will shape the health system. The physical and social realities will determine what mix of home, clinic, or private care should be available. In the course of the discussion I would like to focus attention on the health worker, to try to answer questions such as who should be trained and what factors should be considered in deciding whom to train. What should workers be trained to do, and what is the best way to train them so that their effectiveness can be maximized? How can care and preventive measures at all levels be integrated into other activities?

I would define those factors that must be considered in the shaping of a health system as follows: (1) the existing level of health services, in terms of both facilities and health personnel; (2) the population density and the physical infrastructure of the country; (3) the economics of providing and purchasing services; (4) the role of women; (5) the effectiveness of different ORT mixes; (6) the level of mass communication; and (7) the extent of other development-related activities.

### **The existing level of health services and personnel**

The number and distribution of health facilities is a major determinant of distance between service providers and population. When health facilities are enumerated, pharmacies or clinics run by traditional healers or local practitioners are usually not counted. They have no beds and equipment is limited (as it is in many government clinics), yet they are fixed facilities to which patients come.

The number, skills, commitment, and location of health care providers are the major indicators of access. Again, the group most often (and sometimes exclusively) singled out for training are government health workers — doctors and nurses. Usually their involvement with the community is limited, however, as they remain based at fixed facilities — and then for only a part of the day. Nevertheless, the influence of physicians, especially, on people's health behavior is significant. One cannot bypass the official health providers.

Recently, many governments have expanded their training to include volunteer community-based health workers or others who may have some direct relation to community-related activities. Family planning workers can be utilized, and ORT has been taught to these cadres in Bangladesh and elsewhere. Community workers may include such groups as teachers or agriculture extension workers.

A group of health providers used extensively by the population in the delivery of any health intervention — the pharmacists and drug dispensers — are rarely trained in the use of ORS. Over 30% of first contact between patient and

provider may be with drug sellers. Their attitude toward a therapy may greatly influence use. Drug detail men form another critical group. This is particularly relevant in less-developed countries where these drug company salesmen are often the major source of information on treatment to local practitioners. A recent report indicated that in a country such as Tanzania, there may be one detail man for every six physicians, while in England the ratio may be more like one to twenty.

Traditional or indigenous healers are yet another source of health care. It has been estimated that in India practitioners of some form of traditional medicine provide 40% of first-contact health care. Over 80% of the population will never see a western-oriented health care provider. Being a "traditional practitioner" does not mean that western medicine is not used. In a survey of traditional practitioners in India, over 75% were making extensive use of antibiotics and other modern medicines. The advantage of this group is that they are close to the community — they are part of it. On the other hand, both of these groups — the drug sellers and the traditional practitioners — have their own special interests in pushing products and maximizing profits (as do many physicians). ORS is very low cost and not very profitable. Antibiotics and anti-diarrheal medicines, both of limited or no value, have much higher profit margins. This factor must be considered in any campaign to extend training to these providers.

### **Population density and physical infrastructure**

How the population is distributed and the ease with which it can be reached will affect access to care and instruction. Where populations are widely dispersed, as in many areas of sub-Saharan Africa or in mountainous regions, the provision of health care personnel and supplies can be quite costly. In one rural health care program in Mali, transport accounted for 50% of all costs. Here the value of home-based care takes on special significance. In Egypt, though, 99% of the population lives on 3.5% of the land, and 90% are within four kilometers of a government health facility. Though home-based care is important, the population has frequent contact with health care providers who can easily enhance or sabotage a program. In Bangladesh, there is difficulty in reaching even a very dense population, and much time is spent traveling by foot, country boat, and bicycle as roads reach few areas. Villagers — especially women — may spend their life moving no more than two kilometers from their home.

### **Economics**

New programs usually involve new costs. Money to train villagers or health workers must come either from other programs, from the community,

or from outside the country. What is the most efficient way to spend this money, if the objective is to treat as many cases of diarrhea as possible? At the very least health workers, particularly those at the periphery, must be taught how to use ORS. It is inconceivable, however, that any multipurpose worker should receive extra compensation for providing these services; yet this is often done. Workers should be rewarded only for exceptional services to reach a particular goal in training or a reduction in morbidity or mortality.

Few countries in the developing world provide completely free health care. Even where patients receive free care during limited times of the day, drugs are usually available only at private pharmacies, small shops, or at the hospital — for a price. In many areas the government health care providers spend as much or more time in the private sector where payment is required. The ability to pay for services or medicines (that is, packets), especially in poorer areas where diarrheal disease is more of a problem, is critical to access to care. Since many people pay for the services they receive, should not those who offer these services be better trained?

### **Women and education**

In many societies women have good access to health care facilities. They participate in marketing and can freely travel in the countryside. When women participate in the commercial sector, they have a greater awareness of weights and measures — important skills in preparing ORS and recognizing dehydration. But in many settings, women are confined to their compound or village. Children are often brought to health centers by male members of the family. In addition, a woman's worth in society determines the extent of illness necessary for the family to seek health care. As has been demonstrated in Bangladesh and North India (and in many other areas), where male children have greater value, boys are brought to the health facilities more frequently than girls; this differential referral pattern is one reason for higher female mortality rates.

Literacy rates for women are usually lower than for men. Whether women are literate will determine whether written instructions can be given with packets or spoons. Literacy rates are clearly associated with lowered infant mortality rates (IMR). The effect of female literacy on IMR in Kenya was reviewed in a recent paper by Mosley. Controlling for income, he notes that there is a fourfold difference in IMR in families where mothers have eight or more years of schooling compared with families where mothers had no schooling. What does this imply in terms of expected results from home-based programs?

School children can serve as an entry for the

introduction of health ideas to the family, especially in the above situation. Introducing ORT into school curricula has been tried successfully in Indonesia.

### **The ORT formula and its preparation**

What is the best preparation, and how is it best delivered? Some of the following facts should be considered. Glucose is better than sucrose, particularly when the patient has severe diarrhea; the difference does not appear to be significant with moderate or mild diarrhea. Bicarbonate and potassium can be given separately and are most important if diarrhea is severe. If a complete formula is necessary, packets will have to be distributed. Generally, the more complete the formula, the more effective it is, but the more difficult to distribute. Rice powder (and possibly other starches), as we shall hear from other speakers in this conference, is probably even more effective, but does require additional steps in preparation, such as dissolving the rice powder in warm water. And all preparations require some standardized measure available or present in the home.

### **Mass communication**

Mass media, in the form of radio, television, or newspaper/pamphlet circulation, improve a society's ability to spread a health message. As you have heard in this conference, mass media have been used effectively in both Honduras and The Gambia to spread the message of ORT. In my experience, however, direct contact between provider/instructor and mother is necessary for the proper preparation and delivery of ORT. To the extent that ORT programs in Bangladesh or Egypt have been successful, credit must be given to the quality of individual interaction in the home or clinic.

### **Integration with other development projects**

There is increasing recognition that if health programs are to be maximized at the community level, they should be tied to other development projects. Health lessons can be taught in schools and mosques. Workers in farm extension programs need to be aware of the food value of crops. Delivery and distribution of goods from seemingly disparate programs can be tied together. We should look for synergistic arrangement whenever possible to maximize input.

Given the choice of methods and the constraints to implementation, what is the best way to involve health care workers at the community level? Though each program must be specific to a particular country, three principles should be kept in mind:

1. The methods used to treat diarrhea with ORT should be as effective and accessible as possible within the constraints imposed by the par-

ticular environment.

2. Every effort should be made to train health care personnel — public or private, professional or nonprofessional — in the use of ORT. Proper diet advice for treating diarrhea and simple preventive measures should be stressed. Active support from health care personnel is essential if ORT is to be widely and effectively used.

3. The methods used to teach health workers about ORS must stress practical demonstrations. Further, health workers should be taught how to transmit their messages to other health personnel and patients.

### Some case histories

Let's look at some examples. In Bangladesh, as noted, there is high population density but limited physical access to health clinics because of lack of roads and public transportation. Women have limited ability to move around the countryside, and their level of literacy is very low. The government health care system functions only half days, yet physicians have much influence in towns and are often owners and financial backers of local pharmacies. Drug detail men are the primary source of health information to the medical establishment. A strong home-based program is essential. But there is a clear role for the next level up in the system, and a strong program to train *all* government health workers is essential for two reasons. It will allow them to properly treat diarrhea, and, more importantly, they will give positive reinforcement to any home-based program. It cannot be expected that much care will be given in the village by family health visitors or other itinerant health workers — especially if they visit once a month. The other groups that must be reached are the pharmacists and local practitioners (traditional, indigenous, etc.). Even with the new drug policy in Bangladesh which limits combination preparations and a number of useless drugs, selling habits of pharmacists will not change unless there is a financial incentive for doing so and an active education program. Recently we conducted a small study to look at prescribing habits of local pharmacies. A worker was sent to a pharmacy with a story that his two-year old son had an uncomplicated case of watery diarrhea. In ten pharmacies of two large towns in Bangladesh, only one prescribed ORS for diarrhea, and in all cases feeding was discouraged.

The training of pharmacists and physicians may have even more significance in a country such as Egypt, where more than 90% of the population is within four kilometers of a health center — usually accessible by road — and more than 30% of first contacts with health providers are with pharmacists. As physicians usually refer patients to pharmacists, the training of both

is vital. The physicians providing private care are the same physicians who staff the public health system.

### Conclusions

The following important issues and challenges face us as we try to increase access and effectiveness of ORT programs. As a first principle, programs must be adapted to the local situation, with the following factors being carefully evaluated: the existing health system, the location and training of all health providers, the money available, the role and education of women, the type of ORT formula required and what can be delivered, the role of mass media, and the existence of other development projects. As many different groups as possible should be trained, within the economic constraints. Training should be directed at the household level in those situations where access — physical and social — is limited. But no household program can exist without the support and backing of health professionals. These professionals should not be so narrowly defined as to include only government workers or physicians and nurses. Pharmacists (and drug detail men) are a group that has been ignored; traditional practitioners also fall into this group, but may be more difficult to define. A problem with all of these groups is how to stimulate them to give ORS — clearly a low cost, low technology item with a low profit margin in those areas where it is sold. As has been suggested, we have something to learn from those in social marketing. Regarding training, one thing is clear: training must be practical and require each practitioner to treat a case of diarrhea with oral therapy. Practitioners must be convinced of the worth of ORS. Each training period should include instruction on teaching mothers and other health staff. This should be true with every health intervention. Such training need only take one to two days if it is well organized. Health providers must also be informed that there are many ways to deliver oral therapy and many ways to prepare it (packet, spoon, pinch/scoop), but that the key element is to give fluids and keep the child eating. Dietary messages are critical. The health provider knows the difficulty of giving I.V. fluid, and ORT will certainly reduce the chance of this. Again, I believe a key factor is making the use of ORS a financial plus for those selling medicines or providing health care.

Peripheral health workers provide backup and positive reinforcement for any home-based program. In addition, they are often the first line of health care. How to best train these workers, properly motivate them, and make them a part of an integrated system are problems that face all of us.

# SPIRIT POSSESSION TO ENTERIC PATHOGENS: THE ROLE OF TRADITIONAL HEALING IN DIARRHEAL DISEASES CONTROL

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In northeastern Brazil, infant mortality from diarrhea and dehydration is among the highest in Latin America. It is estimated that 159 out of 1,000 children born in urban northeast Brazil die before their first birthday,<sup>1</sup> with diarrhea as the primary or contributing cause of death in 54% of the cases.<sup>2</sup> And, because unrecorded early deaths are common, particularly in rural areas of Brazil, actual childhood fatalities most certainly climb even higher. Regardless of which statistics are cited, it is fair to say that in this arid region gastrointestinal illnesses take an enormous toll on infant lives, resulting in immeasurable losses for poor Brazilian families.

Faced with the serious and direct threat diarrhea and dehydration pose for infant survival, it is not surprising that cultures throughout the world have evolved their own locally adapted healing systems to help them combat this major child health problem. I will first discuss the elaborate traditional medicine system in northeastern Brazil as it relates specifically to enteric diseases. Next, I will show how these longstanding indigenous health approaches are rapidly changing, sometimes for the worse, with the recent widespread introduction of biomedicine in northeastern Brazil. Finally, I will discuss the implications of traditional healing for the delivery of primary medical services, particularly oral rehydration therapy and related diarrheal diseases control interventions.

This exercise is important if we are to increase the understanding between the people who struggle with diarrheal illnesses and death on the one hand, and health professionals who aim to treat and prevent it on the other. Confronted with data that document the existence of radically different viewpoints pertaining to childhood illness, we can appreciate more fully the important role human culture plays in shaping the diarrheal episode. That other health ideas and healing ways exist and are embraced by countless poor families living in rural and semi-urban areas in developing countries will hopefully aid health professions to move beyond their own explanatory models of disease,<sup>3</sup> including enteric infections. This awareness hopefully will

stimulate a reassessment of the limitations and strengths of the biomedical approach to diarrheal diseases and lead to the development of culture-sensitive approaches to control which skillfully articulate the biomedical and popular spheres of care.

## Methods

The research was carried out from July 1979 to June 1980 with a three-month follow-up in 1981 in Pacatuba, a rural town with a population of about 7,000 in the Brazilian northeast, about thirty-two kilometers from Fortaleza, the state capital. Field observations were occasionally extended beyond Pacatuba; I accompanied village mothers and their sick children to the Marieta Calas Rehydration Center and to a number of hospitals located in the capital when necessary. While I utilized quantitative methods, such as formal questionnaires, medicinal plant collection and botanical identification, and recording of diarrheal illness episodes in children, I relied most heavily upon qualitative anthropological techniques including participant-observation and informal, open-ended interviews with key informants, particularly traditional healers. To the extent possible, I participated actively in the lives of village families in order to understand what diarrhea meant to them. I saw, in a sense, childhood diarrhea and death through the eyes of a village mother by participating fully in the women's sphere of village life. I learned by involving myself and my family directly in the lives of Brazilian peasants plagued by this ubiquitous threat.

## The role of traditional medicine in diarrheal diseases

Diarrhea is an illness of poverty in Pacatuba; it flourishes among the poorest village families with low incomes, faulty nutrition, poor living conditions, and inadequate clean water supplies. Their infants, ages seven to twelve months, are at highest risk for both the most total days and episodes of diarrhea, which climbs on average to a staggering fifty days, or over nine episodes, per person per year.<sup>4</sup> To cure their ailing children, poor village parents in northeast Brazil for hundreds of years have relied solely on their own folk medical wisdom. Ancestors borrowed many of these healing ways from Dutch and Portuguese colonizers and the West African slaves they captured and brought with them. Other medical beliefs and practices evolved as direct responses to specific illnesses and environmental conditions found in Pacatuba. Through trial and error experimentation, people developed their own explanations about the causes of illness, diagnostic techniques, therapeutic practices, a pharmacopoeia, preventive strategies, and carefully selected healers to assist them with major

health problems, such as diarrhea and dehydration. Enhanced childhood survival, perhaps, reinforced the continued use, generation after generation, of a large number of these popular medical practices.

Traditionally, at least three types of indigenous healers treated children with enteric infections: the *rezadeira* or *rezador* (prayers); the *raizeiro* (herbalist); and the *Mae de Santo* (voodoo healer). These "doctors of the poor," however, differ significantly in their training, powers, and healing ways. *Rezadeiras* (-dors), the most common type of lay healer in Pacatuba, are deeply religious women and men who are endowed with the power to heal from God, a special healing force that they inherit either directly from the deity or from an elderly folk healer shortly before his/her death. Because most *rezadeiras* are illiterate, they must learn healing skills not from books, but from their mothers, fathers, or elderly neighbors; they imitate a practicing healer with whom they associate, watching, reciting prayers, and learning to prepare home remedies under the expert eye of their mentor. Unlike *rezadeiras*, who rely primarily on god-given healing powers, the *raizeiros* de-emphasize the supernatural role in illness. As herbalists, they cure with chemical substances extracted from medicinal plants and, more recently, with modern pharmaceuticals. The *Mae de Santo*, head of the religious sect, Umbanda — a voodoo-like religious synchronization of ancient African, Brazilian, and Catholic belief — is distinguished from the other traditional healers in several important ways. As a spirit medium, she has direct contact while in trance with supernatural beings from whom she receives the power to heal. This voodoo healer, unlike the prayers or herbalists, also has the power to cause harm in the form of sickness and even death. Because of her tremendous supernatural power, flirtation with the underworld, and demands for food and money offering, she is feared, respected, kept at a social distance, and often unacceptable to more pious clients.

These healers' skills are in particular demand by village parents, since according to popular thought diarrhea and dehydration are symptoms of a number of folk-defined illnesses including evil eye (*quebranto*, *mau olhado*), fright disease (*susto*), spirit intrusion (*sombra*, *encosto*), intestinal heat (*quintura do intestino*), and fallen fontanelle (*caida da moliera*). An envious glance at a beautiful child by neighbors, friends, or strangers; a sudden, unexpected fright from, say, a passing train or barking dog; intrusion of a dead person's spirit into a child's body; heat that accumulates inside the intestine and upsets the hot-cold humoral equilibrium can all result in diarrhea just as a fall or blow on the head is believed to cause the child's fontanelle to sink into its skull, a signal of grave illness and almost certain death.

Healers and parents arrive at a definitive diagnosis by recalling recent social events believed to trigger diarrhea and noting the child's symptoms and the consistency, color, and smell of his stool.

The course of treatment, although quite foreign to most Western medical professionals, follows logically from this popular diagnosis: the appropriate healer is sought among available alternatives; standard confirmatory techniques are used; and, finally, rituals and treatment are directed at ameliorating the folk-assigned cause of illness. The evil eye, for instance, is drawn out of the child's body by passing three leaves over the victim's body while praying. The evil enters the large, fragile leaves, which wilt quickly; and the *rezadeira*, careful not to spill their evil contents, flings them out an open window. The evil disease forces, including diarrhea, are thought to disappear with the leaves, leaving the child's body "clean" and disease-free. In the case of fright disease, the healer must lift and realign the dislocated internal body parts that have fallen out of place with a sudden start in order to stop the diarrhea. This the healer does by reciting a verse and then lifting the infant's buttocks and hitting them lightly three times. When a child has been possessed by a spirit, the healer must talk to and negotiate with the spirit an acceptable payment of food, candles, or money in order to appease it and coax it out of the child's body. For intestinal heat, the healer (often the herbalist or parent) must re-establish the child's humoral balance by counteracting the excessive heat with "cold" remedies, foods, or baths, and in extreme cases the "heat" must be flushed out of the body by frequent purges — therapies based on the Greek Principle of Opposition described by Hippocrates.<sup>5</sup> Lastly, to effect a cure for a sunken fontanelle, the healer attempts to raise it to its original position by holding the child upside down by its ankles and tapping the soles of its feet or by pulling the infant's hair upward and pushing on the hard palate.

To prevent childhood illness, specific prayers, amulets, and behavioral strategies were advised for each folk illness. But the best protection against infant diarrhea was the traditional pattern of prolonged breastfeeding. Mothers almost always initiated the vital flow of milk without complication shortly after birth. After establishing a milk supply, they continued nursing — the only source of the infant's nutrition — for about the first six to twelve months of life. Even after this, village mothers supplied a significant but diminishing amount of breastmilk for several more years. That breastfeeding played a critical role for infant health in Pacatuba's past is evident from the number of folk medical practices evolved, such as the forty-day resting-in period (*resguardo*), high caloric and protein-rich postpartum diets, and wide use of plant galactagogues

to stimulate milk flow, to insure that mothers not only initiated but continued lactating.

Prolonged breastfeeding did not, of course, prevent all infant diarrhea; the sources of infection were everywhere. Parents in Pacatuba, like members of other peasant communities, were able to draw upon an extensive herbal pharmacopoeia in time of illness. Local healers identified some twenty-one plant remedies they routinely used to treat childhood diarrhea, of which fifteen were identified by Brazilian botanists. A computerized search revealed that of these fifteen, eleven have been recognized by medical researchers as specific to some aspect of gastroenteritis. Specifically, these plants possess amebacidal, anticholinergic, antihelminthic, antibacterial, or antiviral qualities and perhaps, in the case of coconut water, act as an oral rehydration.

### **The impact of modern medicine on traditional practices**

The traditional health beliefs and practices described above, however, are not static; they are being rapidly modified as modernization sweeps through Brazil and biomedicine makes in-roads into the rural northeast. Western-style hospitals, rehydration centers, medical schools, and specialized clinics increasingly provide health care in major cities and, to a more limited extent, in rural communities, such as Pacatuba. Clearly, rural families stand to profit from modern medical miracles: antibiotics that cure tuberculosis, meningitis, and pneumonia, and vaccinations that prevent polio, diphtheria, and measles. However, modern medicine's effect on the rural poor is paradoxical. While sophisticated technology exists, it is often ill-adapted to rural conditions, inaccessible, and unable to effectively treat diarrhea, Pacatuba's commonest childhood ailment. Moreover, beneficial traditional medical strategies are often not recognized until they have been completely undermined.

For example, despite increasing numbers of modern health professionals in the northeast, they remain concentrated in distant cities, are expensive, and often are removed socially from the culture of their poor rural patients. Instead, we learned from analysis of forty illness episodes that diarrhea in poor homes continues to be resolved, for the most part, using local resources. Mothers were the first to diagnose and treat their children with a wide variety of herbal remedies shortly after symptoms appeared only a mean of 0.6 days into the episode; the mother then administered over-the-counter pharmaceuticals, on hand or borrowed. After only 1.2 days, families consulted traditional healers. Shortly after beginning the local healing ceremony, 2.7 days after onset, parents consulted pharmacy attendants to purchase additional drugs. But not until over

eight days elapsed, when dehydration was obvious, did a small number of families consult local physicians; rehydration centers and hospitals, if resorted to at all, were not sought until 9.6 and 12.5 days, respectively, when the chances of severe dehydration are marked.<sup>6</sup> That traditional healers continue to play a significant role in the early management of diarrheal illnesses, even in the face of modern medicine, became apparent in our subsequent study of sixty-two infants admitted to an intravenous rehydration center in Fortaleza<sup>7</sup>: 57 (91.9%) infants had already been treated by indigenous healers for a number of folk illnesses prior to admission. Moreover, using standard microbiological culture and bioassay methods, we determined that these common folk illnesses treated by healers were associated with enteric pathogens such as enterotoxigenic *E. coli* (ST and LT) (24.5%), rotavirus (10.5%), *Campylobacter fetus* subsp. *jejuni* (3.5%), and *Entamoeba histolytica* (1.8%).

Besides the introduction of new healers, modern disease etiologies such as "enterite" and "microbes" are occasionally referred to by village mothers, yet the poorest parents continue to define diarrhea in folk-disease terms and believe that the underlying cause, often supernatural, must be tended by indigenous healers. By no means, however, does this belief keep them from simultaneously seeking help from doctors for the same or different problems. Similarly, the traditional practice of prolonged breastfeeding is being dramatically replaced by bottle-feeding; we have reported sharp declines in both the total numbers of Pacatuba's women initiating breastfeeding and the length of time they lactate, trends most apparent among wealthier village women, but also occurring among the poorest women since 1964. This modification of traditional preventive wisdom has had a significant detrimental impact on children's health, since we have also shown that a bottle-fed infant in Pacatuba suffers twelve times more days of diarrhea than an exclusively breastfed infant. Finally, parents are increasingly looking away from their sweetened herbal teas for therapy towards an almost limitless number of modern "anti-diarrheal" drugs. These include antibiotics like chloramphenicol and tetracycline, cathartics, antimotility agents, and pectin-containing anti-diarrheals, the majority of which have been judged by the World Health Organization to be ineffective, unindicated, or, indeed, harmful.

### **Implications for diarrheal diseases control programs**

These insights from Pacatuba impressed on our minds two important facts. First, whether health professionals recognize it or not, villagers do not exist in a health care vacuum. Quite the contrary: they have their own health care system,

based on tradition, with deeply ingrained and culturally shared illnesses, beliefs, and practices relating to enteric diseases. Secondly, village parents nowadays no longer solely depend on folk-healing ways, but are eclectic in their help-seeking behavior and readily integrate biomedicine when needed. As a consequence of these discoveries, we became convinced that what was needed was an innovative approach to diarrheal diseases control, a health delivery strategy that would build on the strengths of the existing indigenous system while at the same time incorporating effective modern therapy.

Fortunately, there now exists a simple, safe, inexpensive, and effective medical therapy to treat diarrhea, regardless of its specific etiology: oral rehydration therapy. By simply drinking a solution of water, sugar, and salts to replace the water and salt lost by the body during diarrhea, countless lives can be saved from diarrhea and dehydration. Although the solution advocated by WHO is judged most effective in rehydrating children, even simple table salt and sugar or cereal-based solutions made from rice water — readily available in rural village homes — are effective rehydrants. Despite the overwhelming acclaims for ORT in reducing infant mortality, getting the solution and methods to poor families most in need remains a major problem.

Our answer to the problem of accessibility has been to design an alternative oral rehydration program that mobilizes traditional healers, integrates ORT into the traditional healing ceremonies, and builds referral networks that link healers to community-based hospital care for children judged to be at high risk.<sup>9</sup> By spoon-feeding ORT as a supplement to medicinal teas and in the context of healing rituals, healers working together with and instructing village mothers can treat most diarrhea without ever resorting to outside help. When properly approached, we have found healers interested in ORT or any modern method that works, as long as it can be easily incorporated without destroying their own medical tradition. Government officials have also given their tentative support, pending evaluation, to this lay-healing initiative on the grounds that the quality of health care would not be compromised when incorporated into the national health care delivery system.

While collaboration with traditional healers for the delivery of ORT and other primary health care services presents several problems, such as their practice of potentially harmful folk treatments (also present in modern diarrheal management), low literacy, and resistance from medical professionals, to name a few, we believe these can be overcome with creative approaches. The advantages of recognizing traditional healers as ideal providers of village-based ORT far outweigh these problems, from our viewpoint: they

are already there; provide good coverage of poor children; are sought early in the course of illness; are trusted by village mothers; speak the same illness language; recognize clinical symptoms associated with diarrhea and dehydration even though they may call them by different names; and prepare accurate ORT, a skill we attribute to their life-long experience in preparing traditional remedies.<sup>10</sup> In addition, indigenous practitioners follow up children during the three- to nine-day healing ritual and, perhaps most important, strongly advocate preventive breastfeeding.

In conclusion, if we take seriously the challenge of providing basic health care to all people within the next twenty years, it is time we look beyond hospital-based strategies to creative new delivery schemes. Traditional healers have been recognized by numerous social scientists to be critical providers of health care for many so-called hard-to-reach populations.<sup>11-14</sup> And a number of international agencies, such as WHO, have also recently recognized their important contributions to world health:<sup>15,16</sup> USAID and The World Rural Medical Association issued policy statements in favor of delivery strategies that incorporate traditional healers in 1979 and 1980, respectively.<sup>17,18</sup> An alternative traditional healer-centered program, at least in the case of diarrheal diseases control, offers great potential for the delivery of care that not only reaches poor families, but is also medically sound and culturally appropriate.

## REFERENCES

1. Dra. Maria Auxiliadora de Sousa, Professor of Social Medicine, Federal University of Ceara, Fortaleza, Brazil, personal communication, June 9, 1983.
2. Puffer, P. R., Serrano, C. V. *Patterns of mortality in children*. Washington, D.C.: PAHO No. 262, 1973.
3. Kleinman, A., Eisenberg, L., Good, B. "Culture, illness and care: clinical lessons from anthropologic and cross-cultural research." *Ann.Int.Med.* 8 (1978):251-8.
4. Shields, D. S.; Kirchoff, L. B.; Sauer, K. T.; Nations, M. K.; Araujo, J. G.; de Sousa, M. A.; Guerrant, R. L. *Prospective studies of diarrheal illnesses in Northeast Brazil: patterns of disease, etiologies and risk factors*. Presented at ICAAC Meetings, Miami Beach, Florida, October 1982.
5. Chadwick, J., Mann, W.N., eds. *The Medical Works of Hippocrates: A New Translation from the Original Greek Made Especially for English Readers by the Collaboration of John Chadwick, M.A., and W. N. Mann, M.D.* Oxford: Blackwell Scientific Publications, 1950.
6. Nations, M. K. *Illness of the child: the cultural context of childhood diarrhea in Northeast Brazil*. Berkeley, California: Department of Anthropology, 1982 (dissertation).



7. Nations, M. K.; Sauer, K. T.; Araujo, J. G.; de Sousa, M. A.; Guerrant, R. L. *The role of traditional healers and folk etiologies in diarrhea disease control*. Presented at The Tropical Medicine and Hygiene Meetings, Cleveland, Ohio, November 1982.
8. World Health Organization. *Treatment and prevention of dehydration in diarrhoeal diseases: a guide for use at the primary level*. Geneva: WHO Programme for Control of Diarrhoeal Disease, 1976.
9. Nations, M. K.; Shields, D. S.; Sousa, M. A.; Araujo, J. G.; Guerrant, R. L. "Care within reach: appropriate health delivery in the developing world." Submitted for publications. *N.Engl.J.Med.*, 1983.
10. Shields, D. S.; Nations-Shields, M.; Hook, E. W.; et al. "Electrolyte glucose concentration and bacterial contamination in home-prepared oral rehydration solution: a field experience in northeastern Brazil." *J.Pediatr.* 98(5) (1981):839-41.
11. Taylor, C. E. "Challenge to international agencies." *Int.J.of Health Services* 5 (1975):489-97.
12. Bannerman, R. H. "Traditional medicine in modern health care." *World Health Forum* 3 (1982):8-26.
13. Bhatia, S.; Chakraborty, J.; Faruque, A. *Indigenous birth practices in rural Bangladesh and their implications for a maternal and child health program*. Dhaka, Bangladesh: International Centre for Diarrhoeal Diseases Research, Scientific Report No. 26, July 1979.
14. Scrimshaw, S. C. M.; Burleigh, E. "The potential for the integration of indigenous and western medicine in Latin America and Hispanic populations in the United States of America." In B. Velimirovic, ed., *Modern medicine and medical anthropology in the United States-Mexico Border population*, 31-42. Washington, D.C.: PAHO Scientific Publication No. 359, 1971.
15. World Health Organization. *Health manpower development: training and utilization of traditional healers and their collaboration with health care delivery systems*. Geneva: E B57/21 Add. 2, 1975.
16. World Health Organization. *The promotion and development of traditional medicine*. Geneva: 77:1, 1977.
17. Pillsbury, B. L. K. *Reaching the rural poor: indigenous health practitioners are there already*. Washington, D.C.: United States Agency for International Development Office of Evaluation, AID Prog. Eval. Diss. Paper No. 1, 1979.
18. World Rural Medical Association. *Concept paper*. Research Triangle Park, N.C.: International Fed. for Family Health Secretariat, 1980, p. 1-4.

## ORT AS USED IN THE HOSPITAL SETTING FOR BOTH INPATIENT AND OUTPATIENT CARE

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Glucose-linked enhanced absorption of sodium and water from the small intestine is largely in-

tact during acute diarrheas of diverse sicology and forms the basis of glucose-based oral rehydration fluids for many diarrheal diseases. It is a major scientific advance of great practical importance, a powerful therapeutic tool, a valuable public health weapon, and, last but not least, an essential component of primary health care. Oral rehydration therapy is capable of replacing the need for intravenous therapy in 80% to 90% of clinically dehydrated patients who would have been treated intravenously by conventional criteria. In other words, such an oral rehydration solution can adequately repair the deficits of moderately severe dehydration due to acute diarrhea, as well as repair the ongoing diarrheal losses, except in a proportion of cases where the diarrhea stool output exceeds certain limits (that is, more than 10 ml per kg per hour).

### Present formulation and its use in treatment centers

The oral rehydration formula recommended for use by the World Health Organization has the following composition: sodium chloride 3.5 g, sodium bicarbonate 2.5 g, potassium chloride 1.5 g, and glucose 20 g for one liter of water; when dissolved, it has sodium 90, chloride 80, potassium 20, bicarbonate 30, and glucose 111, all in mmol per liter. This composition meets the criteria for efficient intestinal absorption. Accumulated experience has clearly shown that it is safe and highly efficient in the treatment of dehydration from acute diarrheas of all etiologies and in all age groups — infants, children, and adults.

The most important role of ORT at treatment centers is *rehydration*, that is, correction of the deficit of water and salts which has already occurred when the patient is seen (for which purpose oral rehydration solution composition is ideal). This is done rapidly over a short period of a few hours. Once the patient is fully hydrated, ORS is used only to match diarrheal losses. The variable stool sodium losses are met by administering ORS in quantities to meet sodium deficit. In infants and small children, water need is met with other fluids, such as breastmilk (ideally), water, dilute feeds, and other traditional fluids. ORS is not used to meet normal water and salt needs while the patient is being treated. ORS is a powerful drug and has an end point of therapy — disappearance of clinical signs, little or no diarrhea, and appearance of puffy eyes.

### Dehydration

Diarrheal-based dehydration is the net deficit of water and salts. This net deficit arises from an imbalance between intake (usually of water and fluids low in sodium) and losses (in diarrhea, vomiting, sweat, urine, and insensible loss from skin and lungs). With diarrheal diseases in infants, the low-sodium stool losses are balanced

by oral intake of water and other fluids (usually a lower sodium concentration) and renal adjustment of solute excretion. Hence the relative loss of sodium for the amount of water loss is a good deal higher than would be expected from unmodified diarrheal losses alone. Because the deficit of water and salts per kg body weight is similar irrespective of etiology and age, this deficit is ideally met by ORS.

### **ORT in hospital settings<sup>1</sup>**

Both in inpatient and outpatient hospital settings, the present WHO formula for ORS has met with uniform success in infants with hyponatremia. Accumulated experience from six hospital-based studies of sixty-six infants, including twenty-three neonates with hyponatremic dehydration, has firmly established ORT as the treatment of choice. None of the children treated had permanent neurological significance, and only a very small proportion had transient seizures. The results are superior to the best rebottled IV.-treated series.

Pizarro, et al., documented excellent results of ORT using the WHO formulation with 282 neonates (in two separate reports). In these artificially-fed babies, ORS was administered either as two volumes of ORS followed by one volume of water, or as a complete initial hydration, with ORS followed by half its volume as plain water. The outcome was not different with either approach.

ORT substantially reduces hospital costs by drastically cutting down the need of costly IV. bottles, giving sets and supplies, and, through the introduction of outpatient rehydration centers, reducing the number of beds required to treat diarrhea.

There is also evidence that ORT in hospitals leads to marked reduction in nosocomial infection and hospital mortality. In 1980 we introduced clinical trials of ORT in the pediatric unit of a leading teaching hospital in Calcutta. Despite the fact that only a small proportion of patients were included in these studies, the presence of the study team and the excellent results of ORT among the study patients stimulated the pediatricians to use ORT. The increased use of this treatment in the hospital led to substantial reduction in hospital mortality in diarrhea patients.<sup>2</sup>

Outpatient rehydration centers are a vitally important part of ORT in a hospital setting. Such rehydration centers, usually well-run by trained paramedical workers, allow health education and training of mothers on how to prepare and administer ORS, reduce the workload of clinic doctors, reduce the need for hospital admission, allow the observation of patients in order to screen who should be admitted, and act as training centers for health workers at all levels.

At these rehydration centers, mothers are shown how to prepare and give ORS to their children. ORS is administered using a cup and spoon, a cup alone, or a bottle if a baby is accustomed to one. For a weak, small infant, a dropper or a syringe (without the needle) has been found convenient. Nasogastric gavage or a drip (20 ml/kg/hour) can be used in rare situations when the baby is unable to drink and IV. therapy is unavailable.

If a patient vomits (which occurs commonly during the first one or two hours), the administration of ORS should be stopped for a few minutes and then started again. Although patients given fluids intravenously vomit as often as those treated with ORT, vomiting can be a psychological constraint. The vomitus appears both to the therapist and the mother as much more significant than it actually is. If clinical signs are improving, ORT can be continued to its successful conclusion.

### **ORS as an absorption-promoting drug**

In infants and children, ORT does not reduce the magnitude and duration of diarrhea compared to IV.-treated controls. In secretory diarrhea of cholera in adults, it may increase the stool volume by 15% to 20%. Can ORT be improved further so that it not only achieves and maintains hydration, but also reduces the magnitude and duration of diarrhea?

Sodium absorption is enhanced from the small intestine by organic, water-soluble molecules, such as glucose, amino acids, dipeptides, and tripeptides. However, their concentration in ORS cannot be increased beyond the capacity of the small intestine to absorb, since the unabsorbed molecules will lead to osmotic water loss. Probable ways of further enhancing the absorption of sodium as well as water are (a) using polysaccharides (such as rice) and proteins; and (b) use of mixtures of d-hexoses, amino acids, dipeptides, and tripeptides with independent absorption mechanisms. An early study by Nalin and Cash showed that the magnitude of diarrhea in a group of adults could be reduced by adding an amino acid glycine to glucose-based ORS. Clinical trials were conducted in our laboratory in infants and small children with moderate-to-severe dehydration due to diarrhea caused by rotovirus, *V. cholera*, enterotoxigenic *E. coli*, and *Shigella*. One study group received the WHO-recommended ORS with 111 monoglycine added per liter of ORS, and in the other group, glucose in ORS was replaced by 50g cooked rice powder for each liter of ORS. A substantial and significant reduction in diarrhea stool output, mean duration of diarrhea, and the volume of ORS needed to treat in either study group occurred compared to controls treated with WHO-recommended ORS.

A note of caution is warranted here. Although rice is eaten by 60% of the world population, we need many more studies to solve problems, such as the stability of rice-based solutions, means for safe and effective preparation, etc., before we contemplate replacing glucose with cooked rice powder. The second approach, that of adding glycine or even more complex amino acid combinations, should be regarded as having more pharmacological potential to compete with exotic antisecretory drugs. Many more research studies in this area are indicated.

## Notes

1. A complete account of the details of management with optimum use of ORT in treatment centers can be found in the WHO manual, *A Manual for the Treatment of Acute Diarrhea*, WHO/CDD/SER/80.2.
2. A. Sen, et al., unpublished.

## HYPERNATREMIC DIARRHEAL DEHYDRATION TREATED WITH "SLOW" (TWELVE HOUR) ORAL REHYDRATION THERAPY: A PRELIMINARY REPORT

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A multitude of clinical studies carried out in both industrialized and less-developed countries have established the efficacy and advantages, as well as the limitations, of oral rehydration of infants with diarrheal dehydration.<sup>1-7</sup> The most popular sugar/electrolyte oral rehydration solutions (such as that recommended by the World Health Organization) contain sodium at a concentration of 90 mEq/l, and most patients treated have suffered from isonatremic dehydration. A glucose/electrolyte solution containing 90 mEq/l of sodium has also been shown to be successful in the rapid oral rehydration of sixty-one moderately dehydrated infants with hypernatremic dehydration.<sup>8</sup> In the rehydration scheme employed, two-thirds of the total fluid given to replace the infant's deficit was offered as glucose/electrolyte solution, followed by one-third given as plain water (so-called "2:1 bolus" method).<sup>9</sup> Five of

sixty-one infants with hypernatremic dehydration treated by this rapid oral regimen (8%) manifested convulsions.

In an attempt to diminish the possibility of convulsions in infants with hypernatremic dehydration, two modifications were instituted in the oral rehydration regimen: (1) the rate at which oral rehydration solutions were offered to the infant was halved; and (2) a series of infants had their fluid deficits replaced with glucose/electrolyte solution (90 mEq/l sodium) alone without provision of plain water. As described below, these modifications allowed successful oral rehydration of thirty-five infants without convulsions.

## Materials and methods

Since March 1978, oral rehydration has comprised the routine therapy at the National Children's Hospital, San Jose, Costa Rica, for infants with diarrheal dehydration. The oral rehydration protocol, including a description of the procedures to be performed (venapuncture, nasogastric tube), was explained to parents and written informed consent was obtained. Patients in shock, lacking bowel sounds, or with depressed level of consciousness were excluded and rehydrated intravenously.

After completing a medical history and physician examination, the infant was weighed unclothed and baseline blood samples were obtained for serum Na<sup>+</sup>, K<sup>+</sup>, and osmolality. Additional specimens were collected after the successful replacement of fluid deficit (that is, when rehydration was achieved), and twenty-eight and forty-eight hours after admission. Electrolytes and osmolality were determined by standard techniques as previously described.<sup>10</sup>

The oral rehydration solution was prepared by adding NaCl (3.5g), NaHCO<sub>3</sub> (2.5 g), KCl (2.25 g), and glucose (20 g) to 1.0 liter of water. The resultant oral rehydration solution contained (in mEq/l or mmol/l): Na<sup>+</sup> 90, K<sup>+</sup> 30, Cl<sup>-</sup> 90, HCO<sub>3</sub><sup>-</sup> 30, and glucose 111 (for an osmolality of 351 mosm/kg). An estimate of the infant's total fluid deficit (in ml) was made by multiplying the admission weight (in g) by the clinically estimated percent dehydration (expressed as a decimal). In the "2:1 bolus" rehydration method, infants received a volume equivalent to twice the calculated fluid deficit over approximately twelve hours, of which two-thirds was glucose/electrolyte solution and one-third water. The entire glucose/electrolyte solution was given as a bolus over approximately eight hours, followed by the entire plain water component as a bolus over four hours. Thus replacement of fluid deficit was carried out over twelve hours, as opposed to six hours as practiced previously. In infants treated after September 1982, the bolus of plain water was eliminated. The entire twice-fluid deficit

was replaced using only glucose/electrolyte solution over twelve hours.

Mothers were instructed to administer the oral rehydration solutions with a cup and spoon or an infant bottle and were directly supervised by experienced nurses. Nasogastric tubes were used in patients with depressed levels of consciousness or those who did not avidly take oral fluids.

Following administration of the calculated volume of fluid over twelve hours, the infants were reassessed by clinical examination, weight gain, and laboratory tests. Those infants still manifesting clinical signs of dehydration were given another twelve-hour course of glucose/electrolyte solution, the volume based on the more recent estimate of fluid deficit. Infants who were deemed successfully rehydrated entered a maintenance phase of therapy and were given one-half strength formula (04 kcal or 1.6 J/ml) at a rate of 120 ml/kg/24 hours; glucose/electrolyte solution was offered every time the infant passed a diarrheal stool; plain water was given after every two offerings of glucose/electrolyte solution. Mothers were encouraged to continue breastfeeding. Only 9% of infants were exclusively breastfed. The mothers were given instruction in how to recognize and prevent dehydration as well as about the causes and transmissibility of diarrheal infections. Patients were kept in the rehydration area of the Emergency Room for forty-eight hours for purposes of the study.

When infants were discharged, instructions and packets of oral rehydration salts were given to maintain hydration at home if diarrhea persisted; in those cases, mothers were invited to bring the child the following day for reevaluation.

The actual percent dehydration of each infant was calculated by:

$$\frac{\text{rehydration weight} - \text{admission weight}}{\text{rehydration weight}} \times 100$$

Results are expressed as mean  $\pm$  SEM.

## Results

Between May 1982 and April 1983, fifty infants with hypernatremic (serum Na<sup>+</sup>  $\geq$  150 mEq/l) diarrheal dehydration presented to the Emergency Room Service of the National Children's Hospital. Twenty-one of the fifty hypernatremic infants were admitted between September and November 1982, during an epidemic of rotavirus diarrhea. Because of severely depressed level of consciousness, twelve infants (24%) were rehydrated intravenously. The remaining thirty-eight hypernatremic infants received oral rehydration. Thirty-five of these thirty-eight infants (92%) were successfully rehydrated by the oral route alone, while three infants (8%) who started on

oral therapy had to be switched to intravenous fluids because of clinical deterioration.

Of the thirty-five infants successfully rehydrated by the oral route alone, twenty-four received glucose/electrolyte solution followed by plain water by the "2:1 bolus" method, while eleven infants received only glucose/electrolyte solution. As shown in Table 1, the two groups were equal with respect to age and severity of dehydration on admission; 91% of all infants had a history of having vomited at least once. One infant had pneumonia and another otitis media.

As shown in Table 2, the mean serum Na<sup>+</sup> concentration in the two groups treated by 2:1 bolus or with glucose/electrolyte solution alone was similar, as were the percent of infants with serum Na<sup>+</sup>  $\geq$  160 mEq/l, the mean number of hours required to achieve rehydration, and the rate of fall of serum Na<sup>+</sup> between admission and rehydration. None of the thirty-five hypernatremic infants treated orally manifested convulsions.

The kinetics of the changes in serum Na<sup>+</sup> concentration in infants in the two groups rehydrated orally are shown in Figure 1, while mean osmolality levels are displayed in Figure 2. Serum K<sup>+</sup> (mEq/l) concentration in the 2:1 bolus and glucose/electrolyte groups, respectively, were: admission,  $4.6 \pm 0.2$  and  $5.0 \pm 0.6$ ; 24 hours,  $4.4 \pm 0.2$  and  $4.9 \pm 0.3$ ; 48 hours,  $4.7 \pm 0.2$  and  $5.2 \pm 0.4$ .

## Discussion

Hypernatremic dehydration is particularly hazardous and is often accompanied by convulsions, intracranial hemorrhage, and high case fatality.<sup>11-14</sup> Convulsions have been a notable complication of intravenous rehydration regimens for hypernatremic dehydration.<sup>14</sup> Slow replacement of fluid deficits with intravenous rehydration is believed to lower the risk of convulsions.<sup>12</sup> According to Kahn and Blum, convulsions in hypernatremic infants correlated with the rate of fall of serum Na<sup>+</sup> in mEq/l/hour. Rates of decline less than 0.5 mEq/l/hour were reported to be safe, while faster rates were associated with convulsions.<sup>15</sup>

We have previously published our experience with oral rehydration of sixty-one infants with hypernatremic diarrheal dehydration.<sup>8</sup> These infants, most of whom had moderate dehydration (mean 8% loss of body weight), received glucose/electrolyte solution and plain water in a rapid method of replacement of fluid deficits. Rehydration in these infants was achieved in a mean of  $8.5 \pm 0.6$  hours; five infants (8%), however, had convulsions. The mean rate of fall of serum Na<sup>+</sup> in the infants with convulsions was not significantly greater than the other infants who did not convulse. On the other hand, all five infants who convulsed had admission serum

**Table 1****CHARACTERISTICS OF 35 INFANTS WITH HYPERNATREMIC DIARRHEAL DEHYDRATION TREATED WITH ORAL REHYDRATION WITH GES ALONE OR WITH GES AND WATER BY "2:1 BOLUS" METHOD**

Age	With GES Alone N = 11	With GES and Water N = 24
0-6 mos.	6 (55)	12 (50)
7-12 mos.	3 (27)	8 (33)
≥ 12 mos.	2 (18)	4 (17)
<i>Degree of Dehydration</i>		
Mean percent ± SEM	8.5 ± 0.8	8.0 ± 0.6
Mild (5% ++)	1 (9)	5 (21)
Moderate (6-9%)	8 (73)	11 (46)
Severe (≥ 10)	2 (18)	8 (33)

+ (%)

++ Acute loss of body weight based on comparison of admission and rehydration weights.

**Table 2****COMPARISON OF HYPERNATREMIC PATIENTS WHO WERE REHYDRATED BY GES\* ALONE OR GES AND WATER BY "2:1 BOLUS" METHOD**

	With GES Alone N = 11	With GES and water N = 24	P Value
Mean Serum Na <sup>+</sup> (mEq/l) on admission	158 ± 1.4	156.0 ± 1.4	NS
No. (%) with serum Na <sup>+</sup> > 160 mEq/l	3 (27)	8 (33)	NS
Mean Rate of Fall in Serum Na <sup>+</sup> (mEq/l/hr)	1.2 ± 0.3	1.6 ± 0.2	NS
Mean H. to Achieve Rehydration	12 ± 1.5	11 ± 1.1	NS
No. with Convulsions during Therapy	0	0	NS

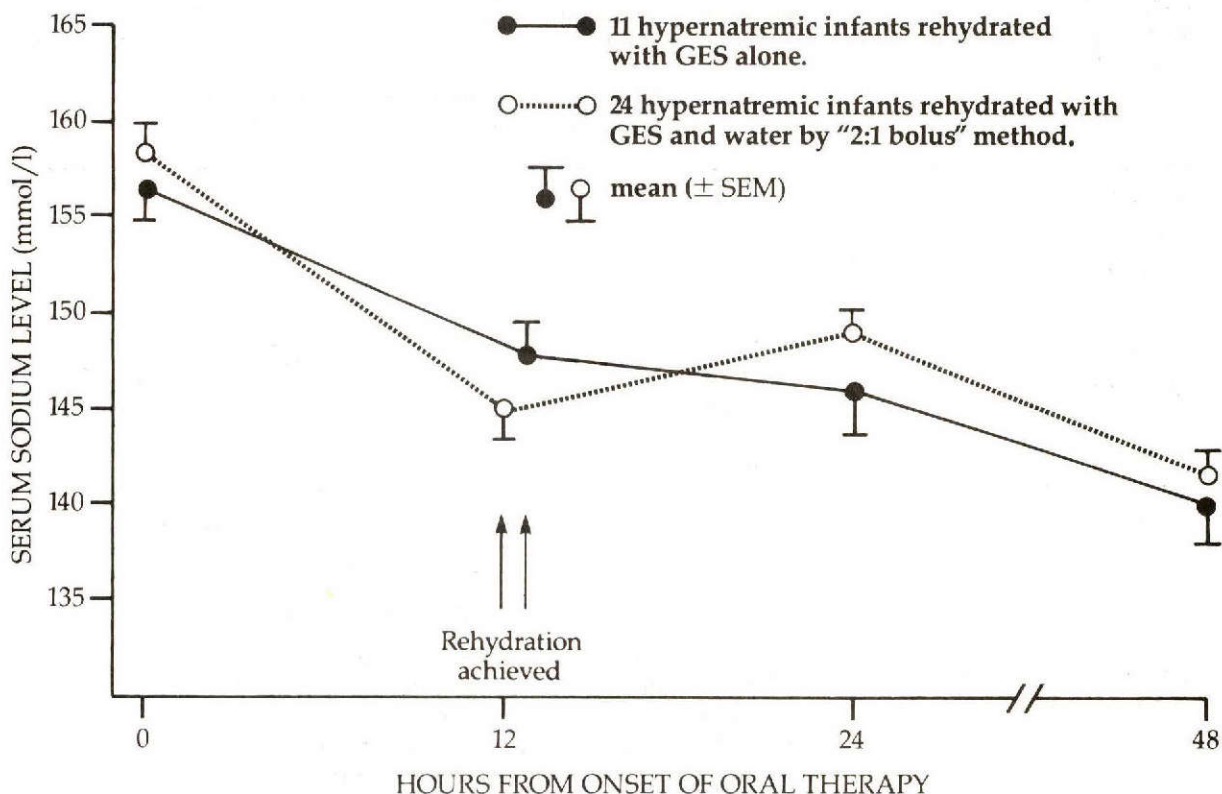
\*Glucose/electrolyte solution.

Na<sup>+</sup> levels > 160 mEq/l, versus only fourteen of fifty-three (25%) of infants who did not convulse.

We decided to investigate whether the risk of convulsions during oral rehydration in hypernatremic infants could be diminished by slowing the pace of oral rehydration and the rate of fall in serum Na<sup>+</sup>. Accordingly, in the current study, the volume of oral fluids calculated to be required to successfully replace fluid deficits was administered over twelve hours, rather than over six hours as previously done. Furthermore, after twenty-four patients were successfully treated by giving glucose/electrolyte solution followed by plain water ("2:1 bolus" method) slowly over twelve hours, the next eleven patients received only glucose/electrolyte solution. It was hoped that the latter modification would further slow

the fall in serum Na<sup>+</sup> between admission and achievement of rehydration. Overall, the groups treated by the slow oral rehydration method had comparable rates of fall of serum Na<sup>+</sup> (1.2 and 1.6 mEq/l/hour) as the sixty-one hypernatremic infants in our previous report (17 ± 0.2 mEq/l/hour) who received rapid oral rehydration. None of the thirty-five infants treated by the slow method manifested convulsions, as opposed to five of sixty-one who had rapid oral therapy (p = 0.16). Although the numbers are too small to be statistically significant, the lack of convulsions in thirty-five hypernatremic infants treated with "slow" oral rehydration represents a highly encouraging preliminary result. Accordingly, additional clinical studies are planned to gain further clinical experience with this modification of our oral rehydration regimen.

Figure 1

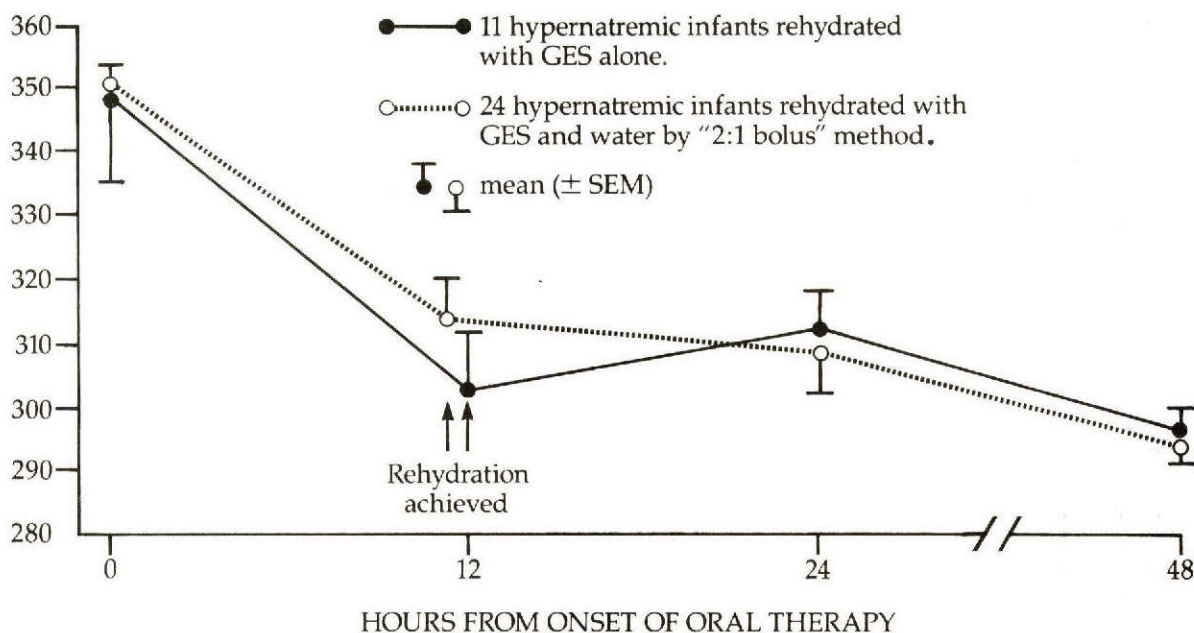


Serum Na<sup>+</sup> (mmol/l) in 35 infants with hypernatremic dehydration. Twenty-four infants were treated with oral glucose/electrolyte solution followed by plain water in a ratio of 2:1, eleven were treated with glucose/electrolyte solution alone.

## REFERENCES

- Nalin, D. R., Cash, R. A., and Rahman, M. "Oral (or nasogastric) maintenance therapy for cholera patients in all age groups." *Bull. Wld. Hlth. Org.* 43 (1970):361-3.
- Nalin, D. R.; Levine, M. M.; Mata, L. J.; de Despedes, C.; Vargas, W.; Lizano, C.; Loria, A. R.; Simhon, A.; Mohs, E. "Comparison of sucrose with glucose in oral therapy in infant diarrhoea." *Lancet I* (1978):277-9.
- Nalin, D. R.; Levine, M. M.; Mata, L. J.; de Despedes, C.; Vargas, W.; Lizano, C.; Loria, A. R.; Simhon, A.; Mohs, E. "Oral rehydration and maintenance of children with rotavirus and bacterial diarrhoeas." *Bull. Wld. Hlth. Org.* 57 (1979):453-9.
- Pizarro, D.; Posada, G.; Mohs, E.; Levine, M. M.; Nalin, D. R. "Evaluation of oral therapy for acute diarrhoea in an emergency room setting: the acute episode as an opportunity to instructing mothers in home treatment." *Bull. Wld. Hlth. Org.* 57 (1979):983-6.
- Pizarro, D.; Posada, G.; Mata, L. J.; Nalin, D. R.; Mohs, E. "Oral rehydration of neonates with dehydrating diarrhoeas." *Lancet II* (1979):1209-1210.
- Sack, D. A.; Islam, S.; Brown, K. H.; Islam, A.; Iqbal Kabir, A. K. M.; Chowdhury, A. M. A. K.; Akbar Alim, M. "Oral therapy in children with cholera; a comparison of sucrose and glucose electrolyte solutions." *J. Pediatr.* 96 (1980):20-5.
- Black, R. E.; Merson, M. H.; Taylor, P. R.; Yolken, R. H.; Unus, M. D.; Alim, A. R. M. A.; Sack, D. A. "Glucose vs. sucrose in oral rehydration solutions for infants and young children with rotavirus associated diarrhea." *Pediatrics* 67 (1981):79-83.
- Pizarro, D.; Posada, G.; Villavicencio, N.; Mohs, E.; Levine, M. M. "Hypernatremic and hyponatremic diarrheal dehydration treated with oral glucose/electrolyte solution (90 mmol/l sodium)." *Am. J. Dis. Child.* (1983) (in press).
- Pizarro, D.; Posada, G.; Levine, M. M.; Mohs, E. "Oral rehydration of infants with acute diarrhoeal dehydration: a practical method." *J. Trop. Med. Hyg.* 83 (1980):241-5.
- Pizarro, D., Posada, G., Mata, L. "Treatment of 242 neonates with dehydrating diarrhea with an oral glucose-electrolyte solution." *J. Pediatr.* 102 (1983):153-6.

Figure 2



HOURS FROM ONSET OF ORAL THERAPY

Serum osmolality (MOSM/KG) in 35 infants with hypernatremic dehydration treated — with oral glucose/electrolyte solution. Twenty-four received glucose/electrolyte solution and free water in a ratio of 2:1, eleven received glucose/electrolyte solution alone.

11. Colle, E., Ayoub, E., Raile, R. "Hypertonic dehydration (Hypernatremia): the role of feeding high in solutes." *Pediatr.* 22 (1977):5-12.
12. Finberg, L. "Hypernatremic (hypertonic) dehydration in infants." *N. Eng. J. Med.* 289 (1973):196-8.
13. Finberg, L. "Hypernatremic dehydration." *Adv. Pediatr.* 16 (1969):325-44.
14. Macauley, D., Blackhall, M. I. "Hypernatremic dehydration in infantile gastroenteritis." *Arch. Dis. Child.* 36 (1961):543-50.
15. Kahn, A., Brachet, E., Blum, D. "Controlled fall in natremia and risk of seizures in hypertonic dehydration." *Intens. Care Med.* 5 (1979):27-31.

## THE ROLE OF HOSPITALS IN THE MANAGEMENT OF DIARRHEAL DISEASES WITH PARTICULAR REFERENCE TO ORAL REHYDRATION THERAPY

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The role of hospitals in the management of diar-

rheal diseases can be examined from several perspectives: historical, functional (in the context of diarrheal disease management), programmatic (in relation to the systems which are vital for diarrheal diseases control), political (in terms of the innovation process in health care), and motivational (with regard to the potential opportunity afforded hospital personnel to influence health attitudes and practices within the community). Ultimately, one other extremely important characteristic of the hospital's role in diarrheal disease management is the ability of hospital programs to influence governmental goals and resource flow.

These characteristics will be briefly discussed to support the view that the most successful national programs of diarrheal diseases control (CDD) have their roots in successful hospital programs: that the hospital provides the ideal nidus for successful, effective program development and efficient program strategy.

Historically, hospitals have been the cradle of modern clinical research and training which have played an essential role in developing new management techniques, such as oral rehydration and maintenance therapy.<sup>1</sup> For purposes of this discussion, oral therapy is defined as "a treatment modality which provides a rational, physiologically-based, effective and safe means of replacing by mouth the losses — of water, elec-

trolytes, and nutrients — accruing due to attacks of acute watery diarrhea.”

Studies of practical oral therapy methods for the treatment of patients with moderate or severe dehydration or with diarrhea capable of causing such dehydration did not exist before 1968.<sup>2</sup> Oral fluids of various types had been recommended by a few investigators and clinicians, based on empirical or anecdotal evidence, but only for mild illness. In practice, most such regimens were reserved for use after a period of traditional starvation therapy during which oral intake was restricted. Reports which had been published did not include detailed balance data in patients with significant diarrheal illness. Reference to technical and lay pediatric<sup>3</sup> and internal medicine texts dating from the period before 1968 (and to some extent into the ensuing decade) easily confirms the fact that diarrheal diseases management at most hospitals included restricting oral intake of water, electrolytes, and nutrients during the acute phase of watery diarrhea.

The detailed balance data of patients with life-threatening diarrhea and dehydration which, when published and confirmed,<sup>1,4-12</sup> led to the acceptance and propagation of oral rehydration and maintenance therapy, were the product of highly specialized research hospitals. However, the pioneering role of research in introducing effective ORT technology has been followed by a repeated pattern of catalyzation of sustained program development by hospital research studies. Such studies can arguably be regarded as an essential phase in institutionalizing ORT programs (Table I).

The explanation for this pattern is partly the fact that exposure to vigorous research methods heightens awareness of the scientific basis and practical success of ORT technique and serves to capture local interest. These are key factors, because only hospitals committed to effective ORT can provide two sine qua nons of national program development, that is, essential referral services and the minimum quantum of daily inpatient and outpatient diarrheal cases required for efficient, effective national training programs.

Hospital-based referral services are essential in national ORT program development because community-based programs, another essential component, can reduce case-fatality rates only by about 50%,<sup>13</sup> whereas the combination of community with referral hospital programs yields case fatality rates of under 1%<sup>14</sup> even among patients with the most profuse and severely dehydrating acute diarrheas. This virtual elimination of mortality from acute dehydrating diarrheas is not only ethically necessary as a goal, but is also essential to secure community, medical professional, and government acceptance of the method and of ORT programs.

Community programs alone are unable to achieve a comparably low level of case fatality rates because a significant percentage of patients with severely dehydrating diarrheas have diarrhea rates and vomiting rates which exceed patients' capacity to drink. This has been confirmed in vaccine development studies in which cholera was induced in volunteers, who were then treated with oral rehydration therapy from the onset of symptoms. Intravenous fluids nevertheless proved necessary in a significant percentage of individuals.<sup>15</sup> In less "ideal" circumstances, higher local "failure" rates can be anticipated. A complete diarrheal diseases control program includes a hospital-based referral system to assure survival of patients whose diarrhea rates and/or dehydration exceed the ability of community-based treatment resources to cope effectively with the disease.

The referral of patients to hospitals as clinic or casualty outpatients or inpatients serves the second key need of program development, i.e., the logistical need for daily caseloads sufficient to support active local and national training programs. For practical purposes, this is best achieved at one or two large teaching hospitals where, as a minimum, five to ten patients with 5% or greater dehydration arrive daily. Such a caseload, together with the far more numerous milder cases, can support practical ten- to fourteen-day courses for about fifteen candidates each, at levels ranging from paramedics to physician-trainer trainees. Such courses are most effective when candidates have the opportunity during the course to actually treat and observe the clinical evolution of patients treated with oral therapy on the ward, including patients with vomiting, mild complications, and other such problems, whose skillful management is the key to practical program success and acceptance.

When caseloads are too low this becomes unachievable, and at the peripheral community level, even in the world's most hyperendemic diarrhea zones, a village of 1,500 persons may generate only six to twelve such cases per year,<sup>16</sup> making village-based practical training by itself unsuitable for effective management of life-threatening diarrhea.

The most successful hospital programs exploit the opportunity of numerous patient visits to communicate with and instruct the mother or attendant effectively. Concern over the acute episode provides a degree of motivation not easily duplicated in casual household contacts, when competing needs distract. The deliberate use of skilled personnel including specially trained nurses, nurses' aides, child health workers or others to recruit the mother into helping with practical oral therapy on the ward, best ensures that the skills will become an effective part of the maternal repertoire. The message must be



appropriately and effectively communicated and should include six or so key points on diarrhea, hydration therapy, and nutrition.<sup>17</sup> The specific content and approach must be included in the training of ward staff. In this way program impact is enhanced, and increased transfer of skills leads in the medium term to more effective and confident home therapy, and ultimately to fewer avoidable hospital visits.<sup>18</sup> Incorporation of information to counter traditional forced starvation practices can bring long-range nutritional benefits with resultant diminution in susceptibility to reinfection. This approach has an additional advantage: it is synergistic with the in-hospital reduction in intravenous fluid utilization (or wastage) and enhances the reprioritization of available resources by reducing inappropriate flow of resources into expensive, often unnecessary parenteral therapy. A reduction in the iatrogenic morbidity accompanying such therapy is also achieved.

For such programs to take root, however, certain aspects of the innovation process and institutionalization of change must be effectively developed at the hospital level. These are in part sociological, political, and, on the individual level, psychological and motivational. To the extent these factors are successfully dealt with, the program becomes self-sustaining and can generate further support from (and motivation for) governmental agencies to further advance the program. Private institutions often follow the lead taken by the less well endowed public ones in this regard. A brief analysis of these factors will serve to crystallize one effective approach to the strategy of program development.

The initial reaction of a hospital to a new therapy, often introduced by a lecture-demonstration project, is one of interest tempered by skepticism. If the hospital is fortunately endowed with enterprising and innovative minds, a few individuals may express an interest in gaining more experience and knowledge of the method.

If a follow-up project designed to try the new method is subsequently developed, the polite reception of the agent of change (the project's visiting director, often a consultant) belies a mixture of unspoken, widely differing local attitudes, including one or more of the following:

1. skepticism
2. uncertainty
3. resentment
4. fear
5. hostility
6. curiosity
7. receptivity

The origin of these feelings varies, but some individuals habitually adopt a "wait and see" or "prove it" attitude; some perceive a threat in the

innovation, which has the potential to upset the established institutional balance of resource flow, the prestige pyramid, political or administrative system or workloads. Individuals at institutions with many venerable routines often see any change as just more work, that is, an addition to routines rather than a replacement or a net reducer of workloads. Recognition and effective management of these attitudes is of critical importance, as this can determine the level of resistance to the new program and, eventually, the program's fate.

To keep the project going and to aid the early institutionalization phase, it is extremely helpful to have the pilot project organized so as to give it (and its participants) extra resources and a high prestige profile and, with these, the license to bend routines or, when needed, even bypass or ignore or change them, in the name of the special project. A useful example is the lifting, for the sake of the project, of a traditional ban on allowing mothers to remain around the clock on the ward with their infants in order to help with therapy. This sort of change is tolerated only in the context of such "temporary" projects to which governmental and international donor agencies have made a significant commitment of interest and prestige. The ideal vehicle for such a project is a short-term research study, since this involves the intellect and ego of individuals interested in the scientific and/or prestige value of a potential publication. Such research projects carry the needed prestige, sustain interest, and permit a sharing of the innovator role, thereby establishing local innovators.

However, those threatened or not feeling a part of the project may actively and passively resist it or try to help it fail. This resistance needs to be sublimated (Table 2). To overcome it and other forms of active skeptical resistance, it is essential to have a clear demonstration of efficacy and scientific and practical advantages of the new method on the wards of the host institution, while inviting the most active participation of the local innovators. A dramatic oral rehydration of even one infant with 10% dehydration by an expert affords an excellent opportunity to reverse a skeptical rumor mill and make it work for the program instead of against it; this begins Phase II of project development, when program reputation soars, sustained by demonstration of significant practical advantages of the new method (more outpatient oral therapy, fewer IVs used, and a sharp drop in percent of patients requiring admission).

It is essential at this second stage to ensure the development of a protocol for continued practical evaluation of the innovation as a routine method at the hospital and to make the administrative fine-adjustments vital to getting the project grafted onto the host system. Before the

consultant leaves, introduction of ORT into the emergency room and outpatient department clinics should be initiated as a "routine" practice undergoing evaluation. The local innovators accept the responsibility to complete the new evaluation project once any needed alterations in patient registrations, procedures, etc., are worked out and functioning. Subsequent scientific publications reinforce the innovation and enhance the influence and prestige of the local innovators.

The practical reduction of costs, hospitalizations, sterile supply usage, and the reduction in workload and improved patient care can in this way become apparent and serve to motivate governmental sponsors to reproduce and develop the program on a national basis. The initial institution is now a national training and evaluation resource available for this purpose. This aspect of hospital ORT programs complements the community programs through outreach to field clinics and further, and offers a potential for effective national program development which cannot be equaled at the community level alone.

In this way the ends (ORT) stimulate the means (governmental motivation to provide resources and administrative support for the program).

**Table 1**

**COUNTRIES IN WHICH HOSPITAL-BASED RESEARCH ON ORT HAS CATALYZED SUSTAINED NATURAL CDD PROGRAM DEVELOPMENT**

Country	Year	Research Site
Costa Rica	1978	Hospital Nacional de Ninos, San Jose
Jamaica	1979	Bustamente Hospital for Children, Kingston
Jordan	1979	Al Bashir Hospital (Pediatric Service), Amman

**Table 2**

**KEY FACTORS IN PROGRAM DEVELOPMENT AND INSTITUTIONALIZATION**

Trainer Trainees:	Talent utilization Home-base support
Motivation and Recruitment:	Research an integral component Prestige of innovation Literature contributions
Resource Flow:	Demonstration of practical advantages
Resistance Sublimation:	Tactful management

**REFERENCES**

1. Nalin, D. R. "Cholera research in Bangladesh." *Lancet* ii (1978):102-103.
2. Nalin, D. R., et al. "Oral maintenance therapy for cholera in adults." *Lancet* ii (1968):370-2.
3. Spock, B. *Baby and Child Care*. New York: Pocket Books, Inc., 1957.
4. Hirschhorn, N., et al. "Decrease in net stool output in cholera during intestinal perfusion with glucose containing solutions." *N. Engl. J. Med.* 279 (1968):176-80.
5. Pierce, N. E., et al. "Effect of intragastric glucose-electrolyte infusion upon water and electrolyte balance in Asiatic cholera." *Gastroent.* 55 (1968):333-43.
6. Cash, R. A., et al. "Rapid correction of acidosis and dehydration of cholera with oral electrolyte and glucose solution." *Lancet* ii (1969):549-50.
7. Pierce, N. E., et al. "Replacement of water and electrolyte losses in cholera by an oral glucose-electrolyte solution." *Ann. Int. Med.* 70 (1969):1173-81.
8. Nalin, D. R., et al. "Oral or nasogastric maintenance therapy for diarrhea of unknown etiology resembling cholera." *Trans. Roy. Soc. Trop. Med. Hyg.* 5-64 (1970):769-71.
9. Cash, R. A., et al. "A clinical trial of oral therapy in a rural cholera-treatment center." *Am. J. Trop. Med. Hyg.* 19 (1970):653-6.
10. Nalin, D. R., et al. "Effect of glycine and glucose on sodium and water absorption in patients with cholera." *Gut.* 11 (1970):768-72.
11. Nalin, D. R., et al. "Oral or nasogastric maintenance in pediatric cholera patients." *Ped.* 78:(1971):366-8.
12. Nalin, D. R. "Sucrose in oral therapy for cholera and related diarrheas." *Lancet* 1 (1975):1400-1402.
13. Rahaman, M. M., et al. "Diarrheal mortality in two Bangladeshi villages with and without community-based oral rehydration therapy." *Lancet* ii (1979):809-12.
14. Nalin, D. R. "Mortality from cholera and diarrheal diseases at a cholera hospital." *Trop. Geog. Med.* 24 (1972)101-106.
15. Nalin, D. R., et al. "The problem of emesis during oral glucose-electrolyte therapy given from the onset of severe cholera." *Trans. Ry. Soc. Trop. Med. Hyg.* 73 (1979):10-14.
16. McCormack, W. M., et al. "Endemic cholera in rural East Pakistan." *Amer. J. Epid.* 89 (1969):393-404.
17. Pizarro, D., et al. "Evaluation of oral therapy for infant diarrhea in an emergency room setting; utilization of acute episode for instructing mothers in oral therapy methods." *Bull. WHO* 57 (1979):983-6.
18. Ashley, D., et al. "Oral rehydration therapy in the management of acute gastroenteritis in children in Jamaica." In F. Holmes, et al., eds., *Acute Enteric Infections in Children. New Prospects for Treatment and Prevention* 389-94. Amsterdam: Elsevier-North-Holland Biomedical Press, 1981.

**MANAGEMENT OF DIARRHEAL DISEASES IN THE HOSPITAL: PRACTICAL CONSIDERATIONS**

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All of the original studies of the efficacy and

safety of oral rehydration solution were done in controlled hospital settings, primarily for the purpose of being able to control the variables closely, but also because the need to replace scarce intravenous fluids in cholera therapy was of utmost concern. At that time, in the mid-1960s, intravenous fluids were often unavailable, of questionable quality, and of high cost, and thus inadequate to prevent the high mortality from severe cholera.

Now, fifteen years later, based on studies done both in and out of the hospital, it is clear that the use of ORS extends from the hospital to health centers and to the home, and its impact far exceeds what was originally envisioned as a treatment only for severe cholera.

Furthermore, in hospitals that already had adequate personnel and supplies for the use of intravenous therapy, there was a reluctance to accept what was thought of as "less than optimum" therapy, in spite of the fact that ORS was heralded as an important therapy for diarrhea in hospitals that were less well endowed.

After having worked with children and adults in hospitals in the developing countries, we thought it important to evaluate the use of ORS in well-nourished young children treated in well-equipped hospitals in the developed world. We felt this was important because of (1) the reluctance to accept an ORS containing 90 mEqNa/l in the treatment of young, well-nourished children, and (2) because most pediatricians in the developed countries were unfamiliar with ORS and its possible usefulness in the developed as well as the developing world.

We studied children primarily in three hospitals: Baltimore City Hospitals, Charity Hospital in New Orleans, and The Social Security Hospital in Panama City. This study took four years to complete because of the paucity of children presently admitted to U.S. hospitals. The paper has recently been published in the *New England Journal of Medicine* (Dr. Mathu Santosham is the senior author), and I would like to briefly summarize the results.

We studied 146 well-nourished children, fifty-two in the United States and ninety-four in Panama, aged three months to two years, who were admitted to hospital with uncomplicated acute diarrhea and a clinical estimate of 5% or more dehydration. Ninety-eight received oral rehydration solution, and forty-eight, standard intravenous hospital therapy. Of those receiving oral therapy, half received the WHO solution containing 90 mEqNa/l and half a similar solution that contained only 50 mEqNa/l.

The results of the treatment were as follows. Ninety percent (87/98) of children randomized to the oral therapy groups could be treated without

intravenous fluid, but only with oral fluid. Only 1% (1/98) failed on ORS, due to a high stool output. There were no failures due to vomiting or carbohydrate malabsorption, although these are known to occur at low frequency. There were no significant complications in children receiving either formulation of ORS. Both hyper and hyponatremia were treated effectively with the oral solutions.

This study clearly demonstrated that ORS can be used effectively with hospitalized children in modern hospitals in developing countries, thus supplementing similar information already obtained from hospitals from the developing world.

The advantages, then, of using oral rehydration therapy in the hospital are that it decreases the need for intravenous fluid by 90% or more, that it decreases the need for trained hospital personnel if the family is allowed to help, and that it decreases the cost of therapy. The use of ORT in hospitals also decreases the risk of intravenous therapy, especially infections; allows for easier implementation of early feeding; and decreases the discomfort to the child. But there are two potential problems with the use of ORT in the hospital. One potential problem is that nursing personnel requirements may be greater if the family is not allowed to participate in the care of the child. Second, medical insurance may not pay for hospitalization if intravenous fluids are not used. Both seem to be readily solvable problems, however, if oral rehydration therapy were widely implemented in the hospital.

For most of the world, there are only advantages to using oral rehydration therapy to a maximum degree in the hospital. For the developed country hospitals, the advantage of oral rehydration therapy will be mainly for the comfort of the child (and the sleep of the housestaff), and since these persons have fewer advocates, the changes in traditional rehydration practices may not come as quickly. Fortunately, in these areas cost, quality, and availability of intravenous fluids are not problems; but then, also fortunately, diarrhea has been relegated to a minor problem of children in these countries.

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\*Results presented in this address are taken from: *Arab Republic of Egypt, Ministry of Health, Strengthening Rural Services, Diarrheal Disease Control Study, May through October 1980*, available on request from SRHD Project, Nutrition Institute Building, Kasr-el-Ainy Street, Cairo, Egypt.

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## SESSION FOUR

### *ORT Program Experiences*

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*Informal Discussion* (L to R): Dr. Mirian Were, Department of Preventive Medicine, University of Nairobi, Kenya; Dr. M. de Sousa, Professor of Community Medicine, Brazil; Dr. M. Nations, Social Scientist, School of Medicine, University of Virginia, USA; Dr. Richard Guerront, Professor, University of Virginia, USA

In Session Four, representatives of fifteen countries described their oral rehydration therapy program experiences. Each person briefly summarized his or her country's program and noted those characteristics distinctive to that country's delivery of services.

Dr. F. H. Abed describes oral rehydration efforts developed by a nongovernment development organization — the Bangladesh Rural Advancement Committee (BRAC) in Bangladesh. A unique feature of the BRAC program, Abed explains, is the remuneration of oral replacement workers — the core workers of the program — according to an incentive salary system. After each worker has taught a group of mothers how to administer oral rehydration therapy, these mothers are graded on their knowledge of diarrhea and their ability to prepare ORT. The oral replacement worker is then paid an amount

which corresponds to these mothers' grades.

The National Oral Rehydration Program (NORP) of Bangladesh is discussed by Dr. Aftabuddin Khan. NORP was established in Bangladesh in 1979. Dr. Khan describes the organization of the training program, the method of distributing packets, and the system for reporting, monitoring, and assessing the overall impact of the program to date.

In *The Gambia*, diarrhea in the wet season tends to be mild and chronic whereas diarrhea during the dry season is much more severe. A program begun in 1980 to combat diarrheal diseases has three treatment plans, Dr. F. J. S. Oldfield explains, with each treatment plan corresponding to the severity of dehydration. The program also features a health education component, including a "happy baby lottery" where, to be a winner, a mother must demonstrate her skill

in mixing oral rehydration solution.

Ms. Enriqueta Sullesta describes the National Diarrheal Diseases Control Program in the *Philippines*, a program begun two years ago with the use of promotional materials, training programs, and a primary health care approach. During the past two years, the encouragement of senior national officials and the private sector has been important for successful program implementation. Regular review and evaluation and consultative meetings with field implementing units have been essential for effective program functioning.

Although an oral rehydration program was established in *Ethiopia* in 1978, Dr. Demissie Habte reports that its coverage of the target population has been minimal. A number of changes are currently being explored, including the use of the new decentralized political system to distribute oral rehydration solution.

Dr. Evan Tercero describes *Nicaragua's* Program for the Prevention and Treatment of Diarrhea and Dehydration. Operating since 1979, the program has been cost-effective, reducing the time that general and specialized medical personnel must spend treating diarrhea cases, decreasing the length of hospital stays for diarrhea, and decreasing the use of intravenous treatment of diarrhea-related dehydration.

A dramatic reduction in diarrhea-related mortality can be attained, Dr. Jean Pape reports, with an ORT program which involves the family in patient care. Pape describes the successful program in *Haiti* which has resulted in national acceptance of oral rehydration therapy.

In 1982, *Honduras* began the national program for diarrhea disease control aimed at creating ORT facilities in institutional settings and developing community participation in education and information dissemination. Dr. Gustavo Corrales discusses the implementation and early results of the program.

The Diarrheal Diseases Control Program in *Indonesia* is closely linked with programs in hygiene and sanitation, health education and nutrition, Dr. Bambang Winardi explains. Winardi describes the success of the program and indicates those problems which still need to be solved.

In *Tunisia*, a prime objective of the oral rehydration program has been the standardization of treatment of diarrheal cases. Toward this end, a scoring system has been developed to determine the child's level of dehydration and, thus, to identify the appropriate treatment plan. Dr. Souad Khadraoui explains how a score is calculated and discusses the advantages of this codified system.

According to Dra. Maria Auxiliadora de Sousa, an important feature of *Brazil's* oral rehydration program is the involvement of community lead-

ers. Among those trained in the use of ORT are the "rezadeiras," traditional leaders often scorned by the medical establishment for their use of prayers and medicinal herbs as "cures." Once taught to recognize the signs of risk of diarrheal diseases and to administer oral rehydration therapy, the rezadeiras have played an important role in health education and treatment.

Since the oral rehydration unit began operation in *Mali* in 1981, ORT has proven to be a successful means of treatment for diarrheal diseases, Dr. Balla Coulibaly states. The cost of oral rehydration therapy has been relatively low, particularly in comparison to the cost of intravenous treatment.

The principal objectives of *Egypt's* national oral rehydration program have been the promotion of ORT and continued feeding and the reduction in mortality from diarrhea and malnutrition. Dr. L. M. El Sayyad reports that successful field trials of home use of ORT have halved the death rate from diarrhea and demonstrated a significant reduction in hospitalizations.

Dr. Deanna Ashley discusses the strengths and weaknesses of *Jamaica's* Diarrheal Diseases Control Program. The program has been successful in moving toward its goal of reducing diarrheal disease case fatality rates and hospital admissions and stays, decreasing the use of intravenous fluid for the management of diarrhea, and increasing the prevalence of breast feeding. One concern, however, has been the limited communication between health workers and parents.

The Diarrheal Diseases Control Program in *Thailand* has experienced similar successes, Dr. Sawat Ramaboot reports. A recent survey found that mortality from diarrheal diseases for children under five years of age had declined. The number of areas with access to ORS had significantly increased, and usage-rate targets of the program had been achieved. Among the problems he cites are the need for more training of health staffs at the provincial level, for additional supplies of ORS to health facilities, and for further linkages between the Diarrheal Diseases Control Program and other health and sanitation programs.

Reporting on the use of oral rehydration therapy in *China*, Dr. Duan Shu-Cheng states that ORT has received wide usage during the past two years. She adds that, in order to make oral rehydration more easily accepted, she would like to have available a new form of oral rehydration solution, such as a modified rice soup, that would be more suited to traditional Chinese custom.

Dr. V. J. Kumar describes an experiment recently conducted in *India* in which five villages were sorted into three groups according to where and how oral rehydration solution was available.

The study found that use and knowledge of ORT was higher in those villages where ORS was available in the local community than in those villages where ORS availability was limited to health centers and hospitals.

## HOUSEHOLD TEACHING OF ORAL THERAPY IN RURAL BANGLADESH

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### Background

That diarrhea is a major cause of morbidity and mortality in rural Bangladesh is well documented.<sup>8,9,17,19</sup> Oral rehydration therapy is a treatment of choice for most diarrheal cases. Packets of oral rehydration salts (ORS) added to the proper amount of water provide an ideal solution for treatment for the vast majority of cases of diarrhea.

Some problems are encountered in supplying ORS to every household in Bangladesh,<sup>8</sup> however. If every case of diarrheal episodes in Bangladesh were treated with packets, millions of packets would have to be produced and distributed annually in a country where more than 90% of the population lives in rural areas and where transportation is poor at best. Cost considerations would also hamper widespread distribution of the packets. The per capita income is only slightly more than one hundred dollars per year, and the market system tends to be exploitative, especially when items are in short supply or are in great demand. In addition, success of the packet is dependent on adding the salts to the proper amount of water and administering it correctly. In Bangladesh, instructions on the packet would be inadequate, as more than 80% of the population is illiterate. A nationwide publicity campaign based on mass media would probably have limited success, since only a small number of people have access to a radio.

The packets are ideal in an ideal situation. But such a situation is hardly present in developing countries. To avoid the problems with packets, special spoons and special containers have been proposed. However, this alternative introduces unfamiliar materials not available in the home, and the use of "tea spoons" is also not likely to improve the situation, as every house in rural Bangladesh does not have a "tea spoon". More importantly, the size of a spoon may vary so much that it would be unsafe to suggest this.

### The BRAC method of oral therapy

The Bangladesh Rural Advancement Committee (BRAC), through its long experience, recognized the need to develop a technique which would, on the one hand, circumvent some of the above difficulties and, on the other, be safe, effective, cheap, simple, acceptable, and readily available in every rural home of Bangladesh. After nearly a year of research and field trials, BRAC developed a health message called the *Seven Points to Remember* (see Table 1). This is a concise but comprehensive summary of all information that a villager needs to know to treat diarrhea with oral therapy in his/her own house. *Seven Points* explains how to prepare and use a lobon-gur mixture for diarrhea and also includes some relevant nutritional and other knowledge.

Lobon-gur mixture is an oral replacement mixture. *Lobon* is Bengali for common table salt or sodium chloride. *Gur* (a kind of molasses) is locally available unrefined sugar (sucrose). *Gur* also contains potassium in approximately the proper proportions to sucrose (that is, when the lobon-gur mixture contains approximately 110 mmol/l sucrose, it also contains between ten and twenty mmol/l of potassium). The mixture is made by adding a three-finger pinch of lobon and a fistful of gur in one-half *seer* of water, followed by stirring.

*Gur* does not normally contain bicarbonate. But since mild to moderate acidosis is easily compensated by the body, the bicarbonate is not an essential ingredient for patients not in severe shock. Patients in severe shock are not likely to be saved without intravenous therapy.

One-half *seer* is a local measurement equal to 467 cc. A study in the Sulla area of Sylhet district in Bangladesh found that all homes have a container of this size and that 95% of village women could estimate this volume within 25%. Two other studies done in other rural areas of Bangladesh corroborated this result.<sup>8</sup>

### Initial program experience: the pilot phase

The experience gathered from twelve months of testing and research on oral therapy was enough stimulus for BRAC to begin a pilot program on the teaching of oral therapy at the household level. Teams of female oral replacement workers (ORWs) were trained to teach mothers about the lobon-gur mixture. During the twelve-month pilot phase, nearly 60,000 households (pop. about 300,000) were taught about the method. The program was remarkably successful in educating Bangladesh women to use oral therapy for the treatment of diarrhea.<sup>16</sup> The experience in this program provided a strategy for an expanded program for the entire country.

### The present BRAC program

Based on its experiences in the pilot phase, a three-year program was launched in July, 1980 to teach oral therapy to 2.5 million households (approximately fourteen million people) in five of the twenty districts of Bangladesh.<sup>8</sup> A description of the salient features of the program is given below:

*The teaching.* The BRAC program, called the Oral Therapy Extension Program, or OTEP, is essentially a teaching program. The most important aspect is the face-to-face teaching of the mothers in each and every household of the program area. The face-to-face strategy facilitates a better relationship between the teacher and the student and, hence, enhances the basic understanding of the message. Moreover, such a teaching procedure ensures teaching in all households, which is almost impossible to attain through other methods. Female workers (ORWs) moving in teams visit each village in a thana (pop. 200,000). During the home visit the ORW first introduces herself and engages in friendly conversation with the women. The conversation is gradually shifted to the *Seven Points*. She invites questions in order to remove confusions and resolve doubts. When the ORW becomes confident that a woman understands the message, she starts to teach her how to prepare the lobon-gur mixture. She shows her how to measure one-half *seer* in a container from her home and marks it permanently. She demonstrates how to measure a pinch of lobon and fistful of gur. Then she asks the woman to do it herself. Finally, she questions the woman to make sure that she fully understands the *Seven Points*. She also asks for any diarrhea patient in the locality. She personally visits such patients and treats them. Each teaching session takes about twenty-five to thirty-five minutes. A team contains seven to eight ORWs, three team coordinators (TCs), and one cook. A team covers a union (approximately 3,000 households, or 15,000 to 20,000 population) in about a month and then moves to the next union in the project area. The TCs are males and are responsible for a number of activities. They visit the village prior to the visit by ORWs and explain the program to the male members and community leaders, seeking their cooperation and assistance. A village meeting with males facilitates and reinforces oral therapy education. The TCs organize a diarrhea control campaign in local primary and secondary schools. They are trained to give intravenous fluid should they be presented with a severely dehydrated patient. They also organize meetings with local healers in order to convince them about the efficacy of lobon-gur mixture.

*Reinforcement and monitoring.* A separate team, all male, carries out reinforcement of the message and monitoring of the activities. Team

members visit a random 5% of the households that were visited by the ORWs about one month before. They inquire about the *Seven Points* and ask women to prepare the lobon-gur mixture for them. A sample of the prepared mixture is saved in a vial for later analysis in the field laboratory. These results are used in calculating the salary of ORWs (this salary system is dealt with later). Team members also conduct usage surveys in the villages taught by ORWs. They ask if there was a diarrheal episode in the household during the past fifteen days and, if there was one, what method of treatment was employed. In the day following the interview, they collect a sample of the mixture prepared by women, if there was a use of lobon-gur, for further analysis. If there was no use of this method, the householder is advised to use it in the future. The team also conducts meetings in the villages to reinforce the program. The results of the monitoring team are fed back to the ORW team to give them an idea of the outcome of their activities.

*The incentive salary system.* ORWs, the core workers of the BRAC program, are paid according to a strict incentive system. The woman interviewed during the monitoring is graded according to her answers about the *Seven Points* and her ability to prepare a safe and effective lobon-gur mixture. There are four grades: Grade A, and a score of ten points, is obtained if the woman remembers all seven points and makes the mixture correctly. Grade B is obtained if she scores seven to nine points and makes the mixture correctly; Grade C if she scores less than seven points, but still makes the mixture correctly; and Grade D is given if she cannot make the mixture correctly. From these results, the number of households visited by each ORW in each grade is calculated. The ORW is paid according to the number of households visited that month in each grade. Taka 4 is paid for each household in Grade A, Tk. 2 and 1 are paid for B and C respectively, while no money is paid for scoring Grade D. The average monthly salary has been found to be Tk. 650 (U.S. \$30).

*Recruitment and training of field workers.* The field workers are selected after going through a series of formal and informal procedures. The posts are advertised in national dailies to allow maximum publicity. Interested women candidates having at least ten years of schooling, not having children less than one year old nor more than four years old are asked to appear for an interview. Aspects such as communication abilities, family background, stamina, recent diseases and present health, intelligence, etc. are assessed before being accepted for a preselection training. The five-day preselection training is divided into two parts — three days in the classroom and two days in field training. This intensive training on the art of teaching and how to

live in teams allows opportunities to observe each candidate more closely. Many of the aspects found otherwise difficult to assess are assessed quite easily through this training. Formal tests and role playing are important assessment tools in this stage. In service, they are constantly monitored through their incentive salary system and other supervisory checks. The training candidates are selected through a lengthy process. Their preservice training in most cases lasts two months for intermediate passed candidates and seven days for graduates. Their training goes much beyond that of ORWs and includes, among other things, leadership, communications, paramedics, and program management.

*Evaluation.* There are two aspects of the evaluation process. The program has a built-in evaluation system. It assesses the program through regular monitoring of the teaching quality of ORWs and by investigating the extent of utilization of the method. These results are constantly fed back into the program for improving the quality. Apart from this, the Research and Evaluation Division of BRAC, an independent unit within BRAC, is investigating the impact of this program on mortality. A population of about 130,000 selected through a double stratification is surveyed every six months to monitor changes in cause — (diarrhea) and age specific (one to four years) mortality. The design of the mortality study has been presented in a number of forums and also been published by the International Center for Diarrheal Disease Research, Bangladesh (ICDDR,B).<sup>14</sup> Data from this evaluation are being analyzed now. Apart from impact evaluation, the Research Division of BRAC has been active in undertaking other ad hoc studies relevant to the program.<sup>11,12,13</sup>

*Analysis of samples.* In order to constantly assess the safety of the home-made mixtures as well as to provide a continuing quality control measure, the sample mixtures collected by the monitors are analyzed for salt and sugar content. Initially, the samples were transported to Dhaka and analyzed by flame photometer for sodium at the ICDDR,B. The cost involved in transportation and centralized laboratory processing led to the establishment of field laboratories in each area where the analysis is done under ICDDR,B technical guidance. The cost of setting up a field laboratory for chloride titration and the training of a locally recruited laboratory worker is less than 400 Taka (approx. U.S. \$20). The monthly chemical requirement is negligible, and the results are available almost immediately. Ten percent of the solutions analyzed by the field technicians are sent to ICDDR,B for further check using automatic chloride titration methods. The individual results available from field and ICDDR,B for the month of January, 1983 were matched. Over 93% of samples analyzed in the field were within 10 mmol/L of the ICDDR,B analyses.

## Results

The results available on the basis of our experiences during the past years are presented here in summary form.

*Program statistics.* A total of 1,545,827 households were covered during the two and a half years of the program. As per original plan, the coverage increased over time as more areas were taken under the program. A summary of the number of households covered in three different time periods is given in Table 2.

During the same period, a large number of households were monitored for assessing the performance of ORWs. Initially, a sample of 10% of the households covered by ORWs was monitored every month. As the volume increased, this was later reduced to 5%. An analysis of the monitoring results reveals that over 90% of the households interviewed for monitoring purposes scored either grade A or B. Proportions in C and D were negligible.

The latest statistics on field staff strength reveal that there are 903 staff currently employed with the program. This includes 525 ORWs, 167 TCs and 81 reinforcement team members.

The total budget for the three years of the program was 35.6 million Taka or 2.3 million U.S. dollars. Until December, 1982 (that is, during the two and one-half years), 23.2 million Taka have been expended. Thus the amount expended to teach a single household was Tk.23 or U.S. \$1.00. However, as the major capital expenditures have already been incurred, the per household cost may in fact decline by the end of the program period. It may be mentioned here that Tk.14.24 was allocated per household in the budget.<sup>8</sup>

*Chloride analysis.* A sample of the lobon-gur mixture collected by monitors are analyzed in the field laboratory for chloride. The results of these analyses are available for the past two and a half years. They reveal that about 90% are in the safe and effective range (chloride concentration of 30-99 mmol/l). The proportion of the sample in different concentration groups is given in Table 3.

*Consistency of results.* The laboratory results indicated that the quality of the program in terms of teaching how to prepare the lobon-gur mixture has been well under control across the periods. The differences as seen from the analyses appear to be negligible. However, in order to know whether these and other differences are statistically valid, the F ratio was calculated to test the means. This ratio was calculated for the following:

- a. differences in chloride concentrations over time (391 random samples taken from a randomly selected area).
- b. differences in chloride concentrations between different areas (576 random samples from eight areas for the month of February, 1983).



c. differences in chloride concentrations between different teams of ORWs (368 random samples from eight teams in a randomly selected area).

No significant difference was found in any of the above categories. This indicates that the results are consistent across different sources of variation and the program has attained maturity.

*Retention of knowledge.* Chloride concentrations discussed so far are based on samples which are collected between fifteen and thirty days after teaching. A study was commissioned by the Research and Evaluation Division of BRAC to assess the knowledge retention over a longer time.<sup>11</sup> A random sample of 250 households in each of the areas covered by the program three and six months previously was surveyed. The results showed that the women retained the knowledge equally well after three and six months of teaching as they did after fifteen to thirty days (available through monitoring).

*Usage.* Unlike retention of knowledge, the acceptance of oral therapy (measured in terms of usage of the method in diarrheal episodes) depends on complex sociocultural factors. The BRAC program is essentially an intervention program and has both positive and negative qualifications. During the initial year of the program, problems were encountered in gaining acceptance. Several studies were undertaken to identify the bottlenecks. Consequently, several program changes were effected. The situation improved. But the usage rate range available from different areas remains very wide (8% to 80%).<sup>12</sup> One of the important reasons for low usage is the perception of the people about diarrhea itself. Mild-to-moderate cases are not considered a disease worth medication, and, hence, about half of the reported patients are treated with no method at all.<sup>13</sup> However, if we leave out this group using no treatment, the acceptance rate shoots up considerably (average 35%). Though this acceptance figure may appear low, this is a "first recruitment" of a single-exposure program. The sociocultural setting of the community along with this understanding may suggest that there should not be much concern about the usage rate.

*Mortality impact study.* The mortality impact study was started in April, 1981. A population of about 130,000 in different project areas is being studied every six months through retrospective surveys.<sup>14</sup> Data collection on three surveys, including the baseline, has been completed. Not unlike any retrospective survey, the data on deaths were found to be underreported in the first round. Several techniques were employed subsequently to improve the death recording, and better results are now coming in. Data from these surveys are being analyzed to construct a correction factor for estimating the missing

events. We may have to wait a little longer to get meaningful feedback on the impact of this program on mortality.

### Concluding remarks

Program characteristics and available results of the BRAC program of oral therapy have been presented. The program sailed along quite comfortably and faced no major problems. The objective of teaching oral therapy to the target households is being fulfilled. The results indicate that the program is heading along the desired route and that it has attained maturity in terms of teaching quality. It has established beyond any doubt that home-based therapy is possible in a developing society and that our illiterate mothers are well capable of understanding a health message and preparing a safe and effective solution for diarrhea in the house, with home ingredients and finger measurements. It has also demonstrated that a large public health educational program can be successful in a rural, developing society without sacrificing the quality of the program. The different components of the BRAC program are only indicators of the factors that may affect the successful completion of the program. The way these components were incorporated into the program are essential guidelines for others.

Table 1

### SEVEN POINTS TO REMEMBER IN CASE OF DIARRHOEA

#### Diarrhoea Prevention Programme/BRAC

1. Loose motion and increased frequency of motion are the first symptoms of diarrhoea. Water and salt contents drain out from the body with each loose motion. If such loose motions continue for some time, symptoms like vomiting tendency, loss of appetite, indigestion, and spasms of hands and legs may set in. Loose motion then turns into diarrhoea, which may prove to be fatal. So necessary measures should be taken in time to save the diarrhoea patients.
2. In order to save ourselves from this disease, we should drink tube-well, tap water. If such water is not available, water from other sources should be boiled and then cooled before use. Rotten food should not be eaten. All foodstuffs should be covered well so that flies cannot sit on them. Hands and mouth should be washed properly before eating. Remember that breast milk is always harmless. But children fall sick when they suck dirty breasts. So the nipples of the breast should always be kept clean.
3. The only treatment of diarrhoea is to replenish by any means the water and salt lost. Pre-

viously it used to be done by intravenous saline injection. Injectable saline contains water, salt, and glucose. But there are some difficulties in using saline for injections that are not easily available in the villages; and since these injections are intravenous, the services of a doctor are necessary and, moreover, expensive. It is, therefore, necessary to take timely measures so that loose motions do not turn into diarrhoea. The easiest treatment is to administer oral rehydration saline. This saline is also made of salt, water, and sugar, like saline for injections. But the advantage of it is that it can be prepared right in the house, and it requires only a little bit of salt, molasses, and pure water.

4. Oral rehydration saline is to be prepared by mixing a pinch of salt with the help of tips of three fingers and a fistful of molasses in half a seer of water well stirred. Care should be taken to mix salt, molasses, and water in the right proportion.
5. Oral saline should be administered immediately after the first loose motion. If it is delayed, it may be difficult to replenish the lost water and salt. As a result, there may be shortage of water in the system of the patient,

and he/she may become weak. If dehydration takes place, saline injections become essential.

6. Adult patients should be given a half a seer of oral saline as prepared, after each motion. The children should be given only as much as they want, but at frequent intervals.
7. Advice in regard to nutrition: During the disease, the patient should be given plenty of water and foodstuffs like rice and curry along with oral saline. In the case of children, breastfeeding by mothers must not be stopped. The patient should be given increased amounts of water and food for at least seven days after recovery. This will help to cure malnutrition and weakness of the patient and minimize the possibilities of his/her falling victim of the disease again.

**DIARRHOEA IS A SERIOUS DISEASE  
PREVENT IT**

**Table 2**  
**HOUSEHOLDS COVERED BY OTEP**  
**BETWEEN JULY 1980 TO DECEMBER 1982, BY**  
**THREE TIME PERIODS.**

<i>Time Period</i>	<i>Households covered</i>
July '80 — June '81	187,604
July '81 — June '82	827,387
July '82 — December '82	530,836
Total (July '80 — December '82)	1,545,827

Source: (2-6).

**Table 3**  
**DISTRIBUTION OF CHLORIDE CONCENTRATIONS AS OBSERVED IN DIFFERENT TIME**  
**PERIODS OF THE BRAC-OTEP PROGRAM ALONG WITH SAMPLE STATISTICS.**

<i>Chloride concentrations (in mmol/L)</i>	<i>Safety and Effectiveness</i>	<i>Time Period</i>		
		<i>July '80 — June '81</i>	<i>July '81 — June '82</i>	<i>July '82 — December '82</i>
< 30	Safe but less effective	8.8	1.5	1.2
30-99	Safe and effective	89.9	94.5	90.3
100-119	Effective but Potentially dangerous	0.7	3.1	6.5
120 +	Dangerous	0.6	0.9	2.0
n		3,903	33,603	18,892
Mean (mmol/L)		64.2	66.0	68.0
s.d.	N.A.	N.A.	21.8	

**REFERENCES**

1. Ali, M. A., et al. "Hand Packaged ORS for Diarrhea." Dhaka, Bangladesh: ICDDR,B, First Conference on Diarrhoeal Diseases, 1981.
2. Bangladesh Rural Advancement Committee. "Six Monthly Report, July '80-Dec. '80." Dhaka: 1981.
3. Bangladesh Rural Advancement Committee. "Annual Report 1980-81." Dhaka: 1981.
4. Bangladesh Rural Advancement Committee. "Six Monthly Report, July '81-Dec. '81." Dhaka: 1982.
5. Bangladesh Rural Advancement Committee. "Annual Report 1981-82." Dhaka: 1982.
6. Bangladesh Rural Advancement Committee. "Six Monthly Report, July '82-Dec. '82." Dhaka: 1983.
7. Bangladesh Rural Advancement Committee. "Oral Therapy Program: Ajmiriganj Thana." Dhaka: 1979.
8. Bangladesh Rural Advancement Committee. "Oral Therapy Extension Program Phase I." Dhaka: 1980 (protocol).

9. Chen, L. C. "Control of diarrheal disease morbidity and mortality: Some strategic issues." *Am.J.Clin.Nutr.* 31:1978.
10. Chowdhury, S. A., et al. "Causes of death: Companygang, Bangladesh 75-78." Dhaka: Christian Commission for Development Bangladesh, 1980.
11. Chowdhury, A. M. R. "The retention of knowledge about home-made ORS — A survey in rural Bangladesh." *Shyhet Med.J.* 6(5):1982, and *Bangladesh J.Chld.Hlth.*, Dec. 1982 (in press).
12. Chowdhury, A. M. R. "Some preliminary results from OTEP: The implications and suggested future directions." Dhaka: BRAC, 1981 (mimeo).
13. Chowdhury, A. M. R. "Diarrhoeal morbidity and treatment in BRAC programme areas: Results from a retrospective survey." Dhaka: BRAC (in preparation).
14. Chowdhury, A. M. R., and D'Souza, S. "A design and field methods for monitoring impact on mortality of an oral therapy programme." Dhaka: ICDDR,B, Working Paper No. 27, 1982.
15. Cutting, W. A. M., and Ellerbrock, T. V. "Home-made oral solutions for diarrhoea." *Lancet*, May 2, 1981.
16. Ellerbrock, T. V. "Oral replacement therapy in rural Bangladesh with home ingredients." *Trop.Doct.* 1981.
17. Guerrant, R. L., and Cash, R. A. "Infectious disease: Treatment of cholera and other dehydrating diarrhoeal illnesses." In L. C. Chen, ed., *Disaster in Bangladesh: Health Crises in a Developing Nation*. Oxford University Press, 1973.
18. Hendrata, L. "Spoons for making glucose-salt solution." *Lancet*, 1978.
19. Oseasohn, R. O., et al. "Field trial of cholera vaccine in rural East Pakistan: First year of observation." *Lancet*, 1965.
20. Rahaman, M. M., et al. "Diarrhoeal mortality in two Bangladeshi villages with and without community based oral rehydration therapy." *Lancet*, 1979.
21. Wahed, M. A., et al. "Sodium content in home-made oral rehydration solutions collected from different projects in Bangladesh." Rangoon: Seminar on Diarrhoeal Diseases in Children in Southeast Asia in the context of Primary Health Care, 1981.
22. World Health Organization. "Treatment for prevention of dehydration in diarrhoeal diseases: A guide for use at the primary level." Geneva: 1976.

## NATIONAL ORAL REHYDRATION PROGRAM IN BANGLADESH

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Bangladesh has a population of over 93 million, almost half of whom are below fifteen years of age. The country is only 54,000 square miles and is situated in a deltaic formation crisscrossed by rivers and canals.

In this country, the crude birth rate is 41 and the crude death rate 16 per 1,000. Out of 1,000 births, 140 die during infancy. Life expectancy is only 47 years. Per capita income per year is approximately U.S. \$110. There is one doctor for every 10,000 people.

Many communicable diseases are rampant in the country due to the favorable situation created by land and weather conditions, population density, housing patterns, sanitation problems, a high illiteracy rate, economic stringency, natural calamities, and the personal habits, superstitions, social attitudes, and feeding practices of the people. Diarrhea and other waterborne diseases take a very heavy toll of lives, particularly in children below five years of age.

### The magnitude of the problem of diarrheal diseases

The following reports reflect the magnitude of the problem of diarrheal diseases in Bangladesh:

— In a survey of 16,000 outpatient visits to thana health centers in one week of February, 1977, 19% were related to diarrhea dysentery, intestinal worms, or typhoid.

— In Matlab thana, in 1974-75, the Cholera Research Laboratory (CRL, now known as the ICDDR,B) attributed 20% of all deaths to either dysentery or diarrhea.

— In Teknaf thana, the CRL recorded 514 deaths in one year, of which 47% were attributed to either dysentery or diarrhea.

— According to the Bangladesh Health Profile of 1977, the death rate due to diarrheal disease is approximately three per thousand. This translates into more than 270,000 deaths per year due to diarrhea in the country.

Diarrheal diseases in Bangladesh are caused by several etiological agents. The most important pathogens are ETEC, rotavirus, shigella, cholera, and camphylobacter. *Vibrio cholera* in Bangladesh are now both El tor and Classical biotypes. *Shigella flexneri* constitutes about 70% of all shigella cases. ETEC are very common.

Diarrheal cases occur throughout the year, but cholera occurs in epidemic form during the months from March to May and from October to November. Rotavirus is common in winter months (December and January). Shigellosis occurs throughout the year, with a rise during spring and post-monsoon. Diarrhea caused by ETEC is most prevalent during the summer.

The incidence of epidemic outbreaks of diarrhea is greatest among people living in low-lying areas and by the sides of rivers and canals. Although all age groups are attacked by diarrheal pathogen, children under five are at greater risk. On the average, adults experience one episode of diarrhea a year, whereas children under five have two to three episodes in a year. At present, mortality due to diarrheal diseases among the under-five age group is approximately ten per thousand.

### National Oral Rehydration Program

While the magnitude of the problem has been realized, it has been difficult to reduce the diar-

rheal episodes dramatically under the present condition. Recognizing the effectiveness of oral rehydration therapy for the prevention of diarrheal death, the National Oral Rehydration Program was launched in March, 1979, with financial assistance from UNICEF.

Major objectives were:

1. To train village voluntary health workers (2,000,000) and government health workers (about 40,000) in the management of diarrheal diseases and the technique of oral therapy.
2. To produce enough oral rehydration solution (ORS) packets locally to adequately supply the health system and village voluntary health workers (VVHWs) and to ensure that these packets meet the quality control standard established by the government.
3. To provide enough ORS packets for all health workers so that they can treat diarrheal cases and distribute the packets in the community.
4. To ensure that diarrhea is properly treated (including proper diet) by the health workers and VVHWs and that all understand preventive measures.

### **Organizational Pattern of the National Oral Rehydration Program**

The national headquarters of the project, located at Dhaka, has four cottage-type production units, one in each division. The project is headed by the project director who is assisted by an assistant director and a number of officers and staff. The national headquarters is responsible for planning, organization of project activities including training, ORS production/distribution, logistic support, compilation of reports, budgeting, and evaluation.

ORS packets are produced in accordance with the WHO-recommended formula using sugar, sodium, chloride, potassium chloride, and sodium bicarbonate packed in polyethylene bags. Each bag has three compartments, with sugar, sodium chloride, and potassium chloride in one, sodium bicarbonate in another, and an instruction leaflet in the third chamber.

### **Progress in training programs**

Intercountry training courses were attended by few personnel from the country. The progress is shown in Table 1.

A multitier training approach was developed with the objective of training 40,000 government workers and 2,000,000 VVHWs within 1983. The progress is shown in Table 2.

The Divisional Deputy Director of Health, Civil Surgeon and Additional Civil Surgeon were taught at the National Oral Rehydration Program headquarters and at ICDDR,B about program objectives, strategies, and diarrheal problems and management. Forty-five officers at-

tended this orientation course.

The second tier of training occurred at the district level, where the Civil Surgeon conducted a one-day workshop to train thana health administrators, medical officers, deputy civil surgeons, health inspectors, health education officers, health superintendents, and other staff. Total trainees were 1,512 in twenty districts. These people, in turn, became trainers in the third tier at the thana level, where they led a one-day training session for family welfare workers, family planning and other health workers, government health assistants, thana council members, and thana-level government workers from various departments. A total of 16,154 trainees were trained in 210 thanas (out of 460 thanas).

The fourth tier of the training program took place at the village level in 184 thanas, with 98,190 VVHWs trained by family welfare workers. During the one-day training session, both written materials and practical demonstrations were utilized.

Since 1982, the ORT training program has been combined with the Primary Health Care training program. Progress, therefore, has not been made as previously scheduled. ORT has been included in all courses for medical and paramedical personnel, and most organizations working for children and mothers are also showing interest in including training in ORT in their instructional programs.

A massive scheme has been developed to train primary school teachers in the management and control of diarrheal diseases. An Expanded Program in Immunization Manual and other teaching aids have been developed, and the training of course instructors is already completed. By June, 1983, 36,000 teachers will be trained. This training will enable them to implement new curricula in their classrooms.

### **Production and distribution of packets**

Due to lack of funds and shortage of ingredients, production capacity has fluctuated from time to time. Yearly production and distribution is shown in Table 3.

Two other private commercial production units began production in 1982 and will produce more than three million packets annually. Government pharmaceutical production units will begin producing ORS sachets soon. About three to four million sachets will be produced annually by these units.

Packets are supplied free of cost from the National Oral Rehydration Program and distributed mostly through the infrastructure of national health delivery systems. Private commercial factories are distributing ORS through private medicine shops. Almost the entire population now has geographical access to the ORS, but coverage is much less.

A quality control laboratory is attached to each production unit. One packet of each worker's daily production is checked for weight, appearance, and chloride content (acceptable range is between 75 to 85 mmol/l). Under proper storage, shelf life is about nine months. Packets are not used if they are torn or show discoloration.

The ORS packets locally produced by the private firms are sold at two different rates: ten cents and forty cents. Each packet from the National Oral Rehydration Program costs approximately six cents, which includes all expenditures incurred in the project. On the other hand, the cottage-type production plants create employment for nonskilled persons, especially for women.

The actual number of packets required for the country is yet to be determined by appropriate study. At present, it is estimated to be approximately eighteen to twenty million. The current annual production capacity of the National Oral Rehydration Program is three million. In 1983-84, annual production will be six million packets. Another three million will be produced by the Government Pharmaceutical Production Unit. Private firms will produce in the vicinity of four million packets during next fiscal year.

#### Recording/reporting/monitoring

Diarrheal cases managed by health workers and VVHWs are written into a report with the name, age, number of packets used, and prognosis indicated. All those reports are submitted to the thana health administrator weekly; after compiling them, the thana health administrator sends monthly reports to the district authority, with a copy to National Oral Rehydration Program headquarters.

Reports received from field workers for the period from September, 1979, to December, 1982, showed that a total of 2,161,729 packets of one-liter capacity were used to treat 1,261,032 cases. Among these cases 1,251,410 were cured, 6,740 referred to hospitals, and 916 died (fatality rate 0.07). Age-specific distribution of cases showed 566,937 (44% of the total) in age group zero to four years, where the approximate population is 16% of the total.

#### Impact of the program

The most important aspect of the program has been the greatly increased awareness, both in public and medical professional personnel, about the value of ORT. The program has benefitted health manpower by providing training in a number of aspects of the diarrheal disease control program, including techniques of planning, organization, and evaluation. The program has also provided the opportunity for developing research in both operational and clinical aspects.

ORT has been identified as a tool for introducing primary health care in the rural areas. The

technique of ORT has been included in all PHC training programs in progress in the country (such as maternal and child health care, health education, EPI, Pallichikishak, etc.).

No systematic survey has yet been conducted to learn the impact of the program in the reduction of mortality from diarrhea. Reporting from all units has not been uniform or regular. At least 50% of unit reports have not reached headquarters (Table 4).

Introducing the use of homemade solution for the management of diarrheal diseases has made rural mothers more confident about the concept of self-help. Community leaders participated in the thana-level training programs, and mothers were trained by health workers during their field visits and when they were managing cases at home.

A number of nongovernmental organizations have also helped develop self-help programs. Training on the management and prevention of diarrheal disease has been included in the nationwide training program.

#### Conclusion

Out of an estimated 1,500,000 deaths annually in Bangladesh, diarrheal diseases alone account for 275,000, and nearly one-third of the total attendance in different health facilities is due to diarrhea. Proper implementation of the ORT program will lead to the remarkable reduction not only in mortality, but also in hospital attendance and hospitalization.

To achieve this goal, however, adequate training is needed for the different levels of personnel engaged in health delivery activities. Recognizing the importance of community involvement in ORT program activities, community chiefs, religious leaders, and schoolteachers have been provided with training and entrusted with responsibilities.

In conclusion, we would like to say that oral rehydration therapy is an established method of diarrheal diseases management, and proper implementation of the current program will help achieve the national goal of "health for all by the year 2000."

**Table 1**  
**PROGRESS ON**  
**INTERCOUNTRY TRAINING**

Areas of training	Year			
	1980	1981	1982	1983
National managers	1	1	0	0
Clinical aspect	0	3	0	3
Laboratory aspect	0	2	0	0

**Table 2****PROGRESS OF NATIONAL TRAINING PROGRAMS  
YEAR 1979-1982**

Level	No. of persons trained	Curricula used	Duration of training
National	45	Booklet, chart, leaflet, lecture, demonstration	1 day
District	1,512	Booklet, chart, leaflet, lecture, demonstration.	1 day
Thana	16,154	Booklet, chart, leaflet, lecture, demonstration.	1 day
Village	98,190	Booklet, chart, leaflet, lecture, demonstration.	1 day

**Table 3****YEARLY PRODUCTION & DISTRIBUTION OF ORS PACKETS**

Year	Production	Distribution	Remarks
1979	845,508	77,391	2 million packets were purchased from local suppliers for training program.
1980	1,877,600	4,468,968	
1981	1,368,600	1,344,136	
1982	2,052,900	2,028,051	

**Table 4****REPORTED CASES, DEATHS & FATALITY RATES**

Year	Reported Cases	Reported deaths	Fatality rates
1980	925,697	542	.04
1981	217,851	297	.13
1982	115,484	277	.2

**DIARRHEA DISEASE  
CONTROL:  
A GAMBIAN EXPERIENCE**

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The Gambia is a small territory of 10,600 km<sup>2</sup>. The estimated population for 1982 was 670,000, and 84% of its people live in rural communities. Children under the age of five years form 17.6% of the population. The climate is subtropical with a distinct hot, rainy season from June to October. The rest of the year is cool and dry.

**Health services**

Health services are provided chiefly by the Ministry of Health, Labour and Social Welfare, but a significant contribution is made by missionary organizations, private practitioners, and the Medical Research Council (MRC) of the United Kingdom. Eighty-nine government health institutions consisting of hospitals, health centers, dispensaries, and subdispensaries are evenly distributed throughout the

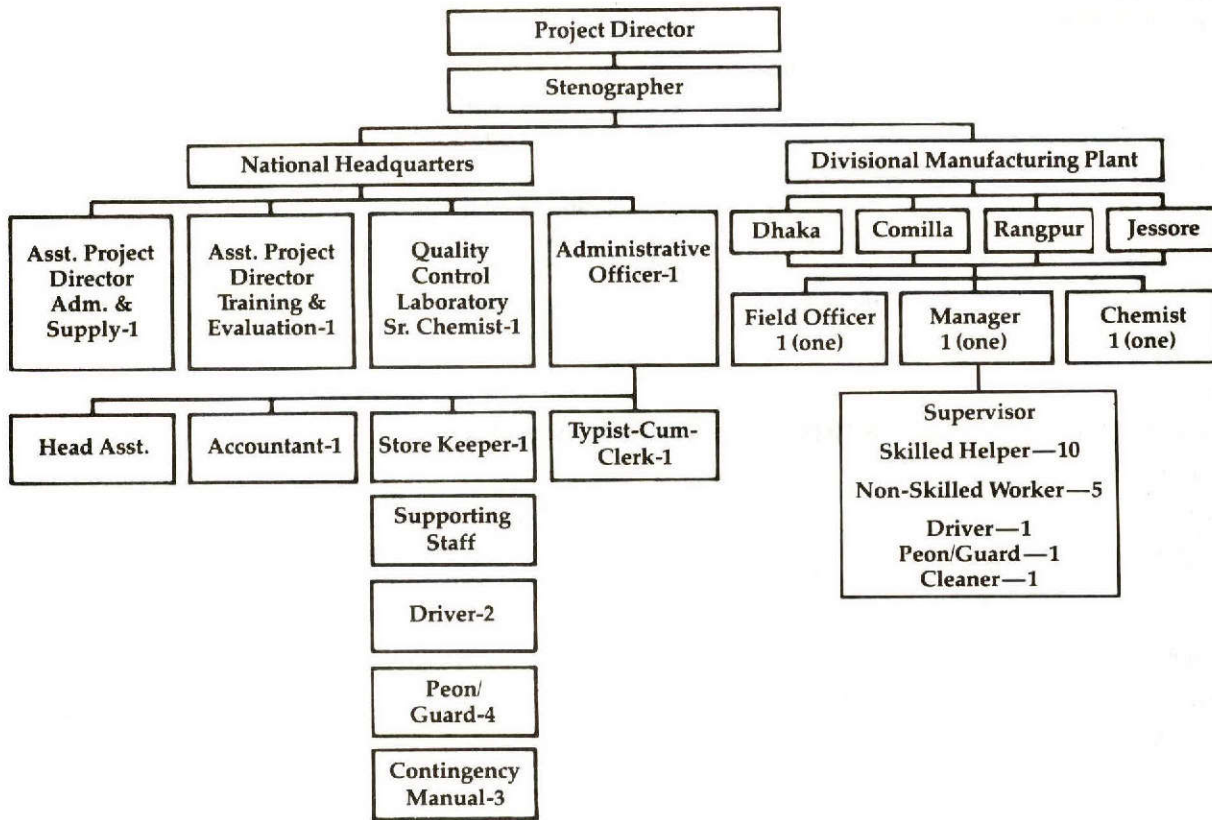
country. They give static and mobile services. With the advent of a phased program for primary health care, village health posts now exist in 129 villages.

It is significant that the people of The Gambia, especially mothers and children, have enjoyed a long and intimate relationship with their health care system.

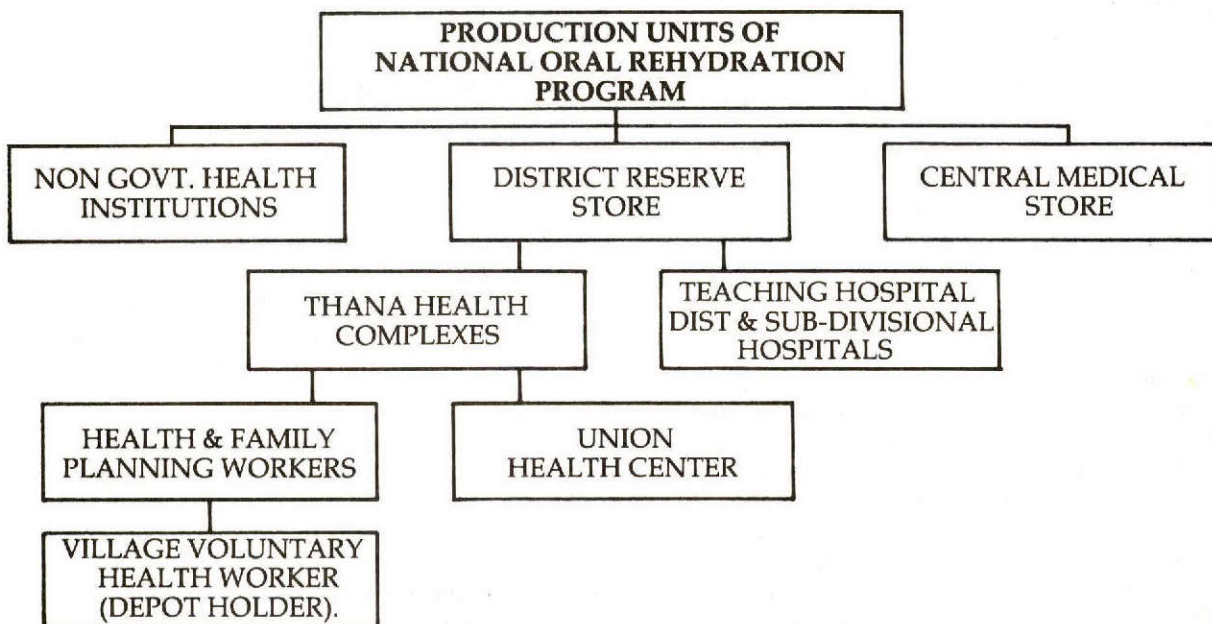
**The diarrhea disease problem**

At present, it is not possible to have accurate national statistics on morbidity and mortality due to diarrhea. However, evidence obtained from clinic returns, hospital records, and field studies have led to the acknowledgement that diarrhea is a leading cause of morbidity and mortality. The 1978 record of yearly occurrence of diseases, derived from returns from all health institutions, lists diarrhea as the fifth commonest condition. The top five conditions causing death in 1975 in Banjul, which has more reliable statistics, are listed in Table 1. Table 2, also from Banjul, lists the top five causes of death in 1978 in children under five years of age. Diarrhea was the most common cause of deaths in 1975, while gastroenteritis and malnutrition were reported the second most common cause of death in 1978 in children under the age of five.

**ORGANIZATIONAL CHART  
NATIONAL ORAL REHYDRATION PROGRAM**



**Table 6  
CHANNEL OF DISTRIBUTION OF ORS  
PACKETS**



A feature of diarrhea in The Gambia is that wet season diarrhea tends to be mild and chronic with little dehydration. Recurrent episodes may lead to malnutrition which, compounded with additional infection, may terminate in an undramatic death. Dry season diarrhea, on the other hand, presents with acute watery bouts leading to rapid dehydration and a dramatic death. Studies carried out by the MRC would suggest a rotavirus etiology. Furthermore, workers at the MCR Dunn Nutrition Unit in The Gambia have shown a strong correlation between low weight gain and the incidence of diarrhea and malaria.<sup>1</sup>

### **The National Diarrhea Disease Control Program**

Although oral rehydration therapy has existed for some time at health units, it was not until 1980 that a national coordinating committee for the control of diarrhea started its work. The objective of this program is to reduce morbidity and mortality due to diarrhea in children under the age of five years, and its target is a 50% reduction in diarrheal mortality by 1985. We hope to achieve this through a strategy which includes case management, health education and health systems, and community research.

Technical advice is provided by the MR, which has carried out field studies on our behalf. We have been fortunate to have, since 1982, the collaboration of the USAID-supported Mass Media and Health Practices project (MMHP). This organization has assisted in the strengthening of the Ministry of Health's health education capacity.

We believe that our approach has several unique aspects.

### **Case management**

Three treatment plans have been devised as follows:

*Plan 1* — Home-based oral rehydration of milder cases using what is available in the home — salt, sugar, water (SSW).

*Plan 2* — Health institution oral rehydration using World Health Organization oral rehydration solution for the moderate diarrhea.

*Plan 3* — Severely dehydrated cases are evacuated to a center capable of administering intravenous and intraperitoneal therapy.

### **Treatment plan chart**

Words and pictures are used on the treatment plan so that mothers can understand those sections addressed to them. The measuring units employed are those easily available in any home — a Julpearl soft drink bottle with the bottle cap. The measure for treatment Plan 1 is one Julpearl cap of salt, eight Julpearl caps of sugar, and three Julpearl bottles of water. The rate of administra-

tion by age is indicated both pictorially and in words. Mothers are instructed to seek help at a health institution should the child not improve.

With treatment plan 2, the salt solution is prepared by health workers, but administered by mothers. Children who make good progress in four to six hours are sent home with measured quantities of salt solution. Mothers are asked to return the next day for reassessment.

### **Health education approach**

In collaboration with the Health Education Unit of the Ministry of Health, Book Production Unit of the Ministry of Education, and Radio Gambia of the Ministry of Information, the Mass Media and Health Practice project (MMHP) has undertaken a project which aims at the development of a methodology for the application of mass communication in the prevention and treatment of acute infant diarrhea in the rural areas. The target audience includes a primary audience consisting of mothers, grandmothers, and older female siblings of children under five, a secondary audience of rural health workers, including community health nurses, maternal and child health teams, leprosy inspectors, and primary health care workers, and a tertiary audience of general physicians, dresser/dispensers, village leaders, and fathers.

Several simple messages are aimed at mothers and their families concerning the preparation and utilization of water/sugar/salt solution, continued feeding during diarrhea, continued breast feeding, additional food after diarrhea, and personal and domestic hygiene. They are also informed where to get help should they need it and are encouraged to teach others the art of ORT. The secondary audience is taught proper mixing of sugar/salt solution and the proper management of moderate and severe dehydration in health centers using UNICEF pads of WHO formula. They are instructed how to teach mothers to mix and utilize sugar/salt solution. The tertiary audience is motivated to support and praise mothers who properly use sugar/salt solution for diarrhea.

The program is further supported by:

1. Training workshops for health workers during which a color-coded mixing flyer for distribution to mothers is introduced. Additional materials are the large treatment poster for use by the health worker, the Ministry of Health treatment manual, and red sashes to be hung on the house by traditional birth attendants and other volunteers who have been properly instructed in the use of WSS.

2. A seminar for physicians run jointly by the Ministry of Health, the Medical and Dental Association, and Mass Media. The Ministry's policy on diarrhea and the Mass Media approach is explained.



## Mixing flyer

The color-coded mixing flyer gives precise instruction in pictorial form on the method of preparation of the solution. The names of the ingredients are written in English as well as in a local language using Arabic script. The reverse side of the flyer shows how to level off the bottle cap.

When primary and secondary training are completed, cluster radio messages are sent out. Initially, the messages focus attention around dehydration, described as "dryness," and its relationship to diarrhea and feeding. The use of adult foods rather than watery porridges is stressed as a source of strength, and extra food after diarrhea has ceased is encouraged.

The message then shifts to preparation and utilization of WSS solution and to indications of when to seek help — five days of diarrhea, sunken eyes, etc.

As was pointed out earlier, the character of diarrhea disease differs in the wet and the dry season. During the dry season, when diarrhea is more severe, the messages emphasize this severity and the need for increased volumes of the solution.

The next set of cluster messages are aimed at popularizing some aspects of the program. In this section is included a "happy baby lottery" designed to test the mother's ability to mix the oral rehydration solution and to use it correctly. Within this set of clusters is information on where to get help if mothers do not remember how to prepare the solution — woman with the red sash, health centers, etc.

The final cluster deals with feces clean-up.

## Happy baby lottery

The lottery is designed to motivate mothers to seek the numbered mixing flyers which act as the entry ticket. Instruction on its use has occurred by means of face-to-face encounters with health workers, reinforced by radio messages. Health workers in twenty centers and eight hundred village volunteers trained as "diarrhea experts" have distributed more than 150,000 handbills.

Selection of eligible villages was by random sampling. Mothers in those villages who produced their handbills entered the draw. Those drawn had to demonstrate their skills at mixing the solution to win a modest prize. A second prize was awarded to those who could answer three out of five questions on utilization.

The climax of the lottery was the final draw performed by the President's wife, Lady Njaimah Jawara, during a one-hour broadcast on Radio Gambia. Fifteen radio-cassette prizes were awarded to individuals. Community prizes of sacks of sugar and rice were won by five villages which were the most active.

The lottery activities drew 6,580 contestants and 4,148 spectators. Of the 1,440 women who won a chance to demonstrate their skills, 1,097 did so correctly. One thousand one hundred fifty-seven were able to answer correctly at least three out of five questions on administering the solution.

## Program evaluation

The program is being evaluated by the collection of the following data:

1. six waves of morbidity data;
2. two waves of nutrition data;
3. three questionnaires about radio messages, practices relating to personal hygiene, and water use;
4. pregnancy history of women sampled.

## Morbidity

As part of the evaluation, a sample of women was questioned six times, from March to December 1982, about the health of their children as well as about their reactions to the illnesses of their children, especially diarrhea. Table 3 presents the results of this survey.

Mothers were questioned about the health of their children in the previous two weeks. Their responses reflect the seasonality of diarrhea. In the wet season, from June to October, increased levels of diarrhea were found, both in number of cases and duration of episode. This finding is what one would expect and confirms epidemiological data already known.

Mothers' perception of the mildness of diarrhea took a sharp rise from March to June. Whether this is the result of the campaign or due to the diarrhea itself is not clear.

The practice of breastfeeding was strong even during diarrhea, as evident in the March/April results. The campaign appears to have reinforced this good practice. From March to June, there is a shift from the tradition of treating diarrhea with herbal teas to the use of WSS preparation. This reversal continued insidiously in the following months. It will be noted from the March/April data that some mothers were already using some form of WSS before the campaigns. The evidence is that such preparations were improperly prepared.

With regard to "Diet for Dryness," the results were less dramatic. The number of mothers has doubled who feed solid food to children with diarrhea, but there still remains some 70% who do not offer solid foods. This finding coincides with the finding that 66.7% of women respond positively to the statement that "solid foods are not good for children with diarrhea."

The number of mothers who sought health center diarrhea treatment for their children declined from 85% in March/April to 59.8% in December. Concurrently, home treatment in-

**Table 1**  
**CAUSE OF DEATH IN BANJUL, 1975**

<i>Disease</i>	<i>No. Cases</i>	<i>Percentage</i>
Diarrheal disease	108	16.4
Acute respiratory infection	104	15.8
Cardiovascular disease	93	14.1
Malnutrition	53	8.1
Prematurity	44	6.7
Others	255	38.9
Total diagnosed	657	100.0
Undiagnosed	491	

**Table 2**  
**UNDER FIVE MORTALITY IN BANJUL, 1978**

<i>Causes</i>	<i>Number</i>	<i>Percentage</i>
Unspecified	91	23.4
Gastroenteritis and malnutrition	83	21.1
Respiratory infection	68	17.5
Malaria	64	16.5
Tetanus	15	3.9
Others	68	17.4
Total	389	100.0

**Table 3**  
**MOTHERS' RESPONSES TO REPEATED QUESTIONNAIRE COVERING HISTORY OF DIARRHEA AND METHOD OF TREATMENT MARCH TO DECEMBER 1982**

(in percent)

	<i>March/ April</i>	<i>June</i>	<i>Oct.</i>	<i>Dec.</i>
Diarrhea in last two weeks	18.1	26.0	11.9	10.3
Four or more days of diarrhea	37.4	41.6	34.8	24.1
Diarrhea was mild	17.7	70.0	64.8	74.1
Diarrhea right now	4.8	9.5	2.6	2.3
Breastfeed during diarrhea	88.3	90.8	88.7	87.6
Solids given during diarrhea	13.6	19.4	24.8	29.5
Mother treated diarrhea	18.2	21.8	31.7	53.8
Mother with tea	53.8	26.4	13.8	10.0
Mother with WSS	20.6	72.5	84.8	89.3
Mother went to health center	85.0	83.1	78.2	59.8
	N = 1,122	n = 885	N = 914	N = 1,004

creased. This is quite remarkable considering that visits to the health centers are not only health events, but also social events. How much this might have been affected by a temporary fuel shortage which began in August and immobilized clinic staff is not clear.

#### Radio messages

Using the happy baby lottery as a guide to the extent to which mothers listened to radio messages and to what extent they absorbed them, 50.5% had *not* heard about the lottery. Of those who had heard about it, two out of five recognized that the lottery was for women only, and 86% knew that the mixing flyer was the entry ticket. Seventy-four percent knew they needed to know about the WSS solution to win a prize. Only 54% could tell what the prizes were, and 23.5% knew who drew the grand prize winners.

By December, knowledge on the proper formulation of WSS rose to 68.8%. The campaign had failed to convince mothers that solid food was good for children with diarrhea, even though this was an important feature in the messages.

The mixing flyer had been seen by 79% of women. Of the 71% who said they owned a copy, 626 out of 627 were able to produce them. Knowledge of the content of the flyer was quite high (87%).

#### Some misconceptions

The evidence suggests that women were learning more and more about diarrhea, or at least more of the campaign messages. Identical ques-

Table 4

**CHANGE IN PERCEPTION OF DIARRHEA AND WSS  
AS DETERMINED BY REPEAT QUESTIONNAIRE  
TO A SAMPLE OF MOTHERS**

(in percent)\*

	Sept./Oct. (N = 820)	Dec. (N = 874)
WSS prevents dryness	85.2	96.1
WSS for child below 6 months	18.2	52.2
WSS for child 6-18 months	14.9	43.8
WSS for child 18+ months	21.3	61.4
WSS stops diarrhea	64.4	95.1
WSS should be made daily	90.0	93.2
WSS to be given slowly with spoon	85.1	80.7
If child vomits, keep trying	57.1	16.1
Baby with diarrhea needs breast	93.5	96.6
Red flag here	66.6	77.6
Red flag means	75.1	84.1
Koran urges cleanliness	98.4	99.4
Feces in compound cause diarrhea	31.2	36.4
Flies carry disease	43.7	43.6
Clean hands after cleaning up feces	89.9	83.8
Clean compound of feces/week	52.9	83.0
Throw feces over wall	65.2	76.9
Bury feces	85.0	86.2
Germs cause diarrhea	83.8	97.3
More can see germs	27.3	27.6
Diarrhea gets rid of germs	64.1	88.2
Heard radio re diarrhea	58.3	42.2
Talked to others about it	51.3	86.2

\*Indicates a positive response.

tions asked in September and December, however, indicate a few misconceptions (see Table 4).

In September, 64% thought that WSS stopped diarrhea. By December, this number had risen to 95.1%. Although this figure is immaterial from the point of view of getting mothers to use the preparation, this is, nevertheless, not the message that was intended. The number of mothers who believed they should continue to try to administer the solution even if the child vomits fell from 57.1% to 16.1%.

The findings suggest that, with regard to cleanliness, we have not been very successful. In September, 52.9% felt it was sufficient to keep the compound clean of feces weekly. This number rose to 83% in December. Surprisingly, 65.2% and 76.9% respectively were satisfied with throwing feces over the wall.

In conclusion, oral rehydration for the treatment of diarrhea is acceptable to the Gambian community, and mothers have demonstrated that, if properly taught, they can prepare and utilize correctly a simple salt/sugar solution using standard bottles with their caps, available in most homes. The materials for such preparation are also available in the home. Face-to-face

instruction would appear to be the best medium of instruction, using color-coded pictorial teaching aids. Radio communication by itself is unlikely to be effective, but is a good support for face-to-face encounters. Greater efforts have to be made to raise the level of personal and community hygiene for a more lasting preventive measure.

## **ORAL REHYDRATION THERAPY IN THE DIARRHEAL DISEASE PROGRAM: THE PHILIPPINE EXPERIENCE**

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The Philippines is a tropical developing country located at the western Pacific in Asia. The popu-

lation, generally of the Malay stock, is estimated at fifty million.

Health care is a function of the Ministry of Health, which implements its programs through its twelve regional offices. The delivery of health services flows down from the regional offices to the provinces/cities, municipalities, and barangays (villages). The rural health units and satellite barangay health centers comprise the first level of the Ministry's health care delivery system.

Indigenous volunteer health workers, like the barangay health workers (village health workers) and purok or unit leaders (a purok or unit is composed of twenty households) participate in the health care delivery in the context of primary health care.

The country's major health problems include diarrheal diseases which mostly affect young children. In 1978, for instance, diarrhea was the second cause of death and of illness among children under five years of age: seven of ten diarrhea deaths and five of ten diarrhea cases were in this age group. Among infants, diarrhea was the third leading cause of death, accounting for one of ten infant deaths.

Most of these diarrhea cases do not require specific treatment. Recent information from an infectious disease center shows that only one-third of the diarrhea cases needed treatment in addition to fluid therapy. In a community surveillance done earlier, only 5% of 200,000 cases were due to cholera.

#### **Oral rehydration therapy in field studies**

Oral rehydration therapy as now perceived was introduced in the country in 1975-77 during field trials. These studies demonstrated that "Oresol" (Oresol is the name of the locally packaged ORS powder of WHO formulation, costing about P0.93 or U.S. \$0.09/packet) was highly acceptable, with mothers claiming it improved the general state of health and appetite of their children and resulted in more weight gain; that its popular use in the community reduced hospital admissions due to dehydration; and that it can be effectively distributed by a local delivery system and may be used widely and safely.

These beneficial effects of ORT encouraged officials to expand its promotion, starting first with pilot areas in each of the twelve health regions. At that time (1978), however, a national program on the control of diarrheal diseases was not yet formulated. Because a national committee was not yet operational, support from the national level and monitoring of the pilot projects was lacking.

#### **ORT in the CDD program**

Recognizing the importance of a unified and systematic approach to the diarrhea problem, the

Ministry of Health adopted a national CDD program. This program, launched in October 1980, had two objectives:

1. the reduction of mortality from diarrheal diseases, particularly among children below five years of age, with the extensive use of ORT; and
2. the reduction of morbidity from diarrheal diseases through strengthening the components of environmental sanitation, maternal and child health, nutrition, surveillance, and health education.

*Organization and training.* In order to carry out the program implementation efficiently, a national committee headed by the Minister of Health was created. A national task force group whose function is to assist both the national committee and the field units in the planning, organization, and management of the program was also organized. Similar committees/task force groups were subsequently organized at all levels of the health care delivery system, that is, from the regional down to the barangay (village) levels.

Training activities were started with a national seminar workshop for regional trainers and were echoed and re-echoed until they reached the barangays. ORT, the "new" program component, was the main subject in these training courses. The main focus of training was field implementation, largely because this was the trainers' orientation.

*Promotional/IEC materials.* Because the need for promotional/IEC materials had been recognized, modules, posters, and pamphlets on ORT were developed and mass produced. The development and production of local materials were also encouraged. To some extent, radio and television were utilized. Presently, more teaching materials for volunteer health workers and doctors/paramedics are presently being developed by the ministry and in collaboration with other agencies. There is need for more IEC materials to reach the target population.

*Implementation — primary health care approach.* Following the training courses, the implementation of ORT took place by level in the health delivery system scheme. The allocation of Oresol increased from 1,000 packets during the pilot-study phase to 10,000 to 20,000 packets per region per month. A reporting form for diarrhea cases and deaths and Oresol supply, distribution, and utilization was devised. The committee/task force at each level supervised the program.

Implemented under the umbrella of primary health care, the CDD/ORT program utilizes the PHC approach and in many instances serves as the entry point for PHC. To illustrate this, picture a community of 3,000 to 5,000 people, the catchment area of a rural health midwife whose base of operation is the barangay health station. Assisting the midwife in the community are two or

more barangay health workers and "purok" or unit leaders. These volunteer health workers help the midwife with the distribution and dispensing of Oresol and the monitoring, referral, and follow-up of cases.

*Field inventory/survey.* To gather information on the status of program implementation, the national task force conducted a survey in some health regions. Results of the survey revealed weaknesses in program implementation. Areas which needed strengthening were the allocation, distribution, and storage of Oresol, promotion, health education, and monitoring. One common problem was incomplete and late reports. These findings necessitated consultation-training meetings with the field units.

*Regional consultative-training workshops.* Thirteen consultative workshops, facilitated by a team of two to three members of the task force, were conducted about a year after the launching of the program. Activities undertaken were the sharing of experiences on the implementation of ORT, clarification of issues, development of guidelines, and strengthening of local action plans for the CDD/ORT program. In these action plans, areas of concern were identified and activities toward the solution were given.

During the experience-sharing sessions, the use of Oresol for purposes other than diarrheal rehydration surfaced. Oresol had been used for high fever, burns, and post-surgery; doctors used it for hangovers; farmers took it before they went into the field; and athletes took it before their games. Oresol had also been given to farm animals.

*Supportive ministry circulars.* Strengthening the program also required revisions of some ministry circulars. Among these were: (1) the reporting of diarrhea cases of undetermined etiology as diarrheas instead of gastroenteritis, (2) the inclusion of diarrhea cases and deaths in the weekly telegraphic report of designated index municipalities, and (3) revision in the CDD/ORT report (Form 1).

*Program review.* A "paper review" of the program based on 1981 reports was made in early 1982. Information on Oresol production, distribution, and utilization and diarrhea cases and deaths was consolidated and analyzed.

In 1981, 3,149,500 packets of Oresol were produced by the Ministry of Health, and 2,955,000 of these were sent to the regions. From the regions, 91% of the packets were distributed to the field units. In some regions, however, a substantial number of their supply remained undistributed by the end of the year. Reported wastage was negligible. There were 790,448 cases (all ages) seen at the health facilities, and of these, 539,281 (83%) were given Oresol. The review also revealed the need to clarify some issues which resulted in the revision of the CDD/ORT

form.

In 1982, a total of 721,914 cases were reported. Of these, 395,594 (55%) were children below five years of age, and 327,647 (83%) of these children were given Oresol. An average of two Oresol packets per child was given.

*Training on the clinical management of diarrhea with emphasis on ORT.* Field visits revealed that while Oresol was fast gaining acceptance at the health centers and in communities, it was underutilized in hospitals. In order to convince the hospital group of the effectiveness of ORT, training which provided ward practice was needed. In anticipation of this training, representatives from two national hospitals were sent to train at the ICDDR,B. These trainees were classic examples of ORT skeptics turned believers. It took some time and effort to establish the oral rehydration unit in one hospital, but it was worth all the trouble. Today we have two institutions at the national level which are used for ORT training: a children's hospital and an infectious disease center.

Two courses on the clinical management of diarrhea were conducted in October, 1982. Participants from the twelve regional hospitals constituted the core of trainers responsible for promoting ORT to the rest of the hospitals, and, as in other echo-training courses, the national task force provided technical assistance. Where the hospital chiefs or top administrators attended the workshops, the echo activity was implemented sooner.

#### **Impact of ORT on ward admission and cost of fluid therapy**

Table 1 shows the difference in the number of ward admissions, deaths, and the amount of money spent for fluid therapy at a pediatric diarrhea ward before and after the establishment of the ORT unit.

In August to December, 1981, before the establishment of the ORT unit, all diarrhea cases for admission were brought to the ward. With the establishment of the unit, the cases were screened (at the unit), and only the severe, complicated ones were referred to the regular ward. All other cases were treated at the unit with Oresol only.

Before the ORT unit (1981), the pediatric diarrhea ward admitted a total of 3,026 cases. With the ORT (1982), there were 1,700 patients. The results of the ORT included a reduction in the total cost of fluids spent from P82,142.20 to P35,843.53 and a reduction in the cost per patient from P27.15 to P21.08 (P1 = U.S. \$0.07). The average length of stay at the ORT unit was twelve and a half hours, and the average Oresol consumption was 1,904 ml. An important feature at the unit was a health education session which the patients and mothers had to undergo before dis-

**Table 1**

**ADMISSIONS, DEATHS AND COST OF FLUID THERAPY  
AT THE PEDIATRIC DIARRHEA WARD BEFORE AND AFTER  
THE ESTABLISHMENT OF THE ORT UNIT  
SAN LAZARO HOSPITAL, MANILA 1981 and 1982**

Month/Year	Admissions	Deaths	Cost of Fluid Therapy			
			IVF	ORT	Total	Patient
AUG-DEC. 1981 (BEFORE)	3026	91	P*72,174.80	P9,967.40	P82,142.20	P27.15
AUG-DEC. 1982 (AFTER)	1700	46	27,365.73	8,477.80	35,843.53	21.08

\*P = Pesos 1P = \$0.07 (U.S.) (P14 = \$1.00)

charge. Following the session, they were given two packets of Oresol to take home with them.

**Summary**

In the Philippines, the ORT program is over two years old. ORT services are now delivered nationwide, mainly through the Ministry of Health's service delivery network, which includes 342 hospitals, 1,991 rural health units, 10,500 barangay health stations, plus the local community delivery system of 12,000 village drugstores and thousands of volunteer village health workers. The quality of implementation, however, still needs improvement.

Our experience in the ORT program has provided a number of insights into its implementation. First, the encouragement and "push" of a high national official is a very important factor in the implementation of a program. Second, a good promotion/training component and experiential learning are necessary for the introduction of the new technology. Third, regular review/evaluation is required to provide the basis for program redirection, and consultative meetings with the field implementing units to facilitate solutions to problems/constraints. Finally, the private sector's support and endorsement of the ORT program affects its acceptance. For example, when the pediatric society questioned the sodium content of Oresol and discouraged its use, doctors stopped giving Oresol.

Other issues which our experience with the ORT program has revealed concern the taste, the packaging, and the measuring container of Oresol. "Beginner-implementers" usually mention the unpalatable taste of Oresol. "Believer-implementers," however, do not find this a problem.

The present packaging of Oresol has both advantages and disadvantages. Although separat-

ing the glucose from the salts will give a longer shelf life, it is more expensive and is a possible source of error in mixing. The possible use of sodium citrate instead of sodium bicarbonate may provide the solution to this problem. Regarding the measuring container for the one-liter solution of Oresol, we recommend a popular drinking glass, the Nescafe glass.

We have also found that Oresol is used for cases other than diarrhea dehydration (fever, burns, post-surgery, etc.). These additional uses may increase the demand for Oresol and create problems in reporting.

Finally, our experience with ORT has led us to recommend that, in cases where puffiness of the eyelids is observed after Oresol intake, patients/mothers be advised to stop or limit Oresol temporarily and resume the treatment when dehydration persists.

**Conclusion**

The program<sup>1</sup> has shown beginning favorable results in terms of mortality reduction, reduction in ward admission, and reduction in cost of treatment. We are looking forward to more significant impacts as we improve the quality and quantity of implementation.

**NOTES**

1. Credit for the program achievements is due to the Minister, Dr. J. C. Azurin, who has a very special concern for the CDD/ORT. We would also like to acknowledge the support given by WHO, UNICEF, KABALIKAT (an affiliate of the Program for Appropriate Technology in Health), and ICDDR,B for their assistance in the training of personnel and in the development of teaching materials which contributed to the program's achievements.

## ORT EXPERIENCE IN ETHIOPIA

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Acute diarrheal disease (ADD) is among the leading causes of morbidity and mortality among children in Ethiopia. Ethiopia has a population of over thirty million, of whom six million are children below the age of five years. Like other developing countries, Ethiopia has the characteristic profile of high diarrhea incidence zones: widespread poverty and ignorance, poor environmental sanitation and water supply, rapid urbanization, inadequate health infrastructure, etc.

Although reliable data reflecting the true incidence of ADD does not exist, studies conducted in scattered population groups find that ADD is the second commonest cause of morbidity and perhaps the leading cause of mortality. Approximately eighty children out of a thousand visit the outpatient department of a children's hospital for diarrhea. A longitudinal study in an urban community found that children under two years were ill for 104 days of the year, and for 59 of these days their illness was due to diarrhea. Children over five years had diarrhea during only four days of the year. The mean number of episodes of diarrhea per year was 6-8, 4-6, and 1-1 for age groups 0-2 years, 2-5 years, and 5-12 years, respectively. Preliminary data from a longitudinal study in a rural farming community tend to indicate that such communities have no advantages over their urban counterparts despite less overcrowding.

Studies conducted in Addis Ababa show that rotavirus accounts for most acute diarrheal disease, and especially for severe cases. Enteropathogenic and enterotoxigenic *E. coli*, together with *Campylobacter*, are the most frequently isolated bacterial enteropathogens. Around 20% to 30% have no recognized enteropathogens.

### **Use of oral rehydration therapy**

Oral rehydration therapy was first introduced on a relatively extensive scale in Ethiopia during the transient cholera epidemic of 1970-1973. Later, the adoption of a program of diarrheal disease control by member states of the World Health Organization at the 31st World Health Assembly in May, 1978, resulted in the establishment of a di-

vision for the control of diarrhea diseases (CDD) in the Ministry of Health. The division has regional coordinators in all the fourteen administrative regions of the country. These coordinators perform CDD as well as maternal and child health (MCH) tasks.

The initial task of the division was to conduct selected surveys to find out the extent of knowledge and use of oral rehydration solution (ORS). The survey indicated that a large majority were either ignorant of ORS or reluctant to use it.

Based on these findings, the CDD program of- fice established as an urgent priority the training of all categories of health professionals. Workshops were held initially for all CDD coordi- nators and subsequently in each of the administrative regions. The administrative re- gions then continued to disseminate the same information to peripheral units. The content of the workshops included the etiology and clinical assessment of dehydration, the use of ORS, and MCH practices related to diarrhea. All partici- pants were encouraged to order ORS from the di- vision or through the branch office.

Despite these activities, the impact on diar- rheal mortality is expected to be negligible be- cause the extent of coverage of the target popula- tion is grossly unsatisfactory. Reliable figures of coverage of the population by health service is not available, but it is recognized that children under five years are the least provided for. Fur- thermore, a long time is likely to elapse for the expanding health services to embrace a signifi- cant percentage of this age group. Consequently, an alternative strategy of delivery of health ser- vices, and specifically of ORS, has to be designed.

Events in progress in Ethiopia over the last eight years have attempted to effect deep-rooted transformation of the society. Two changes are particularly relevant to health.

1. The entire population has been organized into administrative units, known as urban dweller and farmer associations, with a hier- archical infrastructure extending to the national level through district, provincial, and regional committees.

2. Each of these units of the mass organiza- tions are run by popularly elected voluntary members of the respective inhabitants of the community. In addition to performing tasks passed from the government ministries, these elected committee members also motivate the community in several self-help development projects through subcommittees. A popular sub- committee is the health subcommittee which initi- ates health-related activities.

This set-up was explored with regard to the distribution of ORS to children with diarrhea. The experiment has only recently started and is expected to continue for a minimum of one year. Under certain conditions, it may provide the so-

lution to overcoming the low coverage of health services.

The study was conducted in two communities — one with a health facility and another without. Initially, baseline demographic data, feeding habits, status of environmental sanitation and water supply, etc. were collected. The populations in both communities were alerted to the availability of ORS for diarrhea and where to get it. Persons in charge of distribution were trained. Utilization of ORS, diarrhea morbidity, and diarrhea mortality were monitored by field assistants who visited homes every fifteen days.

The results, while preliminary, are very encouraging. It appears that ORS is currently being distributed at least equally effectively in both communities. If the results continue in the same direction, there is great hope that, in Ethiopia, ORS can be distributed outside of the health infrastructure, making it available to 100% of the population in need.

**Table 1**

**ORS UTILIZATION IN TWO COMMUNITIES**

	1	2
Populations — total	4,273	2,567
Population under five years	743 (17%)	496 (19%)
ORS packets distributed	148	106
Deaths in under five years		
—total	7	9
—attributed to diarrhea	5	6
Project preschool child mortality rate/year (< 5)	28	54

**ORAL REHYDRATION IN NICARAGUA  
THREE YEARS OF EXPERIENCE**

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Acute diarrheal disease has been, and still is, an important contributing factor to the high infant mortality rate in less-developed countries — countries whose backward and dependent economies have submitted the majority of their populations to atrocious living conditions with limited access to goods and services. These awful living conditions are manifested in the high rates of illiteracy and malnutrition and the high incidence of infectious diseases.

Traditionally, Nicaragua has appeared in the international annals as one of the countries presenting the most desolate health index on the Continent. According to computations carried out by CELADE in 1974-76, the total population of Nicaragua was estimated at 2,732,520. Sixty percent of this population was located in rural areas or small, scattered settlements lacking basic services. Only five cities had a population over 40,000, one of which was the capital, Managua. In the last three decades, Managua has had an accelerated and disproportionate growth, increasing its population sixfold. This increase has occurred for the most part because of internal migration arising from the uprooting of the rural settlements by the development of extendable productive forms of agrarian exportations, mainly cotton and sugar cane.

The Nicaraguan population is characterized by its marked youth. Forty-eight percent are less than fifteen years old; 59% are less than twenty; and the mean national age is 15.7 years. In 1979, the birth rate was estimated at forty-seven per thousand, and life expectancy was fifty-five years of age. The general mortality amounted to 16.4 per thousand. Sixty-seven percent of the children under six years of age were estimated to display a certain degree of nutritional deficit, and acute diarrheal disease was considered the primary cause of mortality in all ages.

August 1979 marked the creation of the Unique National Health System (SNUS) and the organization's sector in the Ministry of Health (MINSa). Programs were established to benefit the people and the environment, giving priority to maternal and child health care, and shaping it around the global concept of primary health care. These programs were made possible as a result of international assistance. The implementation of the Program for the Prevention and Treatment of Diarrhea and Dehydration was initiated with substantial support from UNICEF, utilizing the method of oral rehydration as a technology appropriate to prevailing conditions.

In this presentation, we will describe Nicaragua's experience with the implementation and development of oral rehydration therapy during the past three years. Because the reporting method on which we now rely is still developing, it is not possible to analyze in detail the different variables noted in the implementation of the Program for the Prevention and Treatment of Diarrhea. For this reason, some essential aspects that we would have liked to have been able to state conclusively must be tentatively explained as follows:

1. *Popular participation.* We hope to show that popular participation is not simply a slogan, nor just an instrument of the community to assist in carrying out its tasks.
2. *The impact of the program in the services.*



Oral rehydration therapy in a country like ours is a simple technology, easily assimilated, of low cost, and of great impact on the health conditions of our people.

3. *The impact on infant morbidity and mortality.* The National System of Vital Statistics has been recently created in Nicaragua. A more thorough analysis of infant morbidity and mortality will be made easier in the future with this centralization of data collection. Despite the fact that our reporting system is still being developed, the data presently compiled give rise to some conclusions about the program, as well as suggesting some hypotheses which will be the starting points for future studies.

### **Implementation and development of the program**

#### **1. Training**

Because oral rehydration therapy is a method which requires precision, and because it is to be implemented throughout the entire country, a training program has been developed with the following characteristics: (a) it is low cost; (b) it is short duration; (c) it is representative of all health areas; and (d) theory has been integrated with practice.

It was possible to combine such characteristics harmoniously due to the existence of the unique, regionalized National Health System and to having previously established norms at the central level concerning oral rehydration therapy. The most relevant activity in the preparation was the reproduction of the information and training received in the regional workshops. This multiplying of workshops greatly influenced the success obtained during the implementation phase of ORT. These workshops were set up to cover the training and implementation phases and the evaluation of the results.

The Program on Prevention and Treatment of Diarrhea and Dehydration was inaugurated with the National Training Seminar held in September 1979. In October 1979, the National Seminar on Implementation and the Foundation for Development of Operations took place, followed by fifteen departmental seminars. The second workshop to strengthen the development took place in July 1978, followed by eight regional seminars.

The Health Team that was present in the national seminars consisted of the regional director or a delegate, the regional nurse in charge of the Maternal and Health Care Program, the head of Regional Statistics, representatives for the organizations of the masses, a regional social worker, and a regional educator of the people. The regional workshops gathered together all responsible personnel from the Oral Rehydration Units (UROs).

We emphasize two elements in the training:

a. The presence of representatives of the or-

ganizations of the masses — settlers, women, youths, farmers, laborers.

b. The training of auxiliary infirmiry personnel, the personnel that Nicaragua uses to provide medical attention at the Oral Rehydration Units.

#### **2. Education and communication**

The effort put forth by the country to lower the morbidity and mortality from acute diarrheal disease requires the dissemination of information to all levels. From 1980 to 1982, different communication media have been used, including audiovisual and written, in order to meet this goal. In all cases, national coverage has characterized these activities.

Since radio is a means of communication accessible to practically all of the Nicaraguan population, a half-hour radio program about diarrheal illness was developed, explaining causes, dangers, prevention, and treatment. Starting in May, 1980, this program was incorporated in the national radio program on literacy. The program is still being presented on a trimestral basis. Due to the program, massive awareness of the presence of the Oral Rehydration Units was also achieved, and there was an increase in the use of the oral rehydration solution. A forty-second bulletin was produced directing people to the nearest Oral Rehydration Unit should they have a child with diarrhea. Highway signs with this same message were placed at the major highway entrances and exits in the more important cities in the country.

An eight-minute program was produced for television demonstrating the method of oral rehydration therapy and showing the medical attention given in the Oral Rehydration Units. Its purpose was to make people aware that the UROs were in all the health centers and booths in the country. This television program was aired bimonthly in 1980, trimonthly in 1981, and monthly in 1982, during the time that the television audience was the greatest (between 7:00 p.m. and 8:00 p.m.).

As a result of the Literacy Crusade, the number of Nicaraguans who could read was raised. The newspaper was, therefore, utilized to educate the population: in 1981, in the *Popular Journals of Health (Fornadas Populares de Salud)*, an article about oral rehydration was presented in the form of a four-page comic strip which could also be detached and assembled so that each family could produce its own brochure. Approximately 400,000 bulletins were produced, half of these explaining the causes of diarrhea and half describing oral rehydration therapy. These bulletins were distributed in the Oral Rehydration Units and in outpatient waiting rooms.

In addition, a rotating folio was prepared which was utilized daily in talks given by those responsible for the Oral Rehydration Units, and an audiovisual slide show, consisting of sixty

slides, was produced, to be utilized in the different regions of the country. The impact of these methods of popular education and communication is reflected in the increased acceptance of oral rehydration therapy.

### 3. *Establishing the UROs*

The Oral Rehydration Units were established progressively, as can be seen in the following numbers: 1979 — 23 UROs; 1980 — 226 UROs; 1981 — 269 UROs; 1982 — 334 UROs. The drop in 1981 is due to the need to close Units in Regions I, VI, and Special Zone I, where there was military conflict.

### 4. *Participation by the people*

The organized participation by the people in the social process has been an essential and constant element.

There are structures that mobilize the health activities of the people, such as the People's Health Councils (Conejos Populereo de Salud). This organization takes part in the programming, organization, and control of the health operations in the different levels: local, regional, and national.

The effective participation of the organized community has played different roles during the course of time:

a. In the program implementation workshops, its operations were directed at: urging the formation of UROs in all centers and health booths; finding and referring children with diarrhea to the established UROs; following up those cases that received oral rehydration therapy; and extending the prevention, treatment, and control programs.

b. With the development and consolidation of the People's Health Councils, the population has had a growing role in the planning and control of the program. It has been possible to form non-institutional Oral Rehydration Units in places where there is no health unit; the most representative has been the installation of these Units in agricultural areas which have an increase of workers during harvest time.

c. Another element of participation of the people comes from the Maternal and Child Care workers, who have been particularly involved in the prevention and treatment of diarrhea and dehydration, in referring children, and in promoting breastfeeding.

d. Another sign of the acceptance and assimilation of oral rehydration is that it is becoming a common practice for mothers or groups of workers to ask for the solutions without admitting the child in the Oral Rehydration Units. Unfortunately, there is no record of this and no system set up to keep track of these cases.

e. One of the more important mechanisms of participation by the people in health matters is found in the *Popular Journals of Health*. The Jour-

nals of 1981 and the one that will be realized in July of 1983 have incorporated elements of the program which emphasize prevention of diarrhea through hygiene and cleanliness.

### 5. *Recordkeeping*

Since the beginning of the program, the general means and rules used in recordkeeping for operations has been used in the Oral Rehydration Units. We emphasize that it is the only component of the Maternal and Child Care Program that has an independent format.

The operative unit produces a monthly record of operations in the URO and sends it to the Regional Health Care Department, which in turn produces a monthly consolidation of the whole region and sends it to the central level (MINSA). This information becomes an essential element in the evaluation and monitoring of program activities.

### 6. *Method of monitoring and evaluating*

In addition to the national and regional workshops, it has been deemed necessary to make constant supervisory visits to each Oral Rehydration Unit in order to access the knowledge received in the training workshops and to help solve daily problems. This practice is carried out in each region through the nurse responsible for the Maternal and Child Care Program.

So that supervision is uniform, a unique guide was produced which is used throughout the country. At the national level, there have been two evaluation workshops (January and July, 1981) which examined the progress of the Oral Rehydration Units in the whole country, specifying tasks at the operative, regional, and national levels.

The National Bureau of Statistics (OFINE) carries out the compiling of data in a monthly format, and the Maternal and Child Care area analyzes and processes them as part of its monitoring.

### 7. *Main obstacles and limitations*

The introduction of oral therapy was initially met with misgivings from a significant number of health care professionals, primarily doctors and graduate nurses. There were questions concerning the type of fluid and electrolyte imbalance in different kinds of dehydration, the observations needed to treat the hospital patient, and the specific laboratory analysis that had to be performed. Such difficulties have not been totally solved, but in the course of the past three years the orientation of many doctors and nurses has been modified.

Three elements which have had a favorable influence are identified:

a. Scientific articles on ORT have been published and distributed at national and regional workshops and through the continuing education system to the health care personnel.

b. The concepts of oral rehydration therapy have been incorporated into the curriculum of medical and nursing schools.

c. The direct observation by the health care personnel of oral therapy has been recorded.

#### 8. *Particularities of ORT in Nicaragua*

The oral therapy program has certain particular characteristics that have contributed to its implementation and development.

a. It is not a vertical program cut off from the integrated medical attention given the child, but rather an activity of the Maternal and Child Care Program executed in all the operative units of the National Health System.

b. The activity is nationwide and has not been established only as a pilot plan.

c. The training method is based on multiple workshops which quickly transmit the components of the activity to the operative units.

d. As it is an integral part of the Maternal and Child Care Program, the ORT program undergoes annual programming in the various regions and operative units.

e. There is a specific recordkeeping method which has permitted a constant evaluation of the activity, locally and nationwide.

#### **Results obtained up to 1982**

##### 1. *Attendance in the UROs*

The attendance in the unit providing services to the dehydrated child increased progressively over three years. In only two years, the number of patients attended to at the Oral Rehydration Units doubled. There are two elements to be noted in the increasing attendance at UROs:

a. The rise in attendance is a combination of an increasing capability to offer services and an increasing demand for services by the population.

b. The fluctuations in attendance, with a peak during the second trimester of each year, correspond to the beginning of the rainy season in May and June, when the diarrheal problem increases. The lowest attendances are registered in the third trimester of the year, when the rains have stopped, the most moderate temperatures are present, and diarrhea incidence is low.

##### 2. *Coverage achieved in the Oral Rehydration Units*

The first objective of the Program for the Prevention and Treatment of Diarrhea and Dehydration was that oral rehydration would be given to 50% of those under six years of age with acute diarrhea. In 1982, a coverage of 43.1% was achieved. This reflects the accessibility of the service to all the population; it also measures the impact of education and communication.

This indicator has been different in the regions of the country and depends on the level of development and the special particularities of each area. Regions II, III, and IV, which histor-

ically have had major socioeconomic development, are no longer different from the other regions. As a result of developmental policies of the Revolutionary Government, priority is to be given to the more backward regions.

##### 3. *Satisfied demand*

One of the indirect results foreseen in the implementation of the program was not only increased coverage of the population, but also optimization of resources that would be achieved by decreasing the number of children treated with intravenous rehydration and by decreasing the number of consultations from patients with diarrhea.

There were increases in the medical consultations in the primary level as a result of the growing demand by the population for health care services, but the consultations in the hospital decreased. The consultations in the Oral Rehydration Units grew significantly from 25.7% to 32.1%, at the expense of the decreased in-hospital consultations for acute diarrhea. Therefore, the program is having the desired impact in the health care services.

We infer that in cost-effectiveness terms, oral rehydration saved time spent by the general and specialized medical personnel on the care of diarrhea patients, decreased duration of hospital stays, and decreased use of intravenous fluid.

##### 4. *In-hospital morbidity and mortality due to acute diarrheal disease*

We observed a decrease in in-hospital mortality in all the infant groups. At the present time, the in-hospital mortality due to acute diarrhea is no longer the number one cause of death; historically, this occupied first place, but now it occupies fifth place as a cause of in-hospital mortality in all the age brackets.

We have developed a hypothesis which might explain the decrease in mortality from acute diarrhea. It cannot be attributed either to a decrease in overall admissions (from 1980 to 1982, there is a 9.5% increase), nor can it be attributed to an improvement in the quality of hospital-based medical attention, as there has been little increase in hospital resources from 1980 to 1982. What is probable is that the children are arriving at the hospital in better physical condition and less dehydrated. The Oral Rehydration Unit usually sends children to the hospital who are more than 10% dehydrated when seen at the URO (the referral system is working); treatment begins, however, prior to referral. Also, the population has been assimilating the knowledge on diarrhea, and this has had a positive impact. Such observations, of course, are subject to further investigations.

#### **Conclusions**

The work presented reflects the activity developed around a health care program and the

achievements that up to now can be appraised in reference to the implementation and development of oral rehydration therapy in Nicaragua. This has been possible because there is a political will from the central government to give "health to all by the year 2000." The other supporting pillar has been the exclusive involvement of the masses in the process of planning, organization, direction, and control of the programs that the Ministry of Health in Nicaragua has established to solve the hygienic/sanitary problems of the population.

The Program for the Prevention and Treatment of Diarrhea and Dehydration is immersed in the general politics of the SNUS. Its priority is children. The ORT method proposed by WHO/UNICEF has accelerated development in the country, with special attention given to the regions historically receiving fewer health care services. The results presented reflect early achievements in the prevention and treatment of diarrhea. The work also presents us with new challenges and questions that will stimulate investigative work in order to identify with greater depth the achievements and benefits of the ORT methodology on the infant population, in the country's fight against acute diarrheal disease.

This is the contribution that the government and the people of Nicaragua, through the Ministry of Health, have made in this international conference in the development of oral therapy in the world. We think that this experience acquires a new value when it is shared. At the same time, we appreciate the contributions that other countries have made through the presentation of their own experiences. We shall try to incorporate them in our program, since combined efforts help preserve the health and lives of the most loved and unprotected group of the population: the children.

## **MANAGEMENT OF DIARRHEA IN HAITI: MORTALITY REDUCTION IN 8,443 HOSPITALIZED CHILDREN\***

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Diarrheal illness accounts for a majority of all deaths in infants and children in Haiti. In a country with a population of over five million persons, there are an estimated 25,000 deaths annually due to diarrhea and dehydration in children less than five years. A 1978 national sample survey of 5,600 children, performed in collaboration with the Centers for Disease Control, revealed that 44% of children had diarrhea during the preceding week, or an estimated two episodes per child per month. Repeat surveys in 1981 confirmed this prevalence. A review of 22,559 pediatric records at the State University Hospital, Port-au-Prince, Haiti, indicated a mortality of 35% among 9,434 patients hospitalized with diarrhea and dehydration during the period 1969-79. A program for the management of infantile diarrhea was established at the University Hospital in 1980. Mortality fell to 14% during the first year, was 1.9% during the second year, and has been less than 1% since January, 1982. This report describes the patient population and the factors which contributed to this result. A 24-bed unit for dehydrated children with diarrhea was opened in the pediatric service at the University Hospital in September, 1980. During the next two years, 8,443 children were admitted with moderate or severe dehydration. Although the unit was open to children of all ages, dehydrated patients older than two years were not encountered in our population. The age distribution of hospitalized children was: 41%, 0-3 months; 31%, more than 3-6 months; 22%, more than 6-12 months; and 6%, more than 12-24 months. Children with marked alteration of consciousness and absent lacrimation and urination were considered severely dehydrated, while irritable children with reduced urine volumes were considered moderately dehydrated. Weight gain between admission and discharge was 9.6% and 6.8% in the two groups, respectively.

Oral rehydration therapy (ORT) utilizing the WHO formula (ORS) and a standard protocol providing full rehydration within four hours and

replacement of continuing losses was introduced to the hospital and used as the sole form of fluid therapy for all moderately dehydrated children. Severely dehydrated children received Ringers lactate intravenously (70 ml/kg over three hours) until they were urinating and drinking and were then switched to oral rehydration.

All cases were admitted with an adult attendant, in most cases the mother, who stayed with the child twenty-four hours a day and administered fluid and food under the direction of the nursing staff. During hospitalization the patients' mothers were carefully instructed in the use of oral rehydration, giving one small cupful (100-125 ml) of ORS for each stool passed and allowing extra fluid ad libitum. Once rehydrated, infants with continuing diarrhea were effectively managed by their mothers at home, as confirmed by follow-up hospital visits three and seven days after discharge. Because of the pressure on limited beds, patients were discharged when their physical examination was normal and the number of stools was less than twelve in a twelve-hour period. The average hospitalization in the unit for over 7,000 patients with uncomplicated diarrhea was twenty-two hours. Only 3% of these children required rehospitalization within one week of discharge.

During the first six months of the unit's operation, 30% of non-breastfed infants less than six months of age developed periorbital edema, and 11% had whole-body edema. This occurred after 1-2 days of hydration with the recommended WHO formula. There were no cases of congestive heart failure, and the edema resolved within thirty-six hours of stopping ORS in all cases. Twenty percent of sixty edematous infants were hypernatremic (serum sodium > 150 meq/L). Following the WHO recommendation to alternate potable free water and ORS avoided this problem, but proved impractical, as attendants consumed large quantities of the purchased chlorinated water designated for the patients. We therefore diluted the ORS in two liters, rather than one liter, and used this as the maintenance solution following full hydration with standard ORS. Edema did not develop, and serum sodium levels were normal (130-150 meq/L) in 100 consecutive patients. This is now standard practice in the unit.

Table 1 shows the mortality rates during 1980-82 according to degree of dehydration and age of patient. The mortality rate correlated with the severity of the dehydration. During this two-year period, the mortality in 1,359 severely dehydrated children was 29.7%, and the mortality in 7,084 moderately dehydrated children was 2.2%. The overall mortality of 14.0% during the first year fell to 1.9% in the second year. This mortality reduction was due in part to the increased training of staff and refinements in our patient

management schema. There was not a significant correlation between age and mortality if one considered children with the same degree of dehydration. However, the 1980-81 combined mortality rate in moderately and severely dehydrated children was inversely correlated with age because of the greater frequency of severe dehydration in younger children ( $P < 0.01$  by Chi-square). The nutritional status of patients also correlated with mortality rates. Malnutrition was present in over 60% of patients according to weight for age criteria. Fifteen percent of patients had second or third degree malnutrition, and this group accounted for 34% of the deaths.

Diagnostic laboratory procedures were performed only on the 20% of patients who remained febrile twelve hours after admission. Hospital policy directed that all children with diarrhea complicated by other illnesses were to be admitted to the general pediatric ward. Nonetheless, 7% of patients admitted to the unit were subsequently found to have giardiasis, amebiasis, malaria, typhoid fever, pneumonia, measles, or meningitis. Despite appropriate antimicrobial therapy, 32% of all deaths occurred in patients with these associated diseases.

Controlled studies involving two hundred uncomplicated diarrhea patients demonstrated that neither ampicillin nor kaomycin administered for the first seventy-two hours of hospitalization reduced the duration or severity of diarrhea. Therefore, neither antimicrobials nor antidiarrheal agents were utilized in over 7,000 patients.

A 30% decrease in the absolute number of severely dehydrated children hospitalized in 1981-1982 was observed, despite the fact that the total number of dehydration admissions increased by 55% in that year (Table 1). Initiation of oral rehydration at home and probably earlier medical attention reduced the frequency of severe dehydration in our patient population. In February, 1981, only 2.3% of five hundred consecutive hospitalized patients had received ORS at home, and 24% were severely dehydrated. One year later, 48% of five hundred hospitalized children had initiated fluid therapy at home; 3% of these patients were severely dehydrated, as opposed to 23% of children not receiving this early therapy.

Additional factors were identified which contributed to the reduction of mortality in the rehydration unit:

1. Prompt initiation of rehydration therapy in the hospital. When the unit was first established, mothers were required to purchase IV fluids in outside pharmacies before therapy was begun. This resulted in a delay of 3.2 hours before patients received fluids. Currently, we initiate therapy within thirty minutes of hospitalization, and the mortality during the first six hours in the hospital has been significantly reduced. Mothers

replace fluids provided by the unit at a later time if they can afford it.

2. Proper utilization and training of medical personnel and patients' families. Our twenty-four bed unit functions well with a staff of 1.6 nurses or aides on duty at all times. Aside from initiating and maintaining intravenous feedings, their major role is to train and supervise mothers in the use of oral rehydration and to record fluid balance data. During a three-month period in 1981, our staff was reduced to a single nurse on the day shift only, due to a lack of funds. The case fatality rate was tenfold higher during this period (6.7% vs. 0.6%). Pediatric residents rotate through the unit monthly as part of their training program. Their role is limited to recognition and treatment of associated diseases. It is of interest that 71% of our deaths occur during the first week of the month when the residents are most inexperienced.

3. Leadership and dedication on the part of the unit director. The introduction of new procedures and techniques requires almost constant reinforcement and education. During a one-month absence of the director, shortly after the unit was established, mortality increased fourfold when staff reverted to previous practices. This unplanned experiment has not been repeated. The staff has now accepted the value of this approach to diarrhea and dehydration.

4. The role of mothers in the hospital and in the home. Mothers were not allowed to remain with their children in the pediatric ward prior to 1980. Since this policy was discontinued, mothers are now part of the therapeutic team, not only contributing to the mortality reduction through ORT and continued breastfeeding, but also reducing the need for costly medical personnel. Once trained in the unit, mothers continue therapy at home and are effective community educators and role models in their neighborhoods. Successful mothers are the most effective promoters of ORT.

We concluded that a dramatic reduction in mortality due to diarrhea and dehydration can be achieved with a program which is based on the prompt use of oral rehydration and education with involvement of the family in patient care. Nurses and physicians are necessary but are most valuable in supervising and training parents and recognizing associated diseases. They have no direct role in the treatment of uncomplicated diarrheal illness and dehydration. Lastly, the establishment of the rehydration unit in the University Hospital of the only medical school in Haiti provided a national center for training medical personnel (aides, nurses, physicians) from all parts of Haiti. The success of this program has led to wide acceptance of ORT by health professionals and to the initiation of a national program to provide oral rehydration

throughout Haiti.

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## **THE CONTROL OF DIARRHEAL DISEASES EXPERIMENT WITH A NATIONAL PROGRAM IN HONDURAS**

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Because of the magnitude of the problem of diarrheal disease in Honduras, the Ministry of Public Health, as the organization responsible for the nation's public health policy, decided to give high priority to the Program for the Control of Diarrheal Diseases. The program's fundamental objective was to reduce the morbidity and mortality resulting from dehydration, the complication of diarrheal diseases that is often fatal for children under five years of age.

A national plan for 1982-85 was drafted, with the following operational strategies:

—the creation of facilities to provide oral rehydration therapy in institutional settings;  
—community participation, organized by community leaders, offering to each family access to oral rehydration therapy, with the support of a national program of education and dissemination of information via the mass media.

This program was to be supported by the production, in a government laboratory, of the necessary ingredients for oral rehydration.

This paper discusses the Honduras experiment in the implementation of a program for the control of diarrheal diseases with the participation both of health care facilities and of volunteers from the community.

### **History of the program**

In Honduras, the Program for the Control of Diarrheal Diseases (PCDD) was organized as a result of the findings of various studies and experiments in the use of oral rehydration therapy. The first study, conducted in 1978 by the Pan American Health Organization (PAHO), demonstrated that ORT could be administered successfully by nurses' aids.<sup>1</sup> A second study, carried out in 1980 with support from the OPS in the Honduran Hospital for Maternal and Child Care, compared the relative effectiveness of a simple solution of sugar and salt with the formula recommended by the World Health Organization.<sup>2</sup> The study found that the complete formula compensated better for potassium deficits in children who were vomiting as well as suffering from diarrhea. These findings resulted in the creation of a facility for providing oral rehydration therapy with permanent staff and adequate equipment and supplies.

Various local experiments on the use of oral solution were also conducted. The most complete of these was performed in the latter part of 1980 by health workers and nurses' aides in Health Region 4 (in the south of the country). Another experiment was carried out by the health workers in the community of Oropoli. Both experiments demonstrated that it was possible for oral therapy to be given by qualified individuals who travelled to perform their work.

During this same period, the Ministry of Health signed an agreement with USAID and Stanford University initiating a project in the use of mass communications for child health (PROCOMSI). This project in Health Region 1 (the east-central part of the country) prepared and evaluated methods for mass media diffusion of information about oral rehydration therapy. The pilot experiment permitted the implementation of the PCDD at the national level.

### **The magnitude of the problem of diarrheal diseases**

In Honduras, diarrheal diseases represent the primary cause of morbidity in infants, and de-

hydration due to diarrhea is the principal factor contributing to the high rate of infant mortality. The incidence of diarrheal disease in children less than five years of age was 145,370 cases in 1981 and 155,515 cases in 1982, with a morbidity rate of 19,813.8 per 100,000 for 1981 and 20,530.7 per 100,000 for 1982. The mortality rate for 1980 was 196.5 per 100,000. Cases of diarrhea occur all year, but there is a marked seasonal variation, with the curve rising in the months from May to August and falling in the coldest months, December and January. This can be related to the fact that the majority of the country's population lives in rural areas (65.6%), and there is significant internal migration of this population to the outskirts of the larger cities — areas which, for the most part, lack basic services, such as drinking water, sewage systems, and some degree of control over the environment.

A low literacy rate (40.5%) also affects the treatment of diarrhea. For the most part, a child suffering from diarrhea will not be offered food, and chronic malnourishment is thus aggravated during prolonged periods of diarrhea.

### **The policy decision**

In the policymaking process, various relevant aspects of the problem were taken into consideration. The structure of morbidity and mortality for the country is characterized by infectious health problems. Ministry of Health policy gives priority to illnesses which are widespread and carry high risk. Chief among these is diarrheal disease and its life-threatening complication, dehydration.

Diarrheal disease primarily affects those members of the population who are under five years old and live in rural areas or on the outskirts of cities. It was recognized that the existence of ORT, a scientifically proven method easily employed in health care facilities and in the home, would provide a solution for these people who do not have easy access to health services. The participation of community volunteers who could be easily trained in the use of ORT would allow rapid expansion in the use of this method of treatment.

With nationwide use of oral rehydration therapy as the goal, the capacity to produce the ingredients for ORT packets was considered a vital factor in the evolution of the program. It was therefore considered advisable to create a single technical body which would coordinate the organization and training of resource persons in a hierarchical structure (from the normative to the operational level). This body would also install rehydration facilities at the different levels of program implementation: hospitals, health centers, and the community.

Taking these considerations into account, the Ministry of Health moved (by means of Resolution 0018-82) to "create a Program for the Control

of Diarrheal Disease which shall be a priority activity for the Health Service." The objective of the program was to reduce the rate of mortality due to diarrhea in children less than five years of age, by means of rehydration therapy using a formula containing electrolytes.

### **The implementation plan**

#### **A. Organization**

The organization of the Program for the Control of Diarrheal Diseases was implemented in the following stages:

—naming of the technical team responsible for the program at the national level, assigned to the Division of Epidemiology and ultimately responsible to the Director General of Health;

—adaptation of adequate human, material, and financial resources at the various levels of health administration;

—formulation and diffusion of norms for treatment for each member of the health staff according to the institutional nature of his/her activity;

—organization of oral rehydration services in the pediatric facilities of hospitals, as well as in the nation's health centers;

—identification and training of voluntary workers in rural areas and the outskirts of urban areas who would contribute to the control of diarrheal disease in each community.

This entire program was completed. A methodology utilizing participation was used in the development of the programmatic and strategic components of the program and carried forward progressively from the central government to the regional, area, and community levels. Oral rehydration services were implemented in all types of institutions and in the community in eight to nine months. The program was established by central government control and follow-up of the different activities necessary to make the program operational at the local level. It should be noted that one of the major problems for the organization of oral rehydration services has been the lack of furniture and clinical equipment. In response to this problem, health teams exercised initiative and creativity in equipping the Oral Rehydration Service with the minimum of supplies and equipment necessary for adequate functioning.

#### **B. Training**

Training of the program's health staff followed these stages:

—The technical team was trained at the central government level on the technical and administrative aspects of the PCDD.

—The eight regional teams were trained at the central government level on the strategic and programmatic components of the control of diarrheal diseases.

—The regional teams became responsible for the area-level training of doctors, nurses, health workers, nutrition assistants, and survey-takers.

—Members of the health staff of each care facility were trained by the area-level teams, who organized the theory-practice content of training sessions to match the operational responsibility of that level.

—The personnel of each health care facility, with help from the area-level teams, trained the voluntary workers in their area of programmatic responsibility.

—The voluntary workers oriented families and community groups on preventive care and control of diarrheal diseases.

Several additional strategies were also necessary. Continuing education was used to keep the health staff at various levels up-to-date. Finally, periodic evaluations determined knowledge and attitudes of the health staff members with regard to the program and its coordination with other health programs.

### **Evaluation component**

PCDD's education component was focused at three levels:

1. Staff dealing directly with clients were held responsible for orientation on diarrheal disease and its treatment. With participation from the operational levels, courses were designed and educational materials prepared. This led to greater understanding of media information by members of the community.

2. With the cooperation of the Ministry of Public Education, a coeducational program for elementary school teachers was initiated. Teachers were given instruction about diarrheal disease and the use of ORT, thereby reinforcing the multiplier effect by educating children as well as their parents and organized community groups.

3. A mass communication project has been in operation since 1980. This project includes basic research, content definition, testing of materials, and formative evaluations.

The project has facilitated the establishment of the PCDD nationwide. Among the successes attested by the formative evaluations are the following:

a. Ninety-seven percent of mothers interviewed had received information on Litrosol: 56% by radio, and 38% from the staff of health care facilities.

b. Sixty-six percent of mothers interviewed knew that Litrosol could be used with any kind of diarrhea.

c. Seventy-five percent of mothers interviewed prepared Litrosol in a liter of water.

d. Sixty percent of the mothers continued to breastfeed during an episode of infant diarrhea.

e. Of all mothers interviewed, 60% recog-



nized the symptoms of dehydration.

The favorable impact of the project indicates that the pilot project begun in one region of the country should be extended across the nation.

### **Logistical support**

In accordance with the policy decision to guarantee access to ORT to the target population (children under five years of age living in rural areas and on the outskirts of cities) and to insure the use of this therapy in the family, special importance was placed on logistical support, with emphasis on the following aspects:

1. improvement of local availability of inputs (oral rehydration therapy packets, sufficient both in number and in the availability of information about them);

2. establishment of a graduated scale of charges: 9% for 1982, 48% for 1983, 70% for 1984, and 100% for 1985;

3. calculation of quantities of ORS which will be needed until 1985;

4. acquisition of additional equipment to increase the national production of packets;

5. import of packets to fulfill the immediate demand;

6. periodic monitoring for quality control of the ORS in the government laboratory.

The system of distribution of oral rehydration salts is handled quarterly in the form of quotas assigned to each region, according to requirements previously established. The oral rehydration salts are considered a basic medicine and thus will be available in the same physical space as other such medical supplies in stores.

Warehouse facilities are inadequate both at the central and at the regional level, as is the availability of transportation. This situation is exacerbated by lack of adequate vehicle maintenance and by roads which are often impassable, especially in winter.

Existing support services include a national network of laboratories, reaching from the central government through the area to the local health centers (CESAMO). There exists a total of sixty-seven laboratories which will participate in the investigation of the etiology of diarrhea. One hundred percent of them have the capacity to perform parasitology, 89.5% bacteriology, 32.8% antibiograms, and 2.9% virology. The information flow related to the program follows channels laid down by the Department of Bio-Statistics and are those used for all such programs.

### **Domestic production of oral rehydration salts**

An electronic machine which functions semi-automatically is used in the domestic production of ORS. Five people are involved in the process: one to open the bags, one to feed the machine, one to fill the packets, one to seal them, and another to load them on trucks.

Production capacity is twenty-five to thirty units per minute, one million units per year with a single shift and two million per year with a double shift. Presealed bags which are opened by hand are used. Initially, unmixed ingredients were used; now, premixed formula is used. The relatively high cost of the latter is compensated for by the following factors:

- raw materials for the bags and for the salts are purchased at the same time, and thus costs are reduced because a discount can be obtained in the cost of the material for the bags;

- premixed salts are more stable and homogeneous;

- some steps in production are eliminated;

- there is a reduction in labor costs in processing the salts;

- there is a reduction in the amount of time necessary for production;

- there is an increase in production from 5,000 units per shift using unmixed salts to 8,000 units using premixed formula;

- there is a reduction in production cost of U.S. \$0.17 per unit.

In the government laboratory, two types of control are employed: production and quality. To maintain production control, temperature is measured every hour; relative humidity is measured every hour; the humidity of the mixture is measured for each batch; and weight of the packets is checked every fifteen minutes. To ensure quality control, glucose content is measured for each batch; electrolyte content is measured for each batch; and microbiological measurements are made for each batch. This latter control is carried out by the national Chemical Pharmaceutical College.

Several problems have been encountered. Initially, suppliers did not comply with shipping standards for raw materials. As a result, raw materials became contaminated, and there was wastage when bags containing the salts broke. These problems were resolved by requiring that suppliers conform with shipping standards. In addition, in the production of one batch of 25,000 packets of salts, hydrated dextrose was used which led to the instability of the product, causing a change of color and making the product lumpy.

The domestic production of ORS has certain advantages. The acquisition of the automatic machine and the use of the premixed formula are expected to reduce costs to a level competitive with prices abroad. The level of demand for salts is such that it can be fulfilled by domestic production without major investment in infrastructure. Domestic production provides a major opportunity for making ORS more widely available, since there will be no need to rely on supplies from abroad. Finally, the growth of the industry will provide jobs in the domestic mar-

ket. Table 1 documents the increasing production of ORS packets and the number imported.

### **System of evaluation, monitoring, and supervision**

In order to achieve the goals of the program, strong linkages between administrative functions and the various levels of health care and community health care systems were required. Adjustment and reorientation of supervisory systems in general, and of those related to the PCDD in particular, were therefore initiated. The aim was to attempt to attain previously defined objectives, to detect variations, and to improve the staff's capacity for analysis and decision-making ability, particularly in the following areas:

1. development of programmatically defined structures and numbers of functions, activities, and tasks;
2. understanding of the progress of the program through behavioral analysis of the various actors in the system, with respect to effectiveness and efficiency in fulfilling their functions;
3. evaluation of results in terms of fulfillment of objectives and adaptation of strategies used.

By means of direct and indirect supervision and periodic meetings, it has been possible to determine training needs and assess administrative support necessary for the accomplishment of activities and tasks. Increase in analytical capacity, detection of problems, decision making and definition of responsibility at different levels, and coordination between the implementation level and that immediately above, as much with respect to process as with respect to product, led ultimately to the design of a series of instruments with the structure presented in Table 2.

The measurement of the progress of the PCDD and success of the personnel involved is organized through periodic meetings between the technical levels which set standards and the implementation levels. Monitoring techniques designed to measure the efficiency of personnel, are used (see Table 3).

Lack of knowledge of real morbidity and mortality due to diarrhea in the country has prevented measurement of the size of the problem and, thus, of the impact of the PCDD activity. Two alternatives are suggested. First, hospital records can be analyzed. Second, with the help of PAHO, a special study of morbidity and mortality has been designed. Using institutional staff, this will be conducted among the target population each year, assuming an adaptation of the existing information system.

### **Summary**

As a result of analyzing Honduras' high incidence of morbidity and mortality from diarrheal

disease, especially among children under five years of age who live in rural areas and on the outskirts of urban areas, the Ministry of Public Health made the important policy decision to:

- implement oral rehydration therapy nationwide;
- establish the domestic production of oral rehydration solution; and
- develop technical and administrative resources for the installation of programs for the control of diarrheal disease at the various levels of health care, involving the active participation of the various voluntary workers in the community (health workers, midwives, and community leaders).

One year after the implementation of the program at the national level, the PROCOSI project shared these results of a pilot study:

- 97% of mothers had received information about Litrosol;
- 76% of mothers prepare Litrosol in a liter of water;
- 66% of mothers know that Litrosol can be used for any kind of diarrhea;
- 60% of mothers continue breastfeeding during a diarrheal episode and know when the child is dehydrated.

These results show that mass communications are effective as information media and that informational messages about the control of diarrheal disease were well understood. We recommend the development of a special study of morbidity and mortality in the target population, to be carried out every year, with the participation of institutional personnel. This would allow the measurement both of the size of the problem and of the impact of the activity developed by the Program for the Control of Diarrheal Diseases.

### **GLOSSARY**

*PCDD*: Program for the Control of Diarrheal Diseases

*PROCOSI*: Mass Communication Project for Infant Health (Proyecto Comunicacion Masiva de Salud Infantil)

*CESAMO*: Health Center with a doctor and support services (Centro de Salud con Medico Servicios de Apoyo)

*HEALTH WORKER*: An elected community representative who receives basic training from the Ministry of Health, which prepares him/her for giving primary care in the community and also to act as a referring agent for the nearest Health Center. Health workers receive no salary. They meet mostly at the Health Center, where they receive continuing education modules and basic medical supplies.

*HEALTH REPRESENTATIVE*: (Representante de Salud) A voluntary worker nominated by the community and trained in the Ministry of Health in basic hygiene and the prevention of disease.

**Table 1****QUANTITY OF ORAL REHYDRATION PACKETS IN HONDURAS BY YEAR AND SOURCE**

(Data from Ministry of Health)

Source	Prior to 1982	1982	1983	1984	1985
National Production	750,000	171,000	3,000,000	4,000,000	5,000,000
Importation	80,000	1,500,000			
Total	830,000	1,671,000	3,000,000	4,000,000	5,000,000

**Table 2****SUPERVISOR FORM FOR THE DIARRHEA CONTROL PROGRAM**

Priority Actions and Activity Indicators	Procedural Norms Accomplish		Problems and Causes	Decisions	Those Resp.	Deadline
	Yes	No				
I. Control of diarrhea 1.1 No. of children with the diagnosis 1.2 No. w/dehydration that were treated 1.3 No. of mothers w/ diarrhea who were educated						

General Observations

**Table 3****MONITORING TECHNIQUES TO MEASURE THE EFFICIENCY OF PERSONNEL IN THE HONDURAS DIARRHEAL DISEASE PROGRAM.**

Available Resources	Population Served 5	Cases of Diarrhea					Productivity		Coverage
		Prog	Obs	% Comp.	Treated	% Comp.	Quantity of ORS used	% Success	Cases treated
									Cases expected

**MIDWIFE:** A member of the community whose role is to deliver infants. Midwives are trained by the Ministry of Health in providing care for women in childbirth and for newborn infants. The midwives meet monthly in the health facility to: receive supplies and drugs for use in childbirth; reports on their work; and receive training modules designed in response to needs identified in the course of their work.

## REFERENCES

1. Isaza, Pablo, Dr. y Col. Aplicacion de la rehidratacion oral en ninos refugiados Nicaraguenses en Campo Luna (Honduras). Folleto-Oficina Panamericana de la Salud. Tegucigalpa, Honduras, 1979.
2. Clements, Mary Lou, M.D., D.T.M.H., M.P.H., y Col. Estudio comparative del uso de una solucion oral de sal y azucar vrs. una solucion oral de glucosa y elecrolitos para el tratamiento de rehidratacion oral en ninos con diarreha. University of Maryland School of Medicina, U.S.A.-Departamento de Pediatria y Laboratorio Clinico, Hospital Escuela, Honduras y Oficina Panamericana de la Salud, Washington, Feb. Mar. 1980.
3. Kendall, Carl. Ethnographic evaluation of Honduras village health worker program: A controlled comparison. A component of the final evaluation Report. Integrated Rural Health A.I.D. Project 522-0130, Sept. 1981.
4. Cerella, Maria Teresa de, Bonnano Z., Maria Rosa. Programa de control de enfermedades diarreicas C.E.D. para 1983. Ministerio de Salud Publica. Tegucigalpa, Honduras, 1983.
5. Parker, Robert. M.D., M.P.H. Terapia oral en la diarreha y la rehidratacion conceptos actuales y consideraciones practicas. Department of International Health, The Johns Hopkins University School of Medicine and Public Health, Baltimore, Maryland, Jul. 1980.
6. Ministerio de Salud Publica, OPS-OMS. Informe final de la evaluacion del programa de control de enfermedades diarreicas (C.E.D.). M.S.P.-OMS, 1982.
7. McLean, Michael, Col. Etiologia de la diarreha infantil y terapia de rehidratacion oral en el noreste de Brazil. Boletin OPS 92 (5): 405-17, Mayo 1982.
8. Riveron Corteguera, Raul; Gutierrez Muniz, Jose. Enfermedades diarreicas agudas en America Latina 1970-1979. La situation en Cuba. Boletin OPS 92 (6):508-19, Jun. 1982.
9. Mobarak, A.B. y Col. Diarrheal Disease Control Study Final Report Phase I to USAID. S.R.H.D. Project, Rural Health Department, Ministry of Health, Arab Republic of Egypt, 1981.
10. Gangarosa, Eugene J. Perspectivas del problema global de las enfermedades entericas, 1975. Boletin OPS V. LXXX (5):397-402, May 1976.
11. Evans, Meza Ronald, M.D. Algunos aspectos epidemiologicos de las diarrehas en Costa Rica. Boletin OPS V. LXXXVI (5):406-19, May 1974.
12. Pizarro, T. Daniel; Posadas, S. Gloria. La enfermedad diarreica aguda tratamiento de la deshidratacion. Hospital Nacional de Ninos, Caja Costarricense de Seguro Social, C.R., 1982.
13. Informe de actividades ano 1982. M.S.P. PRO-COMSI, Tegucigalpa, Honduras, 1983.

## DIARRHEAL DISEASES CONTROL PROGRAM (ORAL REHYDRATION ACTIVITIES) IN INDONESIA

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Indonesia, the world's largest archipelago, extends between two continents, Asia and Australia. Indonesia's total population is approximately 156 million; its birth rate is 35 per 1,000; and its crude death rate is 14 per 1,000. The infant mortality rate in the country is about 90 per 1,000, and the under-five mortality rate is 40 per 1,000.

### The magnitude of the problems of diarrheal diseases in Indonesia

The major causes of death in Indonesia are diarrheal disease and lower respiratory tract infections. Approximately 20%, that is, 400,000 to 500,000 deaths, can be attributed to diarrheal disease. Among infants and children under five, diarrheal disease accounts for 25% and 40% of all deaths, respectively. Diarrheal disease is endemic to almost half of the areas in Indonesia, particularly those where awareness of environmental health is virtually nonexistent. In endemic areas, children under five are most frequently attacked, while in epidemic areas diarrheal disease can occur at any age group. More than half of all diarrheal disease is caused by rotavirus and enterotoxigenic *E. coli*. Salmonella, vibrio, and shigella are the next most frequent causes.

A number of environmental and socio-economic factors contribute to these high rates of diarrheal disease. Studies in rural areas, conducted in 1976 by the Ministry of Health, found that only 12% of the population had access to a proper drinking water supply, and 20% of the population used latrines for fecal disposal. The very low educational level and the sociocultural beliefs of most Indonesians create these low levels of personal hygiene. Most Indonesians consider diarrhea a common mild disease, not one that is life-threatening. In many instances, their treatment of this illness exacerbates, rather than cures, the disease.

Malnutrition is another important contributory factor that may induce or increase the severity of diarrheal diseases in infants and children. Repeated bouts of acute diarrhea can lead to protein-calorie malnutrition (PCM), and studies in Indonesia revealed that about 30% of children under five suffer from PCM. The prevalence of vitamin A deficiency was found to be from 1.5% to 13%. In addition, the practice of breastfeeding among mothers has declined in recent years. Although the prevalence of bottle feeding in Indonesia is still lower than that in developed countries, the increasing use of bottle feeding is a dangerous trend for infants and young children.

#### **Health development based on National Health System**

The control of diarrheal diseases is an integral part of the agenda of the National Health System. Based on the principles of Pancasila and the 1945 constitution, the National Health System consists of three major components, the Basis of National Health Development Policies, the Long-Term Health Development Plan 1980-2000, and the Basic Structure of the National Health System.

The objective of health development is the achievement of the ability of every person to live healthily in order to be able to obtain optimal public health status. The notion of health includes physical, mental, and social well-being, not merely the absence of disease or infirmity. Meanwhile, the essence of national development is the development of the Indonesian man as a whole and the development of the whole Indonesian community, directed toward achieving an advanced, just, and prosperous society based on the basic five principles of Pancasila. Therefore, health development is undertaken as an integral part of national development.

Based upon the problems and policies in health development, the following priorities for health efforts have been defined:

1. strengthening of health efforts;
2. health manpower development;
3. food and drug control;
4. nutritional improvement and promotion of

environmental health;

5. strengthening of health services management and legislation.

In Indonesia, health services in rural areas are mainly delivered through health centers and subcenters. In order to increase the coverage of the services to the people, village community health development (VCHD) activities are being promoted in the village. At the national level, there has been further strengthening of the health infrastructure for health care delivery by frontline primary health care workers. Interest has also been evidenced in urban primary health care aimed at the provision of health services to the slum dwellers and other underserved and unserved population groups in the cities. Throughout the country, health personnel from various categories and administrative levels are being given training and education to enhance their knowledge, skills, and capabilities. Efforts are also being made to compile and process information on the social and cultural aspects of local communities. This information is then disseminated to the relevant parties.

#### **National Diarrhoeal Diseases Control Program**

The Diarrhoeal Diseases Control (CDD) Program is part of the National Health System. Administratively, the program is run by the Subdirectorate of Cholera and Diarrhoeal Diseases Control Program, Directorate General of CDC, Ministry of Health. It has close collaboration with other programs, such as hygiene and sanitation, health education, nutrition, etc.

The activities of the CDD program are case management, epidemiological surveillance and epidemic control, health education, promotion of proper feeding practices, and environmental health. At the early stage of the program, the emphasis of the activities was on case management and the epidemic control of diarrheal diseases. Starting in 1974, the program was expanded to cope with all endemic diarrheal diseases which occurred mostly in children under five. Today, the annual budget allocated for diarrheal diseases in the Directorate General of CDD is more than one million U.S. dollars.

Since most of the diarrheal cases (about 90%) involve dehydration, an emphasis of one CDD program is the distribution of Oralit. Oralit, the Indonesian generic name for oral rehydration solution, is composed of 2.3 g sodium chloride, 1.2 g potassium chloride, 2.5 g sodium bicarbonate, and 25.0 g glucose. Its composition is similar to the WHO standard composition. Oralit has been used since 1970. At first it was used mainly for the treatment of cholera, but since 1974 it has been used more intensively for all kinds of diarrheal cases. At least eight other oral rehydration salt brand names are available on the market, including Pharolit, Oratrolit, Eltolit, etc.

For government purposes, ORS production and supply are centralized. Private pharmaceutical companies have also centralized their production and supply systems. In 1982, there were two government production units and twelve pharmaceutical companies. Government products are distributed to hospitals, health centers, primary health care units, etc., while private pharmaceutical products are marketed through private channels to dispensaries, drug stores, shops, or stalls. The private companies usually supply the government units on request. In 1978, it was estimated that the government had purchased about 1.8 million liters of ORS each year. The amount of ORS marketed by private pharmaceutical companies was unknown.

ORS is available in prepacked form. At present, there are two kinds of packets, the mixed packet and the separated packet. Ingredients of pharmaceutical grade are still imported.

Two sizes of packets are introduced, those for one glass or 200 ml, and those for 1,000 ml of solution. The 1,000 ml packet is for hospital use, and the 200 ml packet is for individual or household use. There is a tendency for pediatricians to use a milder ORS with a lower sodium and potassium content, particularly if used for newborn babies and infants.

Because ORS is considered an essential drug (it is included in the primary health care list of simple drugs), all health facilities (hospitals, health centers and subcenters) are provided with Oralit. Health centers with physicians are also equipped to facilitate intravenous fluid therapy for severely dehydrated cases. These health centers, called rehydration centers, are set up in strategic locations and run by special teams. In some villages, Oralit is also distributed by village field health workers, primary health workers, village welfare educational units, family planning field workers, etc.

To execute the program, training courses carried out since 1974 are aimed at standardizing the method of dehydration prevention and rehydration and at improving and changing the attitudes of workers in managing diarrheal diseases. Priority for these courses is given to physicians and nurses working in rural health centers. New knowledge about rehydration is also being integrated in medical and nursing schools. Between 1975 and 1978, at least 421 physicians and 287 nurses were trained in ORT, and they in turn trained paramedical personnel. By 1979, 515 physicians and 215 paramedics had received training. Oral rehydration practices are also taught to the community leaders in some villages as a part of family welfare education.

To control the epidemic of diarrheal diseases, an epidemiological surveillance system was set up in 1969. Twenty-four out of twenty-seven provinces were equipped with a standard labora-

tory which could isolate enteropathogenic bacteria, particularly *V. cholerae*. Since 1969, epidemic surveillance has been conducted weekly, and monthly reports have been written. In each region, there is at least one mobile team to control any epidemic that might occur. Some health centers with physicians can also act as mobile epidemic containment teams when necessary.

In 1974, a nationwide program for the improvement of environmental health was launched to reduce morbidity from diarrheal disease. Latrines and shallow well pumps are provided to people of low socioeconomic status living in rural areas; with the support of the health education program, people are encouraged to increase, on their own, the number of latrines and pumps in their community.

Although the Diarrhoeal Diseases Control Program was expanded in 1974, many problems still need to be solved. These problems can be categorized into two areas, technical problems and management problems.

The technical problems lie mainly with the Oralit. In Indonesia, Oralit is very expensive and its shelf life is very limited. The length of time it will last depends on the quality of the ingredients, the humidity, and the type of packaging used.

Some observations revealed that Oralit is still not fully accepted by health workers and people. Surveys carried out in different places have found that only 30% to 50% of mothers have ever heard of ORS and that only 15% of mothers use ORS when their children have diarrhea. Children with diarrhea, on the average, drink four to six packets of 200 ml ORS. About 14% of the children and infants refused to drink ORS. In addition, all health centers were provided with ORS, but only 80% used ORS routinely for the treatment of diarrheal cases, and the remainder used ORS occasionally or selectively. Some reports revealed that some health centers were reluctant to use ORS. Refusal to drink Oralit might be related to its taste. Many commercial brand names of Oralit might also confuse people. Other important problems are the availability of Oralit, the spoilage of the product, and the overuse of intravenous fluid. Finally, utilization of the health centers is still very limited. Consequently, their coverage of diarrheal cases is also limited.

#### **Activities of oral rehydration therapy**

The Diarrhoeal Diseases Control Program has launched a short-term program of oral rehydration therapy aimed at the prevention of dehydration due to diarrhea and the reduction of mortality and other ill-effects of acute diarrheal diseases, particularly deterioration of the nutritional status of children under the age of five. Given limited resources, this CDD program will probably achieve the greatest reduction in mor-

idity and mortality if its efforts are concentrated on children under five.

Since the administration of ORS by mouth can vastly decrease the process of dehydration, oral rehydration should be given as soon as a child has diarrhea. Ideally, the treatment of acute diarrhea with ORT should be initiated at the household level. Given the proper instruction, ORS can be safely prepared and administered by mothers. If oral rehydration is handled at home, dehydration could be prevented earlier, thereby reducing the burden at health facilities.

Health education is given to mothers to teach them how to handle diarrhea cases properly. A simple method is demonstrated to prepare Oralit replacement using ingredients which are available in the household, and mothers are encouraged to breastfeed their baby as long as possible. Through mass media (radio, TV, newspaper), the government encourages mothers to keep several packets of Oralit for household purposes. In addition, a community approach using social groups (Family Planning Group, Radio Listeners Group, Farmer Group, etc.) is utilized to motivate the people to use ORS for all forms of diarrhea.

#### **Monitoring and evaluation of the program**

The Diarrhoeal Diseases Control Program is monitored through a routine information system, an integrated system of recording and reporting. The recording system covers all activities of the CDD program and the output of program implementation. The reporting system gives information about the number of cases of cholera and diarrheal diseases (breakdown by age groups) and the number of intravenous fluid (Ringer lactate) and ORS packets which have been used. This routine information system also provides some data needed for epidemiological surveillance activities, to provide information about the incidence of diarrheal diseases, to identify population groups with high risks of illness, and to give an early indication of the occurrence of epidemics.

Diarrheal disease is the most frequent cause of epidemics in Indonesia. From 1969 to 1982, the annual number of cases of epidemic diarrhea ranged from 20,000 to 50,000. The case fatality rate in 1969 was 38% and in 1982 was 3%. A survey of rural hospitals and health centers taken at the end of 1978 revealed that the case fatality rate ranged from 0% to 3%. The number of infected areas increased from year to year, and about 20% to 30% of epidemic diarrhea cases were due to *V. cholerae* infection.

Most of the diarrheal epidemics had received prompt field investigations to determine the most likely mode of transmission and to initiate appropriate treatment and control measures. In order to have better information on specific causes of diarrhea in the community and to help

ensure that more appropriate actions were taken, diagnostic laboratories were developed in most provinces that had a high incidence of reported diarrheal cases.

Besides the routine surveillance activities, thirty sentinel areas in ten provinces were developed to get better information on the implementation of the Diarrhoeal Diseases Control Program. In these areas, two kinds of data were collected. First, the number of diarrheal cases (according to a certain age grouping) covered by health facilities and village health workers was calculated. This activity, if done routinely, also gives information about the usage of ORS packets and other equipments which are needed by each type of health facility and by each village health worker. Second, information was collected on the knowledge, attitude, and practice of mothers and other family members concerning diarrheal diseases. This was obtained by household surveys at the end of one year of the program. Some of the information collected from those sentinel areas included the following:

- 7.7% of the outpatient attendants suffered from diarrhea and 1% suffered from cholera. Among children under five years of age, 28.3% suffered from diarrhea.

- 63% of the diarrhea cases attended the health facilities, and 37% were covered by health workers.

- 13.7% of village health workers come from the nutrition cadres, 12.5% from primary health care cadres, 21% from village government officials, and 30.7% from others.

- 6% of the clinic attendants needed intravenous fluid therapy, and each case needs seven bottles of Ringer lactate.

- 48.5% of the mothers knew about ORS, but only 42.7% of the mothers knew about the benefit of ORS.

- 14.5% of the mothers actually used the ORS for treatment of their children.

- 69.3% of the mothers continued to breastfeed even though their children suffered from diarrhea.

Evaluation of the CDD program is carried out by measuring program output and target activities. The results of evaluation are discussed by all levels of health personnel and implementing units, to analyze the program constraints and to plan solutions for existing problems.

Beginning in October, 1982, the CDD program, assisted by WHO, conducted morbidity and mortality surveys in fourteen provinces covering 60,501 children under five years of age (including 12,679 infants) from 62,201 households. These surveys revealed that, on an average, each child suffers episodes of diarrhea each year (infants suffer 2.85 episodes per year). The age and case-specific mortality rate due to diarrhea for children under five and infants are 5.2 per thousand

**Table 1****ACUTE DIARRHEA CASES (GASTROENTERITIS) IN 194 HOSPITALS IN INDONESIA, 1971-1981**

Year	<i>Acute Diarrhea</i>		Total Cases	<i>Acute Diarrhea</i>		
	Cases	Deaths		Total Cases (%)	CFR (%)	No. of Hospitals
1971	16,147	1,582	121,618	13.3	9.8	84
1972	16,988	1,408	152,667	11.1	8.3	84
1973	24,195	1,301	153,340	15.8	5.4	102
1974	34,564	1,847	296,326	11.7	5.3	172
1975	25,901	1,229	302,188	8.6	4.7	171
1976	33,022	1,561	294,449	11.2	4.7	171
1977	47,551	1,168	404,716	11.8	2.5	194
1978	24,289	840	356,258	6.8	3.5	194
1979	80,610	2,370	784,440	10.3	2.9	194
1980	53,443	1,680	545,308	9.8	3.1	194
1981	69,415	1,698	107,608	6.4	2.4	186

Source: Directorate General of CDC, MOH Indonesia.

children and 13.0 per thousand infants. These death rates give proportional mortality rates due to diarrhea for children under five and infants which are 28.4% and 24.2%, respectively. Most of the mothers (62.3%) bring their children to the health facilities for treatment of diarrhea. Of the mothers, 64.4% like to give pills (enterovioform, sulfa, charcoal), and only 22.0% give ORS (including salt/sugar solution).

**REFERENCES**

1. Brotowasisto. Diare, Penanggulangan dan hasil-hasilnya. Seminar Rehidrasi II di Jakarta 14-18 November 1976.

2. Budiarmo, L. R. Household Survey (preliminary report). 1980.

3. Centre of Statistical Bureau. Statistical Profile of Children and Mothers in Indonesia 1980-1981.

4. Santoso, N. I., Winardi, B., and Soediono. National Health System Development in support of HFA/2000 with special emphasis on Health Manpower Development in Indonesia. Health Manpower Development in Southeast Asia SEAMIC, 1982.

5. Sunoto, Adnan S. W., Saroso, J. S. Diare pada Anak Bayi dan Anak Lokakarya Pemselitian dan Pengembangan Kesehatan. Jakarta: April 1978.

6. WHO Documents. Notes for training courses on prevention and treatment of acute diarrhoeal dis-

**Table 2:****MORBIDITY RATE BY AGE GROUP IN NORTH JAKARTA (November, 1980-1981)**

Age Group	Population	Cases (over 6 mos)	Projected Cases (1 year)	Attack Rate
0-6 mos.	87	18	36	41.4
6-12	82	50	100	122.0
12-18	78	43	86	110.3
18-24	84	16	32	38.1
2-4 yrs.	401	35	106	26.4
5-14	1,452	58	116	8.6
15-24	1,152	50	100	8.7
25-34	783	37	74	9.5
35-44	602	27	54	9.0
45-54	259	19	38	14.7
55-64	94	8	16	17.0
65	41	3	6	14.6
TOTAL	5,115	382	764	14.9

Sutoto et al, 1981.



Table 3

**TREATMENT OF DIARRHEA DISEASES  
(HOUSEHOLD SURVEY)  
INDONESIA, 1983\***

\*numbers have been rounded off to the nearest percent.

Province	Regency	Types of Health Facilities (%)				Type of Drug (%)			
		Permanent health facilities	Drug Stores	Traditional healers	Self medication	Pill (entero vioform, sulfa, etc.	Salt + sugar solution	ORS	Herbs + traditional drugs
1. Sumatera Barat	Agam	56	8	11	25	47	6	16	31
2. Sumatera Selatan	Oki	60	11	12	16	47	4	26	23
3. Kalimantan Barat	Sambas	48	20	16	17	70	4	2	24
4. Kalimantan Selatan	Tanah Laut	44	33	10	13	77	10	5	17
5. Jawa Tengah	Purworejo	38	30	1	31	61	4	15	19
6. Jawa Timur	Jember	59	16	4	21	53	3	27	16
7. NTB	Selong	77	8	6	9	50	13	29	8
8. Jogjakarta	Bantul	89	1	4	6	54	8	24	14
9. Bali	Tabanan	80	8	0	12	70	1	25	3
10. Sulawesi Selatan	Pinrang	58	6	13	23	69	3	9	19
11. Jawa Barat	Karawang	74	22	1	3	87	2	7	4
12. Sulawesi Utara	Minahasa	72	13	1	13	47	9	36	8
13. Sumatera Utara	Delis	54	29	5	12	66	5	18	11
Average (Indonesia)		62.0	16.0	6.7	15.0	64.4	4.9	17.1	13.6

eases, including cholera. 1975.

7. WHO Intercountry Meeting on CDD Programme. Diarrhoeal Diseases Control Programme in Indonesia. WHO SEARO: 1970, 1980, 1982.

8. WHO Scientific Working Group Report 1978. 1980 Programme for CDD. CDD: 80.1.

9. Winardi, B. Sasaran Usaha Program Pemberantasan Penyakit Diarer 1979-2000. Direktorat Jendral: P 3 M.

10. Winardi, Sunoto, Soedarto. Rencana Jangka Panjang Pengembangan proram Pemberantasan Penyakit Diare (P R D) sampai dengan tahun 2000. Medan: 1981.

## EXPERIENCE OF THE ORAL REHYDRATION PROGRAMS TUNISIA\*

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In Tunisia, a heightened awareness of the need for a new approach to combat infant diarrheal diseases developed in the 1970s and resulted in the utilization of oral rehydration. Both early oral rehydration and preventive oral rehydration were applied successfully in several health structures. Thus, when the World Health Organization of-

ferred to assist with developing a national diarrheal disease control program, this idea was received enthusiastically. Such enthusiasm proved warranted; the results of the first evaluation of the program, discussed later in this paper, have been extremely encouraging.

### General information on Tunisia (1980)

Country situated in North Africa

Area: 164,0000 sq. km.

Population: 6,483,700

Growth rate: 2.7%

Infant mortality: 70-75

GNP/pop: U.S. \$1,000

### Plan of operations (1980-1984) of the National Program

*Objective.* To reduce, by means of multiple strategies, the infant and child morbidity and mortality caused by diarrhea.

*Planning.* To implement the program, the country was divided into three zones. Although the choice of the first zone may seem geographically strange, it was based on regions where seminars on diarrheal diseases had taken place the year before the program began. These regions were chosen for their high population density: 45% of the population lives in these areas.

In each zone the program has proceeded in two phases:

• —Phase I: sensitization (limited to certain centers only). In this phase, personnel who can transmit information to others participate in a regional seminar. These personnel include various

categories of doctors, midwives (*sage-femmes*), heads of the maternal and child health (MCH) centers, hygiene supervisors, representatives of the mobile teams, as well as administrators of regional hospitals.

—Phase II: broadening and intensification of the work. This phase involves the training of personnel not reached in Phase I. The training takes place at the staff member's place of work and is conducted by a person familiar with the Phase I seminar and a supervisor.

### The principal strategies

The first strategy or goal is standardization in dealing with diarrheal diseases. Standardization is necessary to guarantee that health workers immediately begin treatment, thereby gaining precious time for ill children, and to enable doctors to use a uniform procedure, thereby supporting the therapeutic plan already initiated. Standardization is obtained by calculating a score in order to determine the child's stage of dehydration. To do this, an annotation of 0 to 2 is given each sign of dehydration. These signs of dehydration are described in simple terms so as to be understood by all health workers. For example, regarding the examination of the skin fold: two points are assigned if the fold remains; one point if it is doughlike; and 0 points if the skin returns quickly to its initial position.<sup>4</sup> The same procedure is followed during the examination of the other parts, namely, the tongue, eyes, fontanelle, extremities, neurological state, and respiration. Once all the signs of dehydration are assigned points, the sum of these points is the child's dehydration score (see Table 1).

This method of scoring has the advantage of codifying an examination customarily done informally by the doctor. The multiplicity of elements to be calculated lower the risk of misdiagnosing the stage of dehydration. Five points are also added to the total score if the child is lethargic or extremely agitated, with strident cries, thereby increasing the child's score to assure that it is in the range where the child should be seen by a doctor. Once the score is calculated, the child can be grouped into one of the stages of dehydration (see Table 2). The score determines the procedure to follow.

*Stage I.* Infants with simple diarrhea are considered to be potentially dehydrated and are rehydrated as a preventive measure. Mothers are instructed to give ORS liberally to their children over a two-day period and to give them three "trabelsi" glassfuls of ORS after each stool (a trabelsi glass is a type of glass used throughout the country having a volume of 30 cc). This volume corresponds to approximately 100 ml. As Figure 1 indicates, the majority of children with diarrheal disease are in this category.

*Stage II.* Oral rehydration is undertaken at the center. The child receives three tablespoons of

the ORS every fifteen minutes for three hours. At the end of this time, the child's score is re-evaluated. If the child has improved and is now in Stage I, the Stage I protocol is applied at home. If the child's condition remains the same or worsens, he/she is sent to the nearest hospital. Oral rehydration is continued during the trip to the hospital, since this trip can take a long time due to problems of transportation or heat.

*Stage III.* In the past, all very sick children were sent directly to the hospital. Today, in all cases, oral rehydration is begun at the center. The method of administering the solution is the same as for Stage II cases, except in special situations where the nasogastric probe is of great help. These special situations are:

—continual vomiting, that is, more than four times per hour;

—state of collapse or precollapse, and when the child is not fully conscious. These are also the two sole circumstances where the child should be directly rushed to the hospital.

Oral rehydration is the recommended treatment for acute diarrhea. Antiperistaltics and other antidiarrheal medicines should not be prescribed in any initial therapy. Antibiotic therapy is recommended only in the treatment of an associated pathological condition. Unfortunately, this instruction is often not followed, and antibiotics are given for intestinal disorders. This can be injurious: the abuse of antibiotics and other medication can cause particularly serious candidiasis in very malnourished children.<sup>3</sup> In practice, it is difficult for a doctor not to prescribe something. A packet of ORS can be presented as if it were a medicine. Moreover, vitamin therapy can be prescribed which, while useful in itself, also plays a psychological role.

The second important strategy of the program is the continuation of normal feeding. This strategy is difficult to impose in that it goes against a longstanding principle held by doctors and circulated broadly.

Finally, two other strategies of the program are health education and improvement of sanitation. Health education is implemented by means of radio, television, and the press and, depending upon the region, through meetings with the local political and religious leaders, women's associations, teachers, etc. The themes of these meetings are mainly preventive rehydration, promotion of breastfeeding, and respect of the rules of hygiene.

Efforts at improving sanitation involve extending and maintaining drinking water facilities. Much work has been put into this area with appreciable results.

### Implementation of the program

*For the training:* Visual aids are used which show the basic elements of rehydration and diarrhea prevention.

*For the operation of the program:* The ORS packets are always available and easily accessible. Technical cards are produced on which the standardized treatment is clearly written. Rubber stamps or seals are procured with which to record the dehydration scores on the medical charts. Posters are printed with the score and procedure to follow. These posters must be printed so that they can be read close up or far away and are convenient to use.

### Evaluation results

There has been a decrease in the number of complaints of diarrhea in relation to the number of people receiving consultations. This decrease has been confirmed by the statistics from twenty MCH centers in Tunis (see Table 3).<sup>12</sup> This decrease was also found to be the case in Mejez El Bab, where this percentage went from 30% to 22% during the intensification phase.

There has been a decrease in the number of hospitalizations for acute dehydration. This was quantified in Mejez El Bab over four years during the critical four-month period of each year.<sup>5</sup> Results are shown in Figure 2. A spectacular decline occurred from 1981 to 1982 after the introduction of oral rehydration to the region.

The mortality rate from dehydration has declined. Mortality rates were calculated for two consecutive years in two pediatric departments with similar criteria for hospitalization. The results, represented in Figure 3, show a clear decline in mortality.

A hospital study comparing oral and intravenous rehydration for children was carried out in Tunis. Ninety percent of these children were moderately or severely dehydrated. Their nutritional status was precarious, with two-thirds of them falling into Gomez groups II and III (equally distributed into these two groups). The study found that the mortality rate was lower in the group treated by oral rehydration (14%) than in the one treated by intravenous therapy (25.8%). A substantial weight gain was also noted. This gain is attributed to the fact that a normal diet (including milk) was begun when the child was admitted. The results of this study should influence those reticent about using oral rehydration for the severely dehydrated. Hopefully, the success rate reported for ORT will lead others to try this form of treatment.<sup>2</sup>

### Use of the oral rehydration packets

The instruction given from the start of the program has been to distribute the ORS packets *largamano*. This has led to the fact that the bookkeeping was neither generalized nor regular.

Table 4, indicating the results of an evaluation conducted in a Tunis health center, shows that the use — or at least the prescription of ORS packets — has increased over time.

### Overall qualitative evaluation of the program

A qualitative evaluation of the program was carried out in all the regions of Zone 1. This evaluation followed the protocol put forth in the WHO document, "Manual for the Planning and Evaluation of National Diarrheal Diseases Control Programs," drawing particularly on Chapter 4 ("Doing a Complete Examination of the Program"). Although this WHO document was very useful, its exhaustive nature led us to draft another, more simplified document which would be more practical to use in future evaluations.

The evaluation showed that our projected targets for training personnel were met and, in one case, exceeded. We had expected to train only 50% of the personnel in Zone 2, but were able to reach 100% of this group. When supervisors visited health centers, they verified that the staffs had developed good skills from the training seminars.

The distribution of packets of oral rehydration solution was found to have been handled satisfactorily. In some zones, in fact, packets were distributed before the expected arrival of the program, due to the fact that staff training had already been conducted in that region.

A survey conducted during the summer of 1980 with 173 mothers who had given ORS to their children revealed that 75% of the children accepted the solution with no problem. Among the remaining 25%, slightly over three-fourths of them refused the solution because of the taste. The latter group included mostly "older" infants and children who were not, or were no longer, dehydrated. Thus, we wonder if, for preventive rehydration, it might be better to use solutions without bicarbonate, since bicarbonate has an unpleasant taste.

There were also achievements in the area of hygiene. One example is the growing number of consumers of potable water. The following figures show an increase of 34% in the number of drinking water installations set up over three years: 1979—384,009; 1980—422,868; 1981—467,272; 1982—514,590.

### Discussion

On the whole, the national program is moving forward satisfactorily. Nevertheless, several less successful aspects should be noted. First, the noncollaboration of private doctors and city pharmacists, with certain exceptions, is a real obstacle. The reasons for their behavior include the following:

— It is quicker to write a traditional prescription than to explain preventive rehydration. While recent therapeutic practice limits the number of drugs prescribed, many private doctors see this limited use of medicine as a handicap. It is nothing of the kind if a dialogue, even

**Table 1**  
**CALCULATION OF THE DEHYDRATION SCORE**

	2	1	0	Score
A TONGUE	Dry	Somewhat Dry	Moist	A =
B EYE BALLS	Very Sunken	Slightly	Normal	B =
C FONTANELLES	Very Depressed	Somewhat Depressed	Flat	C =
D EXTREMITIES	Blue	Cool/Damp	Warm	D =
E NEUROLOGICAL	Apathetic	Sad	Normal Tonus	E =
F RESPIRATION	Ample	Rapid (40)	Calm	F =
G SKIN FOLD	Present	Dough-like	Absent	G =
TOTAL				

N.B.: Add 5 points to the total if the child is agitated with strident cries, or if inert and dejected.

**Table 2**  
**CLASSIFICATION OF THE SCORE**

Score	Dehydration	
	Stage	Degree
0-3	I	Mild
4-8	II	Moderate
9-19	III	Severe

a short one, is begun with the mother. Such a dialogue can clarify the situation and, moreover, can offer an opportunity for health education. When their children are dehydrated, mothers often believe that the best course of action is to send their children to the hospital. They need to understand that hospitalization is not always required and need to know how to treat their children at home.

—Doctors' lack of knowledge about oral rehydration therapy may also explain their reluctance to utilize this treatment. In this regard, the reticence of many private doctors to participate in ongoing training sessions and technical meetings must be denounced. For those doctors who need information about oral rehydration therapy, we recommend that pharmaceutical representa-

tives provide this information with the ORS packets. In the future, this need should be less acute, since oral rehydration is now being taught in medical school.

Because of the common practice in Tunisia to go to the corner pharmacy before consulting a doctor, the pharmacist plays an important role in ORT. Despite the information campaign, however, few pharmacies sell ORS. Pharmacists rarely recommend ORS because they make little profit from the sale of this inexpensive product. Thus, a moderate position for pharmacists would be to recommend the ORS packets alongside of "antidiarrheal" medicines.

A second less successful aspect of the program is the reticence of some hospital departments to use oral rehydration therapy. The two reasons most cited for this reluctance are fear — not convinced that ORT might be effective, they do not even try it — and practical difficulties. Indeed, it is easier to set up an I.V. line than to have someone drink a solution at various intervals. Nevertheless, most pediatric departments — other than those in Tunis, the capital — are set up so that mothers can stay with their children. These mothers can assume responsibility for the ORT. Moreover, in the one pediatric department in Tunis where mothers can stay and where intravenous feeding is limited to several hours and

**Table 3**  
**POSITION OF DIARRHEA IN THE MCH CONSULTATIONS IN TUNIS**

	78	79	80	81	82
Total number of people receiving consultations	151633	141950	160079	168305	157950
Number of consultations for diarrhea	28920	29772	30261	29540	21826
Percentage	19%	21%	19%	17.5%	14%

**Table 4****DISTRIBUTION OF OR PACKETS AT THE MCH CENTER IN ZOUHOUR**

	80	81	82
Cases of Diarrhea	4680	4590	4042
No. of Packets	5355	8727	11507
Packets/Cases	1.14	1.90	2.84

followed up by ORT, mortality associated with diarrhea has been relatively very low: 74% (Maaroufi).<sup>6</sup>

A third problem has been that data has not been evaluated uniformly in all regions, making statistical comparisons difficult. Improvement in the collection and analysis of data is obviously necessary. Efforts in this area are presently underway: an increased number of doctors and several statisticians are located in outlying areas as a part of a decentralization program. In addition, a national survey on infant mortality has been established in order to institute a solid routine system of epidemiological surveillance. Finally, individual research, which has already provided much worthwhile information, should continue, and operational research should be encouraged at the regional and/or national level. The results of this research will help to better prepare for the post-program, that is, the stage where the modern approach to diarrheal disease has become second nature and where the ORS packets are

routinely provided to the health departments.

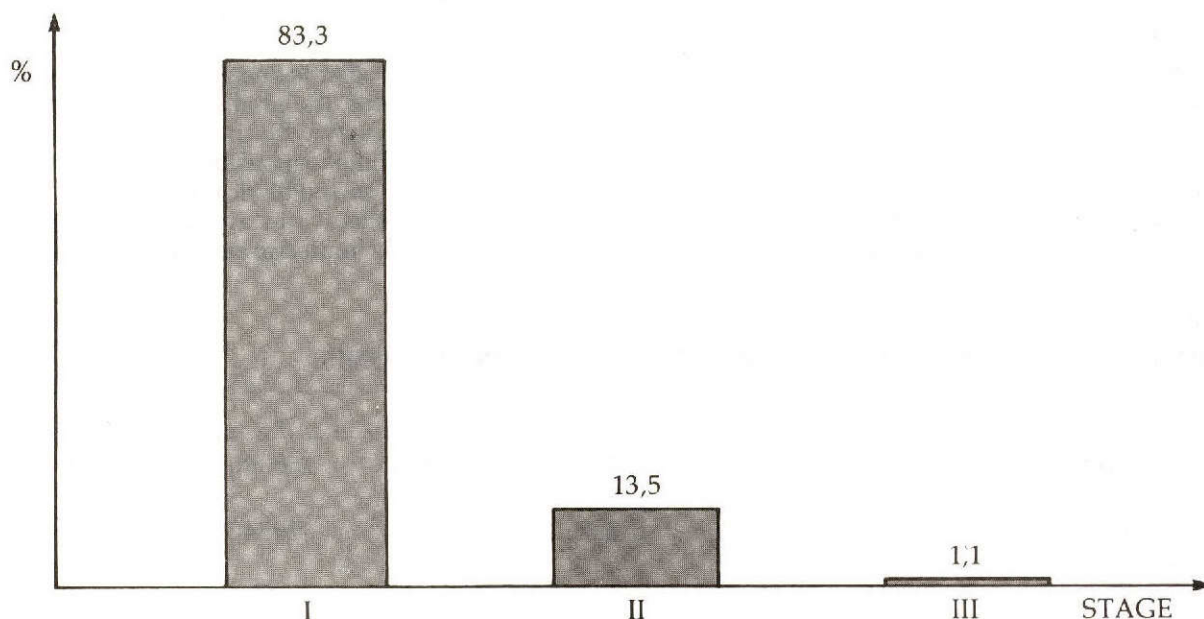
In working toward this goal, several issues need to be considered:

—Should the ORS packets continue to be imported, or would it be more profitable to manufacture them here? To answer this question, it is necessary to determine national needs and to transform the machinery that already exists at the central pharmacy of Tunisia. Currently, this pharmacy produces packets for 500 cc. A change is needed to enable it to produce packets for one liter, so as to perpetuate a uniform message: one packet per liter. Production of the one-liter solution should be strongly encouraged. If production must exceed the needs of the country in order to be profitable, the excess may be shared with neighboring countries in the true spirit of cooperation.

—If the ORS packets must be imported, will it then be necessary to limit their use to curative rehydration and have preventive rehydration carried out with the sugar/salt solution? Doing so would cost us one advantage: currently, the ORS packets are presented to the population as a medicine, which can cut down on the number of drugs that are prescribed.

—If it is necessary to invest money in order to produce the ORS packets here, then what would be the most judicious formula, taking into account not only scientific progress, but also the availability of capital and the nutritional status of our children? One possible formula would be glucose or sucrose, or, better yet, glucose-poly-

**Figure 1:** Distribution of cases of diarrhea according to their style of dehydration. (Based on 5000 cases of diarrhea scored by regional teams i- Nabeul, Mejee El Bab, Sfax, Siliana, Monastic, Sonassi.)



mer, if what is wanted is the maximum number of calories while maintaining a correct osmolarity (six times greater than glucose, 3.5 times greater than sucrose).<sup>13</sup> Another formula would be sodium bicarbonate or sodium acetate, with the latter being better in terms of shelf life and taste.<sup>9</sup>

Finally, it might be judicious to prepare two types of ORS packets: ORS Packet I, an incomplete formula made up solely of sugar and sodium, to be used in preventive rehydration; and ORS Packet II, the complete formula, for the cases of dehydration. The handling of these two types of packets would not be very complicated. Indeed, in many cases, there are already two or three forms of the same medicine, with each form containing a different amount of the product. In such cases, the doctor must be careful to specify the desired product and amount he is prescribing.

### Conclusion

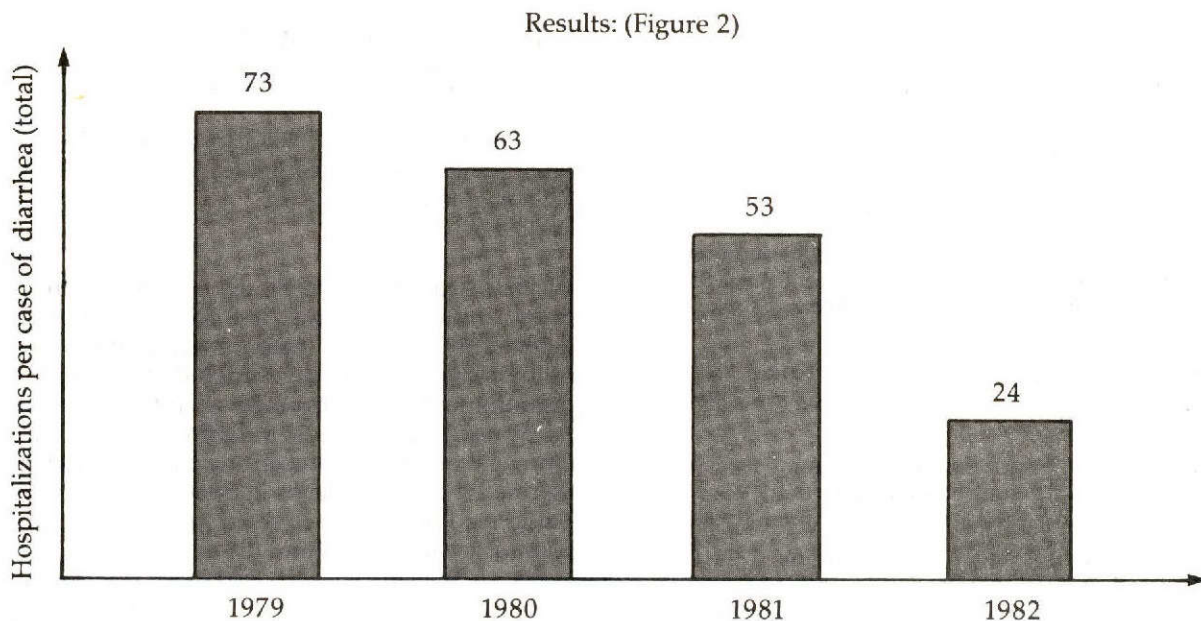
The initial results of the program are quite encouraging. But there remains much to do or to perfect. Our hope for the future rests on the effectiveness of our health education program. Parents are often late in seeking medical attention for their children, especially in rural areas. For this, our best weapon is having rehydration begun at home, utilizing any available method (ORS packets, carefully prepared sugar/salt solution, or traditional solutions). Education in oral rehydration implemented alongside of the pro-

motion of breastfeeding will make possible a significant decline in infant mortality.

\*The author wishes to give thanks for the success of the program to all of the people working in the field, and thanks to all of the people in charge of this program, particularly Dr. Bechir Hamza, Director, and Dr. Salaheddine Meddeb, National Supervisor.

### REFERENCES

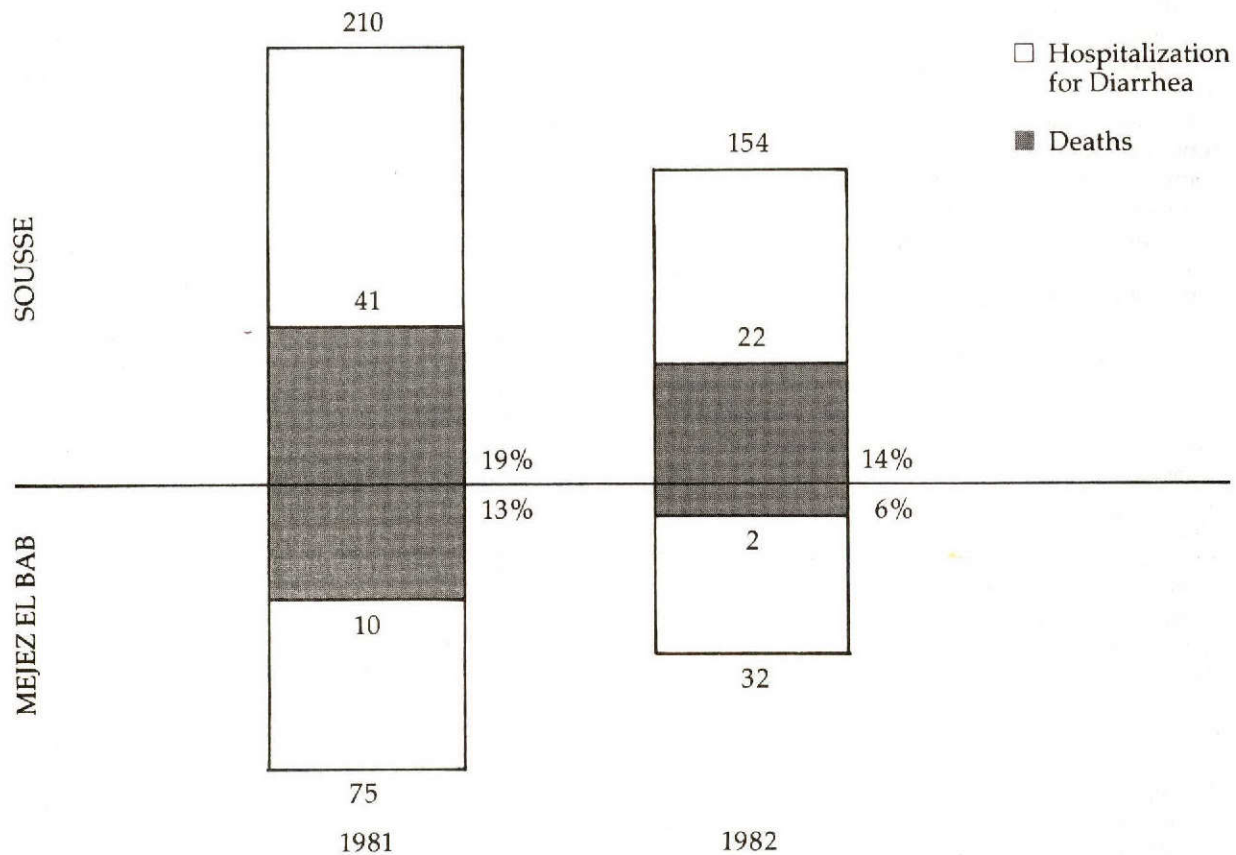
1. Amamou, Z. Methodologie de prise en charge des diarrhees aiguës chez les enfants en age pre-scolaire. These, Faculte de Medecine de Tunis, 1978.
2. Bennour, A. Etude prospective de la maladie diarrheique de l'enfant—Traitement des deshydrations par voie orale—A propos de 101 cas. These, Faculte de Medecine de Tunis, 81.82.
3. Black, R. E. The prophylaxis and therapy of secretory diarrhea—Medical clinics of North America. Vol. 66, no. 3, May 1982:611-21.
4. Fortin, J., Parent, M. A. Dehydration scoring system for infants. *J. Trop. Pediat. and Env. Child Health* 24 (1978):110-14.
5. Kodia. Programme de rehydratation orale a Med-jez El Bab 1982. Communication personnelle.
6. Maaroufi, S. Diarrhees hospitalieres: Etude prospective de 241 cas. These, en voie de soutenance, Faculte de Medecin de Tunis, 1983.
7. Mahalanabis, D., Merson, M. H., Barua, D. La rehydratation par voie orale—nouveaux progres. Forum mondial de la sante, 1981.



**Figure 2:** Decline in Hospitalizations for Diarrhea at the Department of Pediatrics of the Me-jez El Bab Hospital.

Figure 3

DECLINE IN MORTALITY FROM DEHYDRATION



8. Manuel pour la planification et l'évaluation des programmes nationaux de lutte contre les maladies diarrhéiques. Document O.M.S.

9. Patra, F. C., Mahalanabis, D., Jalan, K. N., Sen, A., Banarjee, P. Can acetate bicarbonate in oral rehydration solution for infantile diarrhoea? *Archives of disease in childhood* 57 (1982):625-37.

10. Osman, B. La deshydratation aigue du nourrisson: Etude comparative des différentes modalités de rehydratation—A propos de 309 cas. *Faculte de Medecin de Sousse*, 1980-81.

11. Programme de lutte contre les maladies diarrhéiques in Tunisie. Plan d'opérations 1980-84. Document O.M.S.

12. Rapport d'évaluation du programme tunisien national de lutte contre les maladies diarrhéiques—Mission 6—18 Dec. 1982. Document O.M.S.

13. Sandhu, B. K., Jones, B. J. M., Brook, C. G. D., Silk, D. B. A. Oral rehydration in acute infantile diarrhoea with a glucose polymere electrolyte solution. *Archives of disease in childhood* 57 (1982):152-60.

ORAL REHYDRATION THERAPY IN BRAZIL

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Brazil is situated on the South American continent and is divided into five administrative regions. The Northeast region concentrates 33% of the nation's population. Included among the predominant health problems is infant mortality, one of the highest in Latin America, with diarrheal diseases representing the principal or associated cause of death in 50% of these cases. Other significant causes of infant mortality are respiratory infections and other infectious diseases, such as measles. In Fortaleza, the capital of the state of Ceara, the Division of Epidemiology and Statistics noted that 54% of regis-

tered deaths in infants in 1976-77 were due to diarrheal diseases.

In an effort to understand the epidemiology of diarrheal diseases, individuals from the Federal University of Ceara and the University of Virginia developed a rural project in the city of Pacatuba, Ceara, located 32 km from Fortaleza. After discussions with community leaders, fifty families were selected for longitudinal surveillance based on their geographic location, socioeconomic level, water and sanitation, and their having between two and six children less than twelve years of age. These families were then followed from March, 1978, to October, 1980, through a weekly home visit.

Initial investigations carried out on the history of these families revealed forty-two child deaths among the fifty homes, 50% of which were associated with diarrhea and dehydration and 90% of which occurred in children under three years of age. The prospective surveillance demonstrated a diarrheal attack rate of between one and four episodes per person per year, varying inversely with socioeconomic level and water and sanitation conditions. The diarrheal attack rate was highest in children seven to twelve months of age, reaching the equivalent of fifty days per child per year (14%), with a medium of 5.2 days duration per episode.

Among the 150 episodes in which an etiologic diagnosis was sought, 50.7 yielded recognized pathogens. Of these, 23.5% were enterotoxigenic *E. coli* (ETEC), 9.4% rotavirus, and 8% shigella. In a smaller sample, *Campylobacter jejuni* was found in 7.5%. Clinically, fever occurred in 67% of the inflammatory diarrheas (shigella and campylobacter), in 60% of rotavirus, and 38% of ETEC.

In relation to seasonality, 29.5% of the isolates of ETEC were in the period from October to March, while only 9.3% were in the period from April to September. On the other hand, 28.3% of the identified cases of rotavirus occurred between June and October, while 11.1% occurred in the period from November to May.

Given the elevated incidence of diarrhea among the more vulnerable groups, whether vulnerable due to socioeconomic level or to age or to limited access to medical facilities, this alarming reality called for objective and urgent action. It would be difficult to perform a field study of this nature without including an operational response.

Based on recommendations of the World Health Organization and our own experience with community participation, we sought to identify influential persons in the communities whom we called community leaders. Characteristics of such individuals included: resided in the community and possessed a network of relationships and/or communication with other

local members, for example, as the proprietor of a pharmacy or grocery store, as an active member of a religious group, as a regular "frequent-er" of the health post, as a teacher, etc. We then sought to orient and train these leaders in primary assistance of the child with diarrhea. The chief objectives were to avoid dehydration and to be able to recognize the risk factors leading to prompt referral to the health post.

Once identified, all agreed to participate in the project in the capacity of volunteers whose greatest compensation was helping a sick child as well as gaining prestige in the community. Training was accomplished through informal meetings, generally in one of the leader's homes, providing information about the causes of diarrhea, preparation of the WHO oral rehydration solution, and identification of risk signs, such as vomiting, lethargy, and fever. Most of these "meetings" were exchanges of experiences, since the leaders were already familiar with homemade ORS. Their difficulties lay with the preparation of the ORS, principally with the correct use of the measures. We took great care to use understandable language, since cultural factors led to differences in the terms for dehydration, and attempted not to violate any taboos. The educational level of the leaders varied from third grade to high school graduate. Communication among us was not difficult once our group was perfectly identified with the community.

Our major difficulty in the preparation of the ORS was accurate measurement of the salts. Since communities did not all have the same standard measures, we emphasized the importance of the correct quantity of each ingredient and explained the possible substitute measures when the suggested measure was not available. A form was furnished for collection of data on the children treated (name, age, sex, address, stools/day, and treatment offered), on the mother (name, age, number of children, breastfeeding pattern), and on the outcome of the intervention (cured, improved, no change, died). The forms were collected weekly at a meeting with the group to discuss how the program was faring. At this time, we distributed an average of ten packets to the leaders, each packet yielding a liter of ORS. Initially, we prepared the ORS together with them, later observing as they prepared the ORS themselves.

The communities do not normally have several sizes of spoons. The soup spoon (twenty ml) is the most common, but the "pinch" is also used. We tried to measure this pinch and found it corresponded approximately to a teaspoon (five ml).

The program was promoted through the church at Sunday mass and by word of mouth. It is worth noting that a proprietress of a phar-



macy and a businessman, individuals who already were sought in case of illness, were part of our group. The latter contributed significantly to the success of the project. During the meetings, most interesting was the enthusiasm with which each leader related his own experiences, while at the same time discussing the efficacy of the ORS on the evolution of the dehydration and/or diarrhea.

During 1979-80, 1,162 children were treated, 48.2% under a year, 21.0% between one and two years, and 89.8% under five years of age. The greatest number of cases occurred from January to March, with the fewest from June to November. Three hundred and nine children (26.6%) presented greater than five stools per day. Generally, the leaders followed the case; improvement was generally noted within the first twenty-four hours and recovery after forty-eight to seventy-two hours. There were no deaths, while only three (0.2%) were referred to a hospital.

In the period from March to April, 1978, another program was developed at the Rehydration Center in Fortaleza, where children with dehydration due to diarrhea receive I.V. therapy with the mother remaining at the child's side. Children over three months of age with acute diarrhea requiring rehydration were included in the study while prior antibiotic use excluded the case. At the time of admission, the physician classified the degree of dehydration as average (< 5%), moderate (5-10%), or severe (>10%).

Routine I.V. fluids, consisting of normal saline with 5% glucose, with potassium and bicarbonate, were given until there were clinical signs of improvement, such as increase in weight, improved level of consciousness, and increased urine flow. Patients were then randomly divided into two groups: one continued the I.V. treatment, while the other was switched to ORS using the WHO formula. I.V. fluids were administered in the first group until prescribed fluids were concluded; ORS was given to the second group until the physician or nurse judged the child ready for discharge. All children were examined before leaving the Center.

There were twenty-four children in the I.V. fluid group and twenty-nine in the ORT group. Age varied from three months to seven years, the mean age being ten months and eight months in the two groups, respectively. Other than diarrhea, fever and vomiting were the most frequent associated symptoms. Among stool cultures, notably, ETEC was encountered in 27% of the patients.

At the beginning of therapy, there were no significant differences between the two groups in regard to duration of previous therapy, amount

of I.V. fluids already received, or weight gain. In subsequent treatment, however, significant differences were observed. For example, the ORS group required less fluids for recovery (237 ml vs. 545 ml) and a shorter period of therapy. Likewise, return to normal level of consciousness was rapid in the oral group. The experience showed that, if oral therapy is initiated as soon as possible, the majority of children with acute diarrhea and mild or moderate dehydration evolve satisfactorily, and I.V. therapy is largely unnecessary.

The influence of traditional medicine as an alternative in the resolution of health problems, especially diarrhea, was identified during the Gastroenteritis Project in Pacatuba. Seeking to determine the magnitude of this participation, forty children with diarrhea (thirty-two from Pacatuba and eight from the Rehydration Center) were studied. It was shown that initial care was provided by mothers using medicinal teas in 92.5% of cases. The second level of care was by the "rezadeira" (a traditional healer of the local community who performs a praying ritual and may use medicinal plants) who was consulted during the initial two days of the disease. The third level of care was the pharmacy, generally attended by an untrained employee, with this care occurring about the third day of the disease. The fourth level of care was the physician, who was sought by the patient on the eighth day. The Rehydration Center was visited on the tenth day, and the hospital on the twelfth day.

Recognizing that the rezadeira represented the earliest contact made by the community, we considered better familiarity with the work of the rezadeira a priority in our newly evolving strategy. We now recognize the rezadeira has great prestige in her community and enjoys much credibility, whether due to the fact of her living in the same locale or to her relationship with the patient, and this credibility is intensified even more by her common language and her accessibility. In general, rezadeiras are women, with an average age of sixty, simple in their ways, often illiterate, and with a considerable degree of mysticism. They receive no financial compensation and are present in urban as well as rural areas. The patient demand for their care (which they call "cures") varies from three to five persons per rezadeira per day. The rezadeira offers a specific prayer for each type of disease. A syndrome such as diarrhea can represent several different diagnoses, such as "ventre caído," "susto," "espinhela caída" (fallen abdomen, sudden fright, fallen sternum), or others.

Since, in the past, the rezadeira has been criticized considerably by health science professionals (principally physicians), access to reza-

deiras by interested health professionals was difficult. Our first contacts were made, therefore, with considerable reserve and only after establishing confidence on the part of the rezadeira. Once this contact was made, she was able to provide very useful information, such as her manner of praying (to avoid "losing the force," she cannot teach the prayer), number of children treated, outcome of the disease, etc.

When our relationship with the rezadeira was secure, we tried to incorporate her in our treatment system for the prevention of dehydration without interfering with her prayer ritual. We found her ready to collaborate. After prayer, she prepared the ORS for the child and administered it, orienting the mother to the treatment. This involvement of the rezadeira was a great discovery, since in this way we were acting at the primary level of care through a simplified technology at an extremely low cost. The community leader, described previously, served as an intermediary between us and the rezadeira, as well as a facilitating element in gaining access to her.

At the present time, the Primary Health Project (PAPS) of the Maternidade Escola Assis Chateaubriand incorporates the rezadeiras in their health systems. Rezadeiras receive an initial training to make them competent in the identification of signs of risk and the administration of ORS to children. This training has had favorable results. Mothers place their confidence in the rezadeira, and, since they normally bring their children back to the rezadeira for from three to nine consecutive days of praying, the rezadeira is able to follow the children's recovery.

The operationalization of the system for the control and prevention of dehydration in the Northeast of Brazil should, therefore, involve community participation, especially that of the rezadeira.

## ORAL REHYDRATION IN MALI

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In Mali, diarrheal diseases constitute a public health problem both because of their high incidence, especially among children under five years of age, and the high mortality associated with the disease. Since oral rehydration is considered fundamental to the control of this disease, an oral rehydration unit was established within the department of pediatrics at the Gabriel Toure National Hospital of Bamako on

April 2, 1981. This unit was made possible through the cooperation of Dr. Peter Knebel, USAID Regional Public Health Adviser for the Sahelian countries.

It was our task to verify the effectiveness of this therapeutic method in a hospital department where intravenous rehydration was, until then, the main (if not the sole) method used. To this end, a room was quickly furnished and equipped, and a nurse was put in charge of supervising the rehydration, maintaining daily and monthly records of the cases treated and managing the unit.

The stakes are large: we want to show that this new method is valid and to bring about a radical change in the therapeutic habits firmly rooted in all those — doctors, medical students, nurses — who deal with cases of dehydration. Wanting to succeed in these objectives, we have taken the following precautions:

— For the time being, the unit operates only on scheduled days and at specified times.

— Only those children are sent to the unit who have first been examined by a doctor very familiar with the problems associated with child medicine.

### Epidemiology

After a thorough clinical examination, the children suffering from diarrhea are divided into three groups:

*Group 1:* diarrhea without dehydration. The mother is advised to administer a large amount of the oral rehydration solution to the child (one liter of tap water or one liter of boiled water which has been cooled, to which two pinches of kitchen salt and eight cubes of sugar have been added). She is told to continue breastfeeding the child. We also recommend the use of those foods which have antidiarrheal properties, such as carrot soup, rice water, and flour made from dried breadfruit (*Adansonia digitata*). The mother is further instructed that the child should be brought back for consultation if the diarrhea persists or worsens.

*Group 2:* diarrhea with signs of moderate dehydration. This category includes those children who have experienced dehydration leading to a weight loss of between 5% and 10% of their body weight. Since the child's former weight is rarely known, however, the criteria used to evaluate the extent of dehydration are the state of the fontanelle, the extent to which the eyes are sunken, the turgor of the skin, the degree of hydration of the buccal mucous membrane, the strength and frequency of the pulse, and the degree of consciousness and behavior of the child. The child in this group is fully conscious and is neither agitated nor depressed; the pulse is strong and not accelerated unless the child has fever; the fontanelle, if it still exists, is somewhat

depressed; while the skin fold is slight.

*Group 3:* diarrhea with serious dehydration. In this category, the child is agitated or is not completely conscious; the fontanelle is very depressed; the buccal mucous membrane is dry; the child urinates sparsely or not at all (oligo-anuria); and the pulse is weak, rapid, sometimes imperceptible, suggesting a state of shock.

### Methodology

The children of Group 2 are sent to the oral rehydration room, where they are administered ORS with a spoon or bowl. In the event that the child cannot tolerate the solution or vomits repeatedly, the gastric probe is tried. If this fails, intravenous rehydration is immediately begun. The child is seen again the next day and re-administered the solution, this time using a spoon or bowl, if possible.

With children in Group 3, if there is cardiovascular collapse or considerable vomiting, intravenous rehydration is used from the outset. In other cases, rehydration using a spoon or bowl or, if necessary, the gastric probe, is tried.

Before being admitted into the oral rehydration room, each child receives a card with the day's date, his/her first and last names, age, sex, type of dehydration, and any other abnormalities discovered during the clinical examination (nutritional status, respiratory disease, anemia, otitis, etc.). In the oral rehydration room, the nurse weighs the child and prepares the amount of solution to be administered. Under the nurse's surveillance, the child's mother administers the treatment. Mothers are seated on mattresses which have been covered in plastic and placed on the ground. Up to three mothers can sit on each mattress.

### Treatment

ORS is administered in the unit for thirty minutes to one hour, on the basis of twenty ml per kilo of body weight. In addition, the mother takes home a certain quantity of the solution in a plastic bottle (she will have to pay a deposit of 150 Malian francs which will be reimbursed to her when she returns the bottle; this will likely take place the following day, when she comes in for a routine visit to have her child's condition evaluated). This quantity, calculated on the basis of 120 ml per kilo of body weight, will be given to the child over a six-hour period. We advise the mother to continue to give the child any available liquids (breastmilk; artificial milk, but reducing the dilution by half; fruit juices; etc.).

The results of this treatment are evaluated the following day when the child is brought in for a routine visit. If necessary, a second oral rehydration feeding, identical to the first, is administered. Should the child's condition have worsened, he/she is hospitalized and given in-

travenous rehydration if needed.

The composition of the oral rehydration solution we use corresponds to the WHO-recommended formula: 3.5 g sodium chloride, 2.5 g sodium bicarbonate, 1.5 g potassium, 20 g glucose or 40 g sucrose, and one liter of water. In preparing this solution, we use tap water which we then filter. We have, however, substituted units of volume for the above units of weight. This gives us the following measures for the raw materials: 3 ml sodium chloride, 3 ml sodium bicarbonate, 1.5 ml potassium chloride, and 24 ml glucose or 48 ml sugar in powdered form.

### Results

The numbers of children treated in the oral rehydration unit show sizeable monthly variations, corresponding to the periods of the year. The numbers range from fifteen in the most favorable months to more than 150 in the critical months (April, May), when diarrheal diseases are frequent and the heat is stifling. (The temperature sometimes exceeds 40°C in the shade.)

A statistical survey of one hundred patients revealed seventy-seven cases of moderate dehydration and twenty-three cases of serious dehydration. Boys represented 66% of the cases and girls 34%. Eighty-five percent of these children were between zero and one year old, and 15% were between one and four years old.

Seventy-four of the seventy-seven children with moderate dehydration absorbed the oral rehydration solution normally. Because of repeated vomiting, the gastric probe had to be used with two of the children; this procedure was successful. One child had to be given intravenous rehydration the next day as his condition had worsened considerably, due to excessive diarrhea and vomiting.

Twenty out of the twenty-three cases of serious dehydration responded favorably to the ORT using a spoon and bowl. Three had to be rehydrated intravenously.

It should be emphasized that a sizeable proportion of the children (sometimes even 30% to 40%) did not come in the following day for their check-up visit. This situation is due in part to the difficulty in getting around the city of Bamako, as well as to the extremely small incomes of many families. Often, improvement in the child's condition led the family to renounce the "loss of time and money" involved in a second consultation.

It should also be noted that in the absence of the oral rehydration unit, at least 50% of the children with moderate dehydration would have received systematic intravenous rehydration.

### Cost of the treatment

The raw materials for the ORS are found in Bamako and are sold by the factory in charge of

the preparation of I.V. solution. The quantities of glucose and salt necessary for preparing 1,000 liters of the ORS cost 16,800 Malian francs or 8,400 CFA francs or U.S. \$30.00. Thus, one liter of the ORS costs less than 17 Malian francs (U.S. \$0.03). Even if the selling price was undervalued, it is clear that this solution is inexpensive compared to the price of the solutions used for the intravenous rehydration (more than 860 Malian francs for a 500 ml flask, no matter what the nature of the solution is; to this must be added the price of the I.V. line, which costs more than 600 Malian francs). Moreover, giving intravenous fluid to infants is an elaborate procedure which is not free of risks; if done through the sub-clavian, it exposes the child to the risks of pneumothorax, hydrothorax, etc.

### **Other experiences**

In November, 1981, a second oral rehydration unit opened under the same conditions at the main Center of Maternal and Child health in Bamako. Run by a nurse, this unit in its first thirteen months received 206 dehydrated children between the ages of zero and one year and 105 between the ages of one and four years. Out of 311 children, 229 returned for their check-up the following day. By the second day follow-up visit, oral rehydration using the bowl and spoon had improved the condition of 229 of these children, while twenty-one children had to receive a second feeding of the solution and four had to be rehydrated intravenously.

In April 1983, the same center treated 169 children, 152 of which were between zero and one year of age, and seventeen from one to four years of age. One hundred and nine children were seen again in consultations the next day. Two had to receive a second feeding of the liquid; only one had to be given intravenous rehydration.

### **Conclusion**

In conclusion, ORT has proven to be an extremely effective method of controlling diarrhea. It is not expensive. It is easy to set up anywhere in that it does not require any particular technical expertise. It is not dangerous. Accordingly, it fits perfectly within the framework of primary health care, the approach which the developing countries are presently following.

One problem remains, however. The UNICEF oral rehydration packets are not readily available, and only the sucrose and the sodium chloride are easy to find in all the villages. Can these two sole ingredients be considered satisfactory?

## **THE NATIONAL CAMPAIGN TO PROMOTE ORAL REHYDRATION IN EGYPT**

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Diarrheal diseases in Egypt particularly afflict infants and small children. Preschool children account for one-half of all deaths in Egypt, and one-half or more of these deaths are associated with diarrhea. In fact, 90% of diarrheal deaths occur in children under three, and 75% occur in children under two years of age.

Cause-of-death investigations in two large, independent field trials of oral rehydration therapy in Egypt indicate that 90% of children who died had time to be rehydrated. If vomiting is to be taken as a close correlate of dehydration, then the great majority of deaths are likely due to inadequate fluid therapy.

In my country, there is no insufficiency of medical care. Most of the children suffering from diarrhea were attended by physicians at least once, with the majority seen in private clinics. But 25% of the children died after a week or more of illness, and it is probable that inanition played a role, since it has become customary to withhold breast milk and most food during diarrhea. Our statistics show that breast milk in the first six months and supplemental foods in the second year of life have a somewhat protective effect. The mortality rate from diarrhea is higher for children fed cow's milk than for those on breast milk and is higher for children who did not receive supplemental feedings than for those who did.

Acute diarrhea has a profound effect on nutritional status. In diarrhea season, the incidence of acute undernutrition is far greater than in non-diarrhea season, and children who have recently had diarrhea are far more prone to deficits in weight for their age than children who have not had diarrhea. Studies in the Philippines, Iran, Turkey, U.S.A., and Egypt suggest that ORT will not only reduce mortality, but also the degree of acute malnutrition induced by diarrhea and fasting. Our principal objectives in the national program are, therefore, twofold: to reduce mortality and the prevalence of malnutrition and to promote rehydration therapy, principally oral, and continued feeding. The data presented suggest a

few key strategies:

—We should focus on the group of children at highest risk. The campaign should be targeted to parents of under three year olds.

—Oral rehydration — in all effective forms likely to be accepted — should be the cornerstone of the campaign.

—All those to whom parents turn for the care of their children — physicians, nurses, pharmacists, and, perhaps, lay healers — should be aware of oral rehydration.

—Rehydration and feeding together equal oral therapy.

Research conducted in Egypt over the past three years supports these points. With the use of ORT, the death rate from diarrhea was cut in half in large field trials in rural areas and in hospitals; the need for hospitalization and the duration of hospital stays were reduced; and the cost of treatment was lessened. In the successful field trials, there was an increased acceptance by mothers of continued feeding, and therapy combined with breastfeeding improved weight gain and reduced stool output. Antibiotics were found to have no effect on the duration of diarrhea.<sup>1</sup>

One of the more important outcomes of these studies is that the medical community in Egypt is increasingly aware and accepting of ORT. We believe this acceptance will be critical to our success.

I should mention one field trial, the Menoufia Project, that was notably unsuccessful in reducing mortality. The author reported his findings in *Studies in Family Planning*, and we should appreciate his candor in commenting on the negative results. While we can never be fully certain why this intervention did not succeed, it is instructive to compare this study to a successful field trial, conducted at virtually the same time in another part of Egypt. We hope to take benefit from these lessons, easy and hard, learned in Egypt and elsewhere.

As Table 1 indicates, the Strengthening of Rural Health Delivery Project (SRHD), under the direction of the Ministry of Health, reported considerable success in the reduction of mortality and the continued use of ORT (especially the UNICEF packets). The Menoufia Project, under the auspices of American University in Cairo, reported no reduction in mortality and little sustained use of ORT after one year.

One key difference appears to be the way in which the new treatment was presented to families by the SRHD project. ORT was presented in the context of established primary care and was not externally imposed. The Menoufia Project at its start, however, was linked to Family Planning, which unfortunately confused the people about the nature of ORT and stimulated all kinds of unwarranted and debilitating rumors. SRHD also used multiple visits to families by persons

whose social class and language may have been closer to the village women. Finally, placing a medical project into a community without preparing the community has been found to be a mistake. True involvement of the local medical group may be critical as well.

The National Control of Diarrheal Diseases Project is not just another vertical program, as a diagram of project levels indicates (see Table 2). We are becoming the technical resource center for all diarrheal control and rehydration activities in Egypt through direct relationships to Ministry of Health facilities, through cooperative research and service agreements with universities and international organizations, through contracts with private and public sector institutions, and through practitioner training, dissemination of information conferences, and a mass education campaign.

You will notice that we have inverted one of our famous pyramids to place the target population at the pinnacle of our concern. The Steering Committee of professors, ministers, media, and business persons has accepted this emphasis.

The organization of our project, now in its first year of a five-year program, is shown in Table 3. The technical units are the heart of the work. Drawing on the knowledge and methods of social marketing, we are defining and developing a product and mass education messages based on the language perceptions, concepts, needs, and desires of the target population. The research and evaluation unit supports the marketing approach with qualitative and quantitative surveys, focus group, and product research. It is also developing a total evaluation framework. The training unit supports and manages the practice of doctors, nurses, and pharmacists in regional rehydration centers. Two are operative and have trained several hundred professionals; three more are opening this summer. Eventually, we hope to have up to twenty-five training centers.

The production and distribution unit will eventually design, coordinate, and monitor the production and logistics of a national ORT package, a single I.V. solution, and standard supplies tailored to facilities extending from university hospitals in Cairo to traditional midwives in villages. Other services of our project include the development of research protocols, a national technical newsletter, an information service, and a hot-line. The twenty-six Governorate Coordinators are Ministry of Health employees who act as trouble-shooters at governorate and district levels. They will be invaluable, also, in the informal augmentation of the mass campaign messages. The majority will have been trained in ORT before 1984.

The first diarrhea season of our project has begun. We are busy defining, testing, and refining our organization, our product, and our educa-

**Table 1**  
**COMPARISON OF TWO FIELD TRIALS OF ORT IN EGYPT IN UNDER 5-YEAR OLDS**

	<i>SRHD</i>	<i>Menoufia Project</i>
Diarrhea death rates (per 1,000) control → RX	19 → 11	21 → 24
Sustained use of ORT	60%	9%
Outreach	Multiple, by nurses	Single, by young matriculates
Involvements of local doctors	High	Minimal
Project aegis	Community-based, local MOH network primary care.	Externally-based (University) family-planning associated (at outset).

**Table 2**  
**NATIONAL CONTROL OF DIARRHEAL DISEASE CAMPAIGN**  
**Project Levels**

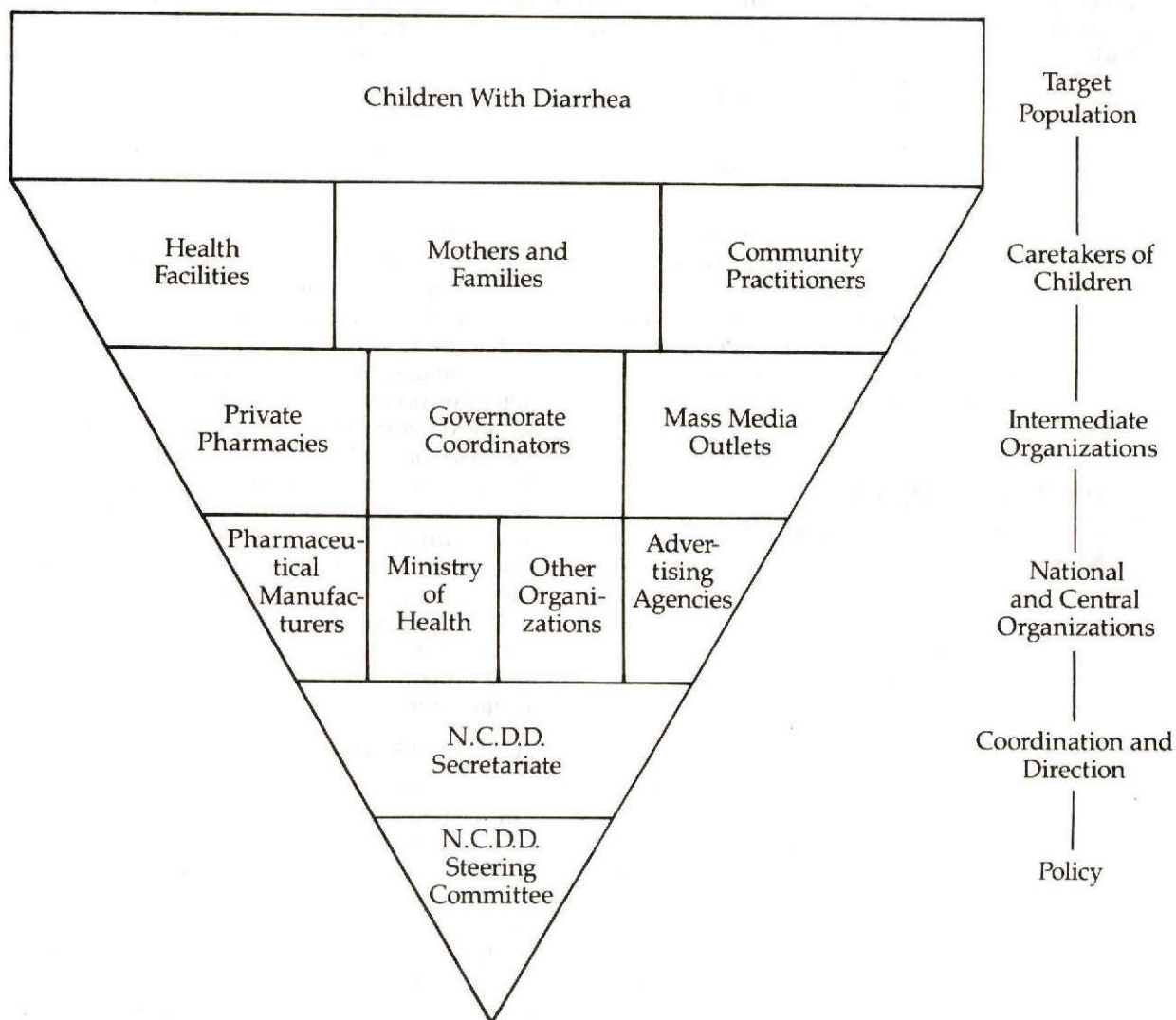
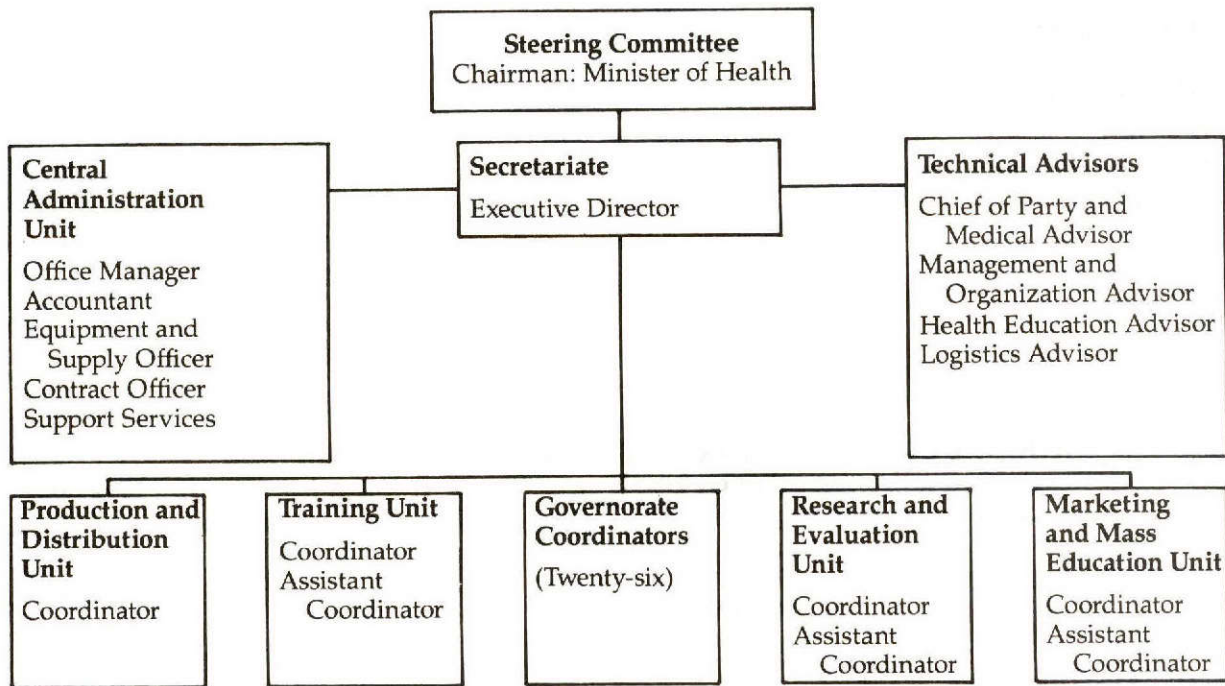


Table 3

NATIONAL CONTROL OF DIARRHEAL DISEASE  
CAMPAIGN ORGANIZATIONAL STRUCTURE



tional campaign. We are optimistic. Our logo, now thoroughly accepted by mothers, reflects this optimism. Perhaps our optimism is based on our long history. A wall painting from Tutankhamen's tomb shows the God Osiris opening the mouth of the Pharaoh in order to restore life. This is the message of oral therapy.

**THE DIARRHEA DISEASE CONTROL PROGRAM IN JAMAICA**

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*National Diarrheal Disease Control Program*  
*Ministry of Health*  
Kingston, Jamaica

In 1979, a review of health problems in children in Jamaica revealed that acute gastroenteritis (GE) continued to be a major public health problem and was the main cause of death in children under five years, accounting for 24% of deaths in this age group. It was also the main cause of admission to hospitals, accounting for 37.9% of pediatric admissions in the age group from zero to fifty-nine months, resulting in a mean length of stay of nine days and generating a total of 35,964 patient days of costly hospital care. Among the 3,690 GE cases seen, 116 deaths occurred, giving

a case fatality rate of 1.2%.

A pilot study utilizing oral rehydration therapy on an outpatient basis was implemented at the Casualty Department of the Children's Hospital to determine whether, by changing the method of case management, a reduction in the admission rate and the use of I.V. fluids could be achieved. During the one-month study period, of 562 cases of acute GE seen, twenty-four (4%) received intravenous fluid and only thirty-four (6.1%) were admitted to the hospital; this compares with 307 (55%) of 559 cases receiving I.V. fluids and ninety-four (16.8%) admitted during a one-month pre-study period.

Based on the results of this study, Phase I of a National Diarrheal Disease Program was developed utilizing ORT as the method of case management for acute GE.

**Program objectives**

The program, integrated into the primary health care system and utilizing auxiliary health workers to avoid additional investments in either manpower or infrastructure, was implemented in two areas of the country, Kingston and St. Andrew, and St. James.

The short-term aims were to:

1. reduce case-fatality rates for acute diarrheal disease to less than 1% in participating health facilities by mid-1982;
2. reduce hospital admissions for acute diarrheal disease by 50% by mid-1982 and by 75%

by the end of 1982;

3. reduce the mean duration of stay for hospitalized cases by 25% by mid-1982; and

4. reduce the use of IV. fluids for managing diarrhea cases by 50% in participating hospital casualty (outpatient) departments by mid-1982.

### Field operations

The overall supervision of the program at each center is the responsibility of a doctor/nurse practitioner, or nurse. A child with acute GE and with evidence of dehydration is detained at the center and a medical auxiliary (either a community health aide or a ward assistant), monitors, guides, and demonstrates to the parent the administration of oral rehydration solution. Once the child is assessed to be satisfactorily rehydrated, the parent is given instructions on the maintenance of hydration and reintroduction of food, before being sent home with packets of ORS. The child returns to the center or is visited at home for reassessment during the next week. The parent is also taught the signs of dehydration and is instructed to return to the center as soon as any sign of deterioration occurs in the child's condition.

Prior to the initiation of the program at the center, the supervisor is selected and trained along with other selected members of the health team, and these form a core team of trainers who, in turn, train the medical auxiliaries and other members of the staff. During the training, emphasis is placed on developing the practical skills needed to deliver ORT as well as the development of some skills in communication needed for effective health education. Pre- and post-tests are administered to each participant.

Between 1980 and 1982, a total of 258 staff were trained, including medical officers, nurses, and medical auxiliaries. The analysis of the pre- and post-tests showed an average increase in knowledge of 40%.

The main focus of the educational program is the parents who bring their children to the centers for treatment. Educational messages are given to small groups or to individuals. To assist the health worker in reinforcing the messages, two pamphlets, "What to do when your child has diarrhoea" and "How to keep yourself and your baby healthy," and posters showing the signs of dehydration and the mixing of ORS have been developed.

In addition, an eight-part series of five-minute radio programs has been developed, pre-tested, and aired on both national radio stations. Two video films have also been developed and used by the Government's Educational Broadcasting Unit in programs for high school children.

### Program results

During the period from 1979 to 1982, the epidemiological pattern of acute GE in Jamaica re-

mained the same, with epidemics of varying magnitude occurring each year between December and March.

By December 1982, thirteen centers were utilizing ORT in the parishes of Kingston, St. Andrew, and St. James.

Small outbreaks of GE during 1982 resulted in the initiation of ORT at six centers in two other areas of the island, St. Thomas and St. Elizabeth, that were not originally included in the program for Phase 1.

Analysis of data from selected centers in Kingston and St. Andrew in 1982 showed that, of 67,219 children seen, 17,385 (25.9%) were diagnosed as having GE (see Table 1). All these children received ORT; however, 1,790 (2.7%) required additional treatment with IV. fluids. At the Children's Hospital, of 56,677 children seen, 17,462 (30.8%) had GE, 1,681 (9.6%) required IV. therapy, and 679 (3.9%) were admitted; and there were fifty-eight (0.3%) deaths from GE. This represented decreases in admission and case fatality rates for cases of GE seen at that hospital from 20.5% and 1.2% in 1979 to 3.9% and 0.3%, respectively, in 1982 (see Table 2).

Although the use of IV. fluids decreased significantly at the Children's Hospital, from 50% in 1979 to 6.7% in 1981, the use increased to 9.6% in 1982. The use of IV. fluids at Glen Vincent Health Centre — the only health center utilizing IV. fluids — also remained high (10.6% in 1981, 9.6% in 1982). Based on observations and an examination of a sample of the case records, this increase is probably related to two factors, the inclusion of non-GE cases, and the insufficient monitoring of the administration of ORT.

### Comments

The review of the program in January 1983 showed that three of the targets set were achieved by the end of 1982. These included (1) the reduction in the case fatality rate to 0.3%; (2) the decrease in admissions to the Children's Hospital of 81%, from 20.5% to 3.9%; and (3) the decrease in the use of IV. fluids of 80.8% at the Children's Hospital, from 50% to 9.6%.

A complete analysis of data from all centers, however, has not been possible because of deficiencies and inconsistencies in the recording, collecting, and collation of data. Inaccuracies in the diagnosis of cases of acute GE have resulted in under- or overcounting at some centers.

Feedback from the field staff indicated that they felt that ORT was an effective method of treating GE and that the integration into the primary health care services did not adversely affect the work at the centers. However, shortages and rapid turnover of staff and inadequate space resulted in only partial implementation of the program at some centers as well as contributing in some instances to inaccuracies and inappropriate use of ORT. The need for close and



Table 1

**NUMBER AND PERCENTAGE OF CHILDREN WITH GASTROENTERITIS SEEN AND TREATED  
AT SELECTED CENTERS IN KINGSTON & ST. ANDREW — 1982**

<i>Centers</i>	<i>Total No. of children Under 5 years of Age</i>	<i>No. &amp; Percent of children Under 5 yrs. with GE</i>	<i>No. of children with GE Receiving I.V.</i>	<i>No. &amp; % of Referrals of GE cases</i>	<i>No. of % of Children Admitted due to GE</i>	<i>No. of deaths due to GE</i>
<b>Health Centers</b>						
Edna Manley	3,600	200( 5.6)	NIL	NIL	N.A.	0
Harbour View	3,019	108( 3.6)	NIL	NIL	N.A.	0
Glen Vincent	3,923	1,203(30.7)	109(9.1)	9(7.5)	N.A.	0
<b>Hospital:</b>						
Bustamante Children's	56,677	17,462(30.8)	1681(9.6)	N.A.	679(3.9)	58(0.33)
<b>TOTAL</b>	<b>67,219</b>	<b>18,973(28.2)</b>	<b>1790(9.4)</b>	<b>—</b>		

( ) — Percentage  
N.A. — Not applicable

Table 2

**NUMBER AND PERCENTAGE OF GASTROENTERITIS ADMISSIONS AND DEATHS AT  
BUSTAMANTE HOSPITAL FOR CHILDREN JAN 1979 TO DEC 1982**

<i>YEAR</i>	<i>Total No. of Cases of GE Seen at Hospital</i>	<i>Total No. of GE cases Admitted</i>	<i>Total No. of Deaths due to GE</i>
1979	3,690	759(20.5)	47(1.2)
1980	7,746	462( 5.2)	36(0.5)
1981	13,143	863( 6.6)	53(0.4)
1982	17,462	679( 3.9)	58(0.3)

( ) — Percentage

ongoing supervision at each center and for standard manuals of procedures to assist supervisors has been clearly identified.

Perhaps the most important deficiency identified is the limited communication and interaction between the health worker and the parent. The dispensing of the ORS or the issuing of packets to the parent without explanation can often result in the failure of the therapy or in parent dissatisfaction with the treatment, leading them to seek care elsewhere.

This is especially true at centers where the patient load is greatest, resulting in a tendency of staff to take short-cuts in diagnosis and treatment. Because of the apparent simplicity of diagnosing and dispensing therapy, all children having diarrhea or vomiting are categorized as GE without an adequate history, examination, or explanation of the treatment. This leads to the inappropriate use of ORT in approximately 12% of children, a group which includes cases of persistent diarrhea, upper respiratory tract infection, otitis media, and pneumonia. Inappropriate use of ORT, particularly in children with persistent diarrhea, can result in protein energy malnutri-

tion, especially when ORS packets are dispensed without explanation on their use and proper advice on nutritional rehabilitation. This failure is further aggravated if there is no built-in mechanism of follow-up of the child to monitor the response to therapy. Failures for any reason will have serious negative effects on the total program, lessening the program's acceptance among the medical profession as well as creating a lack of client confidence in the health services and in the method of case management.

### Conclusion

The importance of closely monitoring, supervising, and periodically conducting critical reviews of programs cannot be overemphasized. By doing this, not only the achievements but some of the major weaknesses and gaps in the Jamaica program have been identified.

Based on the available data, the program has made great strides toward achieving its objectives. However, to achieve the qualitative as well as quantitative success as the program is expanded during 1983-84, focus will be placed on three areas:

1. the improvement of the health information system, with the introduction of a standardized format for recording, collecting, and collating data;

2. instituting a better system of supervision and monitoring of management of cases and of the operations of the program in general; and

3. improving the level of patient/health worker interactions at the center and developing a community education component to the program.

In conclusion, whereas the ORT program in Jamaica has made definite strides, the question of appropriate home intervention remains, and more research is needed so that a suitable policy can be developed.

## NCDDP — THAILAND

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The National Control of Diarrheal Diseases Program (NCDDP), Thailand, implemented in October 1979, was revised in October 1980. Many important activities were started, especially those concerning the promotion of oral rehydration therapy and the training of physicians and health officers on clinical management of diarrhea. The program has not been phased in gradually, but has been implemented throughout the country through primary health care.

The objectives of the program are threefold: one, to reduce substantially mortality from acute diarrheal diseases as well as diarrhea-related malnutrition, especially in children under five years of age, by means of ORT as a primary health care activity; two, to reduce morbidity from acute diarrheal diseases in children under two years of age, by promotion of maternal and child health care practices; and, three, to conduct operational research in order to develop improved tools and strategies.

### **Program implementation**

The promotion of ORT takes place in the following manner. The Department of Communicable Disease Control purchases oral rehydration solution (WHO formula, 750 ml packet size) from the Government Pharmaceutical Organization (GPO) and distributes supplies to all health facilities (except provincial hospitals which can produce their own packets) and to village health volunteers through provincial health offices. Drug cooperatives, run by village committees

and village health volunteers, are established in some villages so that people can buy ORS as well as other essential drugs. Early treatment with available home fluid in mild cases of diarrhea is promoted instead of using sugar/salt (an incomplete homemade) solution when ORS is unavailable.

The medical officers and health officers in provincial levels and district levels are trained regarding clinical and program management. At the present time, these trained staffs have not yet trained the peripheral health workers and community health workers on clinical management of acute diarrhea. Health education on ORT is disseminated through all health facilities in the form of leaflets, posters, etc., and through mass media, especially on radio and TV.

Routine surveillance is done entirely by existing health facilities of which the most peripheral health facilities are at the subdistrict level. Outbreaks and epidemics of diarrhea (especially cholera) have been mostly detected, therefore, by health officers, not by villagers. Stool samples, water, and foods which are suspected as sources of infection are collected by health workers and sent to provincial health laboratories to identify the enteric pathogens. With the supervision and coordination of provincial staff, teams of three to four local health officers are sent into the reported epidemic areas.

The CDD program has been strengthened and integrated into maternal and child health care activities by training all provincial chiefs of the Health Promotion Section who are responsible for the MCH and Nutritional Program in their own provinces. These provincial chiefs, in turn, train and supervise MCH workers (nurses and midwives). With cooperation among the Division of Nutrition, the MCH program, and the Medical School, a nutritional project has intensively promoted the breastfeeding program throughout the country. Information about improving hygienic practices, weaning practices, and selecting proper foods for pregnant women, lactating mothers, and young children has also been disseminated to health workers, teachers, and community members.

The improvement of the water supply and other environmental health practices are overseen by the Department of Health, Division of Sanitation, the Division of Rural Water, and the Division of Environmental Health. These bodies are responsible for the expansion of coverage in the installation of safe water supply and waste and sewage disposal plants. Since 1981, community participation has been stimulated by the training and dissemination of knowledge to local people so that they have the skills necessary to install and maintain water supply plants, rain-water tanks, and latrine and waste disposal plants.

### Program evaluation

Four surveys were conducted in four provinces of Thailand in order to learn the morbidity and mortality of acute diarrheal diseases and the ORS usage rate (coverage) in children under five years of age. The 1980 cluster sampling technique recommended by WHO was used for the survey. Survey results are shown in Table 1.

Most of the figures indicating program achievement were assessed by *estimation* based on the survey because the existing data for CDD monitoring was not appropriate. The results are shown in Table 2.

A review of the program objectives conducted by a Comprehensive Program Review Team from

WHO found that mortality from diarrheal diseases in children under five was very low (probably less than five deaths per thousand), and mortality had declined in recent years. Neither observation could be attributed entirely to the CDD program, but the program must be regarded as an important factor in maintaining the present low mortality.

There is at present no definite evidence that the program of promoting the continued feeding of children with diarrhea while using ORS can substantially reduce diarrhea-related malnutrition. This remains an important objective for which information is required before an evaluation can be made. Neither is there definite evi-

**Table 1**  
MORBIDITY/MORTALITY AND ORT COVERAGE SURVEYS FOR  
ACUTE DIARRHEAL DISEASES IN CHILDREN UNDER 5

Province	Sample size (children 5 yrs)	Date	Result		
			Mortality per/1000	Morbidity (epidisode/ child/year)	ORT coverage (%)
National Survey	11,500	Dec. 1980	1.93	—	—
<i>Central Region</i>					
—Nakhon Pathom	3,074	16-19 Aug. 1982	0	1.67	25.3
—Rayong	3,012	3-13 Nov. 1982	0.67	1.84	25.7
<i>Northeastern Region</i>					
—Roi-Et	3,029	8-16 Nov. 1982	0	2.10	15.9
<i>Southern region</i>					
—Pang-Nga	3,005	13-24 Dec.	0.64	1.75	10.9
<i>Northern Region</i>					
—Kamphang Phet	3,023	5-18 May 1983	0.66	3.54	11.4
		Average	0.39	2.18	17.84

**Table 2**  
TARGET AND ACHIEVEMENT NCDDP — THAILAND 1981-1982  
(as compared to the year 1980)

Program Target	Fiscal Year			
	1981		1982	
	Target	Achievement	Target	Achievement
1. Operation Target				
—Access of ORS for children under 5 years of age.	40%	12%	50%	30%
1. —ORS usage rate in diarrheal children under 5 years of age	20%	12%	30%	20%
2. Problem reduction target (in children under 5)				
—Mortality reduction	13%	8%*	20%	13%*
—Reduction of hospital attendance	20%	12%*	30%	25%

\*by estimation.

**Table 3**  
**RESULTS OF DIARRHEA MORBIDITY AND MORTALITY SURVEYS IN SIX COUNTRIES 1981-1982**

	COUNTRIES					
	<i>Rabat, Morocco</i>	<i>Calcutta, India</i>	<i>Tunis, Tunisia</i>	<i>Lima, Peru</i>	<i>Taiguan, China</i>	<i>Thailand*</i>
No. of children 5 years	1,993	2,521	2,715	1,252	2,527	15,143
No. of children 5 years with diarrhea	363	295	330	330	114	1,271
Annual rate of diarrhea episodes/ child/yr.	4.7	3.1	3.2	6.9	1.2	2.18
No. of deaths of children 5 years in last 12 mo.	29	42	45	25	2	42
No. of deaths preceded by diarrhea	13	10	22	12	0	6
Annual mortality rate among children 5 years/1,000	14.3	16.7	16.0	20.0	0.8	2.76
Annual "diarrhea associated" mor- tality rate/1,000	6.4	4.0	8.0	9.6	0	0.39

\*results from 5 surveys in 5 provinces.

dence that the program has reduced morbidity from diarrheal diseases by promoting MCH practices. The scale of the program activities in the area and the relatively short period of program implementation make it unlikely that a marked morbidity reduction could have already occurred as a result of these MCH practices.

A review of the operational targets found that the program had considerably exceeded the ORS-accessible target (50%). It should be emphasized that the commercial production and distribution of ORS constitutes a very important proportion to the total used, and this has not been estimated. In addition, the ORS usage-rate target (30%) had been well achieved and probably exceeded by the program.

The review found that there had been a reduction in the number of cases admitted and a reduction in the number of severely dehydrated cases in some hospitals. This was not measured, and the significance of the reported reductions in terms of the program performance was impossible to determine. Finally, the data revealed that the mortality from diarrhea in children was already very low, but this could not be attributed to program performance.

#### **Problems identified**

Some important problems were identified by WHO review teams. First, there is a lack of training of health staff in CDD, especially medical staff at the provincial level, health center staff, village health volunteers, and administrators and supervisors. Second, it is not possible at present

to evaluate the role of commercial distribution of ORS and its input on diarrhea mortality.

The WHO review teams found that existing health facilities do not yet receive enough ORS from the program, that information needed for planning and evaluation, especially that concerning diarrhea mortality, morbidity, and the use of ORS, is not adequately provided by existing reporting systems, and that linkage and coordination between the CDD program and the units responsible for the Water Decade program and the Nutrition and MCH program are lacking. They also reported an overuse of antidiarrheal drugs and antibiotics in the treatment of diarrhea and found that, in some areas, it is common practice to discontinue feeding and breast-feeding during diarrhea.

#### **Proposed activities**

A number of activities have been proposed for the year 1984-85, including: supporting provinces in training for peripheral health workers and VHWs, especially on clinical management of diarrhea by ORT; training provincial medical staff, especially those from provincial hospitals, on clinical management of diarrhea; strengthening health education activities through radio, television, and school; conducting research on the use of homemade fluid in the treatment of early cases of diarrhea; studying the role of the commercial sector in the production and distribution of ORS and its impact on diarrhea mortality; and improving the reporting system for the CDD program.

# IMPLEMENTATION OF ORAL REHYDRATION THERAPY IN THE TREATMENT OF ACUTE DIARRHEA IN THE COMMUNITY

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The value of oral rehydration therapy in the management of acute diarrheal disease has been demonstrated in recent years. On the basis of scientific evidence, the World Health Organization has recommended a standard formula (comprised of 20 g of glucose, 3.5 g of sodium chloride, 2.5 g of sodium bicarbonate, and 1.5 g of potassium chloride, to be dissolved in one liter of potable water) for the treatment of diarrhea, irrespective of the etiology and age of the patient. The clinical experience with oral rehydration solution has demonstrated its efficiency. The low cost, ease of preparation and administration make ORT an appropriate technology with a potential for widespread use in primary health care throughout the world. However, operational research is necessary before its widespread acceptance and usage can become a reality.

## Overview of different approaches in India

To promote the use of ORS, thirty-five orientation seminars have been conducted over the last three years for teachers in medical colleges, administrators, and district health officers in India. Simple guidelines for use by primary health care workers have been published by the government in several regional languages. Currently, approximately seven million packets of ORS are produced annually.

Different approaches have been used for the delivery of ORS and provision of health education in the community. In Calcutta (Bengal), alternative strategies include the use of ORS packets and the provision of ingredients in plastic containers in a premixed form (one container having sodium bicarbonate and the other containing a mixture of glucose, salt, and potassium chloride). Standard measures are provided to health workers to prepare ORS according to WHO recommendations. The administration of homemade solutions for the treatment of diarrhea is also encouraged. Simple posters are provided which give information on the availability of ORT services in the community. The ORS is provided by primary health care workers or volunteers. The utilization rates of those seen by volunteers are better than those seen by health workers. For these groups, the utilization rates have ranged

from 50% to 80%, and no mortality has been reported. The impact of ORT on nutritional status is minimal.

In Pune (Maharashtra), the standard formula has been provided to thirty-nine community health volunteers (CHVs) during the past three years. No surveillance has been done, but only one death has been reported from among 1,783 cases of diarrhea treated by CHVs. Sixty-one cases were referred to health centers or hospitals. Ongoing training of the health workers has been found to be a crucial factor in the success of ORT delivery in the community. In Jamkhed (Maharashtra), village health workers have had remarkable success with providing ORS in the form of homemade rehydration solution. Diarrhea-related mortality has been reduced, although concrete data documenting the level of reduction is unavailable. In Hyderabad (Andhra Pradesh), standard formula is used in two villages where monitoring is done daily and in several villages where monitoring is done daily and in several villages where CHVs are provided with ORS packets. Cash incentives have been found to be important in the success of ORS delivery. Using ORT as a point of entry to the discussion, nutrition education is stressed. In Delhi, the social marketing of ORS packets through available channels in the community is emphasized. Although interest in ORT is widespread and several different approaches have been used in India, an assessment of rates of utilization and hospitalization and the impact on mortality and child care practices in a large population group has not yet been undertaken.

## Operational studies on ORS in Haryana

A community-based operational study was undertaken in selected villages of two rural community development blocks in Haryana with the following objectives:

1. to study the implementation of ORS in treatment of diarrhea;
2. to evaluate the impact of ORS on health center/hospital utilization rates;
3. to assess the utilization rates of oral rehydration therapy;
4. to determine the impact of ORS on diarrhea-related mortality; and
5. to assess child care practices in the community and among health workers responsible for providing PHC.

## Selection of study area

Fifty-nine villages from a total of 350 villages were selected randomly to serve as a monitored population. Before the study was initiated, a detailed village history and family history were recorded and a census of each village was taken. Available health facility and health manpower were documented, and a surveillance card was prepared for each child below the age of six

years.

The villages were divided into three groups. Area A, comprised of fourteen villages, served as the control area where ORS was available in the health center and in outposts, but not in each village.

In Area B, comprised of twenty-two villages, all health workers were provided with ORS packets throughout the study period. In these villages, oral rehydration packets had been available for a period extending up to three years. In Area C, consisting of twenty-three villages, health volunteers selected by the community were trained and provided with ORS packets for the treatment of diarrhea. These health volunteers were not given any salary or honorarium for this job.

### **Preparation of ORS packets**

Oral rehydration solution was prepared in bulk according to the WHO formula. It was then transported to two villages, where the village volunteers measured the mixture and placed it in plastic bags, using standard volume containers. The mixture of glucose, salt, and potassium chloride was packed in one compartment and sodium bicarbonate in the other, a procedure which has remarkably increased the shelf life of the powder. For the sake of economy, the contents of the packets were reconstituted in five hundred ml of water. The cost of one packet is forty paise (four U.S. cents).

### **Development of teaching material**

Health education materials focusing on the treatment and prevention of acute diarrheal disease in children were prepared in English and the vernacular for training health workers and volunteers. These materials included essential information and guidelines for the diagnosis of diarrhea, assessment of severity and recognition of danger signals of diarrhea, constituents and method of preparation of ORS, reconstitution of ORS and safety features, recognition and prevention of malnutrition in cases of diarrhea, chemotherapeutic drugs and symptomatic agents, and referral guidelines. This health education material was field-tested for its simplicity, clarity, and adequacy.

### **Training of field staff**

Field workers (high school educated and above) were given training in the method of surveillance, the training of health workers and volunteers, the investigation of death by verbal autopsy technique using lay reporting techniques, and the logistics of supplying ORS. These field workers then trained health workers and volunteers, providing them with health education materials and encouraging those in study Areas B and C to educate the community and

provide ORS when needed. In the control Area A, field workers were trained only in surveillance methodology. Health workers and volunteers were responsible for the treatment of diarrhea and use of ORT. Surveillance was done once a week to determine the frequency and seasonal incidence of diarrhea, number of attacks per child, and pattern of seeking treatment and outcome.

### **KAP study**

Two hundred and ten randomly selected mothers of children below six years of age (or 5% of the total population) were given a knowledge, attitudes, and practice (KAP) study. This study consisted of a pre-tested interview schedule with a combination of structured and open-ended questions. Sixty-eight women from Area A (control), seventy-two from Area B (health workers), and seventy from Area C (health volunteers) were interviewed.

In order to evaluate the impact of training and to determine training needs, the knowledge of community health workers regarding the correct use of oral rehydration solution and various aspects of management of diarrhea was assessed. In this study, thirty CHWs who were not trained at all, thirty-one who were trained according to national guidelines, thirty who were given training for less than one year, and thirty-four who were trained for more than two years were studied. A pre-tested schedule was used for investigation. To assess the accuracy of volume measured, the water measured by glass, cup, and traditional utensil used for measuring milk was compared.

### **Observations**

Diarrhea reached its peak during the months of May to August. The lowest incidence was in children below one year of age; the highest incidence was in children between one and two years of age. A total of 9,799 attacks were recorded in 5,097 children, giving an incidence of 1.92 episodes per child per year. Dehydration was recognized in only 510 episodes, with the main signs of dehydration being thirst (440 attacks), sunken eyes (112), depressed anterior fontanelle (82), and poor skin elasticity (42). None of the episodes manifested such signs of severe dehydration as poor urine output, shock, deep acidotic breathing, and poor peripheral circulation.

The pattern of utilization of health care is summarized in Table 1. In Area A, oral rehydration solution was used in only 16.9% of episodes, as compared to 71.7% in Area B and 75.6% in Area C. There was a progressive increase in each quarter of the year in the utilization rates in Area B and C, but not in Area A. In the control area, there were eight diarrhea deaths, in comparison to only two deaths in

**Table 1**  
**PATTERN OF UTILIZATION OF HEALTH CARE IN DIARRHEAL DISEASE**

	<i>Area A</i>	<i>Area B</i>	<i>Area C</i>	
1. No treatment	628	103	87	
2. Treated by village health worker/health volunteers	894	2,927	2,407	
3. Private doctor	1,188	370	460	
4. Health institution (sub center, PHC, rural dispensary hospital)	398	82	255	
Total episodes	3,108	3,482	3,209	9,799

Area B and five deaths in Area C. The mortality from diarrhea in the three areas is summarized in Table 2. The diarrhea-related mortality as a percentage of all causes and in terms of the case fatality rate was lower in Areas B and C than in Area A.

The study of the knowledge, attitude, and practice of Area A mothers found that preference for ORS was lower, the practice of using ORS less, and the practice of reducing food intake common in control Area A as compared to areas B and C (see Table 3). The preference for injections and tablets was higher in Area A as compared to Areas B and C (see Table 4). The preference for registered indigenous practitioners in the treatment of diarrhea was higher in Area A. In Area C, the main preference was for the PHC worker, while in Area B, the response was mixed (see Table 4). Considerable errors were noted in the measurement by glass or a cup, a problem overcome when the utensil used for measuring milk was employed. This problem was also overcome by measuring five hundred ml of water in a household utensil and then marking the household utensil. This practice ensured the accuracy of volume measurement in

each household at a minimal cost.

After repeated training, the CHWs could enumerate several signs of dehydration, but their recall for signs of severe dehydration was poor. The study showed that repeated training is necessary to understand the correct methods of preparing and prescribing ORS and to develop correct attitudes for the rational management of diarrhea.

### Conclusions

Diarrheal mortality is reduced by the use of oral rehydration therapy. ORT can be successfully provided at low cost through the community's existing health infrastructure. Operational aspects to be considered in its implementation include preparing ORS, training health workers and educating the community about ORT, and ensuring accuracy of volume containers. Repeated on-the-job training of health workers is necessary for the safe application of ORT.

In situations where health workers are not available, health volunteers selected by the community can be trained in the use of ORT. The utilization rate of ORT by volunteers is comparable to that of health workers.

Following the introduction of ORT, there is a

**Table 2**  
**MORTALITY FROM DIARRHEA**

<i>(c) CAUSE SPECIFIC</i>				
	<i>No. of Children</i>	<i>Total deaths in 1 year</i>	<i>Diarrhea related deaths</i>	<i>Percentage of deaths due to diarrhea</i>
A. (Control)	1,600	75	8	10.6
B. (Worker)	1,815	50	2	4.0
C. (Volunteer)	1,682	70	5	7.1

<i>(b) CASE FATALITY RATES</i>				
<i>Area</i>	<i>No. of children</i>	<i>Episode</i>	<i>Deaths</i>	<i>Case fatality per 1,000 children</i>
A. (Control)	1,600	3,108	8	2.57
B. (Worker)	1,815	3,482	2	0.57
C. (Volunteer)	1,682	3,209	5	1.55

**Table 3**  
**KAP REGARDING USE OF ORS IN THE COMMUNITY**

	<i>Area A</i> ( <i>n</i> = 68)	<i>Area B</i> ( <i>n</i> = 72)	<i>Area C</i> ( <i>n</i> = 70)
1. ORS preferred	10(13.9%)	49(68.0%)	57(81.4%)
2. ORS tried in diarrhea treatment	12(17.6%)	55(76.4%)	62(88.6%)
3. Breastfeeding should be continued	42(62.5%)	60(88.3%)	62(88.6%)
4. Food should not be restricted	5( 7.3%)	24(33.3%)	25(35.7%)

**Table 4**  
**THERAPEUTIC PREFERENCE FOR ACUTE DIARRHEA MANAGEMENT — KAP STUDY**

	<i>A(n = 68)</i>	<i>B(n = 72)</i>	<i>C(n = 70)</i>
1. ORS	10(13.9%)	49(68.0%)	57(81.4%)
2. Injections	25	3	3
3. Tablets	35	14	7
4. Mixtures	17	19	14

**CHOICE OF HEALTH WORKER/DOCTOR IN MANAGEMENT OF  
ACUTE DIARRHEA — KAP STUDY**

	<i>A(n = 68)</i>	<i>B(n = 72)</i>	<i>C(n = 70)</i>
1. Primary Health Worker	3	58	64
2. Multipurpose Worker	12	—	—
3. Registered Indigenous Medical Practitioner	62	48	19
4. Hospitalization	2	37	2

**Table 5**  
**KNOWLEDGE ABOUT VARIOUS SIGNS OF DEHYDRATION  
AMONG COMMUNITY HEALTH VOLUNTEERS**

	GROUP			
	<i>I</i> <i>n</i> = 30	<i>II</i> <i>n</i> = 31	<i>III</i> <i>n</i> = 30	<i>IV</i> <i>n</i> = 34
1. Thirst	4(13.2%)	18(58.0%)	15(50.0%)	32(94.1%)
2. Sunken eyes	2( 6.6%)	23(73.2%)	23(76.9%)	32(94.1%)
3. Dry mouth	0( 0%)	12(38.7%)	15(50.0%)	32(94.1%)
4. Poor skin elasticity	1( 3.3%)	9(29.0%)	23(76.9%)	32(94.1%)
5. Excessive crying, drowsiness	9( 0%)	0( 0%)	7(23.1%)	12(35.3%)
6. Depressed anterior fontanel	2( 6.6%)	9( 0%)	8(26.9%)	24(80.6%)
7. Anuria	0( 0%)	0( 0%)	0( 0%)	0( 0%)
8. Shock (poor circulation)	0( 0%)	0( 0%)	0( 0%)	0( 0%)



**Table 6**  
**KNOWLEDGE ABOUT USE OF ORAL REHYDRATION SOLUTION**  
**AMONGST COMMUNITY HEALTH VOLUNTEERS**

	I	II	III	IV
1. Composition of ORS	0( 0%)	2( 6.4%)	9(30.8%)	30(88.2%)
2. Reconstitution of ORS	0( 0%)	3( 9.6%)	10(34.6%)	32(94.1%)
3. Volume measured accuracy	0( 0%)	11(35.5%)	10(34.6%)	32(94.1%)
4. Quality of ORS needed	4(13.3%)	14(45.1%)	17(57.1%)	30(88.2%)
5. Methods of preparing ORS	0( 0%)	2( 6.4%)	9(30.8%)	12(35.3%)
6. Storage of ORS	0( 0%)	1( 3.2%)	15(50.0%)	30(82.3%)

favorable change in the knowledge, attitudes, and practices of the community related to management of diarrhea.

## **ORAL REDHYDRATION THERAPY IN CHILDREN WITH ACUTE DIARRHEA IN SOME PLACES OF CHINA**

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Infantile diarrhea is a severe problem all over the world. Every year, millions of children die of this disease. In China, although the mortality and morbidity of diarrhea has been lowered markedly during the past thirty years, infantile diarrhea is still very common, and we must pay more attention to its prevention and treatment. This paper describes our experiences during the past two years with the use of ORT with acute diarrhea patients.

### **Water and electrolytes disturbances in infants with diarrhea**

Diarrhea occurs most frequently in children under the age of three years. Diarrhea, along with the vomiting and loss of appetite that often accompany it, can lead to dehydration, metabolic acidosis, and hypokalemia. Acute diarrhea predominantly occurs in the following forms: (1) Isotonic dehydration is often present (see Table 1). Hypotonic dehydration may be present in patients with malnutrition. (2) The intensity of acidosis parallels the degree of dehydration. (3) Hypokalemia appears in patients with moderate or severe dehydration, especially when the course is quite long or there is malnutrition. (4) Hypocalcemia and hypomagnesemia may exist.

### **Clinical application of ORS**

Fluid replacement deserves special emphasis for infants with diarrhea. In 1971, the World Health

Organization designed a regimen of ORS which it distributed to many countries. ORT is simple, safe, economical, and effective, and results from twenty countries over the past decade have proven it useful for all types of diarrhea except those with severe dehydration. ORT gave good results in 95% of the patients for which it was utilized. The Control of Diarrhoeal Diseases Program of WHO considers its development an important achievement.

In 1981, China followed the recommendation of WHO and used ORT in Beijing and Shanghai. The use of ORT then spread to the other parts of the country. Altogether, 1,819 cases were reported from nineteen provinces, and 1,359 cases with more detailed observations were analyzed in 1982 at the National Meeting on Diarrheal Diseases in Children. The cure rate was 98.3% (see Table 2), which coincided with that reported from abroad. In 1983, another 626 cases gave similar results (see Table 3).

At the National Meeting on Diarrheal Diseases in Children, we discussed and established the following ORT procedures. We decided that the contents of ORS would be those introduced by WHO, that (based on the principles of the Chinese pharmacopeia) each molecule of glucose should carry one molecule of crystal water, and that the weight of glucose in ORS should be 22 g.

ORS should be used in diarrhea patients with mild or moderate dehydration, for deficit and maintenance therapy, utilizing the following methods:

1. For deficit therapy: fifty ml/kg for mild dehydration and eighty to one hundred ml/kg for moderate dehydration; this amount of fluid should be given within four to six hours. For maintenance therapy: ORS in quantities equal to the amount of fluid the patient lost.

2. For young children: breastfeeding and digestive foods should accompany the ORT, and water should be offered according to the condition of the baby.

3. For infants: ten to twenty ml of ORS given every five to ten minutes, as larger amounts would induce vomiting.

**Table 1**  
**TYPES OF DEHYDRATION DUE TO ACUTE INFANTILE DIARRHEA (%)**

	Cases	Hypotonic	Isotonic	Hypertonic
Shanghai (1960)	94	19.2%	78.7%	2.1%
Beijing (1982)	185	5.8%	80.8%	13.4%
Shan Xi (1982)	218	25.2%	72.1%	2.7%
Guang-Dong (1982)	193	14.5%	83.9%	1.5%
Giang-Xi (1982)	221	9.95%	82.35%	7.69%
Giang-Xi (1982)	52	3.8%	88.5%	7.7%

**Table 2**  
**CURE RATE FOR TREATMENT OF**  
**DIARRHEA WITH ORS (1982)**

	Cases	Curative Rate %
Beijing	129	97.7
Shan Xi	241	97.9
Shan Xi	254	96.9
Guang-Dong	333	90.0
Si-Chuan	78	100.0
Guang-Xi <sub>(P)</sub>	40	100.0
Guang-Xi <sub>(L)</sub>	37	97.3
Fu-Jian	63	93.1
Ho Nan	63	100.0
Niang Xia	99	100.0
Ho Bei	69	100.0
Total	1,359	98.3%

**Table 3**  
**CURATIVE RATE OF ORS (1983)**

	Cases	Curative Rate %
Nan Jing	52	90.4
Guang Dong	134	100.0
Guang Xi <sub>(N)</sub>	11	81.8
Guang Xi <sub>(M)</sub>	39	100.0
Guang Xi <sub>(P)</sub>	108	88.9
Guang Xi <sub>(L)</sub>	30	96.0
Fu Jian	60	96.6
Total	626	93.5%

4. ORS should not be given to newborns or to babies with shock, heart failure, renal failure, or other severe complications.

5. Parents should understand the ORS regime.

#### Clinical experience with ORS

Since the 1950s and 1960s, researchers have conducted a number of studies on the absorption

mechanisms of the small intestine. These studies have found that there is a co-transference between glucose and sodium (Na). The modified formula for ORS recommended by WHO in 1971 has been shown to work well with diarrhea patients. Our only reservation has been that we felt that a sodium concentration of ninety mmol/l may cause hypernatremia. Beijing Children's Hospital has reported that it is better to dilute the Na concentration to fifty to ninety mmol/l and to dilute the ORS to one-third. The ORS used in Children's Hospital of Shanghai First Medical College contains NaCl 3.1 g, KCl 1.4 g, NaHCO<sub>3</sub> 2.4 g, glucose 27.7 g. The solution concentration (mmol/l) contains Na<sup>+</sup> 81, K<sup>+</sup> 18, Cl<sup>-</sup> 71, HCO<sub>3</sub><sup>-</sup> 28, glucose 140. Applied clinically for four years in acute diarrhea with moderate dehydration, this formula has given satisfactory results.

With cases of repeated vomiting in acute diarrhea, ORT has not been found altogether successful. Small amounts of sedatives or acupuncture have sometimes reduced the vomiting, allowing for the use of ORT. ORT combined with a Chinese herbal medicine song has also helped stop the vomiting. Finally, good results have been reported when ORS has been given with a nasogastric catheter.

For the initial treatment of a baby with severe diarrhea, we have often made the baby fast to facilitate the bowel function. WHO recommends feeding a baby even when he/she has severe diarrhea. Having tried to do this in two hospitals, we believe that this treatment deserves further observation.

All reported cases of diarrhea occurred here in the fall and the winter. Rotavirus was isolated from most of them. Two studies examined the effects of antibiotics on acute diarrhea. A hospital report found no difference between the 48 patients given antibiotics and the 175 patients who were not. Another province gave ORS to one group of thirty-nine patients with ORS plus aspirin and another group of thirty-nine patients. Again, no significant difference was found.

## Discussion

Darrow first introduced ORT in 1949; Harrison reported his experiences with ORT in 1955. In China, ORT has been used clinically since 1957. Hospitals in Shanghai and Beijing have treated infants with acute diarrhea with salt, sugar, and carrot soup. In 1965, Chinese ORT (sucrose 20 g, salt 0.5 to 1 g, KCl 0.5 g, add warm water to 200 ml) was recommended and used in villages. Our feeling at that time was that ORT could be used in patients with mild dehydration and without vomiting, but that ORT was not effective in patients with severe diarrhea. This failure of ORT to work successfully may have been due to the fact that we did not mix ORS in the proper proportions.

Our experience of the past two years with the use of the WHO formula for ORS has shown that oral fluid intake can replace parenteral therapy. We have found that ORT is effective in cases of acute diarrhea with various causes, including rotavirus, a few strains of EPEC, salmonella, and shigella. In a study in one hospital where stool glucose and stool sodium were measured before and after ORT, the stool glucose and stool sodium returned to normal after rehydration. One research group conducting experiments with rabbits found that ORS was more easily absorbed in the small intestine than glucose.

Acute diarrhea is a common disease during childhood. ORT is a simple and acceptable treatment for diarrheal dehydration. During the past two years, ORS has been widely distributed in some places of China, but more work will have to be done to obtain accurate data on its use. We hope in the future to use a kind of ORS more suitable to traditional Chinese custom, such as a modified rice soup, so that ORT will be more easily accepted in the countryside.

## REFERENCES

1. "Clinical Management of Acute Diarrhea." Report of a Scientific Working Group.: New Delhi: WHO Diarrhoeal Disease Control Programme, 30 October-2 November 1978.
2. Pan American Health Organization, et al. *Oral Rehydration Therapy: An Annotated Bibliography*. Collaborative project, 1980.
3. Mahalanabis, D. "Rehydration Therapy in Diarrhea." In Tord Holm and Jon Holmgren, eds., *Acute Enteric Infections in Children, New Prospects for Treatment and Prevention*. Chapter 16, p. 303. Elsevier, North-Holland: Michael E. Merson and Roland Mollby, 1981.
4. *Chinese Journal of Pediatrics* 20(3) (1982):181.
5. Proceedings of National Meeting on Diarrheal Diseases in Children in China, 1982.
6. Proceedings of South China Meeting on Diarrheal Diseases in Children, 1983.
7. Meeuwisse, G. "High sugar worse than high sodium in oral rehydration solutions." *Acta Paediatrica Scand.* 72 (1983):161-66.
8. Saberi, M. S., and Mehdi, A. "Oral hydration of diarrhoeal dehydration, comparison of high and low sodium concentration in rehydration solutions." *Acta Paediatrica Scand.* 72 (1983):167-70.
9. Finberg, L., et al. *Oral rehydration for diarrhea*.
10. Children's Hospital affiliated to Shanghai First Medical College. "Infantile diarrhoea and rehydration therapy." *Chinese Journal of Pediatrics* 11(3) (1960):223.
11. Children's Hospital affiliated to Shanghai First Medical College. "Dialogue of rehydration therapy in children (2): oral rehydration." *Chinese Journal of Pediatrics* 15(3) (1966):190.
12. Children's Hospital affiliated to Shanghai First Medical College. "Oral rehydration therapy." *Pediatric Clinical Manual*. Third edition. Beijing: People's Health Publisher, 1982.

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SESSION FIVE  
*Implementation of ORT  
Programs*

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*Panel Presentations* (L to R): Dr. Bradley Sack, Professor of Medicine, Johns Hopkins University, USA; Dr. D. Pizarro, Children's Hospital, Costa Rica; Dr. D. Nalin, Merck, Sharpe and Dhome Pharmaceutical Company, USA; Dr. L. Finberg, Professor, State University of New York, USA

Papers presented in Session Five deal with issues related to the implementation of ORT programs. They examine the relationship of national policies to program policies, the need for linkages with other health and nonhealth programs, the place of logistics in public health planning, and the options for ORS production and distribution.

Dr. Donald Shepard describes procedures for determining the cost effectiveness of ORT activities. After defining cost effectiveness, Shepard suggests the varied uses of cost effectiveness analysis and explains how such an analysis can be determined.

According to Mr. Robert Hogan, a nation's health policies have a positive or negative effect

on the likelihood that oral rehydration therapy will be implemented successfully. Hogan describes five policies currently in existence in many countries that enhance the acceptance of oral rehydration therapy and suggests two policies which ought to be implemented if the potential of oral rehydration therapy is to be fully realized.

Arguing for a combined approach to diarrhea disease control, Dr. Susan Cole-King says that oral rehydration services, education about ORT, and distribution of ORS should be linked with other health and nonhealth activities. She explains that epidemiological evidence suggests that diarrhea causality is not a chain, but a net,

and therefore must be approached from a number of points.

Dr. James Heiby describes a model delivery system in which nonprofessional community health workers provide a limited range of services and are supervised by field health workers. He recommends a format for field supervisors to use in conducting supervision and describes a desirable role for second-level supervisors.

The concept of selective primary health care is examined by Dr. John Briscoe in his analysis of the relationship between a community water supply and health. Using figures set forward in a major article about selective primary health care (SPHC), Briscoe assesses the accuracy of these numbers and the conclusions drawn from them. He compares successful and unsuccessful PHC national and pilot programs and looks at the relationship of national commitment to their degree of success.

Logistic decisions in the implementation of ORT programs are discussed by Dr. Ronald O'Connor. Too often programs rely too heavily on "one critical path," O'Connor explains, and give logistics low priority. Instead, comprehensive delivery programs are needed for services and supplies, he states.

One such comprehensive program is described by Dr. Jesus Azurin. During the past two years, the Philippines Ministry of Health has instituted primary health care nationwide and has implemented an administrative reorganization which integrates health services. In order to make the best use of hospitals, a system of hierarchy for referrals has been developed, with serious medical problems referred to hospitals and lesser health needs served elsewhere.

The experience to date with ORS production is reviewed by Dr. Hans Faust. Production methods and factors that affect these methods, such as choice of formula, stability of ingredients, and presentation of packets, are discussed. Local production of ORS packets can substantially reduce cost and enhance self-reliance.

Viewing oral rehydration solution in the context of the Essential Drugs Program, Mr. Roger Goodall argues that oral rehydration therapy should be an integral part of Essential Drug policy. Goodall assesses the relative advantages and disadvantages of alternate approaches to the administration and use of ORT and describes various options for the distribution of supplies.

Specific advice about how to improve the acceptance, availability, and correct use of oral rehydration therapy is given by Dr. Gordon Perkin. Perkin recommends the use of pictorial instructional pamphlets, the identification of a readily recognized and widely used local container, pictorial instructions on ORS packets for mixing the solution, and the availability of a variety of dosage forms of ORS.

## PROCEDURES FOR ASSESSING THE COST EFFECTIVENESS OF A DIARRHEAL DISEASE CONTROL PROGRAM BASED ON ORAL REHYDRATION THERAPY

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Oral rehydration therapy is an innovation with the potential of significantly lowering the number of childhood deaths in a developing country at an affordable cost. This paper briefly describes the procedures for determining the cost effectiveness of ORT activities. The procedures are described more fully in a manual being written with Dr. Richard A. Cash for the Diarrhoeal Diseases Control Program of the World Health Organization (Geneva, Switzerland) entitled, "Manual for Determining the Cost Effectiveness of Oral Rehydration Therapy."

### Definition of cost effectiveness

Cost effectiveness (CE) is a ratio that relates the cost of a program to the health benefits that it generates. It is defined by:

$$CE = \frac{\text{cost of activities}}{\text{health effects of activities}}$$

For ORT activities, the cost is the difference between cost of treating diarrheal diseases in a population before instituting ORT activities and the corresponding cost after ORT activities. Health effects are the differences in the number of diarrhea-associated deaths in this area before and after ORT activities. Thus, the main measure of cost effectiveness is cost per death averted. The lower this ratio, the better are the ORT activities being studied. That is, the more health effects are produced per unit of expenditure.

### Uses of a CE analysis

There are several important uses of a CE analysis of an ORT program. The first, and often the most important, is a conceptual use: structuring the content, required resources, and expected impact of ORT activities. The second use is for planning: the CE analysis allows a manager to compare investments in ORT activities with those in alternative health programs, either curative or preventive. For example, ORT activities can be compared with other primary health care services, such as immunizations. Third, a strategic use of CE analysis allows a manager to compare

alternative approaches to delivering ORT — for example, home-based programs versus centers, or packets versus spoons. Fourth, such analyses allow managers to forecast the effects of modifications to ORT activities on cost and on health impact. Thus, alternative modifications can be considered and recommendations developed. Fifth, a CE analysis allows a manager to evaluate the achievements of a current or past set of ORT activities.

### Required information

*Cost data.* In order to estimate the cost of ORT activities, we need to estimate the amount and unit cost of the resources used in producing and delivering ORT. Most important are personnel who deliver ORT services or educate users about

it. Here the "unit cost" is the salary of the worker involved. The number of such workers and their fraction of time for ORT activities (or control of diarrheal diseases more generally) are the required quantities. The unit cost and quantities of supplies must be estimated. Finally, indirect costs are estimated, such as supervision; maintenance of facilities and equipment; use of facilities, such as health centers; and other costs. This type of analysis gives "fully allocated costs" that reflect not only new costs of the ORT activities, but also the prorated share of existing resources used for ORT.

*Data required to estimate health effects.* Two main measures of health effects are proposed: estimated deaths averted and hospitalizations averted. The ideal set of data for each would be a

Table 1

### HOUSEHOLD SURVEY FORM ON INCIDENCE AND TREATMENT OF DIARRHEA

Cluster Number _____		Village _____		Cluster _____		Interviewer _____		Date _____				
Household <sup>a</sup> (1)	Name of each Child less than 5 (2)	Approx. age (yrs) (3)	Diarrhea <sup>c</sup>		Type of Hydration Treatment					Other Drug Treatment		
			No <sup>d</sup> (4)	Yes (5)	No (6)	Yes (7)	Packets <sup>e</sup> (8)	Home Mixture <sup>e</sup> (9)	Facility ORS <sup>f</sup> (10)	IV (11)	No (12)	Yes (13)

<sup>a</sup>Identify household with name and house number (if possible).

<sup>b</sup>Include only children less than 5 years of age.

<sup>c</sup>Did that child have diarrhea within the last 15 days? (Diarrhea is 3 or more loose or watery stools within 24 hours.)

<sup>d</sup>Check Yes or No. If "No" is checked, skip remaining items for that child and go on to next child less than 5 years.

<sup>e</sup>Number of containers or packets of ORT given to child. Indicate volume of packet or home mix container. If quantity not known, simply check type.

<sup>f</sup>ORS prepared and given at a health facility.

<sup>g</sup>Indicate abbreviation for type of drug treatment. The interview supervisor should develop a list of commonly used drugs and combinations including examples for each drug. The following are some examples of drugs: sulfa, clioquinol, kaolin or kapectate, neomycin, paragoric.

Table 2

### COST-EFFECTIVENESS (CE) OF SELECTED HEALTH INTERVENTIONS IN DEVELOPING COUNTRIES

Rank by Cost Effectiveness	Intervention	Annual Cost per 100,000 Pop.	Annual Deaths Averted per 100,000 Pop.	CE (Cost Per Death Averted)
1	Home-Distributed Oral Rehydration Therapy—Egypt	\$ 7,000	69	\$ 100
2	Immunization (Indonesia) EPI	\$ 5,000	35	\$ 130
3	Oral Rehydration Program (Zaire)*	\$ 18,000	75	\$ 240
4	DDT Spraying Against Malaria	\$200,000	800	\$ 250
5	Measles Vaccination (Ivory Coast)	\$ 30,000	63	\$ 479
6	Pilot Projects in Primary Health Care	\$400,000	303	\$1,320

\*Projection

large field trial with direct monitoring of mortality and hospitalizations. Unfortunately, the assessment of deaths in this matter would require surveillance of thousands of children. This is not feasible for most country or regional programs. As an alternative, deaths averted can be estimated through an epidemiologic model.

*Epidemiologic model.* The model requires a limited field survey to collect data on certain items and combines these data with information from literature on other items. The most important item assessed through the survey is the rate of use of ORT: in what proportion of diarrheal cases of children less than five years ORT is used. This is assessed through a cluster survey of 1,050 children. Access is determined by knowing the location of health care facilities and providers in relationship to the population. Data from the literature are used to assess the incidence of diarrheal disease, its case-fatality rate in the absence of any rehydration therapy, and the efficacy of ORT (the percentage reduction in case-fatality rate of ORT under ideal conditions). In this analysis, we take the efficacy of ORT to be 67%. The efficacy is not 100% because ORT alone may not be sufficient for chronic diarrhea, shigella, dysentery, and certain other forms of nonacute dehydrating diarrhea.

Under the epidemiologic model, we estimate effectiveness (the value of ORT in averting death in a person offered ORT under typical field conditions) as the efficacy of ORT multiplied by its rate of use. We estimate the health impact of ORT (the fraction of diarrhea-associated deaths averted in a given geographic area) as the product of the effectiveness times the access (proportion of persons living within a prescribed time or distance of people or facilities where ORT is available). Table 1 is a survey form that can be used to determine the rate of use of ORT.

The advantage of this epidemiologic model is that the number of deaths averted can be estimated through a survey that can be conducted in a matter of months, with the relatively small sample size of 1,050 children. Direct assessment of mortality would require many times this number of children and one or two years for assessment of deaths. This model can be considered a quick approximation for determining cost effectiveness of ORT activities. Managers interested in a more definite analysis are encouraged to conduct a direct field assessment. Such an assessment will determine whether the assumptions of the model are valid in the situation at hand.

### **Interpretation of CE ratios**

The CE ratio derived by this model can be compared with those of other health interventions. Table 2 shows such cost effectiveness ratios for other selected primary health care interventions.

One example of an ORT activity, a projection for the proposed national program for Zaire by Robert Hogan of the World Health Organization, suggests that the cost per death averted would be on the order of \$240. A program in Egypt cost only \$100 per death averted, although this program did not count the cost of the existing resources that it used. The author expects to be involved in a field trial of these procedures. If the results confirm the cost effectiveness ratios gathered or projected from existing programs, we will confirm that ORT is indeed a highly cost effective health intervention.

## **NATIONAL HEALTH POLICY AND ORAL REHYDRATION THERAPY**

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The advisability of oral rehydration therapy in the treatment of diarrhea is no longer a controversial issue in many places. When compared with other competitive uses of health resources, the potential cost effectiveness of ORT, including the complete formula ORS, seems equally certain. Studies such as those described by Dr. Shepard document the economic advantages that this therapy brings to particular countries. These studies should also serve to influence the health policies and goals of countries.

Nearly all countries already have health policies and goals, however, and these can affect, either favorably or unfavorably, the likelihood that the advantages of ORT will actually be realized. I would like to describe briefly five policies, currently already accepted by large numbers of countries, which seem to me to imply the rapid acceptance and large-scale use of ORT. Next, I would like to mention two policy decisions which need to be made if ORT is to bring about the economic and social benefits which we all feel it promises. Third, I would like to indicate the elements which the World Health Organization feels should be included in a country's plan of operations.

Most developing countries, in their planning documents, in their presentations at the World Health Assembly, and elsewhere, have adopted the following policies, among others: (a) emphasis on primary health care, (b) priority attention to child health, (c) greater community involvement in determining health goals and plans and in implementing health programs, (d) self-sufficiency, and (e) appropriate technology. Rather than dismiss these as empty words or slogans, I

feel these can be carefully enough defined so as to be meaningful policies, that is, guides to action.

If a country chooses to pursue primary health care as a matter of *policy*, I take it that this means, among other things, that they have decided that health services should be given at the lowest organizational level possible. WHO and UNICEF, in their recently issued joint statement have suggested that ORT to *prevent* dehydration be given by family members themselves and that oral rehydration solution for the *treatment* of dehydration be given at first-level facilities. A policy to emphasize primary health care in a country with a serious diarrhea problem implies that ORT will be a part of such care.

Many countries have decided that giving priority to the health problems of children is a desirable policy. While one might question whether such a priority, together with emphasis on the health of mothers, is advisable if it implies a certain neglect of the health of working-age men, this policy is widely accepted and implies that attention be given to those conditions which most seriously affect children. That diarrhea is a leading cause of childhood morbidity in *every* developing country of the world, and in most is the first or second cause of childhood mortality, suggests that an emphasis on child health means greater emphasis on diarrheal disease control and ORT.

If a country has decided that the priorities and content of its health programs will be decided in consultation with individual communities, then the fact that ORT can be introduced into *all* communities, even those with the least developed formal health structures, makes it a particularly attractive vehicle for the implementation of such a policy.

The policy of "self-sufficiency" involves primarily economic considerations. It says, "We will offer those health services which can be paid for with our own resources." If Dr. Shepard and others are correct that ORT is an excellent choice from an economic point of view, then its extensive use is clearly consistent with a policy of self-sufficiency.

"Appropriate technology" can be defined as analogous to self-sufficiency, but without directly involving cost considerations. A country which has a policy of emphasizing appropriate technology says, "We will offer those health services that can be effectively delivered with our country's technological capability." Both in terms of the production of ORS and, most importantly, in terms of the technology required to *deliver* ORT, it may well be a country's most attractive choice if the country is committed to a policy of appropriate technology.

Since so many countries already have these five policies, all of which seem to be highly con-

sistent with the extensive use of ORT, why has its use not been more widespread? There are many reasons, but one may be that countries need to consider adopting a few additional policies. (Policies are clearly not the whole problem; implementation is probably more important. To the extent that policies determine what is to be implemented, however, they can be important.) I would like to suggest two broad policies which may be worth consideration: (1) emphasis on coverage, and (2) prioritization of health services in terms of their potential contribution to decreasing morbidity and mortality.

*Coverage.* A policy or commitment to offer services to as high a percentage as possible of the susceptible population needing that service would do at least two things. First, it would establish a long-term goal from which specific targets could be rationally determined. Second, it would facilitate subsequent evaluation of the extent to which such targets have been achieved.

*Prioritization.* If it is a country's policy to give priority attention to those conditions which are the leading causes of morbidity and mortality and those conditions for which feasible control programs can best be developed, then programs such as diarrheal disease control and expanding immunization and interventions such as ORT could be given greater emphasis. The determination of priorities is obviously a decision for individual countries to make. The recognition that the purpose of health programs is to reduce morbidity and mortality and that a rational process can be followed in assigning priorities could lead to acceptance of the prioritization process as a critical national health policy.

Once countries have established a sound policy basis, WHO has suggested that a well-formulated plan of operations is an essential step in the development of a program.<sup>1</sup> Such plans will often be part of a more general planning document including a variety of primary health care interventions, or they may constitute a separate document. In either case, we believe that a well-formulated plan of operations will include the following elements:

1. *Objectives and targets.* What will the program accomplish in terms of reducing diarrhea mortality and morbidity? How many children will have access to oral rehydration solution? How many childhood cases of diarrhea will actually be treated with ORS? To what extent will other services be available and used? (Targets should be specific, quantified, measurable, and realistic.)

2. *Strategies.* How much emphasis will be given to each of the four strategies recommended by WHO: case management, maternal and child care practices, environmental health practices, and epidemic control? Which specific aspect of each strategy will be emphasized (for example,



"breastfeeding" in maternal and child health)?

3. *Delivery systems and personnel.* How will services actually be delivered? What will be the role of each of the potential providers of services? How will the providers be trained (who, when, where, what, by whom)?

4. *Activities.* For each strategy, what are the specific activities that health providers will need to carry out? What will be the output of each of these activities? (For example, in carrying out the case management strategy, health facility staff will need ORS and production facility staff will have to produce ORS. The output for receipt of ORS would be "x" packets for each health facility, and the output for production would be "y" packets per year.) What are the times and sequences involved in carrying out all the activities?

5. *Evaluation.* How can data from routine information systems, sentinel information systems, and special studies be used to assess the achievements of program targets? In what way will activities be monitored?

6. *Budget.* What will be the annual cost of the program? To what extent are the necessary resources available from the national budget? What other sources of funding can be developed?

As Dr. Merson noted, fifty-five countries have thus far developed well-formulated plans. We hope this number will double by 1989.

Sound policies and well-formulated plans in themselves are obviously not enough. They need to be implemented and then evaluated. But if they are not *sufficient*, we feel they are *essential* conditions for the successful realization of the dramatic potential offered by oral rehydration therapy.

## NOTES

1. A more thorough description of WHO's recommendations for planning is given in the "Manual on the Planning and Evaluation of National Diarrhoeal Diseases Control Programs."

## ORAL REHYDRATION THERAPY AND ITS LINKAGES WITH HEALTH AND OTHER PROGRAMS

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### Introduction

Diarrhea is only one component, albeit an important one, in the complex web of childhood ill-

ness. Furthermore, the prevention of mortality from diarrhea by the use of oral rehydration therapy is only a first step in the strategy of dealing with the problem of diarrhea — the emergency operation, as it were. The fact that ORT is simple, feasible, and effective should not blind us to the wider problems of diarrhea control, nor cause us to overestimate its impact on child health and mortality, if implemented alone, out of context of other programs affecting health.

### Why link ORT programs?

There are good epidemiological, organizational, and logistical arguments for linking ORT with other programs. First, let me deal with the epidemiological reasons.

There have been several studies and many analyses from macro data on the causes of infant and young child deaths in different countries and regions.<sup>1</sup> While there is much debate about the priority causal factors, there is general agreement on the following:

—Most children die of multiple causes. This has been aptly described by Mosley as "The Road to Death."<sup>2</sup>

—Diarrheal diseases and nutrition are inextricably linked as major causal factors contributing to childhood mortality.

—Differences exist between countries and within countries, although in the poorest socioeconomic groups there are probably no more than five to six conditions (acute respiratory infection, diarrhea, malnutrition, measles, malaria, and accidents) which account for 80% of child deaths (excluding neonatal deaths).

—Approximately 40% to 50% of infant deaths occur in the neonatal period and are not associated with diarrhea at all.

—Nonhealth sector interventions play a significant role, the most important of which is female education.<sup>3</sup>

The linkages between malnutrition and diarrhea have been so well documented that they hardly need elaboration. It was shown that use of ORT improved nutritional status in the Philippines, Egypt, and Turkey.<sup>4</sup> Similarly, it was shown in Colombia that nutrition programs reduced the incidence of diarrhea.<sup>5</sup> Current research from West Africa suggests that less than 10% of child deaths are caused by acute diarrhea, deaths which could be prevented by ORT, whereas 30% of deaths are due to chronic diarrhea and malnutrition. This study also reports that 25% of children have diarrhea for more than 25% of the time.<sup>6</sup> Preliminary findings from Haiti suggest that while diarrhea accounted for two-thirds of the mortality, the prevalence of severe third-degree malnutrition was 2%, and two-thirds of the diarrheal deaths occurred in these severely malnourished children.<sup>7</sup>

Diarrhea is also associated with other infec-

tions, notably measles. In infants, diarrhea can be associated with malaria and almost any infection, such as the very common acute respiratory infections. But it is the multiple synergisms between different diseases, between the causal factors which contribute to the diseases, and the interventions themselves which argue most cogently for linked strategies. In the Narangwal study, the greatest impact on health was observed with combined nutrition and health services, where mothers and children were cared for as one unit.<sup>8</sup>

What I wish to emphasize here is the obvious. Epidemiological evidence suggests that the model with which we are dealing is not so much a chain of causations, where a break in one link alone can be dramatic, as a net or a web. It is only if we can cut the net in a number of different places simultaneously that we can effect change in the situation.

### **Managerial and logistic arguments for program linkage**

This raises all the old issues of vertical versus integrated programs about which we are still arguing after thirty years. The debates on selective primary health care, cost effectiveness, and efficiency are particularly relevant in the context of ORT.

The arguments against integration revolve, on the one hand, around issues of ineffectiveness, inefficiency, poor management, and control, and, on the other, the poor quality and low coverage of existing health infrastructure in most countries. Many vertical programs have been justified by the argument that a single concentrated effort is needed which can be more effective initially and which can be integrated later. Also, the argument goes, we cannot or should not wait for the PHC infrastructure to be established to reach the whole population when feasible and low-cost technologies are available now.

Experience has shown that the only justification for the intensive concentrated effort is if there is a real possibility of eradication. Malaria, yaws in West Africa, immunization campaigns, and family planning programs have had millions of dollars poured into them, often larger than the total health budgets of the countries. In Pakistan, for example, approximately one-third of a district health budget is currently spent on the malaria program. Elaborate organizational structures have been set up to supervise, support, and "manage" these programs. We have seen how many countries with vertical disease control programs which were initially successful have had a resurgence of the disease because of the lack of infrastructure to sustain and maintain them after the so-called "attack" phase.

Experience has also shown that there are difficulties in integrating programs which have ini-

tially been set up separately. Competitiveness, bureaucratic power struggles, health workers' attitudes, and reward systems all militate against integration. It was found in India, for example, that field workers from special programs were more resistant to taking on expanded activities than workers from more comprehensive programs.<sup>9</sup> In many countries, a number of unipurpose malaria workers are attached to health centers, but there is strong resistance to the idea that they take on other duties when visiting villages.

Vertical programs often become very powerful and actually drain resources from existing programs. In India, the Maternal and Child Health Services were virtually destroyed when the vertical Family Planning Programs were started in the 1960s. Even the issues of phasing and progressively developing programs have to be examined carefully. We are not operating in a vacuum; most countries, with the possible exception of those which have recently undergone revolution, already have complex health systems and programs. Almost all program areas today claim to be "spearheading" primary health care (for example, water and sanitation, the Expanded Program in Immunization [EPI], diarrheal diseases, family planning, etc.). To support this, there is some good evidence that community involvement is more effective when the initial program thrust, such as a water supply program,<sup>10</sup> meets felt needs. However, this principle cannot necessarily be applied to the health system where, in most countries, we already see organizational structures and programs competing for scarce resources. Diarrheal disease control, as a relative newcomer on the scene, should ensure that it does not fall into this trap — an especially tempting one, in view of the successes documented from small-scale, intensively supported programs which could probably only be successfully replicated on a national scale by a well-managed, resourceful, and powerful vertical program.

The argument that we cannot wait for PHC can be dealt with quite simply. We are not "waiting" for PHC — we (and I speak collectively for countries and those who are supporting them) are actively developing PHC programs now. I believe there has been tremendous progress in the past five years. Of course, there are problems and these need to be addressed. One of these is overload — too much is being expected and demanded of community health workers in particular, who are often only part-time volunteers. The need to establish priorities is clear, but the initial package should be related to the local epidemiology, felt needs, and resources, and should be locally determined. Diarrheal disease will inevitably be identified as one priority to be addressed in a PHC program.

The other problem is inadequate management. If as much attention were to be paid to improving the management of PHC at the local, intermediate, and national level as is paid to vertical programs, and if the resources and glamour which are attached to vertical programs were given to PHC development, the "not waiting for" argument would be irrelevant because PHC would be accelerated, and with it, the implementation of priority programs. The problem, of course, is that PHC management requires different skills, attitudes, and approaches which are not as yet well understood, but which differ in many respects from those needed to manage vertical programs. Also, the process whereby such skills are acquired is even less well understood. The marriage of the epidemiological and public health disciplines is, I believe, one of the more urgent issues in PHC today.

Even in the short term, how effective can single disease programs actually be in achieving an impact on health? We are not dealing with diseases, but people. Single-disease programs are generally unacceptable to families and communities. If a health worker visits a home, or a mother brings her child, the child's whole health problem needs to be solved. The mother cannot understand why only a part of the problem can be dealt with and the rest has to be referred to somewhere else. Besides, it is inconvenient to move from health worker to health worker, or from one clinic to another. This is one reason why EPI programs, for example, do not achieve desired coverage. A woman attending an antenatal clinic is unlikely to go somewhere else for tetanus immunization; or a mother who brings her child to a child clinic with a temperature is told to take the child to one clinic for weighing and nutrition education, another for treatment, and to bring the child back another time for the immunization. She will not. The very use of the word "programs" for these different activities and elements is misleading as it suggests that they can or should have a separate identity — an organizational unit of activity requiring separate strategies, staffing, supplies, logistics, etc. It is the technologies that are different, but these are the priority tasks of PHC, and any health program for children in particular must include them.

Lastly, most of the successful ORT projects are study/research projects which, even though covering a relatively large population, nevertheless have a high level of supervision and monitoring. How replicable are these in national programs if implemented as a vertical program?

### **Implementation aspects — problems and opportunities**

It is as important to look at the reasons for success or failure as at the successes or failures

themselves. Unfortunately, the failures tend not to be published, although a few have been, for example, the Menoufia project in Egypt and the Bohol project in the Philippines, and others.<sup>12</sup>

The most evident obstacles to implementation in field experience thus far have been:

1. lack of infrastructure through which oral rehydration programs can be implemented;
2. oral rehydration ultimately depends on changes in life style and patterns of child care in the home. To maintain such activities requires continuing motivational programs rather than simply a single promotional effort or campaign;
3. lack of referral arrangements for children who do not respond to home treatment by mothers. Such arrangements are needed to maintain credibility;
4. negative attitudes of health workers, who place greater priority on more technologically complex interventions; and
5. vested interests in the profits from pharmaceuticals and control over medical care in the private sector.

In the Menoufia project, the main reason for failure was identified as inadequate education. Proper use of ORT requires reinforcement over time. One visit is clearly not enough. In Narangwal, it was found that only when an intensive training program for supervisors, village-level workers, and mothers was introduced into the existing, relatively well managed PHC program was any impact achieved.<sup>13</sup> In the Bangladesh Rural Advancement Committee (BRAC) Program, extensive home visits were found to be necessary. In the successful Egypt study, four to six periodic home visits were made by nurses from the health facility. This goes well beyond simply providing information; the need to motivate and change behavior has to be accompanied by demonstration and even practice under supervision. Health and hygiene and nutrition education also play a critical role.

In developing program linkages, it is perhaps useful to distinguish between provision of service, information dissemination, and distribution of supplies. These can be combined programatically, but they need not be. A variety of different approaches and channels can be used for each program component.

*Service delivery.* Clearly, it is neither economically nor managerially feasible to establish a service network for ORT alone. It is cheaper, too, if these services are provided by health workers already in touch with the target population regularly, if supply and logistic systems can be shared, and if supervision and referral services are combined. The PHC approach offers the most viable opportunity for reaching families in homes regularly. It can also effectively combine priority services. In one of the documented "failed" projects in the Philippines,<sup>14</sup> where a

package of selected PHC interventions including ORT was provided, the author argues that the project was not successful in reducing mortality because it did not address itself to the major cause of mortality: acute respiratory diseases. Also, too little attention was given to essential curative services, especially antibiotics.

Community members, preferably female community health workers, can visit homes regularly and can combine such visits with advice and assistance on general priority concerns. The kind of CHW we more often hear about, however, is one who sits in a community-built "clinic" or house and waits for the sick to report to him (it is often a male), and who then goes to "lecture to" a village meeting about latrines! The traditional birth attendant is another viable community agent who has been used effectively in ORT programs. Here, she combines the role of maternal care with a few key child health activities. A PHC program which emphasizes maternal and child health care is the most likely to result in improved community health.

The effectiveness of any program using community workers is determined by the quality and frequency of supervision from the outside agency — the health system or other supporting organization. Few countries can afford to have different supervisors for different program components, and it is obviously appropriate to link ORT with any viable community-based program which provides personal rather than environmental services. The ideal is an MCH-focused PHC program which is in contact on a personal level with the target group of mothers and children. It is important, however, to recognize that it is the lower socioeconomic groups we are attempting to reach, and these are the most difficult. This is why a community-based, domiciliary approach, which actively seeks out vulnerable families and attempts a total coverage using large numbers of community volunteers as part-time workers, is likely to be the most effective approach for delivering priority primary maternal and child care services.

The problems of combining ORT with water programs is that they are usually not structured to provide personal services and may not have the credibility or capacity to advise on nutrition and other aspects of child health. If a network to do this is established, it automatically becomes a "PHC Program" by definition, as indeed has happened in a number of projects. Collective community involvement often begins with the water project, but later this leads to other needs being identified and community workers being selected and trained for a variety of personal service tasks.

It is inconceivable that an ORT program could be implemented without dealing with nutrition components. The value of linking ORT with

child growth monitoring is that mothers (and health workers) come to see the relationship between growth, health, nutrition, and diarrhea. This is especially valuable where episodes of illnesses are marked directly on the growth chart above the curve, not somewhere else on the back or on another form. Mothers can be taught to do this themselves by putting a symbol above the month whenever an episode of diarrhea occurs. This, incidentally, provides a good method for monitoring the frequency of diarrheal attacks as well as their impact on nutritional status. Advice on ORT as well as nutrition, supplies, and/or food supplements needs, of course, to be provided as an integral part of a nutritional surveillance program.

Immunizations have also been identified as a high priority component of PHC. In many countries, these are organized and managed separately from MCH care, although peripheral multipurpose workers may carry them out. More often, a vaccinator goes to a village at periodic intervals. It is difficult to see how such a program could be integrated with ORT unless it is a part of the MCH program. However, periodic visits to villages can be used for distribution of supplies, for supervision and support to a depot holder or village health workers, and for identifying the names of children requiring immunization within the context of the overall PHC services. Lessons learned from the EPI program evaluations suggest that, in most situations, integration with MCH services has been a more effective means of achieving coverage. Also, family planning programs have proved to be successful for service delivery, primarily because of the extensive outreach network for supply distribution.<sup>14</sup>

Most countries organizationally link diarrheal diseases control programs with communicable disease control programs. However, these latter departments were set up in the 1950s and 1960s primarily to deal with the vertical campaigns. While they do have large numbers of field workers, they tend to work less on a one-to-one personal service level than as an environmental or mass approach in applying a technology. Field workers, who are not usually residents of the community, contact community leaders and carry out tasks, such as spraying or contact tracing for communicable diseases, or mass health surveys or vaccination. The attitudes and training of senior and mid-level managers and field workers is different from the PHC-oriented regular service delivery approach. When an episode of diarrhea occurs, because of the need for continuous and regular interactions between families and health workers and the need for the latter to be residents of the community, ORT activities fit more appropriately with the MCH/PHC program approaches than with those nor-

mally undertaken by itinerant or peripatetic workers of communicable disease control programs.

*Information dissemination.* When programs are combined, opportunities exist to inform and motivate on other topics. For example, a child is brought to a clinic for immunization. At the clinic, the mother sees a group clustered around a nurse demonstrating something with beer bottles and powders. Her curiosity is aroused and she joins the group.

Apart from the service delivery channels, which are probably the most important means of information dissemination, the rapid development in the use of mass media in recent years provides new opportunities for the promotion of ORT. Educational messages on ORT must be combined with nutrition advice. ORT information can also be linked to the promotion of breastfeeding campaigns and with some simple hygiene messages, whether in mass communication or through service delivery channels. The information needs to be simple, short, and clearly understood by illiterates. The BRAC approach — standardization of the message into ten basic points which everyone at all levels can memorize and about which they can inform others — seems a good one, one which avoids conflicting and confusing messages.<sup>15</sup>

The topic of education of the public is dealt with in another conference session, but suffice it to say here that there are many communication channels which can be exploited. Local transport is a relatively underdeveloped communication method for health information. An arresting poster in a bus (which people have time to read) could trigger a lively discussion. Information dissemination can take place through political meetings, religious groups, national social organizations such as women's movements, trade unions — the possibilities are legion. The communication aspects of ORT can be linked to almost anything! The danger lies in restricting information dissemination to only one program delivery system.

Among the more important target groups for information dissemination and motivation are health and allied professions, especially pharmacists. Journals, in-service training programs, and professional meetings provide opportunities for ORT promotion to these groups.

*Distribution of supplies.* It is in the area of distribution of supplies, a topic dealt with extensively in another conference session, that great opportunities for program linkage occur. The most obvious example is with family planning. Community-based distribution programs have been developed which rely on a community-level individual with minimal training who acts as a *distribution depot* as well as a source of information. She/he may or may not be expected to

do other tasks comparable to a CHW, but may simply be a source of supply and accompanying information. Over seventy family planning, community-based distribution programs have been set up around the world, and many of these have expanded to distribute other supplies and information.<sup>16</sup> A supervisory support network is established to ensure regular supplies and to monitor their distribution and, hopefully, their effectiveness or impact on the community.

These kinds of programs can be started where there is, as yet, no PHC program and can be expanded to include other activities at a later date. Other kinds of health-related supplies can be added to family planning programs, which are probably the most developed community-based distribution programs. The criteria for the type of supplies which can be distributed in this way are those which require only minimal training to distribute, which are low cost and effective for priority health problems, and which are relatively safe and stable to deliver and store in homes. These include ORS, iron and folate for pregnant women, chloroquin for malaria treatment, and treatment for intestinal parasites. The most successful community-based distribution programs are those run by private voluntary organizations which use social marketing techniques.

Although the distribution of ORT and contraceptives through commercial channels has considerable potential, experience with this so far has been mixed. Other activities are apparently needed, such as house-to-house communication and demonstrations, as discussed above. Social marketing techniques are also necessary in order to ensure a level of demand which is commercially viable. The support of the health professions is clearly a crucial factor for success in all programs, but particularly where commercial channels are used. The credibility, demand, and profitability of the product are considerably influenced by the health professionals.

### **Nonhealth programs and ORT**

Finally, there are the nonhealth programs to which ORT can be linked. Apart from the media, the primary school system is the most obvious candidate to be considered in any major national effort which aims at behavior change. In Indonesia, school children were taught in five half-hour sessions why and how to give ORT. When these lessons were evaluated, three-fourths of the families knew how to prepare solutions and recognized the need for them.<sup>17</sup> In the village of Ajoya in Mexico, children conducted a "diarrhea survey," linking the breastfeeding of younger siblings with diarrhea. Disturbed by the result of these findings, some of the women (with the help of CHWs) organized a play to make the whole community

aware of the importance of breastfeeding.<sup>18</sup>

In almost every village of the developing world there are primary schools. The government budget for education is usually two to three times that for health. While in some countries not all children attend school, the school and its teachers exert a strong influence in disseminating information and are regarded as authoritative sources of new ideas. School teachers are invariably members of village development committees. In my experience visiting many PHC programs, my subjective impression is that those that work best are those where a teacher is either a CHW or the coordinator/leader of a community health team. The potential role of the national primary school system in health development such as ORT is as yet unrealized in most countries. ORT and other priority PHC interventions could provide a vehicle around which to mobilize the primary education school network.

Female literacy programs are clearly another important channel for communicating ORT information. Any program in which women gather together for learning skills or working collectively can be utilized. Most rural development programs that use extension workers can include ORT.

Agricultural extension workers may be eager to promote health messages, especially if their doing so can improve productivity. Diarrhea is seasonal in many countries. A campaign to inform about and promote ORT, combined with building up adequate supplies just prior to the diarrhea season, could involve all sectors, especially over a relatively short period.

### Summary

What is important is that ORT be inserted into a variety of other ongoing activities and programs, using all opportunities and channels. Let us not establish this as yet another health "program." What programs to which ORT should be linked within a country depends on what is there already and which programs or sectors are most effectively disseminating information, for distributing supplies at the community level, and providing services. *Not one, but many, programs should be used for ORT.* These multiple potential opportunities will need to be explored and analyzed in each country. There is no one optimal approach which is universally applicable.

Probably the best strategy is to have, concurrently with national efforts, an area where implementation can be closely monitored and problems identified as they arise. One might also envisage several different combinations and linkages in different ways which can be monitored. The need to learn and to adapt from experience, to develop local capacity for problem-solving, and to design appropriately flexible programs is

probably the most important ingredient for success.

### NOTES

1. Puffer and Serrano, *Patterns of Mortality in Childhood* (Washington: PAHO, Pan American Sanitary Bureau Regional Office of the World Health Organization, 1973); B. Mensch, et al., *Comparative Patterns of Child Mortality Differentials in Developing Countries*, Paper presented at the Population Association of America meeting in Pittsburgh, Pa., April 14-16, 1983; J. E. Rohde, "Why the Other Half Dies," *The Leonard Parsons Lecture* (University of Birmingham, England: March 15, 1982).
2. H. W. Mosley, *Will Primary Health Care Reduce Infant Mortality? A Critique of Some Current Strategies, with Special Reference to Asia and Africa*, Paper prepared for the IUSSP Seminar on Social Policy, Health Policy and Mortality Prospects, Paris, February 28-March 4, 1983.
3. Mosely, op. cit.; J. Hobcraft, et al., *Socio-economic Factors in Infant and Child Mortality: A Cross National Comparison* (London: World Fertility Survey Publication, forthcoming); Hugo Behm, "Socio-economic Determinants of Mortality in Latin America," *Population Bull. of the UN*, 13, cf. Fig. 11, p. 10, showing striking correlation between deaths under two years of age and mothers' education.
4. Republic of the Philippines/WHO/John Snow Public Health Group and International Study Group, "A Positive Effect on the Nutrition of Philippine Children of an Oral Glucose Electrolyte Solution Given at Home for the Treatment of Diarrhoea, Report of a Field Trial," *Bull. of the WHO* 55 (1):87-94; A. E. El-Sherbini, et al., "The Use of Oral Rehydration in Infant Diarrhoea," *Journal of the Egyptian Public Health Association* 53 (Suppl. 5 and 6):82-104; A. Egeman and M. Bertan, "A Study of Oral Rehydration Therapy by Midwives in a Rural Area near Ankara," *Bull. of WHO* 58 (2).
5. J. D. Wray, "Direct Nutrition Intervention and the Control of Diarrhoeal Diseases in Pre-school Children," *The American Journal of Clinical Nutrition* 31 (November 1978):2073-82.
6. A. Tomkins, London School of Hygiene and Tropical Medicine, personal communication, 1983.
7. J. D. Wray, Columbia University, New York, personal communication, 1983.
8. C. Taylor, et al., "The Narangwal Experiment on Interactions of Nutrition and Infections," *Indian Journal of Medical Research* 68 (Supplement, December 1978).
9. C. Taylor, et al., "Child and Maternal Health Services in Rural India," in *Integrated Family Planning and Health Care*, Vol. 2 (World Bank Publication, in press).
10. APHA International Health Programs, *Primary Health Care. Progress and Problems. Analysis of 52 AID Assisted Projects* (Washington: 1982).

11. Teckce Belgin, "Oral Rehydration Therapy. An Assessment of Mortality Effects in Rural Egypt," *Studies in Family Planning* 13 (11):315-27; N. E. Williamson, "An Attempt to Reduce Infant and Child Mortality in Bohol, Philippines," *Studies in Family Planning* 13 (4):106-17.
12. A. Kielman and C. McCord, "Home Treatment of Childhood Diarrhoea in Punjab Villages," *Env. Child Health*, August 1977.
13. Williamson, op. cit.
14. R. A. Cash, *Oral Rehydration for the Treatment of Diarrhoea — Its Value as a Health Component in Community Based Family Planning Distribution Programmes*, Paper prepared for Workshop on Family Planning and Health Components in Community Based Distribution (CBD) Projects, Charlottesville, Va., January 12-14, 1982.
15. T. V. Ellerbrok, *Oral Replacement Therapy in Rural Bangladesh with Home Ingredients*, Unpublished report (Dacca, Bangladesh: BRAC).
16. Johns Hopkins University (1982), op. cit.
17. J. E. Rohde and T. Sadjimin, "Elementary School Pupils as Health Educators: Role of School Health Programmes in Primary Health Care," *Lancet* 1 (8182) (June 21, 1980):1350-2.
18. D. Werner and B. Bower, *Helping Health Workers Learn* (Palo Alto, Ca.: The Hesperian Foundation, 1982), pp. 27-31 to 27-39.

## THE SUPERVISION OF ORAL REHYDRATION THERAPY WITHIN PRIMARY HEALTH CARE PROGRAMS

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Oral rehydration therapy is a compelling technology. But a simple, effective technology is not necessarily associated with simple, effective delivery systems for that technology. The issue I would like to discuss in this paper is how program managers can translate this scientific achievement into an effective program, while continuing to provide other basic health services.

A simple model delivery system will illustrate a number of factors that we as health professionals should consider as we try to make ORT a part of primary health care. A cadre of nonprofessional community health workers (CHWs) provide a limited range of health services in this model. In addition to ORT, the CHWs provide family planning services, iron supplements for pregnant women, assistance with immunization efforts, selected health education related to nutri-

tion, hygiene, pre- and post-natal care, presumptive treatment of malaria, selected first aid treatments, and referrals to the clinic system. Let us further suppose that it is a relatively small program with only five hundred CHWs. Responsibility for making service delivery effective falls to a relatively small group of professional health workers who are organized into a hierarchy that is technical as well as administrative. That is, there are several distinct categories of personnel, each of which is responsible for supervising a larger number of personnel with less technical training. This is the familiar administrative pyramid, but the challenge, as we shall see shortly, is to make function follow this eminently reasonable form. Whatever other responsibilities these professionals may have in health posts, clinics, and hospitals, it is the role of this hierarchy to make a simple, community-based program work. And it is the organization and effectiveness of the supervisory system upon which I will focus.

I have described this model program as "simple," but the CHW and his supervisors might disagree with such a label. Consider the question, how many discrete activities are we asking the CHW to master in a program such as this? By "discrete," I mean that mastery of one activity is more or less independent of performance in other activities. If a CHW can correctly mix oral rehydration solution for one child, we have some confidence he can do so again. If he can do it ten times, we are even more confident. But these observations do not provide the basis to assume that the CHW is equally adept at explaining how to administer the solution. His ability to explain the use of oral contraceptives or to promote immunization are similarly distinct.

One could, for example, divide the CHW's role in ORT into, say, twenty discrete tasks and specific areas of knowledge. The precise number is not important since, as we shall see, we make these distinctions only because it helps clarify the relationship between ORT and other health services. The various CHW health services I mentioned earlier could easily total two hundred discrete tasks. With five hundred CHWs, simple multiplication reveals that the supervisory hierarchy is responsible for 100,000 CHW tasks and related areas of knowledge.

Sobering as such a number may be, it is also useful to pay attention to exactly what the tasks are that one is counting. Few primary health care programs could produce a complete and unambiguous statement of exactly what the CHW is expected to do. And here ORT provides an important lesson for all health services. When we say that a CHW must be able to properly mix an ORT solution, we can and do go on to specify very unforgiving standards. We can say that one solution was better prepared than another. We know what constitutes improvement in this par-

ticular task, and we know what we mean by "success." And, more importantly, if the health professionals have done their job, the CHW knows, too.

There are, of course, good reasons for these exacting standards: a poorly prepared solution may be ineffective or even harmful. The consequences of failure are indeed serious. Other activities are more difficult to assess objectively, such as the ability of the CHW to explain coherently the use of the solution, to maintain follow-up of the sick child, or to make referrals when needed. But few would argue that failure here is any more acceptable than in preparing the solution. Other kinds of activities are even more difficult to describe in measurable terms, such as promoting early treatment of diarrhea, convincing mothers of the value of immunizations, or explaining family planning. With good reason, health professionals are themselves uncertain about exactly how they want the CHW to go about certain tasks. In many cases, the state of the art is primitive indeed compared to the extensive scientific basis for the treatment itself. But, as ORT clearly indicates, if health professionals are unwilling to state clearly what they want the CHW to do regarding a given task, we must conclude that they are not entirely serious about succeeding in that activity.

Of course, no program can afford to dismiss the insights and creativity of CHWs and other members of the community. But if the program is to find and exploit the best of these ideas, some kind of systematic approach seems necessary. Simply giving the CHW a vague mandate, such as "Promote ORT in the community," creates a situation in which even knowing what different CHWs are doing is extremely difficult, and improvement even more so.

If, however, we can provide the CHW with a clear statement of what to do, expressed so that supervisors can in some way measure the degree to which he carries it out, then at least there is a solid basis to improve the design of these discrete tasks. If one approach does not work, it will be possible to demonstrate this with some certainty. Then the program can explore alternatives. Indeed, that is exactly the purpose of paying so much attention to how we describe what we want the CHW to do: these definitions are not policy statements or dogma, but tools; they are operational definitions.

From this perspective, one can begin to appreciate the factors that influence how effectively ORT will be delivered in a program with a number of other health services. A substantial proportion of 100,000 distinct activities involves some element of ORT. Whether or not the operational definitions of these activities are well designed, the role of the supervisory system is to maximize the degree to which the delivery sys-

tem functions as designed. Where a given CHW fails to perform a given activity as it has been defined, one could label this a "problem." How ORT and other services are delivered will depend, to a large extent, on how the supervisory hierarchy organizes itself to identify and correct these problems.

The most conspicuous member of the supervisory hierarchy is the primary field supervisor, the health professional with direct line responsibility for supervising the CHW. The concrete actions taken by the field supervisor to resolve discrete problems in CHW service delivery represent the final expression of the management of the program. The significance of virtually everything the supervisory hierarchy does depends on the effectiveness of this kind of activity. If individual supervisors are not capable of correcting specific, concrete shortcomings in CHW service delivery, the collection of information, training in supervisory methods, arrangements for transportation, and other accoutrements of supervision count for little. This is not the place to discuss the different options available to a field supervisor confronted with a certain problem. But clearly focused training, direct assistance, and a variety of measures to encourage and motivate the CHW are central elements. Since policy decisions can widen or narrow the supervisor's options in resolving a problem, it would be advisable for program managers to give explicit attention to this surprisingly neglected area.

Even assuming that he can effectively deal with at least some problems, the field supervisor is still faced with the difficulty of efficiently identifying problems among hundreds of CHW activities. Practical operations research is urgently needed to examine this process in more detail, but some general statements seem justified:

1. The common technique of simply asking the CHW to list his problems, where successful, is highly efficient. But how a supervisor asks about problems and then reacts to the CHW's response is extremely important. Even if they seem mild or intangible, any negative consequences associated with a candid listing of problems by the CHW are utterly counterproductive for the program as a whole. Secondly, it is clearly imprudent to stop here, even if supervisors are highly skilled at eliciting frank discussions. Few CHWs can be realistically expected to have both the skills and perspective to diagnose all of their own shortcomings. This remains ultimately the responsibility of the supervising health professional.

2. A CHW who lacks important knowledge or skills in an area such as ORT is highly unlikely to perform the corresponding services satisfactorily. In terms of supervisory time, the knowledge and skill level of the CHW constitutes highly accessible information. With elementary interviewing skills, the supervisor should be able



to estimate the ability of a CHW to carry out a given task with a relatively small time investment.

3. Assessing the quality of care actually provided by the CHW is clearly more time-consuming. Direct observation of service delivery is desirable, but follow-up interviews with recent clients and role-playing sessions can be nearly as revealing.

4. To assess the coverage of the community with a given service, it is difficult to imagine a satisfactory alternative to random household visits, even though this is a relatively time-consuming activity for the supervisor.

In any program similar to the model under discussion, there is usually some limit on the supervisory time available for the kind of activities I have just listed. All such supervisory systems are, of necessity, highly selective in their efforts to assess CHW activities. If field supervisors generally have the necessary skills and administrative support to identify and resolve discrete problems, the overall effectiveness of supervision will largely depend on how they select the CHW activities to examine. One common pattern is to select certain CHW activities, or even portions of activities, and examine these on a regular, virtually stereotyped basis. Thus, a supervisor would routinely count the number of ORT packets distributed by a CHW, but ignore coverage of diarrheal cases, the timeliness of treatments, and the effectiveness of the related explanations. Frequently, there is a standardized reporting form that reinforces this focus. Among the most apparent advantages to this arrangement are: (1) that it is probably the simplest pattern of supervision; (2) regular, stereotyped visits and reporting require little ongoing decision making; and (3) highly focused supervisory visits can be carried out fairly rapidly. On the basis of what we know about ORT, its potential to prevent deaths, the factors that reduce its effectiveness, and the possibility of harm from its improper use, all these considerations lead one to doubt that ORT services can be adequately supervised through relatively superficial, standardized visits. The effective incorporation of ORT into a primary health care program will, therefore, require specific attention to how a given activity of a given CHW is selected for fairly detailed supervisory attention. To identify and resolve the most important service delivery problems scattered among 100,000 CHW activities requires some kind of ongoing, active decision-making process. Only if this is done well is ORT likely to receive the close attention it merits on the basis of its potential impact. How field supervisors themselves are supervised is a major, direct determinant of the effectiveness of ORT services in this setting.

Briefly, the role of a second-level supervisor

should include:

1. Resolving problems in CHW service delivery that the field supervisor could not resolve himself.

2. Direct field evaluation of the primary supervisor's ability to resolve discrete CHW problems.

3. Assessing the field supervisor's ability to identify problems by re-examining selected CHW activities judged by the field supervisor to be satisfactory.

4. Guiding the field supervisor's selection of CHW activities to be evaluated.

Each of these functions, of course, includes ongoing training of the field supervisor. The role for tertiary and higher-level supervisors would be analogous in such a system, with each level focusing on the next lower level supervisor while using CHW service delivery as the primary point of reference. A program where the most highly trained personnel do not deal systematically with concrete CHW problems has, in effect, placed a limit on the level of technical sophistication that it will apply to the most important, difficult, and persistent shortcomings of service delivery.

The complexity of efficiently organizing several distinct types of supervisors to identify and resolve discrete problems among 100,000 CHW activities is not difficult to appreciate. Some kind of formal information system is certainly warranted for an effort of this magnitude, even at the cost of personnel time. If such an information system is to be of practical use in the process of supervision, it should have the following properties:

1. The format for recording information should be flexible enough to describe any problem that might occur.

2. Reports should allow higher-level supervisors to take actions to resolve at least some problems without a time-consuming field visit.

3. The system should be organized to facilitate continued attention to a given problem until it is resolved.

4. Information on specific problems and their resolution should be in a form that can be verified by higher levels of the supervisory hierarchy.

5. The content of reports should facilitate the development of case study materials that reflect those aspects of the problem identification and resolution process that are of general interest for program personnel.

On first glance, the latter point may seem to be rather academic. But the long-term impact of supervision ultimately depends on transferring problem-identification and problem-resolution skills to colleagues with less extensive training, using real world problems. Any program that expects to deliver services like ORT effectively must take this process seriously.

# WATER SUPPLY AND HEALTH IN DEVELOPING COUNTRIES: SELECTIVE PRIMARY HEALTH CARE REVISITED

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## Primary health care (PHC) and selective primary health care (SPHC)

In the health delivery systems of most developing countries, the bulk of available resources are devoted to curative services delivered from urban hospitals (Stern, 1983). With the exception of a few vertical programs, such as smallpox and yaws programs, health services have remained largely curative and largely unavailable to poor urban and especially rural people.<sup>2</sup> There have, however, been some dramatic exceptions to this general pattern. Of particular importance is the health care delivery system developed in the world's most populous country, The People's Republic of China,<sup>3</sup> but equally striking successes have been achieved in Sri Lanka, India, Vietnam, and Cuba.<sup>2,4,5,6</sup>

In the light of the failure of most countries to deliver health services to the majority of their people and the success of other countries with similar resource bases to reach this goal, the WHO, UNICEF, and other international agencies embarked on an ambitious effort to encourage more countries to adopt the principles which had proved so successful in the above-mentioned countries.

At the Alma Ata Conference in 1978, the characteristics of the successful systems were analyzed and the concept of PHC defined and endorsed by all participating countries. Of particular importance in this definition is the explicit recognition given to the multiple causes of poverty and the manifestation of these causes in ill health, with the strategy therefore being defined as a multifactorial approach rather than simply a set of medical activities. In particular, PHC was to include:

... education concerning prevailing health problems and the methods for preventing and controlling them; promotion of food supply and proper nutrition; an adequate supply of safe water and basic sanitation; maternal and child health care, including family planning; immunization against the major infectious diseases, prevention and control of locally endemic diseases; appropriate treatment of common diseases and injuries; and provision of essential drugs.<sup>7</sup>

Shortly after Alma Ata, two biomedical scientists, Walsh and Warren,<sup>8</sup> published a critique of this PHC concept in the *New England Journal of Medicine*. This critique and the alternative "selective primary health care" (SPHC) concept advocated by Walsh and Warren have received widespread and generally favorable attention in the scientific and development communities.

The reasoning behind the concept of selective primary health care is simple. While the adherents to the idea profess sympathy to the concept of comprehensive PHC as expressed in the Alma Ata Declaration, they are acutely aware of limitations on the resources available to developing countries for implementing primary health care programs and argue that insufficient resources are available for implementation of all components of the original PHC program. What is necessary, then, is to examine each possible item in the overall program individually, to determine what the costs of implementing that item are, and what the effectiveness of the program is in reaching any particular objective, such as reducing infant mortality. The items are then ranked in terms of cost-effectiveness, and the "selective primary health care" program is designed to include the most cost-effective items within the overall budgetary constraints pertaining in any particular circumstances.

The approach is thus presented as simply a minor modification of the original concept expressed in the Alma Ata Declaration, a modification which adheres to the principles of Alma Ata, but makes the concept of primary health care operational and implementable.

The SPHC package emerging from the cost-effectiveness calculations is almost exclusively medical, including measles and diphtheria-pertussis-tetanus vaccinations, treatment for febrile malaria, oral rehydration for diarrhea in children, and tetanus toxoid in mothers. Biomedical research for the development of vaccines and therapies for major tropical diseases, too, are considered "cost-effective." More systemic non-medical activities, such as community water supply and sanitation and nutrition supplementation, are rejected as being "non cost-effective."

The rationale of the SPHC approach has been widely accepted by both the scientific community (a computer search turned up dozens of references to the original article, with virtually all the articles accepting the premises of the SPHC approach *in toto*) and by policymakers in many international agencies, with the recent USAID health sector policy<sup>9</sup> an outstanding example of the application of these principles.

The purpose of this paper is to examine the details of the cost-effectiveness calculations with respect to one of the components of PHC (*viz.*, community water supply), the choice of the measures of effectiveness chosen, and the methodology followed in comparing activities which

fulfill different objectives. The rationale behind SPHC is also examined in terms of the light which this rationale can shed on the experience of both successful and unsuccessful national and pilot projects. The article concludes with a consideration of the programmatic and political consequences of SPHC vis-a-vis PHC.

### The details of the water supply and sanitation cost-effectiveness calculations

As indicated earlier, a computer search was carried out to identify articles in the scientific literature which referenced the original Walsh and Warren article. Many of these references referred to the original article only to reinforce a contention that a particular field of inquiry was important, but some of the articles present a criticism of the details of the cost-effectiveness calculations pertaining to a particular sector, the objective usually being to argue that the ranking of the specialty of the particular author should have been higher than indicated by Walsh and Warren.

In this spirit, a critique of the numbers used by Walsh and Warren in assessing the cost effectiveness of investments in water supply and sanitation is presented in this section.

The data used by Walsh and Warren for the capital costs of water supply and sanitation programs are based on recent and widely verified World Bank data, and, aside from noting that in certain circumstances (such as tubewells in rural Bangladesh<sup>10</sup> and latrines in Zimbabwe<sup>11</sup>) the per capita costs may be an order of magnitude less than the costs used by Walsh and Warren, there is no basis for disagreement with the cost data used.

What is apparently not appreciated by Walsh and Warren, however, is that, whether or not there are additional investments in water supplies, people in many Third World settings (particularly in urban areas) pay substantial amounts of money for poor-quality water supplies. A well-documented, but by no means unique, case is that of poor people in Lima, Peru,<sup>12</sup> the results of which are summarized on Table 1 below.

Table 1

#### THE QUANTITIES OF WATER USED AND EXPENDITURES ON WATER IN LIMA, PERU

Quality of Service	Quantities used (1/cap/day)	Monthly Household Expenditures on Water (soles)
Poor (vendors)	23	105
Medium (standpipe)	78	22
Good (house connection)	152	35

Table 1 shows that improvements in the quality of water supply service in urban areas may be associated not with an increase, but a reduction in the monetary costs of the supply, a finding by no means unique to Lima. One of the most experienced water supply engineers in the world has found this phenomenon to be virtually universal in developing countries and has concluded that "if daily expenditures made to a water carrier were invested instead in a proper piped supply, far more economical and better water service could be provided."<sup>13</sup>

In terms of a cost-effectiveness analysis of the sort used by Walsh and Warren, then, the economic cost of such water supply improvements may be much smaller than the overall cost of the project, since much or often all of the costs can be covered by "simply" redirecting expenditures which are already being made by the population for an inferior water supply service. Since the Third World is rapidly becoming as much an urban as a rural world, since similar willingness-to-pay is often demonstrated by rural inhabitants,<sup>14</sup> and since those urban dwellers paying high costs for poor water supplies are those urban dwellers with the highest incidences of disease, this phenomenon is of major importance in terms of improving health through the investment of relatively few outside resources. The rub, of course, is in the word "simple," for these poor urban residents are frequently not recognized as either legitimate or deserving by their governments, and the organizational and managerial implications of these changes are by no means trivial. A key issue, then, is political will and program management, themes to which attention is directed later in this paper.

Turning to the denominator in the cost-effectiveness factor, an assessment of the likely impact of a water supply and sanitation program on health is far more problematic than the assessment of the effects of other PHC programs which operate more directly on the causes of disease. Thus, while it is a relatively straightforward (although not trivial) task to calculate the effects of a tetanus or measles vaccine on death rates, a similar assessment of the effects of a water supply and sanitation program is fraught with problems, for the intervening steps linking the program inputs to health outputs are far more numerous and the necessary behavioral changes far more complex. In particular, the assumption that the water supply produces the quantity and quality of water for which it was designed is frequently incorrect, as is the assumption that the water supply is being used appropriately by the classes or age groups most affected by water-related diseases.<sup>15</sup>

In light of these problems, it is appropriate to proceed with caution in attempting to assign a "typical value" to the effect of water supply and

sanitation programs on health.<sup>16</sup> In their analysis, Walsh and Warren drew on only a small sample of the large number of available studies and reached universal conclusions which are not supported by a more comprehensive assessment. For instance, Walsh and Warren concluded that while water piped into the home might result in substantial reductions in diarrheal diseases, water supplied through public standpipes would affect only a very small reduction (about 5%) in the incidence of diarrheal diseases. While this was certainly the conclusion to be drawn from the couple of studies examined by Walsh and Warren, fundamental doubts have been raised about the results of one of the studies,<sup>17</sup> and a more complete analysis of methodologically sound, available studies would have indicated that where improved quantities of water of improved quality became available through standpipes, the expected reductions in diarrheal diseases would be an order of magnitude greater than the 5% assumed by Walsh and Warren. This is indicated on Table 2, which is abstracted from a recent comprehensive review of the health effects of water supply and sanitation programs.

**Table 2**  
**THE EFFECT OF WATER SUPPLY AND PROGRAMS IN 24 NONINTERVENTION STUDIES<sup>18</sup>**

<i>Parameter Affected</i>	<i>Number of Studies</i>	<i>Reduction in % Diarrheal Diseases (median)</i>
Water quality	6	30%
Water availability (mostly through standpipes)	11	34%
Quality and availability	4	40%
Excreta disposal	8	40%

There are reasons, then, to believe that the figures used by Walsh and Warren in both the denominator and numerator of the cost-effectiveness calculations for water supply and sanitation programs are seriously in error. Furthermore, since the approach taken by Walsh and Warren is one in which the cost-effectiveness of different components of PHC are compared, it is pertinent to note that there are also serious problems with the costs and effectivenesses used by Walsh and Warren for the more traditional medical components, which their analysis suggested were most appropriate in a "selective" approach. Specifically, in the examination of several small, nongovernmental health projects<sup>19</sup> which served as a basic source

of data for the Walsh and Warren analysis, "costs generally did not include capital investment, training, expenditures beyond the primary level of health care, or the value of expatriate and volunteer labor."<sup>20</sup> In scaling these projects to a national level, the costs would be substantially greater and the effectiveness of the programs substantially less due to "political and administrative problems."<sup>20</sup> Indeed, the generalizability of these findings has been questioned by many (including the Director General of the WHO<sup>21</sup>), with the comments on the Indian project being typical: "It was the dedication of the team leaders, their total involvement in the community programs, and their special organizational abilities which made the program successful"<sup>22</sup>

However, as will be detailed in the following sections, the "selective primary health care" analysis of Walsh and Warren is, in our opinion, flawed by fundamental conceptual problems which are much more serious than the problems of detail outlined above. For this reason it is not appropriate to attempt to present revised cost-effectiveness figures for water supply and sanitation programs and other components, or to suggest, on the basis of such revised estimates, an alternative hierarchy of programs for "selective primary health care."

#### **The criteria used for assessing the effectiveness of health programs: what are the objectives and who decides on these?**

Health is a multifaceted concept. At the most elementary level, it is possible to distinguish between severity of effect (infection, disease, disability, and death) and age group affected (infant, child, or adult). A fundamental difficulty in comparing different health programs is that, typically, different programs affect different facets of health. One program, for instance, may affect infant mortality only, while another might affect infection, disease, disability, and mortality in all age groups.

Decision theory offers only some simple concepts in suggesting how to analyze trade-offs between programs which affect different facets of health in this way. In particular, with reference to Figure 1, decision theory tells us only that, if outcome 1 and outcome 2 are both desirable, and if the costs of the programs represented on the diagram are equal, then program B is always preferable to program A, and program C is always preferable to program A (a concept known as "Pareto optimality"). Decision theory tells us explicitly that, if we are unable to reduce output one and output two to a common measure (such as dollars), then the only way of resolving whether program B is preferable to program C is to submit the choice to decision makers and have them tell us which program is preferable.

It is immediately apparent, then, that two questions are of fundamental importance in attempting to compare different health programs:

1. What are the health outcomes which will be considered?

2. Who will be the judges of the trade-offs between these outcomes?

A first concern with the procedure followed by Walsh and Warren is their choice of criteria and the consistency (or lack thereof) in applying these to the components of PHC which they analyze. For the most part, Walsh and Warren consider reductions in infant mortality to be the unique criterion of interest, thus comparing, for instance, the cost per infant death averted through water supply and sanitation programs, and expanded immunization and oral rehydration therapy programs. This lands them in a bind, of course, for such a procedure means that all programs which do not result primarily in reductions in infant mortality (one of these considered by Walsh and Warren is an onchocerciasis control program) will automatically be rejected. The procedure followed by Walsh and Warren, then, is to write down that onchocerciasis control programs "prevent few infant deaths," leaving the reader to assume, reasonably, that onchocerciasis control programs may be justified on grounds other than reductions in infant deaths.

So far so good. With respect to the example which is followed through the present analysis — water supply and sanitation — Walsh and Warren follow a quite different procedure. Since it is never argued that the only effect of a water supply and sanitation program is a reduction in infant mortality, the only consistent procedure would be to repeat the procedure followed in the onchocerciasis control program and make no comparison between a water supply and sanitation program with a program the unique effect of which is to reduce infant mortality. This Walsh and Warren do not do. Instead, they compare water supply and sanitation programs with programs aimed specifically at reducing infant mortality (such as oral rehydration therapy programs) and conclude, not surprisingly, that the programs which affect infant mortality only are more effective in this than a program which has multiple effects on all manifestations of disease in all age groups. If we imagine that "outcome 1" on Figure 1 represents reductions in infant mortality and outcome 2 some other desirable outcome (such as reduction in adult morbidity), then Walsh and Warren's procedure is equivalent to claiming that program B is superior to program C simply because B gives us more of outcome 1 than C (ignoring the fact that C gives us more of desirable outcome 2 than B). This procedure is obviously unsatisfactory.

As indicated earlier, trade-offs between different outcomes cannot be considered in isolation

from the decision as to who will make such trade-offs. While Walsh and Warren could almost certainly defend their choice of reduction in infant mortality as an important criterion, other scientists would claim that other criteria (such as morbidity in the adult population<sup>23</sup>) are important, too. Where different criteria are used, of course, the cost-effectiveness of different programs will be quite different. For example, in the case of cholera, whereas rehydration therapy has been shown to be less costly and more effective in saving lives than immunization, if morbidity reduction becomes the objective, the results of a cost-effectiveness analysis would be reversed.<sup>23</sup>

In the spirit of John Grant, however, who argued that primary health care and other development programs should follow "the principle of inherent need and interest," in which "projects in a village should grow out of its own needs and interests, and not be superimposed by some idealists,"<sup>24</sup> we would argue that the trade-offs between the outputs of PHC programs be done in light of the expressed needs of the communities involved. From an examination of the actual health and nutrition practices of families in the developing world, it is clear that their de facto priorities do not agree with the assumption of Walsh and Warren that reductions in infant mortality are of unique concern. In particular, throughout the developing world the economic welfare of families is highly dependent upon the economic production of adults,<sup>23</sup> giving rise, for example, to discrimination in feeding among household members to protect the actual or potential breadwinner in subsistence settings.<sup>25</sup>

In assessing actual practices, however, attention has to be given to the fact that families, like villages, are not division-free entities, and it is necessary to go one step further and ask whose interests in the family should be given greater weight.

From a variety of perspectives it seems clear that the group whose needs are most important, in terms of the health of the community in general and young children in particular, are mothers. First, virtually all components of PHC programs are based on the assumption that mothers will be the most important front-line providers of health care to children.<sup>26</sup> Second, of all the correlates of infant health, none is as strong or as consistent as mother's education,<sup>27</sup> implying that there are few better investments in health than those which meet the needs of women, particularly those which alleviate the constraints limiting the education of girls and women. Later in this paper it is argued that a particularly important constraint faced by women in undertaking, to use James Grant's term,<sup>28</sup> "discretionary activities," such as education and child care, is the enormous demands made on women for performing time-

consuming, repetitive tasks. Investments which relieve mothers of part of this burden will have an effect on child health which is as certain as it is impossible to quantify.<sup>16</sup> Indeed, many experienced investigators of the determinants of health in the Third World would concur with Latham,<sup>29</sup> who has argued that "attentions to women's rights and the emancipation of women may ultimately have more impact on nutrition and infection in developing countries than any of the (conventional nutrition and health) interventions."

Concerned, then, with the exhortation of the Director General of the WHO that mothers become the subject and not the object of health programs, the following sections of this paper assess some principal constraints aired by women in implementing PHC programs.

### **Women as the front-line health care workers: some constraints**

A concept central to all PHC programs is that no lasting advances in child health can be made unless the mother is involved in these programs. Thus, most of the core elements of PHC programs — such as breastfeeding, supplementary feeding, oral rehydration therapy, and household hygiene — involve the mother as the front-line health worker. Indeed, the objective of PHC programs may be described as the improvement of "mothering, the poorly-defined but crucial interactions between mother and child that form the principle determinants of health, growth and development."<sup>30</sup>

To carry out the complex and demanding task being set her by primary health care programs, the mother faces four principal constraints, namely, technology, knowledge, resources, and time. One way of visualizing PHC programs is that such programs are aimed at relieving the mother of one or more of these constraints so that she may become a more effective mother.

In their analysis of "selective primary health care," Walsh and Warren focus their attention almost exclusively on the first of these four constraints, technology, an approach common to the policy formulations of some development agencies, too. While there is no doubt that technological advances, such as improved expanded vaccination programs and oral rehydration therapy, open new vistas in terms of the potential for child health in developing countries, the provision of improved technology alone is insufficient, for usually the effective implementation of such technology requires simultaneous inputs of knowledge, resources, and time on the part of the mother. Let us consider a few examples.

*Breastfeeding.* Primary health care programs provide both information to the mother on the fundamental importance of breastfeeding for the health of her infant and technology in the form

of programs designed to monitor the growth of her child. While such programs are essential, equally essential is the availability of time for the women to breastfeed their babies. Studies throughout the world have shown that where women work outside of the home, they do not have the time available to breastfeed their babies, with the result that the inputs of knowledge and technology provided by the PHC program cannot be translated into improved child-rearing practices. (A typical finding is that of a study in Malaysia, where women recently employed breastfed their children 33% less time than women in a control group who had not recently been employed.<sup>31</sup>)

*Oral rehydration therapy.* ORT technology undoubtedly opens entirely new possibilities for the reduction of mortality in young children in developing countries. As in all other cases, however, the provision of the technology alone will have little impact unless the constraints faced by the mother in using the technology are addressed simultaneously. The constraints are many: in many areas of the world, the cost of rehydration packages is too great for poor families;<sup>32</sup> in almost all situations, traditional understanding of food and liquid withdrawal during diarrhea have to be changed,<sup>33</sup> and thus the ORT technology has to be accompanied by educational and informational inputs. Finally, since "continually giving a sick infant large volumes of liquid by spoon or cup is time-consuming, tiring, and inconvenient for an overburdened mother with other children plus household and farm work to do, ORT may require the commitment of more time and energy than she can easily provide."<sup>34</sup>

*Clinic-based supplementary feeding and other programs.* Perhaps the simplest of all programs, in principle, is one in which the mother comes to a clinic or distribution center to collect food for her child, to weigh her child, or to have her child immunized. Yet many studies have shown that attendance at a clinic drops off dramatically as the distance to a clinic increases<sup>35</sup> and that women in the labor force are frequently unable to avail themselves of such services because of the constraints on their time.<sup>36</sup>

*Food preparation and storage.* Recent longitudinal studies in Bangladesh<sup>37</sup> and The Gambia<sup>38</sup> have documented the vital role of food contamination on the transmission of diarrheal diseases, an effect which becomes particularly marked when great demands are made on the time of the mother. In The Gambia, for instance, at the peak diarrheal transmission season, "feeding of small children is particularly haphazard . . . infants may be left in the compound in the care of young nursemaids with a supply of porridge or gruel for the next 8 or 9 hours, and food for the evening meal is sometimes stored over-

night . . . "38

In sum, the great demands placed on the time of Third World mothers constitute a serious barrier to the implementation of PHC, with these constraints often being particularly acute at those times of the year when children have most need of additional health care<sup>39</sup> and in low-income families where the incidence of illness is greatest.<sup>40</sup>

The overall effect of restrictions in the availability of time is evident in recent data from the Philippines. Although the children of working mothers received 5% more food than the children of a comparable group of mothers who were not working, the children of the working mothers weighed, on the average, 7% less than the children of the mothers who did not work, an effect attributed to the lack of time available to working mothers to translate increased resources and improved knowledge into improved health of their children.<sup>41</sup>

Thus, although improved water supply and sanitation conditions affect PHC in several ways — by reducing the disease load (see Table 2) and thus the need for child care, by increasing available income through reducing payments for water (see Table 1), and by releasing the calories used in carrying water (12% of a woman's caloric intake in East Africa)<sup>42</sup> — most important of all effects may be increasing the time available to mothers for carrying out child care and other "discretionary activities."

### **Time and mothers' needs in developing countries**

A recent workshop in "Women in Poverty" examined the phenomenon of poverty among women in the Third World and analyzed how women might become actors in and beneficiaries of the development process.

Three conclusions of this workshop are of particular importance for PHC. First, time is the most important resource which poor women have available to them.<sup>31</sup> Second, studies in a variety of developing countries (Bangladesh, Bolivia, Indonesia, and the Philippines) have found that the rural mother engages in ten to eleven hours per day of active home and market production,<sup>40</sup> whereas women in industrialized countries typically work at and outside the home only six hours per day.<sup>31</sup> And third, poverty is concentrated in female-headed households, and the number of these households is large (typically between 15% and 35%) and increasing.<sup>31</sup> Thus, the workshop concluded that, for women in developing countries, "saving time is development, for time saved from humdrum tasks is time to invest in human capital,"<sup>31</sup> and that priority should be given to "technologies that reduce the time women and children spend fetching wood and water and preparing food."<sup>31</sup>

### **Time required for water collection**

The impact of the installation of a convenient village water supply system on the time spent by women and children in carrying water has been documented throughout the world.<sup>16</sup> To give just a few of many examples: in the lowlands of Lesotho, 30% of families spend over 160 minutes per day collecting water;<sup>43</sup> as a result of improved water supplies in the Zaina scheme in Kenya, about 100 minutes per household per day are saved from the water-collecting activity;<sup>44</sup> in East Africa, rural families spend up to 264 minutes per day carrying water;<sup>42</sup> in East Nigeria, families spend up to 300 minutes per day collecting water.<sup>43</sup> Studies in Asia (for example, the Philippines<sup>41</sup> and Thailand<sup>14</sup>), too, have documented the substantial amount of time spent in collecting water in many areas.

### **Felt needs of low-income women**

It would thus appear that a major constraint on women's "discretionary activities" (including child care) in many developing countries is the enormous demand made on their time for the performance of repetitive, time-consuming tasks. It has further been documented that in many rural communities the fetching and carrying of water is one of the most important of these tedious tasks. What do the low-income women of the Third World have to say about this when they are asked directly, when they are treated, as Halfdan Mahler would have, as subjects and not just as objects in the development process?

In looking for answers to this question, it bears repeating that societies in general, and societies in developing countries in particular, are typically sharply divided along class and sex lines. Earlier in this paper it has been argued that particular attention should be paid to the concerns of poor women, yet determining the concerns of this largely disenfranchised group is not simple, for two main reasons. First, the sexual division of labor is universal, with the time-consuming tasks performed by women seldom, if ever, being performed by men; and, second, "the decision-makers or leaders in the agencies and in the target communities are usually men and they communicate with other men and not with the women."<sup>45</sup> Thus, as has been documented for Kenya,<sup>45</sup> the reduction in time-consuming tasks like fetching and carrying water is a high priority need for rural women, but is typically given low priority when the "village leaders" (men) are asked for their opinion.

Where surveys of community needs have been aware and taken account of such factors, throughout the developing world water supply has ranked high on the list of expressed priorities.<sup>46</sup> In a recent review of the findings of surveys of low-income women in developing countries, water supply improvements were

found to "rank right alongside the most basic human need (adequate food) in many (such) surveys."<sup>40</sup>

### Cost effectiveness revisited

Returning to the decision model outlined earlier, it is thus apparent that when, first, outcomes of programs are not arbitrarily restricted solely to reductions in infant mortality and, second, the trade-offs between outcomes are made by poor Third World women and not scientists, water supply programs routinely constitute an integral part of PHC programs in those (large) areas of the developing world in which access to adequate water supplies is restricted.

It is thus not surprising that, in all countries in which PHC has been successful, improvements in water supply and sanitation conditions have been an integral part of strategies for both improving health and improving the status of women.<sup>47,48</sup>

### Summary and conclusions

Six years after Alma Ata, what is the prospect for the PHC philosophy as outlined in the Alma Ata Declaration? On the one hand, the concept is clearly a viable one which has been implemented successfully in a number of large, low-income developing countries and with considerable, if only temporary, success in a number of pilot projects in developing countries which have made little progress at the national level.<sup>19</sup> The overwhelming reality, however, is that in those countries which had made little progress before Alma Ata, little progress in implementing PHC programs has been made since.<sup>27</sup> Simplifying a complex debate, there have been two main contending theses explaining this failure. On the one hand, many have seen the failure of PHC programs in most developing countries as a predictable consequence of a "lack of political will," while others have focused on technical factors, such as the scarcity of resources for implementing PHC programs and the necessity for making cost-effectiveness choices on components to be included in an overall PHC program.

For those who favor the technical interpretation of this experience, the "selective primary health care" approach of Walsh and Warren is an insightful and pragmatic tool to be used in making choices in the light of the "resource scarcity," about which interventions are "cost effective." This analysis, as has been shown in this paper, is fundamentally flawed. If the problem is a problem of "resource scarcity," how is it that several low-income countries have implemented strikingly successful PHC programs, while many other countries with higher GNPs per capita have failed completely? If the problem is the comprehensive nature of the Alma Ata formulation of PHC, then how is it that all of the suc-

cessful national programs have taken such a comprehensive approach? And if water supply and sanitation programs are not "cost-effective," why is it that all of the countries in which PHC has been effective have made improvements in water supply and sanitation a cornerstone to their PHC approach? In summary, although the approach taken by Walsh and Warren and used as a basis for sector strategies by some international development agencies has a certain appeal to fundamental notions of rational planning, the approach fails totally to account for the experience which has been accumulated with PHC programs throughout the world. This being the case, then, there are several critical questions. Is there an alternative interpretation which explains the experience with PHC programs more satisfactorily? If so, what are the implications of this alternative interpretation for policy? And, finally, why has the obviously flawed "selective PHC" approach proved to be so compelling and attractive to some development agencies?

Even the technically focused analyses of the SPHC sort usually mention in passing the "importance of political will and management" in the implementation of PHC programs. An alternative explanation for the success of some national PHC programs and the failure of others considers this factor of political will to be fundamental rather than incidental. The importance of this commitment is evident from both longitudinal and cross-sectional observations. Thus, history shows that prior to World War II cogent blueprints for appropriate health services were drawn up for both China and India (in the form of the Bore Commission Recommendations of 1943). To John Grant, who played a major role in this process in both countries and who recognized that "the use of medical knowledge . . . depends chiefly upon social organization,"<sup>24</sup> subsequent developments could have been no surprise. Where the government made a fundamental commitment to meeting the health (and other) needs of all people, as in China, enormous progress was made in developing an appropriate health delivery system. Where no such commitment was made, as in India, health services changed little over the intervening forty years.<sup>49</sup> Similarly, a contemporary cross-sectional comparison of countries which have made marked progress in the development of health services for all, with those countries in which adequate services have been developed for only a small minority, shows that progress has been rapid only where "health and health care became a political goal and eventually came under political control as a part of overall development."<sup>2</sup>

To the proponents of this alternative interpretation, the experience of the successful non-governmental PHC health projects which are the object of so much attention in the cost-effec-



tiveness analyses, too, is consistent with this theory on the centrality of political commitment. For what distinguishes these successful small projects from the unsuccessful national projects in the same countries is not the resources available nor the choice of technology, but that, through dedication and management, these programs have managed to overcome the problem of the lack of political will that characterized the national programs in these countries.<sup>21,22,27</sup>

Thus, the concerns of the technical analysts with "resource constraints" and the use of "non cost-effective technologies" appear to be either false problems or second-order problems. The problem of "resource scarcity" is a problem wrongly named, for it is clear that this problem arises not because there are insufficient resources for the health sector, but because the vast majority of these resources, both public and private, are devoted to an existing urban, hospital-based, capital-intensive health care system serviced by and meeting the needs of an elite minority.<sup>1</sup> The problem of appropriate technology is a real one, and there is no doubt that, where political commitment exists, PHC programs will become more effective through the use of ORT, expanded immunization programs, improved low-cost sanitation technologies, and other technological improvements. This does not imply, however, that an enormous amount cannot be done with existing technologies. The successful experiences

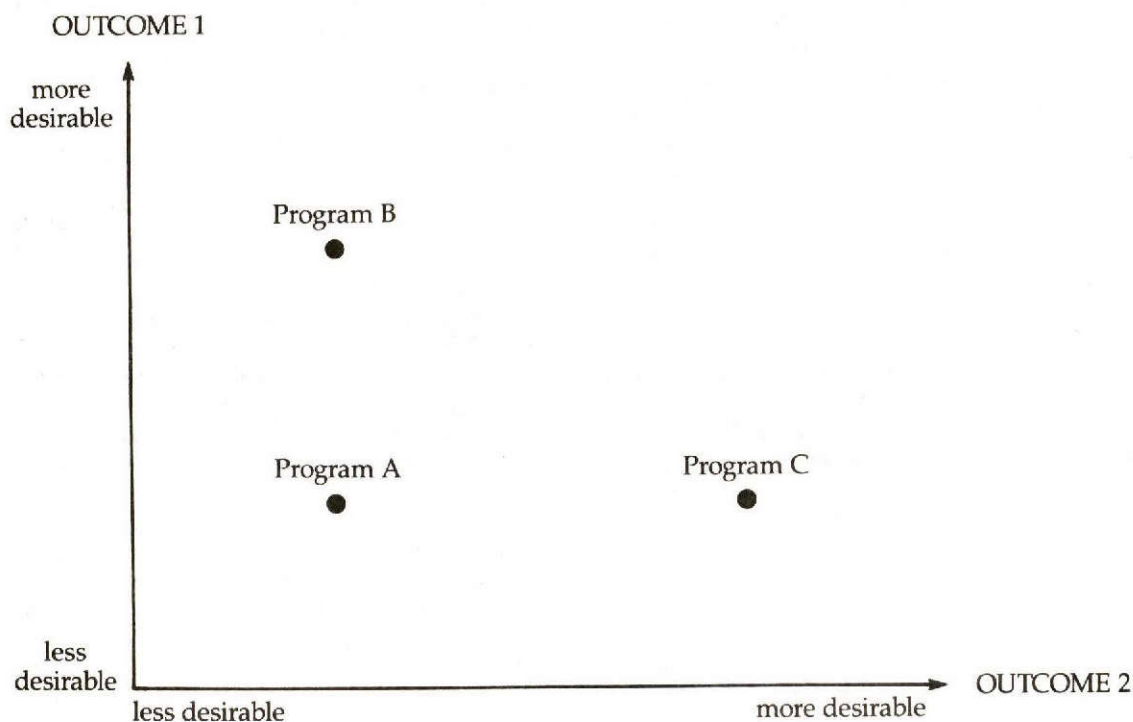
in China, Sri Lanka, Cuba, Vietnam, and India all demonstrate the progress that can be made without the technological advances which some international development agencies suggest to be the major impediment to improving health in developing countries. Indeed, what the experience of the successful national PHC programs shows is that the issue of appropriate technology is intimately related to the issue of political commitment, as is evident in the development and widespread use of innovative "appropriate" solutions to the problem of sanitation technology in both China<sup>50</sup> and Vietnam<sup>51</sup> and the imaginative incorporation of traditional medicine into a modern health care delivery system in China.<sup>27</sup>

Given these manifest shortcomings of the Walsh and Warren type of approach, why has it proved to be so attractive to certain development agencies and many developing country governments?

First, the only reasonable conclusion from the evidence is that credit for the success, or blame for the failure, of national PHC programs lies squarely with the government of the country concerned. Where PHC programs have failed, this is because the commitment of the government to "health for all" its people is little more than empty rhetoric.

The implication for development agencies with a genuine concern for the health of all people has been stated by one of the pioneers of the PHC

**Figure 1**  
**THE CHOICE OF PROGRAMS WITH DIFFERENT OUTPUTS**



movement: "Where support is available, let it be selectively directed to those countries which already have, or are taking steps to develop, a form of decision-making and implementation which is likely to be effective."<sup>2</sup> Since the support of some development agencies for certain countries has more to do with political imperatives than a true concern for the health of the people of that country, such agencies use analyses, such as that presented by Walsh and Warren, to deflect responsibility for death and illness from its true source, namely, the home governments and their international supporters, and to assign responsibility for such suffering to "neutral" causes, such as "resource shortages" and "the limitations of technology." In short, "selective primary health care" is not, as the authors would suggest, a practical modification of the PHC concept, but rather a negation of much that was positive in the PHC approach formulated at Alma Ata.

## REFERENCES

1. Stern, E. "Health and development." Paper presented at International Conference on Oral Rehydration Therapy, Washington, D.C., June 1983.
2. Newell, K. W. "Developing countries." In J. Fry, ed., *Primary Care*, 196-218. London: 1980.
3. Hetzel, B. S. "Basic health care and the people." In B. S. Hetzel, ed., *Basic Health Care in Developing Countries: An Epidemiological Perspective*, 1-10. Oxford: Oxford University Press, 1980.
4. Ratcliffe, J. "Social justice and the demographic transition: Lessons from India's Kerala State." *Int. J. Health Services* 8(1) (1978):123-44.
5. Djukanovic, K. "The Democratic Republic of North Vietnam." In B. S. Hetzel, ed., *Basic Health Care in Developing Countries: An Epidemiological Perspective*. Oxford: Oxford University Press, 1980.
6. Navarro, V. "Health Services in Cuba: An initial appraisal." *N. Eng. J. Med.* 287 (1972):954-59.
7. World Health Organization. *Declaration of Alma Ata*. Report on the International Conference on Primary Health Care, Alma Ata, USSR. Geneva: September 6-12, 1978.
8. Walsh, J. A. and Warren, K. S. "Selective Primary Health Care: An Interim Strategy for Disease Control in Developing Countries." *N.E.J. Med.* 301 (1979):967-74.
9. United States Agency for International Development. *AID Policy: Health Assistance*. Eleven pages. Washington, D.C.: 1982.
10. United States Agency for International Development. *AID Policy Paper: Domestic Water and Sanitation*. Sixteen pages. Washington, D.C.: 1982.
11. Morgan, P. R. and Mara, D. D. *Ventilated Improved Pit Latrines: Recent Developments in Zimbabwe*. Thirty-eight pages. Washington, D.C.: World Bank Technical Paper Number 3, 1982.
12. Adrianza, B. T. and Graham, G. G. "The High Cost of Being Poor: Water." *Arch. Environ. Health* 28 (1974):312-15.
13. Okun, D. A. "Review of Drawers of Water." *Econ. Dev. and Cult. Change* 23(3) (1975):580-83.
14. United States Agency for International Development. *The Potable Water Project in Rural Thailand*. Fourteen pages and annexes. Washington, D.C.: 1980.
15. Briscoe, J. "The role of water supply in improving health in poor countries (with special reference to Bangladesh)." *Am. J. Clin. Nutr.* 31 (1978):2100-13.
16. Saunders, R. J. and Warford, J. J. *Village Water Supply: Economics and Policy in the Developing World*. Two hundred and eighty pages. Johns Hopkins University Press, 1976.
17. Dworkin, D. and Dworkin, J. "Water supply and diarrhea: Guatemala revisited." Thirty-eight pages. Washington, D.C.: AID Evaluation Special Study No. 2.
18. Hughes, J. M. "Potential Impacts of Improved Water Supply and Excreta Disposal on Diarrheal Disease Morbidity: An Assessment Based on a Review of Published Studies." Draft manuscript for publication, thirty pages. Atlanta: CDC.
19. Gwatkin, D. R.; Wilcox, J. R.; Wray, J. D. *Can Health and Nutrition Interventions Make a Difference?* Seventy-six pages. Washington, D.C.: Overseas Development Council, 1980.
20. Evans, J. R.; Hall, K. L.; Warford, J. "Shattuck Lecture, Health Care in the Developing World: Problem of Scarcity and Choice." *N.E.J. Med.* 305 (1981):1117-27.
21. Mahler, H. "Preface." In Gwatkin, D. R., et al., *Can Health and Nutrition Intervention Make a Difference?*, vii-x. Washington, D.C.: Overseas Development Council, 1980.
22. Sharma, R. and Chaturvedi, S. K. "India." In B. S. Hetzel, ed., *Basic Health Care in Developing Countries: An Epidemiological Perspective*, 87-101. Oxford: Oxford University Press, 1978.
23. Chen, L. C. "Control of diarrheal diseases morbidity and mortality: some strategic issues." *Am. J. Clin. Nutr.* 31(12) (1978):2284-91.
24. Grant, J. B. *Health Care for the Community, Selected Papers of Dr. John B. Grant*. Baltimore: Johns Hopkins University Press, 1963.
25. Chernichovsky, D. "The economic theory of the household and the impact measurement of nutrition and related health programs." In R. E. Klein, ed., *Evaluating the Impact of Nutrition and Health Programs*. New Jersey: Plenum Press, 1979.
26. Cole-King, S. "Primary Health Care: A look at its current content." Eighteen pages. New York: UNICEF, 1981.
27. Mosely, W. H. "Will primary health care reduce infant and child mortality? A critique of some current strategies, with special reference to Africa and Asia." Forty-three pages. Paper presented at IUSSP Seminar on Social Policy, Health Policy and Mortality Prospects, Paris, 1983.

28. Grant, J. P. "The State of the World's Children, 1983-83 [sic]." Twelve pages. New York: UNICEF, 1982.
29. Latham, M. C. In G. T. Keusch, "Resume of the discussion on Interventions: strategies for success." *Am. J. Clin. Nutr.* 31(12) (1978):2252-56.
30. Rohde, J. E. "Preparing for the next round: Convalescent care after acute infection." *Am. J. Clin. Nutr.* 31(12) (1978):2258-68.
31. Birdsall, N. and Greevey, W. P. "The Second Sex in the Third World: Is female poverty a development issue?" Thirty-six pages. Paper summarizing findings of Workshop on Women in Poverty, International Center for Research on Women, Washington, D.C., 1978.
32. Kielmann, A. A., and McCord, C. "Home treatment of childhood diarrhea in Punjabi villages." *Environ. Child Health* 23 (4) (August 1977):197-201.
33. Academy for Educational Development. *Results of Honduras Field Investigation*. Forty-three pages. Washington, D. C.: 1982.
34. Parker, JR. L.; Rinehart, W.; Piotrow, PT.; Douchette, L. "Oral rehydration therapy for childhood diarrhea." *Population Reports L*(2) (1980).
35. DeSweemer, C. In F. T. Koster, "Resume of the discussion on 'Health care interventions'." *Am. J. Clin. Nutr.* 31(12) (1978):2274-78.
36. Popkin, B. M. and Solon, F. S. "Income, time, the working mother and child nutrition." *Env. Child Health* (1976):156-66.
37. Black, R. E.; Brown, K. H.; Becker, S.; Alim, ARMA; and Merson, M. H. "Contamination of weaning foods and transmission of enterotoxigenic *E. coli* diarrhea in children in rural Bangladesh." *Trans. Roy. Soc. Trop. Med. Hyg.* 76 (1982):259-64.
38. Rowland, M. G. M. and McCollum, J. P. K. "Malnutrition and gastroenteritis in the Gambia." *Trans. Roy. Soc. Trop. Med. Hyg.* 71 (1977):199-203.
39. Chen, L. C.; Chowdhury, A. K. A., and Huffman, S. C. "Seasonal dimensions of energy protein malnutrition in rural Bangladesh: The role of agriculture, dietary practices, and infection." *Ecology of Food and Nutrition* 8 (1979):175-87.
40. Popkin, B. M. "Some economic aspects of planning health interventions among malnourished populations." *Am. J. Clin. Nutr.* 31(12):2314-23.
41. Popkin, B. M. "Time allocation of the mother and child nutrition." *Ecol. of Food and Nutr.* 9 (1980):1-14.
42. White, G. F.; Bradley, D. J.; White, A. N. *Drawers of Water Use in East Africa*. Three hundred and six pages. Chicago: University of Chicago Press, 1972.
43. Feachem, R.; Burns, E.; Cairncross, S.; Cronin, A.; Cross, P.; Curtis, D.; Khan, M. K.; Lamb, D.; Southall, H. *Water Health and Development: An Interdisciplinary Evaluation*. Two hundred and sixty-seven pages. London: Tri-Med, 1978.
44. Carruthers, I. D. *Impact and Economics of Community Water Supply: A Study of Rural Water Investment in Kenya*. One hundred and twenty pages. London: Agrarian Development Unit, Wye College, 1973.
45. Elmendorf, M. *Women, Water and Waste: Beyond Access*. Seventeen pages. Washington, D.C.: WASH Project, 1982.
46. White, A. N. "The role of the community in water supply and sanitation projects." In *The Impact of Interventions in Water Supply and Sanitation in Developing Countries*, 121-38. Washington, D.C.: USAID, 1981.
47. Hsiang-Kuan, JC. "China: The rural health service." In B. S. Hetzel, Ed., *Basic Health Care in Developing Countries: An Epidemiological Perspective*, 121-27. Oxford: Oxford University Press, 1980.
48. Van Tin, N. "Mass prophylaxis on a national scale." In *Twenty Five Years of Health Work*, 21-40. Hanoi: Vietnamese Studies, No. 25, 1970.
49. Banerji, D. "Social and cultural foundations of the health services systems of India." *Inquiry* Supplement to Vol XII (1975):70-85.
50. McGarry, M. G. and Stainforth, J. *Compost, Fertilizer and Biogas Production from Human and Farm Wastes in the People's Republic of China*. Ninety-four pages. Ottawa: International Development Research Centre, 1978.
51. McMichael, J. "The double septic bin in Vietnam." In A. Pacey, *Sanitation in Developing Countries*, 110-15. New York: Wiley, 1978.

## LOGISTICS DECISIONS IN THE IMPLEMENTATION OF ORT PROGRAMS

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I would like to focus my remarks on the important logistics decisions in the implementation of oral rehydration therapy programs and to begin with an anecdote that may be familiar to many of you. Over the last year I have been working with a country which, by almost any standards, is fortunate and advanced in its development. Roads and communications are good and health has a high priority, at least as measured by the number of government health workers, facilities, and amount of money people spend on health. The medical profession is progressive and has embraced ORT. Government policy supports ORT provision on a wide scale; donor agencies are active in support of health, as the infrastructure exists to absorb resources.

In this fortunate environment we were exam-

ining health service statistics and noted a surprisingly low frequency of visits of children under the age of five with diarrhea. It turned out that, as part of strategy to increase self-reliance and shorten pipelines, an in-country production facility for ORS had been planned, funded, built, and would "soon be open." However, plans for the transition period had, in fact, resulted in a full year's gap in availability of ORS packets: the country was essentially devoid of ORT activity for a year. Why was there no ORT? First, the clients were not bothering to come to health centers, which were oriented only to packaged, prepared ORS and which had none to offer. Second, the private sector had not become involved with the distribution and sales of ORS through shops and pharmacies. And finally, there had been no emphasis on community-based training and home preparation of ORS from local materials.

Variation on these themes are probably part of the experience of many here. What lessons does this regrettable vignette suggest to those concerned with the practical issues of ORT logistics on a large scale? Three in particular are worth considering. These lessons are:

1. the inherent instability and fragility of systems which depend on one critical path or process;
2. the low priority and prestige attached to logistics in public health; and
3. the futility of attempting to meet a widespread community need through a system structure that is inherently unable to respond.

Let's examine these lessons one at a time.

### **The instability of systems relying on one critical path**

A series of levels and units are connected by pathways for transfer of information, materials, money, and even an occasional decision (see Figure 1). In the process of procurement, distribution, and use, there are many opportunities for potential problems and many places where things can go wrong, and often do.

In this country, at least, this general principle is often known as "Murphy's Law," which roughly translates as, "If anything can go wrong, it will." We need not dwell on the multiple opportunities for Murphy's Law to take effect in systems relying on one critical path, ranging from *simple neglect* in the face of more interesting or apparently pressing business, *abuse* by misdirected staff, *human error and inexperience*, and the *laws of chance*. All may act individually or in concert to disrupt the function of any single system.

The important point here is to recognize that concentration on direct delivery of ORT through the public health system is in fact to rely on the weakest leg of a tripod of health actors, with the

stronger often being the private sector and the community.

If there were no reasonable alternative, as is often the case with immunization, then pinpoint focus on the public health logistics system alone would be reasonable. This is not the case with ORT; important, even predominant alternatives exist in the private sector distribution and marketing system and in the direct home-based preparation of local mixtures. Use of either or both of these avenues would have minimized the critical path problem in our example by building on alternative systems that have proven themselves effective.

### **The low priority and prestige attached to logistics in public health**

Let's be honest with each other: which of you have longed for the challenge of having direct responsibility for a logistics system? Not very many. How many of your most competent, committed colleagues would see a logistics management posting as a natural and important stepping stone in a public health career? Again, not many.

Only immunization and family planning programs have paid more than passing attention to logistics. It is an area that is not perceived as professionally important or rewarding, yet how many of us have tried to work in health services facilities that lacked drugs and supplies? Virtually all of us.

I know of only three realistic responses to this problem, all of which, fortunately, are compatible with and mutually supportive of logistics success in ORT.

*First, change the priority placed on public health system logistics management.* Try putting good people in charge and reward performance with promotion, recognition, further education, or whatever incentives fit. Compared with most public health efforts, measuring logistics performance is easy: they have the supplies or they don't, and objective, quantitative indicators are readily constructed.

*Second, use the people and system that know how to move mass market, low-cost consumer goods, which is what ORS packets are.* Commercial distribution of family planning supplies works. Comparable products such as ORS packets, subsidized if necessary to provide competitive profit margins, fit right into the commercial retail sales and distribution networks that reach far beyond any realistic projection of sustainable public health facility-based services. The private sector rewards people who get the goods delivered and sold. Very clear signals are provided for those who consistently fail to perform: they either go out of business or they lose their jobs, approaches that the public service sector rarely employs.

*Third, use systems that don't depend on the yet-to-be-demonstrated new priority attached to public health logistics.* ORT is a paradigm for effective, home-centered, need-driven, public health action. The Egyptian example of effective home-prepared ORS from locally available ingredients should be a landmark for those interested in effective, sustainable, low-cost attacks on the diarrhea/dehydration problem.

We are talking about attacking a problem that does not show up in health services facilities 90% of the time and that can be treated effectively at home using home-prepared local ingredients. To focus all our attention on propping up public distribution systems that aspire to sustain free delivery of packets to every household is betting all our money on the riskiest alternative. This view may seem strange from a speaker representing the logistics management attack on ORT, but it is essential in a realistic appraisal of the tools at hand. There is plenty of work for us to do directly in improving public sector logistics performance: training and technical assistance can be productively applied, given the decision to make public health logistics a priority. This essential effort does not lessen the importance of the third lesson from the opening anecdote.

### **The futility of attempting to meet a widespread community need through a subset of the health system inherently unable to respond**

A visual reminder of the territory we are trying to cover may be useful (see Figure 2). The diarrhea burden is represented by a large circle with smaller circles superimposed to represent delivery strategies via the public health, private and commercial sectors, and homemade mixtures.

The relative importance or size of the delivery strategy circles will differ from place to place over time, but I submit that the example is adequate to allow concluding these opening remarks by focusing on the important public health logistics policy decisions faced in virtually every country. I believe there are three such decisions which ideally should be made in a closely linked sequence:

The first decision — to support publicly the reality of multiple, mutually supportive ORT delivery strategies — is perhaps the most important single public health decision and leadership responsibility in ORT logistics. Everything else, including our potential for success, rests on this.

The second decision is to make a balanced public health *investment* to stimulate development of the three strategies supported. Balance does not imply *equal* investment, but rather appropriate attention to stimulate the private sector in the form of good people and enough money (both the commercial distribution networks and other private nongovernmental organization

groups) and to implement the communication and training strategies essential for families to do what they can for themselves at home. This investment is critical, even though it may require only part-time attention by committed officials in a small country or proportionately larger investments in larger settings. The problem is that the *roles* are unfamiliar to many public health decision makers, and top-level support is required to legitimize and encourage good people in mid-career to undertake such pioneering efforts.

With the above decisions made, then the decision to attack the public health delivery element for services and supplies can be placed in context. I mention *services* first, because repeated practical, hands-on, face-to-face training in ORS preparation appears to be essential. This implies transport planning to the village level, which in many settings is enough in itself to engulf public health logistics resources.

Finally, we arrive at what some may consider *the* logistics problem — *supplies*, in the form of sustained delivery of ORS packets, to the most peripheral facilities and perhaps to every household. ORT, an essential primary health medicine, *can* be delivered to the dispensary level if reasonable priority is at last placed on public health logistics. The knowledge and management methods exist and do not require great leaps of faith to apply vigorously and with confidence in the result. I expect that the panel session that follows will concentrate on the practical issues of supply pipelines which, being slower, longer, bigger, and more expensive than expected, offer many opportunities for management improvement.

However, my skepticism and anxiety level go up markedly when we go beyond packet supply to facilities and talk of sustained free delivery of ORS packets or any primary care medicine to every village household. For what reason? Three, the first two applicable to primary care drugs in general and the last to ORT itself. They are the sham of free medicine for all, the motivation/incentive problem for peripheral workers, and the needless dependency on packets.

*The free medicine fable* — In my opinion, the greatest sham in public health in the developing world today is the political mirage of free drugs; the great shame is that it is largely unnecessary, as poor people throughout the world consistently demonstrate their willingness to pay for medicine far beyond any conceivable level of government expenditures. Governments do not, despite public postures, succeed in making sustained supplies of medicine freely available, and certainly will not do so to every household in the country.

*The motivation problem for peripheral workers* — I do not believe we know how, in many societies, to supervise and provide incentives for village

Figure 1

TYPICAL PUBLIC DRUG SUPPLY SYSTEM

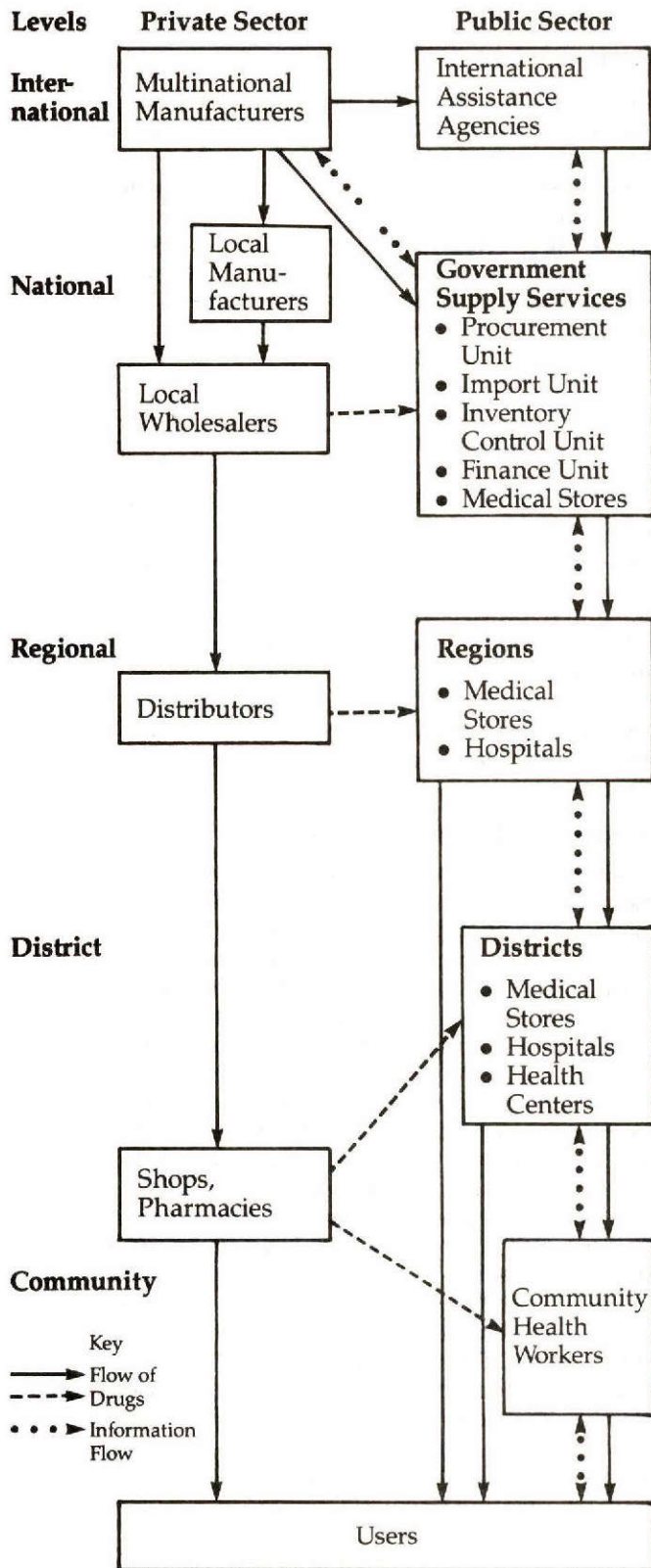
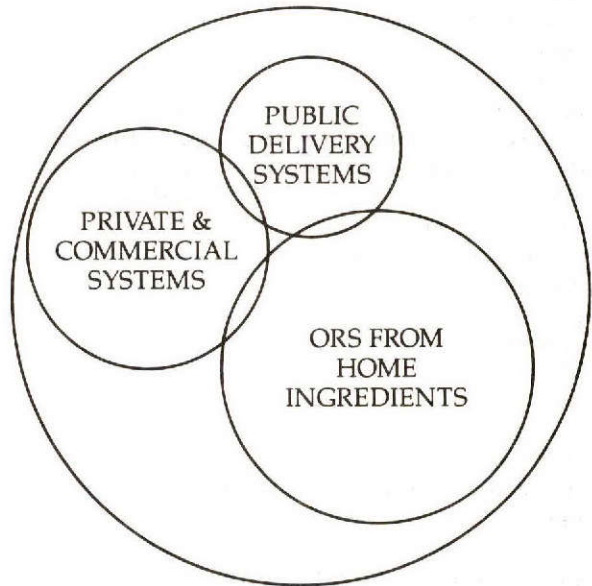


Figure 2:

ORT DELIVERY SYSTEM RELATIONS AND THE DIARRHEA PROBLEM



workers to make house-to-house visits on an indefinite basis. If we don't, then perhaps we should use the few visits that can be made to teach, not just to create unrealistic expectations. *The unnecessary dependency created by reliance on packets at the village level* — We know that face-to-face training is important and that home-made mixes work. Why create *dependency* in the minds of workers and clients and a huge logistics headache when there is a more direct, front-line solution?

My closing thought for your consideration recalls the statement about "war being too important to be left to the generals." ORT delivery is too important to be left to the public health generals. We have critical roles to play, but direct operational responsibilities for delivery of ORT must be constructed with a realistic eye to the resources, particularly the people, we have to work with. This enterprise we pursue together is not a mass, one-shot, eradication campaign; rather, it is to create a sustained response capacity for mothers to react immediately to a pervasive potential killer, to be ready to act indefinitely, and to act at home.

## LOGISTICS AND ORS PRODUCTION

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I am sure that most of you are aware that our distant country lies at the crossroad of the western Pacific on the opposite side of the globe from where we are now. Yet its history and destiny has been closely linked of late with this great American nation. From your forebears and your institutions we have learned and cherished the values of democracy, of individual welfare, and of freedom. Thus it is that our government evinces a basic preoccupation with health both for the individual and the community.

Enshrined in our constitution is the provision that it is the responsibility of the state to provide adequate social services, including those for health, for all our people. The Ministry of Health has been mandated to carry out that responsibility, and the present political administration has vigorously and diligently endeavored to afford every Filipino, regardless of economic status, creed, or religion, to avail of such services.

Across the years, our Ministry of Health has tried various approaches to provide health services to all our people. In spite of this, a segment of our population has remained underserved. On June 30, 1981, however, on the occasion of the inauguration of the New Philippine Republic, President Marcos directed that primary health care be institutionalized throughout the country. In compliance with this directive, the Ministry of Health planned and developed a primary health care program that would be possible within our sociopolitical system and with the highest possibility of acceptance by our people. Its goal is to make basic acceptable and affordable health services readily available to every citizen, in every barangay (village) throughout the country, irrespective of his station in life.

For a start, we trained almost 9,000 midwives, 8,000 nurses, and 4,500 physicians to initiate preparation, organization, and implementation of primary health care. To date, 27,630 barangays are already practicing PHC since we began implementation on September 11, 1981, the occasion of our President's birthday. By the end of 1983, we shall have completed the organization and practice of PHC in the 48,000 barangays of our country, including the incorporation of various health programs, such as maternal and child health (MCH), malaria, etc. The success of our oral rehydration therapy program, which is a part of MCH, is dependent on PHC. However, in some villages, we have used ORT as an entry point for PHC.

While PHC is the main thrust of our Ministry of Health, there are many other programs which we have instituted. These are programs which respond to the demands of President Marcos for innovative solutions to age-old problems.

### The health budget

It has been theorized that an ideal health budget should be anywhere between 10% to 14% of the total national budget. It is claimed that this would result in distinct and rapid improvement of health indicators. While this may happen, such a budget might affect deeply the total socioeconomic development plan and thus create a negative factor in health development. It is imperative, therefore, that the budget for health strike a happy balance with the overall national targets. The cost of health programs must be interwoven with the national objectives and determined by a set of priorities directed to maximizing available resources.

The Philippine health budget represents only 4.2% of the national budget. This is so because the national policy dictates that the development of indigenous energy sources, such as geothermal and hydroelectric power, and economic development are necessary priorities. To sit back and bewail this situation would be a disservice to our people. The Ministry of Health has accepted this and embarked on a set of priorities to improve the health status with the available resources.

### Integration of health services

Health is one of the country's biggest investments. Yet the development of health departments is lopsided. The building of hospitals and the recruitment of medical personnel are issues of major concern, and the bulk of the health budget has been used for the maintenance and expansion of such hospitals. Preventive health services, on the other hand, receive a much lower share of the annual budget. In rural areas, recruitment of medical personnel is difficult due to the monotony of the job and the tendency to lag behind in clinical expertise. A wide gap is thus created between the preventive and curative services, and a two-way referral system becomes almost impossible. The health situation is aggravated by medical and nursing schools' use of curricula which are no longer relevant to the needs of the people. There is little effort made to restructure the curriculum beyond hospital-based medical education, regardless of specific conditions and problems in rural areas. The increasing cost of medical and nursing education has resulted in graduates demanding adequate returns for their college expenses.

These factors have contributed to the deteriorating quality of health services. First-level care in the rural areas is no longer adequate, and hos-

pitals are overcrowded with patients who should have been attended to in health centers. There is an obvious lack of coordination and integration between the preventive and curative services of the health system.

The Philippine Ministry of Health recognizes the problems caused by the uncoordinated functions and activities among and between the different health services. It realizes the need to improve the whole process of health care delivery in response to present day economic and social realities. It believes that integration is both necessary and inevitable in order to affect adequacy, economy, and effectiveness.

Webster defines "integration" as the act of combining diverse elements into a harmonious complex whole. The World Health Organization defines "integrated health services" as those necessary for the health protection of a given area and provided under a single administration. "Integration of health services," however, has several meanings depending upon how broad is its concept. One point of view would have an integrated health system as a total system made up of components from both public and private sectors. Another way of viewing integration is the coordination of all government agencies rendering different forms of health services under one administration. The Ministry of Health and the Regional Directors at this particular time view integration as the merging of the preventive and curative services under a single administrator with the ultimate aim of providing one comprehensive health program for the nation.

In February 1983, Philippine President Marcos approved a proposal to reorganize the Ministry of Health. The main feature of the reorganization plan is the decentralization of all health programs to the level of the implementation and the integration of all health services within the province under the administrative jurisdiction of the provincial health office. The integrating center, therefore, will be the office of the provincial health offices.

We have completed the implementation guidelines and worked out the details of this reorganization. It is hoped that the following results will be achieved:

- provision of a low-cost health delivery system (total cost will not decrease, but unit cost will be decreased significantly);
- increased economy and efficiency;
- prevention of the overlapping and duplication of functions;
- expansion of health services to the rural areas to attain greater coverage;
- development of a more effective recruitment system;
- maximum utilization of available manpower;
- consolidation of administrative services by

- eliminating administrative fragmentation;
- consolidation of financial, accounting, and management staff;
- effective sharing of available facilities, such as laboratories, x-rays, and other equipment;
- provision of an automatic, two-way referral system;
- systematic management of data;
- proper allocation of financial resources;
- prevention of personnel conflicts;
- equitable distribution of personnel; and
- improved management capabilities.

### **Standardization of hospitals**

As broadly defined, a hospital is an institution having professional health workers and supportive personnel housed in a physical plant with facilities and equipment to render medical and other health services on an inpatient and outpatient basis. In standard practice, the hospital has been viewed mainly as a curative and rehabilitative health service facility. It is also seen as a vehicle for the training and professional upgrading of skilled medical manpower and for the pursuit of higher learning through the conduct of basic and applied medical research.

The hospital is not an independent structure, but part of a network of health services that serves a purpose dictated by the overall health environment in which it operates. The need for hospital services relates directly with the nature and magnitude of health problems existing in the locality. It is also directly affected by the level of performance in promotive and preventive health services delivery. When promotive health services fail, the need for curative service become strained and exhausted. Conversely, when promotive health services are effective, the strain on the resources of hospitals is relieved. Since promotive and preventive health care are relatively less costly and serve the greater bulk of the population, it is more rational to expand promotive and preventive health activities rather than hospital facilities.

Because of the relatively high cost of operating and maintaining a completely staffed and equipped hospital, the Philippine Ministry of Health has adopted a system of hierarchy and referral in the delivery of hospital services such that lower-cost and lower-level health services are offered at the periphery and higher-cost and higher-level medical services are offered only at the centers. The lower-level health service facilities serve to screen patients so that only those requiring higher-level health care are referred to the higher-level hospitals. A system of decongestion is thus achieved at each level in the hierarchy. At the same time, the utilization of sophisticated and expensive hospital facilities and manpower is maximized.

The types and levels of skills and services cor-



responding to each level of health facilities in the hierarchy are defined in relation to the levels and patterns of health service needs identifiable in the environment. Standards of skills, equipment, manpower, and services, therefore, need to be developed and updated from time to time in response to the overall health needs of the population. The Ministry of Health has formulated a hospital development program which focuses on the rational distribution of resources and strategic location of facilities so as to provide the most appropriate levels of services at the least cost.

This task is complicated by the fact that such program formulation does not start from a zero base, but must take as given many past irrational and fragmented decisions regarding the location of facilities and their corresponding levels of sophistication. The problems arising out of these past irrationalities have emerged in the last few years, affecting both government and private investment returns as well as public welfare. The highly lopsided distribution of hospitals in favor of a few urban centers is well known. So is the wide variability in the occupancy rates and quality of services offered by the various facilities operating nationwide. All these problems add up to the high cost of medical care, prompting the Ministry of Health to formulate a national program that will provide the necessary levels of health services at the least cost.

The national hospital development program seeks to rationalize the delivery of health and medical services in order to benefit the largest number of people at the least cost to both government and the private providers of services, as well as the general public who are the ultimate consumers of services. The program likewise aims to identify the desirable levels of services that will meet the various needs and strike a reasonable balance between promotive, preventive, curative, and rehabilitative services.

In the furtherance of these objectives, the program recognizes the contribution of the private sector and adopts a strategy of private sector and government partnership and cooperation in the delivery of health services. At the same time, the program is committed to the principles of equity and welfare and will, therefore, adopt a people-based strategy of health service delivery consistent with the general developmental thrusts of the government. In simple terms, this means that in the programming of services and health facilities investments, consideration of people's needs takes precedence over the need for professional and technological advancements, or the need to put up medical show cases in order to keep up with our more advanced neighbors.

#### **Diarrheal disease control**

We have instituted an economical remedy for diarrheal diseases — the oral rehydration therapy

solution which is called "Oresol." Oresol is easy to administer and virtually has no harmful side effects. It has effectively lowered the mortality rate in diarrheal cases from any cause. Most of the deaths from diarrheal diseases in our country were among infants and young children. Distributed free of charge by the Ministry of Health, these packets are given out at the neighborhood level throughout the whole country by our rural health units. Last year we produced and distributed 4.5 million one-liter packets of Oresol. This year we targeted 9.0 million packets.

## **FIELD EXPERIENCE WITH ORS PRODUCTION**

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Since the late 1960s, when the effectiveness of oral rehydration was first recognized, a number of rehydration solutions with different compositions were available in pharmacies. Most of the products were basically composed of the same ingredients as those used for intravenous fluids, but presented in powder form, with flavor, color, vitamins, and other additives. In many places where these drugs were not available, the expensive sterile intravenous solutions were used also for oral treatment; in fact, in some countries, they are still being used at the present time.

The formula that was subsequently developed and recommended by WHO contains the following basic ingredients per liter of water:

- 20.0 g glucose anhydrous
- 3.5 g sodium chloride
- 2.5 g sodium bicarbonate
- 1.5 g potassium chloride

The choice of this particular formula, known as oral rehydration salts, was mainly based on physiological considerations and evidence of clinical acceptability which had been confirmed by various studies. Little attention was given at that time to possible chemical reactions and stability.

In 1969, before it began to promote the present formula, WHO arranged for trials of ORS production in sachets together with VIFOR, a pharmaceutical company in Geneva. In 1975, UNICEF associated itself with the effort to provide ORS and by 1980 was already supplying a total of twenty-six million packets globally. The first few batches were flavored, but this was later abandoned because of the impossibility of providing a universally acceptable flavor, the doubtful advantage of flavoring, and the addi-

tional cost and logistics load. Since then, the single presentation of ORS distributed globally by UNICEF and WHO has been the four previously cited ingredients added to one liter of water. The scientific basis for the single formulation has been described in the 1983 Joint WHO/UNICEF Statement titled "Management of Diarrhoea and Use of Oral Rehydration Therapy."

For practical reasons and to avoid overdependency on the central procurement and global provision of ORS, UNICEF and WHO have been encouraging the national and regional production of ORS. Since 1979, both agencies have been supporting local production through the transfer of "know-how" and the supply of equipment, raw materials, and packaging material. Guidelines for the production of ORS have been available since 1980.

### Stability

The main problem has been the stability of ORS. As the product has become more widely used and distributed, it has been found that even packets produced in industrialized countries may, after some time, turn yellow and even brown. This usually happens, however, only under tropical conditions (hot and humid) and if packets have not been properly sealed, or if the raw materials have not been dried to the required moisture content. WHO-supported laboratory studies have shown that the discoloration is a sign of the interaction of glucose and sodium hydrogen carbonate, which leads to decomposition of glucose. The process is accompanied by the formation of 5-hydroxymethylfurfural (HMF) and various polymers thereof. While this change in ORS does not appear to affect its effectiveness or safety, it does affect its acceptability and shorten its shelf life.

In some developing countries, the stability problem has been solved by packing the glucose or bicarbonate separately. The potential danger of misuse, however, discouraged WHO from adopting this solution. The main approach to improving the stability of packets has been to recommend a further reduction of the moisture content of the raw materials and the mixture, the use of high quality packaging material, and suitably air-conditioned and dehumidified production facilities. This solution, although in theory very satisfactory, proved to be unfeasible in some developing countries due to a lack of the necessary facilities or funds to establish and maintain them.

A second approach was, therefore, adopted — to search for a chemically more stable formulation with equal clinical efficacy that could be produced with all the ingredients mixed together, and possibly in less sophisticated facilities, should the situation demand it. The most effective and convenient solution seemed to be the

use of a substitute for bicarbonate. Preliminary tests, terminated in August 1981, showed that trisodium citrate probably offered the best prospects as a substitute for bicarbonate.

Based on this, WHO initiated testing for stability of three different formulae with citrate by exposing them over a three-month period to various temperatures and packaging materials, including aluminum foil and polyethylene. By the end of 1982, the tests had confirmed that a composition with glucose anhydrous and trisodium citrate in place of sodium bicarbonate was the most stable of the tested compositions.

### Clinical trials

A recommendation to use the alternative ORS formula with citrate can be made *only if* there is sufficient evidence that its effectiveness is equal to that of the currently recommended formula. The WHO Diarrhoeal Diseases Control Program has initiated controlled clinical trials with the citrate formulation in four countries, and several more studies will be implemented shortly. The results of these studies are not expected by the Program until the end of 1983. An evaluation and an official statement from WHO on the citrate formulation can therefore not be given before then.

### Choice of formulation

An important point needs to be made here: the present ORS formulation is not discredited by an alternative citrate formula and can still be used and produced in countries where the climatic conditions do not lead to accelerated deterioration of the product. In the future, countries will be able to choose between the two options, depending on the availability of raw materials, packaging material, and production facilities; on the prevailing climatic conditions; and on the policies set by the ministry of health.

The present formula is available at the moment at a cost of about U.S. \$0.05 *ex* factory. Assuming use of the same packaging material, the alternative formula is only slightly more expensive. However, if ordinary polyethylene material can be used for packaging instead of aluminum foil, then a savings of about U.S. \$0.01 per packet can be expected for either formulation, all depending on local prices and presentation (including printed inserts). This, in fact, represents a savings of about 50% on packaging materials only. These estimations do not include the costs of production machinery and labor.

### Alternatives for presentation

If the bicarbonate formula is to be produced, the following presentation can be recommended:

—ORS packed in aluminum foil as presently distributed by UNICEF for use in countries with a temperate climate (preferably not over 40°C);

—ORS packed in polyethylene bags for use in hospitals or facilities with a rapid consumption rate (approximately three weeks, depending on climate);

—ORS packed in two separate polyethylene bags (bicarbonate separated) for use in countries having a tropical climate, locally produced raw material such as bicarbonate, and difficulties in obtaining foreign currency for the importation of aluminum foil.

If the citrate formula is to be produced, the same options are possible, mainly:

—ORS packed in aluminum foil; less expensive qualities are being tested;

—ORS packed in paper/polyethylene laminations or other material, mainly for use on automatic filling/sealing machines, but also for three-sided, presealed packets; this type of material can result in some savings and is also being field-tested;

—ORS packed in polyethylene packets; this presentation is particularly recommended for hot and dry countries. In humid climates the product has a tendency to lump, and airtight packing may be preferable.

#### **Production methods**

The choice of formula, packing material, and finally of production equipment depends also to a great extent on the amount of ORS to be produced.

*Small quantities of ORS* can easily be prepared in hospital pharmacies for in- and outpatients:

The hospital may choose to produce two sizes of packets, one for matching the containers used in the hospital and another to give to patients for home preparation. For this type of production, the hospital should take full responsibility for quality control. Assuming immediate consumption, the ORS can be packed in polyethylene or even paper sachets.

If *decentralized provision* is the policy of the ministry of health, the same type of packing in polyethylene or even paper bags can be chosen. Although this "cottage" industry type of production seems to be very attractive, a few details may be worth studying beforehand.

1. In cases where the raw materials and packaging material cannot be purchased locally, the ministry will have to arrange for their distribution to the production units, which will be an additional administrative and logistic burden for the ministry.

2. If a country has a series of such decentralized production units, careful planning and supervision will be required to ensure that all have the required material in stock all the time.

3. The investment for basic equipment for this type of production is about U.S. \$2,500 per unit. The investment would probably not be justified

for production of less than 50,000 packets per year.

4. ORS, being an essential drug, requires quality control. The cost of establishing a quality control laboratory with all the necessary instruments will have to be charged to the product. This will increase the price of the packet, especially if only small quantities are produced.

While cottage industry production can be very successful, a careful study of the logistic and economic aspects of the particular situation should be made before choosing between the provision of ready-packed ORS from a central production unit and provision through cottage industries.

*Larger quantities of over two million packets per year* are easier to fill and to pack with semi-automatic equipment. This means mixing the four ingredients with simple equipment, such as a drum mixer, and dosing the powder with a hand-dosing machine. The capacity of such a machine depends mainly on the operator. In certain cases, as many as twenty-eight to thirty packets can be filled per minute, a little more than half of the capacity of an automatic machine. The powder is filled in a presealed sachet which can be made of paper, polyethylene, aluminum foil, or any other material; these packets can be sealed manually with a hand-operated sealer. This type of packaging is advantageous in that it is more flexible and there is less spoilage of packaging material. The equipment normally does not require special ambient conditions and is simple to repair locally.

*Quantities of more than four million packets* are more conveniently filled and packed with an automatic machine. However, such industrial equipment will function satisfactorily only if properly installed in air-conditioned rooms with a humidity of not more than 40%, and only if the product has good flow characteristics and the packaging material is of good quality and perfectly printed. The machine needs daily maintenance; a well-trained mechanic must be present. In addition, the need to provide servicing and spare parts from abroad can lead to dependency. Past experience with such equipment in developing countries has not always been encouraging. However, if the equipment is produced locally and service is guaranteed, its use should be considered. An automatic machine usually does not handle ordinary polyethylene material. This handicap limits the choice of packaging material and may even lead to dependency on overseas supplies. If the packaging material is printed locally, the print quality must be of a high standard. The photocell on the machines usually cannot handle irregularly and poorly printed foil and will not operate to full satisfaction.

For each country, the optimum equipment will need to be studied carefully and will depend on

a number of criteria, including the availability of reliable infrastructure, qualified staff for maintenance, quality control, logistics, distribution, and others.

The production of ORS may also require planning for additional storage space. A shipment of raw materials and aluminum foil for five million packets will require several containers. This volume of storage space will need to be available in a warehouse if all the material is stored properly on pallets. Depending on the demand for ORS, equal space will be needed for storing the boxes containing the finished product. It is clear that these quantities are difficult to handle manually and that a lifter and transporting equipment should be available.

WHO has also supported the study of ORS in tablet form. A few industries have taken up the production of an ORS tablet, especially for use in industrialized countries. Up to ten tablets are needed in some cases for a one-liter solution so that there is a risk of misuse. No effort has been made to date to stimulate the production of a tablet in developing countries due to the additional investment for a compressing machine, strict requirements for air-conditioning, need for qualified staff, and higher cost of the final product in comparison to the powder in sachets.

In collaboration with TETRAPACK, an ORS drink has been developed and can be produced by most companies using TETRAPACK BRICK filling equipment. A practical trial is planned in the Philippines. Production of a ready-made ORS solution may not be an economic proposition in all cases, but may be appropriate for use where water is heavily contaminated during epidemics and in selected urban areas. In Zaire, a beer factory is known to have produced ORS solution during an emergency.

### Uniformity

Commercially produced ORS is available in tablet, liquid, or powder form. The ORS in powder form is usually packed in sachets, but the quantity does not always correspond to that required by the ministry of health. The presentation and appearance vary from one supplier to another. A large variety of products can confuse the public and hamper the progress of the national program in its implementation stage. The identification of a standard national dosage, a standard presentation, and a label with "instructions for use" adapted to the local culture and in local language(s), possibly including illustrations, may be of very great value, particularly in the case of packets distributed by the ministry and used in a national program. Such details cannot be provided on a packet produced for global use, but definitely should be included if ORS is produced locally.

### Conclusion

Locally produced ORS, though no less expensive than importing packets in most cases, offers other advantages which cannot be expressed in monetary terms. Apart from the important principle of national self-reliance, there is the flexibility to produce ORS according to local needs, including the ability to respond immediately in case of an emergency and the freedom to choose a dose adapted to a standard size of container that is widely available in a country. A saving in foreign currency can be made if a simpler presentation is chosen and local packaging material, as well as raw materials, are used.

There is no doubt that a suitable mode of ORS production can be found for each particular case, and the Program is ready to provide any further assistance that may be required.

## ORS IN THE CONTEXT OF THE ESSENTIAL DRUG PROGRAM

MR. ROGER GOODALL

*Adviser*

*Essential Drugs*

UNICEF

New York, New York

The provision of ORT should be an integral part of a comprehensive essential drugs policy, rather than a "vertical" monocomponent program. This essential drugs policy in itself is a part of the strategy of primary health care.

At the 1978 International Conference on Primary Health Care at Alma Ata sponsored by the United Nations Children Fund and the World Health Organization, 134 nations declared their commitment to the adoption of primary health care. Some five years later, implementation has been achieved only partially in nearly all of these countries because of the numerous constraints that beset the task — not the least of which are the practical expression of the political will and the reorganization of existing health structures.

Perhaps the most direct problem to be tackled, however, is that, in the developing world, the health services lack the basic essential drugs and the infrastructure to deliver them to the people in greatest need, people who largely live in rural situations away from conventional urban facilities. If the health services cannot cope with the most immediate and urgent health needs as they are perceived by the community — such as malaria, hookworm, river blindness, diarrheal diseases, or whatever they may be — then no other PHC interventions, health education, immunization programs, and so on, no matter how neces-

sary they may be to the long term goals of PHC, can be implemented or will be accepted by the community.

The provision of essential drugs to the community is the key that unlocks the door to the achievement of primary health care and the Alma Ata declaration of "Health for All by the Year 2000"

As we know, diarrheal diseases and the associated state of malnutrition account for the death of an estimated five million children under five years of age every year, about ten deaths every minute. Oral rehydration therapy is a proven tool in dealing with this emergency.

It is well to keep clearly in mind that ORT comprises a strategy to change the behavioral response of parents to childhood diarrhea — to produce an appropriate response which encompasses the several components of a complete diarrheal disease control program. Such a program includes health education, environmental sanitation, personal hygiene, and provision of clean drinking water, as well as the administration of oral rehydration solution from the onset of an acute attack of diarrhea.

The best approach or combination of approaches to oral rehydration in any community should be decided according to the local circumstances. Each alternative poses its own logistical problems and requires specific responses. For instance:

A. Home prepared solutions may be introduced either as a sugar/salt type of solution or a food-based solution, such as rice water. These require the consistent availability of the ingredients at a price that parents can afford. Home-prepared solutions also require, especially in the case of sugar/salt solutions, a heavy investment of the health educator's time. The health educator must make repeated visits to reinforce the knowledge of the mixing techniques and to provide a continuous supply of mixing spoons or measures if these are to be used.

B. Pre-packaged ORS may be seen as providing a "complete" formulation of greater efficacy and, therefore, be considered preferable. But the problem of logistics is greater with this type of solution. To justify the health education effort required in introducing this behavior response, the following requirements must be continuously met.

1. An estimate (and regular revisions of estimates) must be made of the quantities of ORS packets required in the area, including seasonal variations, if any, to ensure that supplies of ORS are universally available.

2. Packaging may be done at a cottage industry level or centrally on a national or regional scale, or packets may be fully imported. At the cottage industry level consistent supplies of ingredients and packaging material must be assured, with

alternative or back-up suppliers identified. Stock control, taking into account normal lead times, must be implemented; and managerial capacity and constant supervision of mixing and packing is essential.

Central packaging has basically similar requirements, but supplies may be imported, lead times longer, and stock control, therefore, more critical. Also, with higher technology involved in machine packaging, technical expertise is required. Starting up new plants demands technical knowledge. As a rule, production of ORS with automatic machinery is economically justified only for production of an amount above four million packets per year. Smaller quantities are preferably packed by hand or with semi-automatic equipment, unless the automatic equipment is used also for packing other products in powder form.

An automatic filling/sealing machine costs about \$70,000 without accessories and spare parts and performs to full satisfaction only if installed in an airconditioned (dehumidified) room, connected to a stable, fluctuation-free power supply, and maintained and adjusted by qualified mechanics.

Semi-automatic equipment can reduce the investment needed by about half. At least twenty-five three-sided, presealed packets per minute can be filled by a dosing machine. The same number of packets can easily be sealed after filling with a hand-sealing machine. Such machines do not require a special production room and can be installed in any suitable, available room at the time when ORS is to be produced and packed. The dosing equipment can normally be adjusted within a fixed range of dosage volumes and used for filling into bottles, tins, and other containers, in addition to the sachets used for ORS.

If supplies of ORS are to be fully imported, normal stock control and warehousing capabilities are required. This option may well be cheaper than the cost of local production. ORS sachets cost close to \$0.08 to \$0.12 each. Local production costs are often higher, especially if raw materials have to be imported.

Imported supplies may also be obtained from UNICEF or other agencies. It is important for governments to know the correct procedure for obtaining supplies from UNICEF: UNICEF is *not* Sears & Roebuck! It is necessary to contact the local UNICEF representative to receive advice, either to obtain reimbursable procurement — paid for by the government but supplied through UNICEF — or supplied and paid for by UNICEF as part of its country program. Over the past three years UNICEF has distributed over fifty million packets of ORS throughout the world.

3. Regardless of the means by which supplies of ORS are secured, they have to be distributed

efficiently to the user. It is imperative to the success of a program that supplies are consistently available. To achieve this, a mix of different channels may have to be used simultaneously. The various options available include distribution through:

—fully commercial channels. This has the advantages of involving no cost or utilization of the health services resources, but has the disadvantages of high cost to the consumer and little or no control over the formulation of advertising and promotion techniques.

—semicommercial or social marketing whereby government-produced ORS is sold through small traders at a determined price. This ensures lower cost to the consumer but may result in an unreliable supply if the stocker does not cater adequately to the needs of the community.

—the health services. This ensures free or low-cost supply to the parent and can ensure that supplies of ORS are tied to health education campaigns. It requires that health services invest in stock, warehousing, transport, and management, any of which may be deficient, so as to ensure success of the diarrhea disease control program.

Stock control cannot rely on the assumption that the depletion of supplies will trigger a "pulling" of replenishment stock through the system. Continuous restocking may well need to be "pushed" through the system, as, for instance, is being done in Kenya and Tanzania, where pre-packed kits of essential drugs — including ORS, of course — are distributed to rural health facilities at regular intervals, demanding no stock control capacity at the user end of the chain.

At least two other areas need to be dealt with in a CDD program, but these are being discussed elsewhere — namely, (a) promotion and public education concerning ORT, and (b) research, both in terms of developing the formula into super ORS using amino acids, for instance, and in terms of social anthropology. It is well to remember that we need to listen to and learn from a community as much as we need to teach.

## **FOUR WAYS TO IMPROVE ACCEPTANCE, AVAILABILITY, AND CORRECT USE OF ORAL REHYDRATION THERAPY**

DR. GORDON W. PERKIN  
*Executive Director*  
PIACT/PATH  
Seattle, Washington

There are several inexpensive and effective ways to increase the availability, acceptance, and/or

correct use of oral rehydration therapy:

1. *Availability of accompanying instructional materials.* It is possible to develop pictorial pamphlets which explain how to prepare ORT, how frequently to give it, the importance of continuing to feed the child during episodes of diarrhea, and the importance of continued breastfeeding. These pamphlets, developed with the participation of the consumer, are tested, modified, and retested until more than 80% of the target audience correctly interprets the messages in an unaided situation. The Program for Appropriate Technology in Health (PATH) has now developed ORT pamphlets for nonreaders in several Asian and Latin American countries. The small black and white pamphlets are inexpensive to produce in large quantities and have been shown to increase the correct preparation of ORT significantly.

2. *Identification of a universal container.* PATH has found from its work in Asia that in each country, there is a readily recognized, widely used, local container. This may vary from a Mekong whiskey bottle in Thailand to a Nescafe glass in the Philippines to a Blimbing glass in Indonesia. These containers are recognized throughout the country and are readily available to a high percentage of the population. It is recommended that when countries embark on local production of ORT, they adapt the size of ORT package to correspond with a readily available, local container rather than limiting their production to one-liter packets. It is easier to adjust the size of the ORT packet to that of a locally available container than to instruct millions of mothers in the correct preparation of a packet that requires an unfamiliar one-liter container.

3. *Including simple pictorial instructions on the ORT package can improve correct mixing and use.* PATH's ORT projects in Indonesia, Bangladesh, the Philippines, and Thailand have demonstrated the feasibility of incorporating simple pictorial instructions on the ORT package. These three-step instructions include (a) opening the sachet, (b) adding the powder to water, and (c) stirring to dissolve. The incorporation of this simple message on the package has been associated with a significant improvement in correct mixing and preparation of ORT.

4. *Alternate dosage forms.* The availability of a variety of ORT dosage forms will contribute to wider use and acceptance. PATH has developed an ORT tablet, with each tablet providing sufficient electrolytes for 150 cc of ORT solution. The tablet appears more medicinal than loose powder, and a glass of ORT solution can be made as it is needed so there is less wastage. Also, the ORT tablet is perceived as a "medicine" and is appropriate for sale through small shops where large numbers of people buy basic supplies. Providing different dosage forms of ORT

designed to fit different delivery systems will contribute to widespread availability and use. The objective should be to ensure that a variety of dosage forms, ranging from simple home preparations to commercially distributed products, are available in each country.

## LUNCHEON SESSION

At the ICORT luncheon, Dr. Nyle C. Brady notes that the conference program has two components, "show-and-tell" and "so-what." While all conferences include the "show-and-tell" sessions where participants describe their program experiences, not all also have the "so-what" sessions where individuals must ask themselves what they have learned and what they will do with this information. Brady urges ICORT participants to take advantage of the momentum the conference provides to take action in their home countries.

### "SHOW-AND-TELL" AND "SO-WHAT"

#### ICORT Luncheon — June 9, 1983

*Chairperson: DR. NYLE C. BRADY  
Senior Assistant Administrator for Science and  
Technology  
Agency for International Development  
Washington, D.C.*

We have reached a very critical point in this conference, a point where we are shifting our focus from the gaining of information to the using of that information for human good.

The successful conferences that I have observed usually have two critical components. The first component is what I call "show-and-tell." In the formal sessions, learned speakers make scholarly and moving presentations to show their fellow participants what they have learned and to tell them about their successes and failures. Between formal sessions, during the coffee breaks and the social hours, further informal exchanges take place as participants tell each other what they know. This conference component is essential since it fulfills the needs to communicate, to exchange views, and to influence each other's thinking. All conferences have the "show-and-tell" component.

The second component of a successful conference can be termed the "so-what" component. It requires participants to ponder what they have heard and learned and to ask themselves the question, "so-what?" So what are they going to do about what they have heard and what they have learned? How do they expect to change their own actions and the actions of others? And, how do they expect to communicate to others what they have learned?

All conferences have a "show-and-tell" component. Many fail to include the "so-what" aspects. To me, the "so-what" component may well be more critical for a successful conference than the "show-and-tell" component. It forces us to ask what we intend to do in our respective positions at home to utilize the information we have gained on oral rehydration. What specific actions must we take to ensure greater utilization of one of the most appropriate and least expensive health tools the world has ever produced? What must we do to motivate decision makers at home to support oral rehydration therapy strongly? What advice do we give donors as to how they might best encourage effective oral rehydration therapy around the world?

As I observe this conference program, I see that we are now deeply involved in the "so-what" aspects. We have listened to some excellent presentations by international and national political leaders, by researchers, and by professional health officers. We have discussed widely with each other our experiences as we have seen ORT develop and begin to be utilized in our respective countries. We are now focusing on what could and should be done to ensure greater use of this remarkable technology to save human lives.

May I encourage each of you, as you participate in discussions the remainder of the day, to focus on the "so-what" aspects of this conference. Speak up on issues which concern you and share with each other your thoughts on means of implementing what we have learned here during this week. A few hundred of us have participated in this conference. But the potential is for millions to be favorably influenced by what comes out of this conference. I would urge each of you to develop your own "so-what" list of actions you expect to take and to encourage in your respective countries. To the extent feasible, you should share your thoughts with others. I also urge you to give thought to what the ICORT sponsors might do to take advantage of the momentum the ICORT has developed and to help you do your jobs at home.

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**SESSION SIX**  
**IMPLEMENTATION OF**  
**ORT PROGRAMS**  
**(CONTINUED)**

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*Panel Presentations (L to R): Dr. A. El Tom, Professor, University of Khartoum, Sudan; Dr. L. El Sayyad, Ministry of Health, Egypt; Dr. D. Ashley, Ministry of Health, Jamaica*

The success of an ORT program depends on effective training of staff, education of the public, and supervision and evaluation of personnel and program. These implementation issues are examined in the ICORT papers presented in Session Six.

Training issues are discussed by Dr. Paul Touchette, Ms. Patsy Whitesell, Dr. Robert Parker, Dr. S. C. Pal, and Dr. Katherine Elliott. The development of effective training programs requires an understanding of those behavior patterns necessary to administer oral rehydration therapy, argues Dr. Paul Touchette. Touchette examines present behavior as well as desired behavior and considers the positive and negative reinforce-

ments that exist for maintaining and changing actions.

Ms. Patsy Whitesell describes the components of a successful training program. These include agreement on recommended procedures for performing the activity, development of performance-based training, determination of an implementation plan, and evaluation of the training activity.

According to Dr. Robert Parker, the content of training programs should be heavily attitudinal, convincing health workers and mothers of the desirability of oral rehydration therapy. This is best done, he argues, by actual demonstration where workers and mothers can see how a child



improves after being treated with oral rehydration. Parker states that repetition is also an essential element of training, since one-shot training is not effective over the long run.

If resources are scarce, who should be trained first? Dr. S. C. Pal addresses the issue of training needs, examining the roles of doctors, community health workers, and village health workers in the implementation of ORT programs.

Dr. Katherine Elliott suggests that training health professionals in oral rehydration therapy requires a "reorientation." Having been previously taught that they must dispense medicine, health professionals must unlearn the "drip and drug" response and be convinced that ORT works. Elliott outlines how this reorientation can be accomplished and emphasizes the importance of learning by doing.

Educating the public about oral rehydration therapy is the subject of papers by Dr. William Smith, Ms. Denise Ayres, and Dr. Jack C. S. Ling. Dr. Smith states that use of oral rehydration therapy in unsupervised settings has its attendant risks, and increased attention must therefore be paid to public education. Citing lessons learned from programs in Honduras and The Gambia, Smith discusses the nature of public education and proposes a structure for a public communication campaign.

Ms. Denise Ayres calls the need to create public acceptance of oral rehydration therapy "a major marketing challenge." She describes the role of *Diarrhoea Dialogue* in the international dissemination of information and relates experiences of readers about how best to educate mothers in ORT.

Arguing that education about oral rehydration therapy should go hand in hand with education about other health issues, Dr. Jack C. S. Ling cites the need to join together information and education and mediated communication and interpersonal communication. Although one is often emphasized at the expense of the other, each offers substantial benefits.

Dr. Robert Black, Dr. Stanley Foster, Dr. Dennis Foote, and Dr. Juan Jose Arroyo consider issues related to the supervision and evaluation of oral rehydration therapy programs. Dr. Robert Black details how to plan a program and evaluate its achievements. He recommends calculating specific targets at the outset and delineating a set of specific activities by which these can be achieved. The program can then be evaluated on the extent to which its mortality reduction targets have been attained. Black suggests how to go about monitoring program activities, supervising health workers, and evaluating the program operation.

Too often health staff members lack important knowledge about how to mix oral rehydration solution packets, how to prepare a salt and sugar

solution, and how long and at what rate ORT should be given, Dr. Foster claims. Foster offers three explanations for this lack of information and suggests how more effective supervision can increase the effectiveness of ORT. He identifies those persons who can be the most appropriate supervisors for each level of service, provides checklists for supervisors, and discusses the manner and the frequency with which supervision should occur.

Dr. Dennis Foote suggests how a program director should go about structuring an evaluation of an ORT program. Since the questions asked determine the information that is obtained, Foote states that it is important to decide what information would be most helpful before an evaluation is conducted.

While supervision and evaluation are essential to a successful program, they are not necessarily easy activities to implement. Dr. Juan Jose Arroyo cites a number of constraints experienced in conducting supervision and evaluation and suggests several possible solutions to these.

## **BEHAVIORAL ANALYSIS APPLIED TO TRAINING RURAL HEALTH CARE PROVIDERS IN HONDURAS AND THE GAMBIA**

DR. PAUL E. TOUCHETTE  
*Harvard Medical School and  
The Kennedy-Shriver Research Center  
Waltham, Massachusetts*

Training, as most of us know it now, is expensive and cumbersome. It requires time, travel, experts, and materials, none of which is readily available. What is worse, training is likely to fail as it often has in the past. Traditional modes of training are simply not sufficient to the rapid, broad-scale introduction of ORT with maximum safety and impact.

Significant numbers of people will have to be trained if ORT is to be widely accepted and practiced in the world's developing countries. Physicians need to understand the practical realities of ORT so that they can support and promote its use with the patients and health personnel they supervise. Front-line health providers, rural nurses, auxiliaries, and health workers need to know how to use ORT properly for mild, moderate, and severe dehydration. They will also need to acquire new skills in order to teach mothers the critical ORT behaviors, proper mixing, and slow, patient administration of the mixture.

Important insights gained from principles derived from the experimental analysis of behavior can facilitate training. The experimental analysis of behavior has provided the empirical bases for

a functional, almost engineering, approach to the solution of problems in human learning.<sup>1</sup> In this context, training is necessarily only one element in a coordinated plan to modify behavior patterns. The lack of rehydration therapy for the dehydrated child can be viewed simply as a problem of absent behavior. The solution to the problem is the widespread, competent application of oral rehydration therapy. Our task in arranging adoption of ORT in developing countries involves eliminating some common behavior patterns while establishing and maintaining others. Simply put, the objective is to change what people do when children are ill. The prevention and amelioration of dehydration in infants and young children through the use of ORT requires that health care workers and rural people do things that are well within their capacities, but which are most unlikely without training and incentives. I ask that you keep in mind that training people gives them the ability to engage in behavior. Incentives may provoke behavior, but positive consequences which follow the behavior are what strengthen and maintain the use of new skills. In the absence of reinforcing consequences, newly learned behavior will fall into disuse almost immediately.

Ignorance is only one reason for the absence of desirable behavior. And training is traditionally designed to deal only with ignorance. Educators may produce effective instructional programs which impart knowledge, but fail to change behavior. Experimental analyses have repeatedly shown that even well-learned behaviors will not be applied if incentives are absent or negatively arrayed. As we plan training for health care providers in ORT, we must consider the social and physical environments in which they will perform following training, their access to materials and information, the skills which they must possess in order to do what is needed, and their motivation to perform. Even with very limited resources, we can assure significant change in health care behaviors through careful, coordinated efforts which address all of these elements.

If you accept the premise that the purpose of training is to change behavior, then all of the reasons for absent behavior must be addressed, not just ignorance. Consideration of the six elements listed below is essential to success.

1. Necessary skills or knowledge may be absent.
2. Discriminations which identify when to emit the behavior may be unformed.
3. Necessary materials or implements may be unavailable.
4. There may be no positive consequences for engaging in the behavior.
5. There may be positive consequences for engaging in incompatible behavior.
6. There may be punishing consequences asso-

ciated with the desired behavior.

We know that, in developing countries, few members of the health care infrastructure and virtually no rural mothers have the necessary knowledge and skills for ORT, because they have had little opportunity to acquire them. Training, traditional or otherwise, could address this problem given sufficient resources. Skills and knowledge without motivation and access, however, produce little or no change in behavior patterns (Skinner, 1969). Even direct, face-to-face training may vary from expeditious and effective to tedious and soon forgotten, depending on whether proper behavioral principles are considered in selecting methods of instruction. Subsequently, trainees will make use of their newly acquired skills only if the consequences are worth the effort.

### **What to teach: selecting and specifying training objectives**

The selection of what to teach and the methods for teaching it may appear entirely obvious to some. We think that this is not the case. The results of our field research in Honduras and The Gambia suggest that a detailed analysis of the behavior patterns which we plan to instill and of those which currently exist is not only helpful, but essential. Keep in mind that our method addresses training as an agent of behavior change, not an end in itself.

Step one is to identify in great detail the behaviors which constitute competent and effective ORT, and to specify each component so that it is measurable and observable. Analyzing the task into behavioral objectives provides us with a target for training. Behavioral objectives are nothing more than descriptions of what the student will be able to do if training is successful.<sup>2</sup> Two difficult processes are involved in this first step. A consensus must be achieved among the intervention team with regard to every element of the rehydration process in each context where training will take place (hospital, clinic, field station, household). And that consensus must align with government and health service policies. What mixture, how measured, how prepared, how administered, when, under what circumstances, and for how long must be agreed to unambiguously. Collateral nutrition, hygiene, signs of worsening or improvement, and criteria for seeking medical assistance must also be specified. The second process is field investigation to identify current practices, sources of information, and what sorts of measuring, mixing, and administration tools are available. One possible outcome is the determination that several different curricula must be prepared to deal with intranational variations in language, culture, and geography. In countries like Honduras, cultural variations are minimal. In others like The Gam-

bia, training must be carried out in several different languages. Nurses and auxiliaries who are going to train mothers to mix and administer must themselves be trained in instructional procedures. Field research will reveal whether the role of trainer is familiar or foreign and what practices are currently employed.

Effective and empirically verifiable training must be built on behavioral objectives and accurate information about current practices. Only a team can put together these specifications. We employed physicians, nurses, instructional designers, project administrators, and field researchers. An inevitable outcome of this convocation is a list of target behaviors which vastly exceeds the realistic scope of ORT training. What not to teach thus becomes as important as what to teach.

Some selections of training targets are readily made because few options are viable given the outcome of field research. In cases where there are many options, we make selections based on behavior modification criteria, such as: performance, cost, likelihood of positive consequences, relevant disincentives, compatibility with existing behavior patterns, and observability.

#### **Whom to teach: selecting the target audience**

Identifying the key figures at the top of the health care infrastructure and assuring that they are wholly dedicated to ORT is not so much a matter of training as it is one of eliciting a serious commitment. The presence of their support is essential to the success of training. Physicians who will preside over health service delivery must be familiar with the realities of ORT in nonmedical settings so that they can provide realistic advice, instruction, and support to those who must implement it. It would be nice if we could get each physician, starting with the national Director of Pediatrics, to go to a rural home and rehydrate a sick child with available resources. He or she would then truly be in touch with the realities of home-based ORT.

In our program, instruction began with rural health care workers, nurses, and paramedics. These individuals could then serve as models and trainers of mothers. It was therefore essential that they be competent in ORT, confident and fluent in execution, faultless in their instruction of others. It is worth spending the time and effort necessary to produce excellence at this level. These persons constitute the geographically dispersed expertise prerequisite to widespread adoption and safe employment of ORT.

From a behavioral perspective, a crucial feature of ORT is that it is a process best learned by visual observation. In fact, it is difficult to imagine someone becoming fully competent at ORT administration without observing a model. For this reason, if no other, it is essential that all

areas of the country where ORT is to be taught have, within walking distance of each household, at least one expert to serve as a model. In sparsely populated areas, the demographics of carrying this out may necessitate the use of "expert mothers" as well as medical professionals. It is likely that the role of model and instructor will be a new one for many. Training must address the development of teaching skills and the conviction that instructing mothers is as important as direct intervention. This innovation *must* be supported by the health care hierarchy.

Mothers and, to a lesser extent, older siblings are the individuals who will administer ORT in most nonacute cases. No face-to-face training program could be expected to contact this massive population, much less produce universal expertise in the short term. Awareness of ORT and key points can, however, be communicated quickly through mass media, typically radio. Mothers of recently or currently sick children can thus be motivated to seek information and assistance. Equipped with some prerequisite knowledge, mothers of children in need of ORT are eager to learn and easily instructed by the local health care workers.

#### **How to teach: selecting teaching methods**

Some of the relevant principles which should guide training efforts are these:

1. *Give them reasons to care about what they are about to learn.* Principles and rationale should precede instruction in procedures.

2. *Provide a model to be observed and imitated.* Teach primarily by example, using lecture only to provide rationale and explanation. Make sure that each individual trainee actually performs all of the elements of ORT under supportive supervision.

3. *Gradually eliminate prompting until the entire performance is carried out by the trainee, unaided.* Initially, the trainee imitates the trainer. Then the trainer stops modeling, but provides verbal prompting. Next the trainer drops the verbal prompting, but provides positive feedback at each step taken independently and executed correctly. Finally, the supervisor provides positive feedback only after the trainee has completed the entire performance independently.

4. *Analyze the task into its component parts.* Such an analysis is useful in order to assure that nothing is overlooked, and because learning each component is much easier than attacking the whole process as a unit.

5. *Use positive reinforcement and avoid errors.* The task analysis should make each step in the learning process so small that trainee success is virtually assured right from the outset. Reward each successful approximation with praise. Teach nurses and paramedics to teach in small steps and use positive reinforcement when train-

ing mothers.

6. *Use uniform words, phrases, recipes, and formulations throughout.* Make sure that instruction is coordinated internally and that it is consistent with radio messages, posters, written instructions, what doctors tell their patients, and any other sources of information about ORT.

7. *Make the learning situation as realistic as possible.* Use spoons, bowls, water sources, clocks, measuring devices, and packets of sugar/salt which are available in rural homes. Assure that health workers will be able to carry out ORT as it would be done in a home. Be sure that they can recognize and point out to mothers the signs of severe dehydration. Administration and symptom identification can be practiced with a lifelike doll.

In both Honduras and The Gambia, training involved our best effort at getting a large number of health care workers actually to carry out all of the behaviors revealed in our task analysis of ORT. This is quite different from the usual reliance on verbal instruction and verbal reply to indicate learning. The premise is that being able to say what should be done and being able to do it are two different things. We actually supervised and observed lots of people doing ORT properly with dolls or youngsters. The empirical validity of training is assured when this training is required to produce directly observable behavior in every trainee. Pilot testing will reveal any gross inadequacies. Subsequent problems can usually be worked out by trainers in the field.

### **Stabilizing and improving a correct performance**

How you learn and what happens immediately after you learn have a profound influence on how well you remember and execute a newly acquired skill. Our long-term training goals include continued competent performance for years, even decades, and the ability to carry out ORT in any environment where it is needed, not just in the training environment. These goals require that training continue a little beyond the point at which trainees acquire initial competence. Newly learned skills are fragile, somewhat clumsy, and subject to disruption by change of setting. With only a small added effort, training can produce a fluent, stable, generalizable performance. The keys are discrimination of competent from incorrect execution, acquisition of the ability to execute the procedures quickly as well as accurately, and being able to carry through the procedures outside the training environment.

1. *Change the performance from the model and determine whether the change is detected.* During the initial training a correct model was presented repeatedly; now the trainees are asked to identify a change in the performance which is an error of

omission or commission. This process will help to establish the discriminations which let the trainee recognize whether each step is or is not performed correctly. This skill will allow them to maintain their own performance and to recognize competence in those whom they instruct. In The Gambia, we had the trainees themselves invent the errors which other trainees had to uncover. We call it "the discrimination game."

2. *Get them to do it at a rate which approximates that of a well-practiced individual.* Rate of execution (how long it takes to carry out mixing and initial administration) provides an index of expertise. We call it "fluency," something that comes with practice. Training is often terminated while the trainee is still slow and clumsy in his or her execution. We do not end training until the trainee is somewhat fluent.

3. *Give them homework.* Send the new trainees back to their base of operations with an injunction to carry out ORT with a sick child in a home and then to train a mother of a sick child in executing ORT at the first opportunity. Assure that as little time as possible elapses before the trainee puts the newly acquired skills to work in the field. Trainers should tour field sites, if possible, to provide positive support and aid in solving problems.

### **Incentives: to learn and execute ORT**

The motivation for health care workers to learn a new technique is largely intrinsic. Novelty and individualized attention to the trainees will result in enthusiastic participation unless the instructional program produces confusion, embarrassment, or demeans them. Unfortunate outcomes are well-known in field training, but not in well-conceived, pilot-tested programs.

The incentive to carry out ORT day after day, month after month, year after year must come from sources extrinsic to the training exercise. Training can make available new behavior patterns, but it can only weakly address motivation to use those competencies. Well-conceived training incorporates efforts to sensitize the trainees to existing natural contingencies of reinforcement to which they might otherwise have been insensitive. The intervention team must take into account the issue of what consequences will support the new ORT behavior during the planning stage.

The preliminary results of our field research program have revealed that mixing behavior (both packet and sugar/salt) is readily maintained, as is symptom identification. The slow, patient administration of rehydration solution is more difficult to maintain, as is the injunction to dispose of any unused mixture at the end of each day. The former interferes with daily routine and has no immediate outcome; the latter appears to be a waste of scarce resources.

### The remaining causes of absent behavior

*Discriminations which identify when to emit the behavior may be uninformed.* This is an area of great importance in which little field research has been done. The question is, what features of the sick child lead to the selection of intervention? In our experience, rural mothers must be sensitized to the dangers of dehydration and to the fact that it is a byproduct of diarrhea. Health care workers are accomplished at identifying signs of moderate and severe dehydration. Mothers readily identify pre-acute signs, such as listlessness, loss of appetite, and loose stools. Our primary concern is that rural mothers use appropriate criteria for initiating home-based ORT and obtaining acute medical service.

*Necessary materials and implements may be unavailable.* If the necessary materials are not available, motivating and training health workers would simply provide them with a new burden of frustration. The absence of ORT packets or the basic ingredients for a home-mixed solution constitute an insoluble problem for the health care provider and must be addressed as would any medical material supply problem. The government of The Gambia chose to promote water-sugar-salt solution because of a conviction that it could not provide a continuous supply of pre-mixed packets. Packets are available to health care workers in fixed facilities. Honduras, on the other hand, committed itself to procuring and subsequently producing sufficient packets. Training in the two countries was initiated with very different behavioral targets as a result of the differences in the availability of materials prerequisite to the desired behavior. In both countries, volume measuring implements were virtually nonexistent in households, necessitating a resort to bottles and bottle caps for liquid and dry measures. These implements are hardly ideal, but field research left no alternative. The bottles have narrow necks, making it difficult to pour in packet contents without spilling. Home-mixed solutions of water-sugar-salt necessitated the use of a mixing bowl or gourd, as measuring the dry ingredient into a bottle using a bottle cap is impossible. The availability of supplies and implements defined the behaviors to be taught.

*There may be no positive consequences for engaging in the behavior.* Many attempts at motivating health-related behaviors carry an explicit or implicit threat. This approach is less effective in changing existing patterns of behavior than providing rewards for approximations of the desired behavior. Reinforcing approximations requires that we identify relevant existing behavior patterns and may mean including a few behaviors in the instructional campaign which we know rural mothers are now doing correctly. Rather than telling rural mothers the potential dangers of the overuse of antibiotics, we may

want to reward mothers who use ORS and breastfeed.

ORT produces an immediate, visible change in the well-being of a child only if that child is acutely dehydrated. Results in these cases are dramatic and will convince any parent or practitioner that ORT is a worthwhile endeavor. Home treatment of sub-acute cases may produce no visible improvement in the child. In fact, mothers may be disappointed to find that there is no symptomatic relief from diarrhea. Since there is no naturally occurring positive consequence, the burden of providing positive reinforcement falls to health care workers, community leaders, radio, and other media. It is not sufficient for rural nurses to be able to say to us that mothers must be praised for administering ORT. We must be certain that the nurses and community members are in fact praising mothers and that the mothers perceive these actions as supportive. The more customary pleading, cajoling, and threats of dire consequences are not likely to produce slow, sustained application of rehydration fluids. Behavior provoked by entreaty is at best temporary unless positive consequences follow.

*There may be positive consequences for engaging in incompatible behavior.* Many rural mothers now respond to diarrhea by withholding food, administering purges, antibiotics, and agents which immobilize the digestive tract. These remedies either have the appearance of medical sophistication or impact directly on the primary symptom. Folk medicine may include anything which happens to coincide with the time course of the illness so that it apparently ends the disease. Our strategy is essentially one of displacing inappropriate interventions with the new patterns of behavior related to ORT. A crucial element in this strategy is to focus attention on dehydration rather than on diarrhea. We have found that rural people are not aware of dehydration or its dangers, but learn readily. A public awareness campaign emphasizing dehydration can reduce the motivation to eliminate diarrhea and shift attention to the maintenance of proper hydration and nutrition.

*There may be punishing consequences associated with the desired behavior.* The intrusion of ORT into most waking hours may be the most difficult motivational problem to overcome. Home-based ORT requires that the child's mother engage in extended activities which are costly in terms of time and disruption of important household chores, such as food preparation. Repeated bouts of diarrhea or several children of vulnerable age within a single household may produce an intolerable burden. The data are not in yet on whether local paramedics and nurses, supported by radio messages and other media, can keep mothers engaged in effective home-based ORT. In some countries, the broadening of

the ORT burden to include extended family and immediate neighbors may serve to reduce its punishing impact on a single individual. In countries with very low population density, mothers may have to carry the burden alone.

### In closing

The universal promotion of ORT throughout a country presents an extraordinary challenge to trainers. It is a massive task which we must inevitably meet with meager resources. We find ourselves addressing a major public health problem in which: (1) the patient's family must diagnose the problem to determine that medication is required, (2) the patient's family may have to prepare their own medicine (and there is serious risk if this is done improperly), (3) a slow, continuous 24-hour administration regimen must be adhered to, and (4) the outcome of the regimen may be imperceptible or in direct conflict with expectations.

Behavior analysis makes an important contribution to our understanding of how to change behavior patterns, whether it be altering an existing pattern or creating new ones. Our projects have made a strong effort to use training which builds on existing behavior. We conducted our initial field research and planned our training programs around positive reinforcement and behavior modification techniques. We selected our training objectives using behavior modification criteria in addition to the best medical knowledge available. We trained front-line health providers who are the most visible and influential at the local level, after insuring that they would be supported by the health hierarchy.

Does this approach require unrealistic resource allocation? I think not. Our priorities were somewhat unconventional, emphasizing the collection of detailed information from the field, careful planning, and pilot testing of training procedures. Radio messages and print media were coordinated with the training received by front-line health care workers. Radio was used to promote awareness and to provide positive reinforcement for ORT-related behavior. Planning is inexpensive relative to execution of training. Radio is a very cost-effective medium. The model, which is still developing, is replicable, but requires modification to suit the features of each locale.

Pioneering projects such as ours in Honduras and The Gambia will reveal the impact of a behaviorally-based strategy. Evaluation data are already sufficient to indicate widespread awareness, adoption, and administration of ORT in these two countries. A determination of longevity awaits. We hope for "institutionalization" of ORT such that parents and medical personnel alike come to regard it as the customary and proper response to dehydration.

## REFERENCES

1. Skinner, B. F. *Reflections on Behaviorism and Society*. Englewood Cliffs, New Jersey: Prentice-Hall, 1978.
2. Skinner, B. F. *Contingencies of Reinforcement*. New York: Appleton Century Crofts, 1969.
3. Kibler, R.; Barker, L.; and Miles, D. *Behavioral Objectives and Instruction*. Boston: Allyn and Bacon, 1970.

## MAKING TRAINING DECISIONS

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Effective training is vital to a successful program for diarrheal disease control. Training must be carefully designed and implemented to provide necessary skill in the use of oral rehydration therapy to all the workers who should use it. Trainers, developers of training, training directors, managers, program directors, donors, advisers — all these individuals have a role in ensuring that effective training is accomplished. They must all make decisions on what should be done next and how it should be done in order to further the training efforts of the program. The following steps are crucial to an effective training program:

1. Agree on the recommended procedures for performing the activity so that workers can be trained.

The first requirement in planning and developing training is a clear statement of what should be done by the health worker. Debate about procedures is interesting and stimulating for the persons involved, and debate is necessary if the best decisions are to be reached. If progress is to be made in training workers to use ORT, however, acceptable methods and procedures must be agreed on so that clear messages will go out to the individuals being trained. If conflicting or confusing information is presented, the workers may mistrust the information and are likely to continue their current practices. Experts should be encouraged to agree on and to support acceptable procedures for ORT.

2. Develop performance-based training.

Performance-based training is designed to result in performance of a particular task or group of tasks. It is based on a clear definition of the tasks and provides only the skills and knowledge required to perform the task. The worker learns by actually doing the task, rather than just reading or hearing about it. By including only the necessary information and practice in the training, resources required for development and implementation are kept to a minimum. If correct

performance is important and resources for training are limited, performance-based training should be developed to ensure effective results.

3. Plan for implementation so the right individuals are trained at the appropriate time.

Each individual expected to use ORT will need to be identified and trained if the use of ORT is to increase. The best time for training is as close as possible to the time a worker will be expected to begin performing the task on the job. If training is done a long time before the skill can be used, the skill will be forgotten. If training is given after a worker has begun performing a task, the worker may have already developed incorrect habits which could be difficult to change. Implementation plans should consider who needs the training and when they will use the skills they learn. Listing all the individuals who need training, planning who will train each of them, and providing preparation and support for the trainers must be done systematically.

4. Evaluate to determine whether training is working.

Evaluation is the way to determine whether training is working and what should be done to improve it. Observation of training activities can provide information about whether training is performance-based. Observation of workers on the job can provide information about what tasks they perform and how well they perform them. Surveys of workers can provide information about the extent to which workers are being reached with training. Evaluation will provide a basis for making decisions about the next steps to be taken in development or implementation of training.

Current and planned training activities should be assessed periodically to decide where subsequent efforts should be directed. The above steps would be important for training any type of workers to use ORT or to perform other tasks. Use of training resources to accomplish these steps will be appropriate and effective in meeting the training needs in diarrheal disease control.

## IMPLEMENTATION OF ORT PROGRAMS — TRAINING

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There is no question about the efficacy of oral rehydration therapy interventions. A major concern of this conference, therefore, lies in the area of effective implementation of ORT programs. Adequate training, in its broadest sense, is one of the key elements leading to program success.

Such training encompasses the initial acquisition of appropriate knowledge, skills, and attitudes, plus periodic reinforcement and supervision, involving both health personnel and the users of ORT in the home.

### Health personnel

Training programs need to be designed to reach all levels of health workers from the village to the teaching hospitals. Implementation of ORT depends on acceptance and use by health professionals, as well as by large numbers of peripheral workers. In many developing countries, one of the first steps in achieving credibility for ORT is to convince the medical profession. Demonstration efforts using trial implementation at many different levels of the health system will probably be required to convince skeptical physicians. In the long run, however, training can make the greatest impact on those health personnel who teach mothers how to use ORT.

The content of training programs, especially among workers who have previously been taught to refer cases for intravenous rehydration, needs to be heavily attitudinal, persuading them of the value of ORT. Equally important are health education skills, since the widest impact can be achieved only through teaching family members how to use ORT. Change in attitudes and development of education skills are highly dependent on practical experience. The chance for a worker to see a thirsty child avidly taking an ORT solution from a spoon and the subsequent rapid recovery from dehydration is worth days in a classroom. Training programs, ideally, should be a combination of didactic sessions and practical experience, preferably alternating back and forth during the training period.

The amount of training required depends on the level of workers, their literacy, and the type of program involved (use of packets or home sugar and salt). There has been minimal documentation of the optimum amount of training required to produce effective workers. Wawer has reported that home visitors in Zaire were adequately trained following one and a half days of theory and a similar amount of time divided between practice in the training center and actual practice in community homes (Maria Wawer, personal communication, 1983). After one year, which included one mid-year refresher session, the home visitors were observed to correctly teach mothers 80% of the required items of information, but only checked the mothers' technique of ORT preparation 30% of the time. The latter practical step in training mothers was found to be the most difficult to maintain.

### Training users

Repetition and demonstration are the most important elements when training mothers or fam-

ily members in the use of ORT. As in the case of health workers, the ideal setting is in the home or clinic when a child with diarrhea and dehydration is encountered. Such programs require an effective primary health care infrastructure. Although "one-shot" lessons and mass education may make families more aware of ORT and increase its use, in most cases only through repeated and direct contacts will effective use be learned and maintained. This seems to be borne out by the evidence that most of the programs that have shown significant reduction in diarrheal mortality, such as in Narangwal, India, or the Strengthening of Rural Health Delivery Project in Egypt, involved frequent contacts between the health workers and mothers in the home.

### Conclusions

Although training health workers and families in the use of ORT is known to be a key element in ORT implementation, there has been almost no research specifically designed to measure quantitatively the essential inputs and processes required for effective training. These data are badly needed if we want to design training approaches that have a reasonable chance to reduce diarrheal mortality at an affordable cost.

## TRAINING OF HEALTH PERSONNEL FOR IMPLEMENTATION OF AN ORT PROGRAM

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Training of all levels of health services personnel and education of mothers and members of the community should form an essential and integral part of the Diarrhoeal Diseases Control Program. Experience has shown that mere distribution of ORS in the community, without adequate training of the health personnel and the community, does not result in its proper utilization.

The National Institute of Cholera and Enteric Diseases (NICED), Calcutta, has been entrusted to monitor training of health personnel at all levels in connection with the national CDD Program of India. Since 1980, thirty-seven two-day national seminars on ORT have been organized in different parts of the country by NICED with WHO assistance. One thousand seven hundred fifty-four personnel have been trained so far, including 1,196 clinicians, 174 public health doctors, 259 health administrators, and 125 of various other categories (see Table 1). These trained doctors will serve as faculty members for

the district and the PHC-level training courses. When the training program was evaluated by WHO in 1982, it was observed that wherever these training sessions were held, the proportion of diarrhea cases treated with ORS increased significantly. A downward mortality trend was also noticed.

During 1983-84, approximately four hundred district-level training courses are proposed to train PHC doctors. These PHC doctors will, in turn, train the paramedical staff, including the village health workers.

As a WHO-collaborating center for research and training in diarrheal diseases, NICED has conducted six intercountry/interregional courses on different aspects of the CDD Program (see Table 2). Ninety-two scientists from eleven countries have been trained. Four more intercountry courses will be conducted during 1983 with WHO assistance. The purpose of these training courses is to orient the CDD program managers as well as senior-level scientists to act as trainers for their own countries.

**Table 1**  
**DISTRIBUTION OF DIFFERENT CATEGORIES OF PARTICIPANTS OF 37 ORT SEMINARS IN INDIA**

CATEGORY	NO.	PERCENT
A. Clinicians		
1. Teachers	210	12.0
2. Nonteachers		
a. Service	747	42.6
b. Practitioners	239	13.6
B. Public Health Doctors	174	9.9
C. Health Administrators	259	14.8
D. Others	125	7.1
Total	1,754	100.0

N.B. Average no. of participants per seminar = 474.

In order to improve the CDD training program, a number of points need to be discussed in greater detail. First, for the effective implementation of an ORT program, it is highly imperative that the top-level clinicians in a developing country be convinced of the utility of this simplified therapy. This can only be achieved by practical clinical demonstration. These clinicians will be primarily instrumental for motivating the health administrators as well as other categories of clinicians.

The main question is whom to train first if the resources are scarce. Since the community health workers will have to play the pivotal role in home delivery of ORT, they have to be trained by the doctors in charge of primary health centers. Therefore, the doctors at the different levels of



**Table II**  
**WHO INTER-COUNTRY COURSES HELD AT NICED, CALCUTTA DURING 1981-82**

COURSES	NUMBER OF PARTICIPANTS FROM							GRAND TOTAL	
	BANGLA-DESH	INDIA	INDO-NESIA	MONG-OLIA	NEPAL	SRI LANKA	THAI-LAND		MAL-DIVES
Inter-regional Course for Managers of National CDD Programmes	—	7	2	—	—	4	3	1	20*
Clinical Management of Acute Diarrhoeal Diseases (Two Courses)	1	15	4	—	1	5	8	1	55
Laboratory Aspects of Acute Diarrhoeal Diseases (Two Courses)	—	11	3	—	3	3	3	—	23
Epidemiological Research in Acute Diarrhoeal Diseases (One Course)	1	6	2	1	—	2	2	—	14
Total (Six Courses)	2	39	11	1	4	14	16	2	92

\*Also included one participant each from Papua New Guinea, Siera Leone and Yemen.

the health care delivery system, that is, the state, district, and PHC levels, will have to be trained before the training program for peripheral workers can be initiated.

If the decision is made to implement a salt/sugar mixture at the home rather than packets of ORS, the training of the community health workers will have to be geared up and designed in such a way that they are in a position to educate mothers to prepare the homemade mixture properly. The chance for variations in the electrolyte concentrations in these homemade mixtures is extremely high. Unless mothers are repeatedly trained, which is a difficult proposition, the success of a homemade salt/sugar solution approach is highly doubtful.

The training should be an integral part of a broad PHC training program, and doctors will be the best trainers because of the clinical nature of the training involved. Nurses can be useful, however, to educate mothers in hospital settings.

On the question of who should be trained in a village, it is felt that, to have a better implementation of the ORT program, the village-based health workers should be trained repeatedly, at certain intervals of time. The effectiveness of the training program should be evaluated periodically.

To improve the training components of the ORT program, we need to take the following steps immediately:

1. motivate the national CDD program managers to undertake training programs;
2. prepare curriculum and teaching aids for the trainers at different levels;
3. establish clinical demonstration centers; and
4. provide adequate funds for training.

## TRAINING IN ORAL REHYDRATION: REORIENTATION OF HEALTH PROFESSIONALS

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Perhaps one of the most significant, but perhaps also one of the most underexplored and undocumented aspects of training in oral rehydration therapy, is the matter of professional detraining in order that effective retraining can take place. In relation to health professionals, this is a different problem from the one of replacing ill-founded folk beliefs, although many of the principles involved are obviously similar. Simple people mostly possess good sense and will cooperate in behavior change when they are shown that this is to their advantage. It may be more difficult to persuade some health professionals that they will receive any personal advantage from the promotion of oral rehydration. Yet their attitudes are crucial if the idea of drinking as the appropriate response to diarrhea is to become successfully imbedded in the minds of all ordinary people. Health professionals must themselves be convinced that oral rehydration works satisfactorily enough to be considered the correct scientific response, and this process may well require both theoretical reeducation and conviction through practice. In this process, the medical elite in any country can make a most important contribution.

### **The need for new attitudes**

Medical education has tended to emphasize the responsibility of doctors to intervene, to apply their special knowledge in a way that adds, often dramatically, to their unique status; and this status frequently represents a considerable investment on their part of time, energy, and money. As the possibilities of dramatic intervention have increased, thanks to the tremendous growth in our scientific knowledge over the last fifty years, so has the seductiveness of advanced medical technologies. Therefore, to set up an intravenous drip or to prescribe a new "miracle" drug, rather than to recommend the giving of a simple drink, must seem to many doctors a reaction which reflects much more satisfactorily their agreed role in society. They have spent years learning the mysteries of medicine to qualify themselves to produce impressive, scientific answers to health problems.

But now, in diarrhea, they are being asked to cooperate in a public "demystification" of medical technology. They are being asked to recommend as the initial remedy against the danger of dehydration — the lethal factor in diarrheal infections — a procedure which any family can learn to carry out at home, given simple instructions, simple ingredients, and access to further help should this become necessary. Sharing their knowledge in this way moves doctors into much more of a stand-by situation; and this dilemma applies, of course, also to nurses, whose training has similarly become much more medicalized.

A comparison might usefully be made with attitudes towards the practice of breastfeeding. Here, health professionals are in a position to exert a valuable influence, but the as yet unenlightened find it more suitable to their own view of their special situation to advise a switch to a feeding bottle, which contains a measurable amount of a known milk mixture, rather than to offer the more simple encouragement and advice which may well help a mother to breastfeed successfully. Yet we all know that the decline in breastfeeding contributes to the number of deaths from diarrhea among small children in the Third World.

Attitudes among health professionals towards oral rehydration and breastfeeding may matter less in more prosperous societies, where health care facilities are readily available and standards of hygiene are high. But western attitudes, along with western medical education, have been exported to places where the majority of the people live in very different circumstances. Paradoxically, in the West we have now come to realize that breastfeeding carries greater significance than that of just being one way to get food into a baby, and its decline is being reversed among the more highly educated. One can only hope that the trend towards bottle-feeding can be arrested

in time so that it need never reach those least privileged societies whose children most need the protection which human milk offers against infection, especially the common infections in the environment which cause diarrhea. In the battle to reduce unnecessary deaths among the children of the poor and the underprivileged, the attitudes of highly educated health professionals in the developing countries towards oral rehydration and towards breastfeeding have a very special part to play. If they accept the significance of diarrhea as a major factor in childhood mortality and morbidity, and if they likewise accept the scientific value of oral rehydration as the simple, cheap, effective, and acceptable remedy to prevent mortality and diminish morbidity which can safely be administered on a widespread scale by community health workers and by families themselves, then there is every chance of the battle being won.

### **The role of effective leadership**

Leadership, to be effective, must inevitably come from those who have the power to influence government policymaking and who also have the respect of both their peers and the community in general. In the case of oral rehydration programs for the treatment of acute diarrhea, whatever the causative agent, the attitude of the influential medical leaders in the country, especially the pediatricians, is crucial. They are the ones who teach the medical students and order the treatment procedures in the hospitals and health centers. Equally important, they deal with private patients whose families are also highly influential. Only when the leading pediatrician in the country is sufficiently convinced about oral rehydration to prescribe and to personally supervise the giving of oral rehydration fluid to the Prime Minister's or President's precious only son, who happens to be quite ill and dehydrated from diarrhea, is the concept of ORT likely to get the powerful political backing it needs. And for that pediatrician to take such a therapeutic stance may well mean unlearning the "drip and drug" reaction and acquiring personal confidence in the efficacy of the simple oral rehydration technique.

### **The importance of "learning by doing"**

To achieve this goal, the scientific basis of ORT needs to be continually stressed by making summaries of the research findings which substantiate its principles readily available in ways which will appeal to busy practitioners. But theory is of little use without practice, and "learning by doing" is an equally important part of the de-training and retraining process. Oral rehydration, properly carried out, is dramatic in its effects; anyone who has had the experience of themselves orally rehydrating a quite severely dehy-

drated patient can hardly fail to be convinced of its value. Nothing in the way of information can replace that actual experience, both for health professionals and for ordinary people. However, there is an art to the giving of oral rehydration, especially where there is vomiting associated with the diarrhea or where the patient, although thirsty, has become lethargic and disinclined to cooperate. This is where the support and the encouragement of leaders, who have the confidence and the respect of less experienced health workers, can play an essential part in the training process. It is people like Dr. Dhiman Barua who have played such an important role in the training courses for doctors provided by the World Health Organization, because he has shown these doctors how to manage oral rehydration, and he has been beside them to provide the confidence necessary to continue when they encountered difficulties. It is this kind of training experience which needs to take place at all levels, from the university hospital right down to the village, where experienced mothers can teach, support, and supervise the inexperienced.

In this context of "learning by doing," I am always reminded of a conversation I once had with Dr. Gunawan Nugroho, who was responsible for the innovative community health care project at Solo in Indonesia. He told me how, in the beginning, he had been puzzled about how best to teach health care skills to simple people with very little education. Finally, he thought of asking a local farmer how he set about training a young buffalo to pull a plough for the first time. The farmer was amazed that this was seen as a problem. It was simple, he told Dr. Nugroho. All he had to do was to harness the novice alongside an experienced older buffalo and the young learned what was expected within a couple of days. In thinking about training at any level, we should always remember the adage:

What I hear, I forget  
What I see, I remember — but  
What I do, I know!

Finally, although oral rehydration can save millions of lives, it ought always to be seen as part of an integrated diarrheal disease program. The indications for referral for additional treatment must be clearly understood at every level, and these indications need to be agreed upon with the local health professionals, who must be willing to carry the final responsibility for the success of the program. The message to the community must be consistent and continuous. Nevertheless, some flexibility in implementing oral rehydration therapy is essential because it may be impossible to provide identical oral rehydration solutions at every stage from the home to the hospital. Instead, there may need to be some kind of continuum between homemade mix-

tures, packet distribution, and the provision of oral and (for really seriously dehydrated patients) intravenous fluids at suitable medical facilities. Only a convinced cadre of health professionals can manage, support, and supervise such a continuum. They will be convinced only when theory has been borne out by personal practice, when they know not only how and why ORT works, but have themselves acquired the actual skills required for making up a variety of acceptable oral rehydration fluids and for getting these fluids in adequate quantities into the mouths of those with the diarrhea.

## EDUCATING THE PUBLIC ABOUT ORAL REHYDRATION THERAPY

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"To obtain maximum benefit in many areas, oral rehydration must be made available in villages where there are no trained health professionals. . . . The anticipated advantages of such programs are expected to justify the risks, but programs without medical supervision have not yet been carefully monitored for complications or results to determine how the solutions are actually used."

Letter: *Journal of Pediatrics*,  
1983, Drs. Harrison, Finberg,  
Harper, and Sack.

The central concern of the medical community has shifted from the clinical efficacy of oral rehydration therapy towards the practical risks of using ORT in unsupervised settings. These risks are clear.

- Super concentrated solutions of oral rehydration salts are dangerous.
  - Diluted solutions of ORS are ineffective.
  - Too little of ORS is ineffective.
  - Too rapid administration of ORS can induce vomiting.
  - ORS given alone for long periods without other liquids and foods can be dangerous.
- A number of questions must be addressed:
- Will mothers learn, remember, and use the right mixing proportions?
  - Do mothers have an adequate volume measure available? Can they, in fact, determine what a liter is?
  - Do mothers have the time and patience to give an ORS solution slowly over twenty-four

hours to a sick child, given all the other demands on their time and energy?

—Will mothers give up traditional practices like purging which are counterproductive?

—Will mothers breastfeed during episodes of diarrhea and give other liquids?

—How do we teach mothers — hundreds of thousands of mothers — the new skills and attitudes associated with proper use of ORT in unsupervised settings?

Interestingly, these questions are not medical ones. They are educational and they are sociological. They move ORT out of the laboratory, out of the clinic, and even out of the small pilot study, and place it squarely in the arena of social and behavioral change.

Fortunately, we now have two large-scale and comprehensive programs of public communication to promote oral rehydration therapy — one in Honduras and one in The Gambia — which help answer some of these questions. USAID, through its Offices of Education and Health in the Bureau for Science and Technology, has supported not only a comprehensive public education campaign in ORT in each country, but also has financed a scientific evaluation of both programs, looking at changes in rural attitudes, knowledge, behavior, and health status. The programs do not yet answer all our questions, but they do contribute significantly to our understanding of widespread ORT promotion.

In both countries, the Ministries of Health are developing a campaign which combines radio, specialized print materials, and health worker training to deliver information on home treatment of infant diarrhea, including the proper preparation and administration of ORT. In Honduras, the government is promoting a locally produced WHO-formula packet called Litrosol. In The Gambia, the government is promoting a sugar/salt (S/S) rehydration regimen as a standard for village-based prevention of dehydration, with UNICEF packets used at fixed health facilities for cases of moderate dehydration. The goal in both countries is to have mothers use ORT early in an episode of diarrhea and to seek help if needed. Other critical messages pertain to breastfeeding, weaning, food preparation, personal hygiene, and sanitation practices. Figure 1 illustrates the level of campaign activity in each country during the first year.

Early results of the evaluation, which is being conducted by Stanford University's Institute for Communication Research, are encouraging. The Stanford study includes a panel study of some 750 to 800 mothers, implemented in waves over a two-year period. The panel study is supported in both countries by a prepost mortality, and health worker study. In Honduras, an ethnographic study has been added. Results in Honduras show that, after one year, 48% of the

audience reported using Litrosol to treat diarrhea at least once. During the same period, recognition of Litrosol as a diarrheal remedy went from 0% to 93% of the population. Of those reporting to use Litrosol, 94% used a full liter of H<sub>2</sub>O; 95.7% used all the packet to make the mixture; 59.7% gave the whole liter to the child; 36% discarded the leftover solution; and 9% used Litrosol for the full three days (most used it for one to two days only). Results in The Gambia show that, after eight months of campaigning, 66% of mothers knew the correct 8-1-3 water/sugar/salt (WSS) formula. Forty-seven percent of mothers reported using WSS formula to treat their child's diarrhea.

More answers are nonetheless needed. Will mothers continue to use ORT? What age child is being treated with ORT? If the mothers are making mistakes, what kinds of mistakes are most common? What continued inputs will be necessary to sustain these levels of use? These and other questions are being examined now, but the project staff feels that several lessons can now be drawn from the experiences in these two countries that will help planners of similar programs elsewhere.

### Some Lessons

*Lesson #1: Coverage, timeliness, and credibility — you need all three.*

If the goal is to produce widespread use of ORT in unsupervised settings, then three factors are critical: coverage, timeliness, and credibility. *Coverage* is the ability to reach many people quickly, and it is best achieved through the media. In most countries, this means radio. *Timeliness*, or the availability of specific mixing and administration reminders at the moment they are needed, is best accomplished by print and graphic material — specifically, a packet label and a one-page graphic flyer. *Credibility*, or the acceptance of ORT by patients, is best achieved through the full support and use of ORT by recognized health professionals in the country — physicians, nurses, and health workers.

*Lesson #2: Have a plan which includes everything. You can't have a piecemeal program.*

To bring these three elements together, a comprehensive plan is needed. It must include:

—an adequate supply and distribution system for oral rehydration solution.

—an explicit linkage between what health providers, radio, and print media tell the public — a single set of simple, noncontradictory messages on how to mix ORS, how to give ORS, and how to know when ORS is not working.

—a training program for health providers which emphasizes ORS teaching skills as well as ORT administration.

—a radio broadcast schedule timed to reach specific audiences.

—a series of simple print reminders of key skills that accompany each packet.

Lesson #3: *Base the plan on field research.*

An effective plan must be based on field research of existing audience practices and beliefs. A few key questions that need to be answered in this research are:

—How will mothers mix the solution? What containers are available?

—Where can mothers obtain packets if they can't get to a health center?

—Whose advice do mothers take about diarrhea?

—What do mothers want a remedy for — the loose stool, appetite loss, weakness; what do they most worry about when a child has diarrhea?

—What are mothers doing now — purging, giving teas, withholding food, etc. — and why do they feel these are appropriate methods?

—What type of print material would be most valued and used — pictures, words?

—Why do mothers listen to radio; whom do they trust as radio announcers?

There are many other questions which also need answers, but these key areas will trigger responses critical to developing a sound plan.

Lesson #4: *Correct the plan as required — keep it flexible.*

Monitoring the campaign is essential. Regular visits to villages, watching how ORT is being used or misused, systematic interviews with health workers and mothers will expose weaknesses impossible to predict otherwise. Once discovered, correct these mistakes; do not try to argue them away. Mistakes are normal, almost inevitable, and they can be corrected if they are admitted.

Lesson #5: *Emphasize simplicity.*

Avoid the temptation to complicate matters. Make the advice to mothers simple — use only a few print materials; do not ask health workers to do much more than they are already doing; and repeat a few good radio programs over and over rather than making dozens of new ones.

### **Some background considerations**

The Mass Media and Health Practices program is part of a growing genre of health education activities referred to as public education or public communication campaign. The public communication campaign is an approach to popular education that attempts, in a predefined period of time, to change a particular set of behaviors in a large-scale target audience with regard to a specified problem. During the past two decades, dozens of campaigns on topics as varied as forest fires, mental retardation, energy conservation, smoking, alcoholism, littering, seat belts, venereal disease, malaria, breastfeeding, latrine construction, population control, and infant diarrhea

have attempted to inform, motivate, and often to change the behavior of a wide audience in a short time.

Not all of these experiences have been positive; indeed, many have been disappointing. In a recent review of public education, entitled *Public Communication Campaigns*, Dr. Ronald Rice concludes:

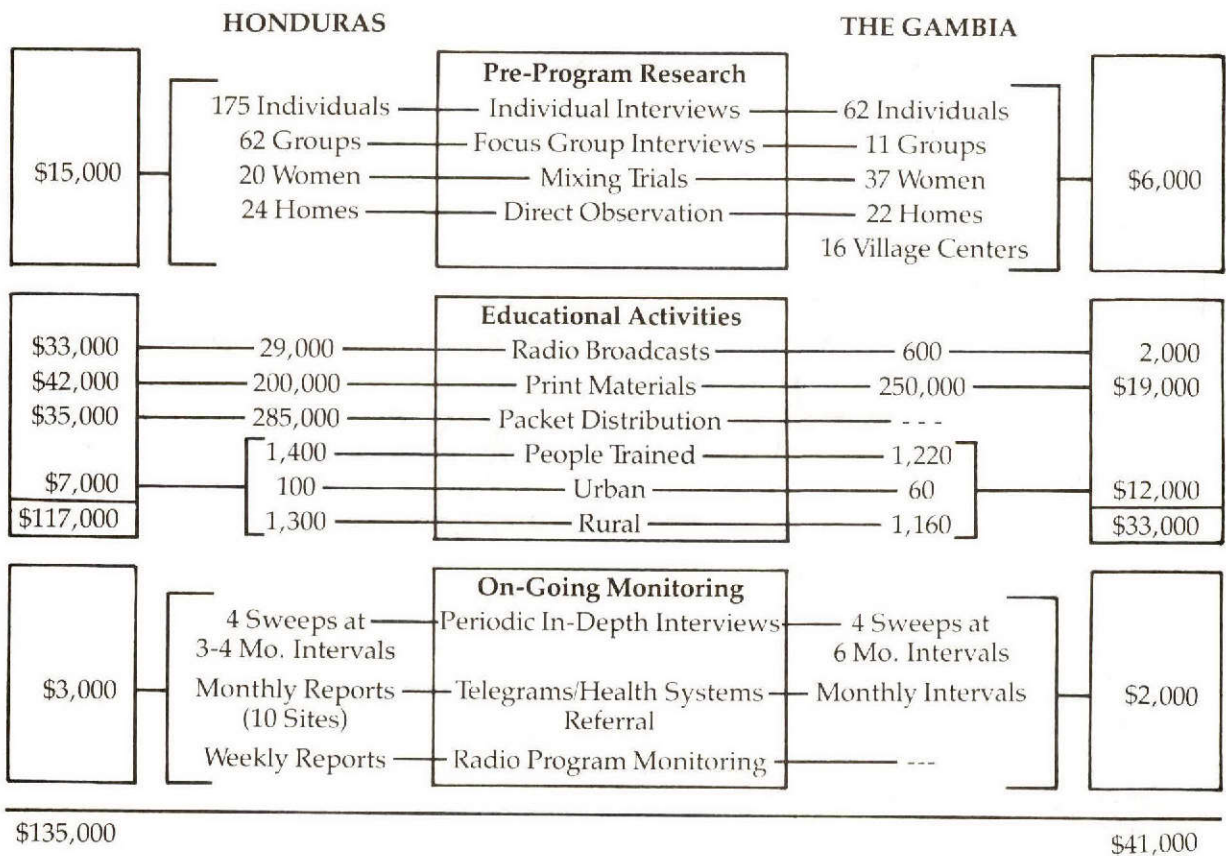
After the early belief in the power of the media to persuade any audience faded, communication researchers are generally pessimistic about the probable success of such campaigns. But the mood of communication researchers has, for the most part, changed, as indicated by the title of the journal article, "Some Reasons Why Information Campaigns Can Succeed."<sup>1</sup>

This change in mood is a result of two factors. First, we now have several documented successes. Second, we have a growing realization that public education is no "quick fix," but rather a useful, if complex and not well understood, new tool of popular education. Gradually the concept of a campaign is giving way to the idea of regular, operational programming built upon the concepts of careful message definition, integrated delivery systems, and midcourse monitoring and correction.

Experience with public education for health is extensive.<sup>2</sup> In the population control area, for example, at least half a dozen projects with three years' experience or more have improved contraceptive availability, increased sales of contraceptive products, spread knowledge, and stimulated wider use of the methods promoted, at a cost below that of most traditional programs.

The success of a public education approach depends upon its ability to provide a sufficiently large number of people with practical and important new information. It must make an impact on the consciousness of the intended audience by rising above the everyday clutter of advice and suggestions to become an important new priority in their lives. It must change what people do as well as what they think and believe. This cannot be achieved by the mere repetition of simple slogans, the mass exhortation to do the right thing, or the indiscriminate use of mass media alone. It requires a sensitive understanding of how people are affected by specific health problems, articulate crafting of useful and practical educational messages, and a coordinated distribution network that reaches each individual through various channels simultaneously.

The program structure being proposed here (see Figure 2) reflects the importance of these elements as applied to a health problem. It includes a preprogram planning and development phase, an instructional intervention, and an ongoing



monitoring and evaluation system with clear results in knowledge, attitudes, and behavior.

The planning and development stage emphasizes the collection of critical information needed to prepare an effective program design. This information answers important questions, such as: (a) Who in the total population should be selected as the principal audience? (b) What communication channels are most critical for these people? (c) What behaviors should be advocated? (d) What resources are needed to conduct the program? The final program planning, including budget and resource requirements, is based upon the results of this investigation.

In order to reach large numbers of people, mass media, particularly broadcast media like television and radio, should play a central role. A woman hearing health messages on the radio should also hear the same advice from a health worker, receive printed information from her child's school, participate in a community health fair, and see related posters.

The public communication campaign is divided into discrete cycles. Each cycle covers the same basic information, but with slightly different approaches. These cyclical changes reduce audience fatigue and permit a continued renewal of audience involvement. From an administrative perspective, the cycle approach is important because it permits program planners to design segments of the program sequentially. They do not need to design the entire program at once. This

means they can work with fewer production facilities over a longer period of time; more importantly, they can incorporate results of the earlier phases into the planning of later phases. In essence, it permits the planner to make important iterative changes in educational strategy.

These changes must be made in response to information on the acceptance and efficacy of project activities. It is the purpose of the monitoring and evaluation component to ensure that this information be available at relevant and timely intervals. A monitoring system which permits the random sampling of select segments of the audience will be developed. Planners will know: (a) how a microcosm of their intended audience feels about the advice they are receiving; (b) whether they are taking that advice; and (c) what obstacles they are encountering. These monitoring devices can also point out important logistics problems, such as a breakdown in delivery of printed matter or use of inappropriate broadcast times to meet audience needs. This type of ongoing evaluation is essential in making corrective changes in future cycles, as well as for providing program administrators with a clear idea of their overall potential success.

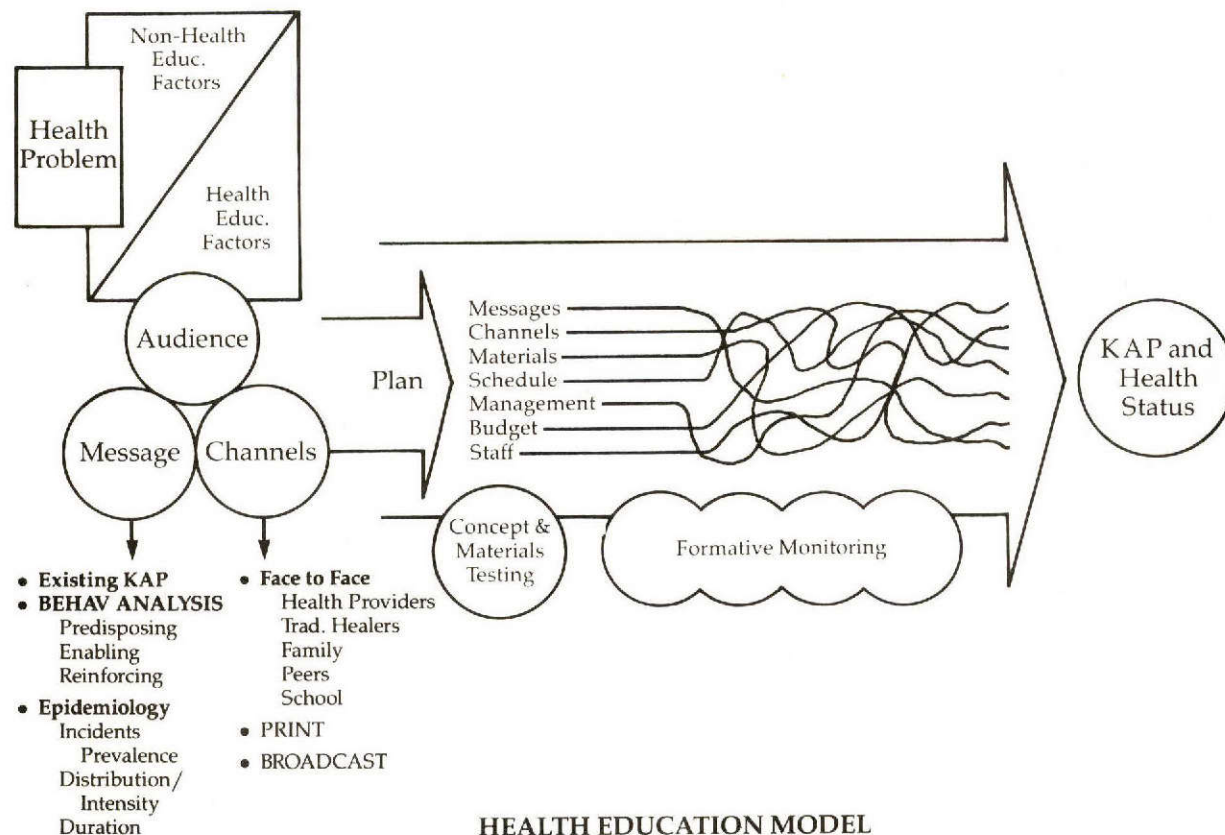
Public education has traditionally been operated as a program — a single intensive effort focused on a critical problem and limited in time. This is less a fundamental characteristic than a coincidence of historical precedent. Indeed, the cyclical nature of many public education themes,

Figure 2

PRE PROGRAM PLANNING

INTERVENTION

RESULTS



the seasonal nature of disease, agricultural topics, and nutritional cycles — argues for comprehensive annual programming of multiple themes, carefully integrating and varying the intensity of different messages. Additionally, the fact that public education addresses different audience segments permits multiple programs to be managed simultaneously. Finally, the changing characteristics of audiences over time, the increasing sophistication of messages, and constantly changing constraints argue for a consistent programming strategy like public education which incorporates regular audience reviews and feedback as part of the fundamental instructional structure. In these ways, public education can rise above the tradition of the national mobilization programs of the 1960s and 1970s and become a regular operational tool which maximizes the use of mass media by systematically focusing on selected themes integrated with equally powerful print and face-to-face delivery systems. In this way, public education can represent an important new tool in a growing array of effective education alternatives and a particularly important tool in the challenge to reach thousands of rural mothers with practical, yet safe advice on how to use ORT in unsupervised settings.

**EDUCATION OF THE PUBLIC**

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Lack of understanding about diarrheal diseases and oral rehydration therapy does not stop at the village boundary, despite the fact that most health education programs are still aimed at this level. Although the ultimate goal must be to have mothers worldwide giving early oral rehydration therapy automatically, this can only be achieved against a general background of awareness about the subject that permeates not only the village community, but the country as a whole. There are many examples of attempts to promote ORT at one level or another within countries which would have had more success had the educational effort "gone national." The message may be phrased differently for ministry staff and pediatricians than those working health centers, but the ultimate objective is the same: to increase awareness about and use of ORT.

Creating an atmosphere of acceptance na-

tionally will not, of course, be easy. There are many practical and financial restrictions to the development of national health education programs. In many places, use of ORT will go against existing attitudes and practices. People need to be informed about the size and importance of the problem of diarrhea. This is a major marketing challenge that can only be met with a flexible range of approaches to convince not only the users, but everyone who could be involved in promoting ORT.

### **Diarrhoea Dialogue**

*Diarrhoea Dialogue* is an example of just one approach to the problem of promoting information about diarrheal disease prevention and control, and especially ORT, on the kind of international scale that is required. Produced in London, but with input from all over the world, the newsletter now goes to ninety-five countries. Demand for *Diarrhoea Dialogue* has grown rapidly since it began in 1980. Requests for the newsletter come from a surprisingly wide range of people, highlighting a crucial information gap. Information exists at both the upper end of the scale (clinical and other research documents) and, to a varying degree, at the community level (basic health education materials). There is, however, a great shortage of general promotional and publicity material to cover the middle ground. *Diarrhoea Dialogue* aims for that gap, giving basic information about all aspects of diarrheal diseases in a well-presented format.

The English edition of the newsletter (print run 20,000) is produced quarterly and distributed free to developing countries and on subscription elsewhere. French and Spanish editions are also available, both producing around 6,000 copies of each issue. We are planning the development of Portuguese and Arabic editions and encourage attempts to translate all or part of the newsletter into local dialects. Major editorial themes are planned well in advance, but each edition always includes a range of other topics on news, reviews, and letters pages.

Our readership is very broad, ranging from contacts in ministries to senior medical staff, nurses and doctors in health centers, public health officials, and health educators and trainers in adult literacy centers. This list is endless. Anyone who requests *Diarrhoea Dialogue* receives it, because we feel it is as important that someone running an agricultural extension project reads the newsletter as the district medical officer. It is only through familiarity with the subject that ORT will become commonplace.

With such a broad audience, selection of material for the newsletter could be a problem. The way we approach this is to present all the key issues, but from a range of points of view. We always try to balance practical advice with rele-

vant research reviews and information sent in by readers on local and national diarrheal disease control programs. The intention is that both ministry and health center staff can all read *Diarrhoea Dialogue* and learn something from it.

The "dialogue" aspect of the newsletter is crucial. For example, issue thirteen was devoted largely to reports of various countries' diarrheal disease control programs written by the people involved. As well as describing their work, they reported candidly on assistance given by agencies. The main agencies assisting in this work were also given the opportunity to report on their latest initiatives in diarrheal disease control around the world.

Another vital aspect of the dialogue is our readers' correspondence. We have been sent a wealth of information about local initiatives in prevention and control of diarrhea, and local attitudes and problems with promotion of ORT. Misunderstanding about ORT — what should be given, when, and how, is continually mentioned in these letters. We have learned that the basic messages about ORT can never be repeated enough in *Diarrhoea Dialogue*.

### **Reaching mothers**

What has our readers' experience been with producing health education materials for mothers? We have been sent many suggestions for messages and materials, all of which need to be carefully evaluated to see whether they have any relevance for wider use. Some of the points raised most often are noted below. All have been sent to us by health workers and others involved in teaching mothers.

1. *Community support for programs and attitudes to diarrhea.* Diarrhea is often not considered a problem in communities, even if it is responsible for high infant mortality rates. If this is the case, it is impractical to relate the use of ORT to diarrhea. It needs to be related to another element to which mothers will respond. For example, in many places, ORT has been introduced as an integral part of nutrition programs, as lack of food is a problem recognized by mothers. In other communities, introduction of ORT has been successfully linked to an existing positive practice, such as breastfeeding.

2. *Simple, feasible messages.* A point made by many of our readers is that both the message and the instruction it gives must be simple and easy to put into practice. If mothers are given too many things to remember, especially if some of these (such as preventive measures, particularly those to do with water supplies and sanitation) are impractical, crucial messages, such as early drinking, may be forgotten.

3. *Which messages?* Having experienced the problem of too many or conflicting messages, various readers have told us that they have had



to decide which, in their community, are the most essential points to put across. These are some of the priorities identified:

— *early, extra drinking* as soon as a child has diarrhea and vomiting. Any household fluid can be used, including a simple sugar/salt solution if mothers have been shown how to make this.

— *awareness of signs of dehydration* if early drinking has not helped. This is a crucial communication problem. Readers have told us that it is often too difficult for mothers to understand and remember all the signs of severe dehydration, such as the pinched skin fold and sunken fontanelle, etc., and that, in any case, mothers should be aware the child's condition is worsening *before* these signs have appeared. It has been suggested by some readers that perhaps this information could be reduced to one earlier indicator of the child's condition, plus one of the signs of severe dehydration. For example, the early indicator could be the child's lack of energy combined with diarrhea and vomiting. Some readers have suggested that the single easiest sign of dehydration for mothers to understand may be the child's lack of tears.

4. *Which media?* We have been sent a variety of materials. Some readers involved in national programs have attempted to integrate various media. The key issue is the *training* of the people who will carry out the research in the community as to what materials and media are most acceptable. Only then can the programs be planned. Feedback from readers who have been on the receiving end of health education programs has shown that various combinations of print materials and mass media (especially radio) productions have proved acceptable as long as they are integrated and do not contain contradictory messages.

5. *Flexibility of approach.* In some areas where ORT is being promoted, health educators find it helpful to promote it as a medicine, as this gives it more credibility in the community. Other projects have shown, however, that the danger of this approach is that, if supplies of the "medicine" cease for some reason, mothers are reluctant to give water or other fluids alone. A Kenyan reader told us that his answer to the promotion of early ORT that was both acceptable to mothers and useful was to encourage the drinking of tea. The tea is boiled and mothers are happy to give increased amounts when children have diarrhea because, in this community, tea is considered to have medicinal properties. Some people have found that despite the practical problems (measuring water and storing the fluid), if one-litre ORS sachets are available, it is easier to show mothers how to use these than to teach them how to measure out the correct amounts of locally available ingredients for sugar/salt solutions.

## Conclusion

Increasing public awareness about ORT will require widespread social marketing campaigns that will need to call on every possible promotional and communication technique. None of these will be successful, however, unless the materials and messages produced are developed with and in complete understanding of the community at which they are aimed. Even more important, having created awareness about ORT, the health infrastructure must be able to respond to demand and supply either ORS sachets or the necessary ingredients to make up oral rehydration solution.

## EDUCATING THE PUBLIC

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In a narrow and perhaps a traditional sense, there is a world of difference between information and education. The task of the former has consisted of collecting information and presenting it in an interesting way, often through the media, to different audiences. And the information officer's responsibility is traditionally perceived to end there. Education, on the other hand, involves a much more complex process. For it to be successful requires an act of participation on the part of the learner and an all-important dialogue between the educator and the learner encompassing mutual learning and discovery. But in a broader sense, and certainly in recent years, the two have converged. Most information officers today view their task as that of disseminating knowledge with the purpose of mobilizing support and serving as a communications bridge between the people and the public services. And few health educators nowadays leave out of their brief the need to influence policy and to reach the decision makers. I see them as two elements of the same continuum of communications activities.

Whether information or education, we cannot escape the fact that one must make contact with the people. We can either contact them on a face-to-face, person-to-person basis or through some mediated approach to reach a larger number of people. There has been considerable debate as to the merit of interpersonal communication, which is indisputable, and as to the efficacy of the mediated communication, which is hard to refute in terms of cost-effectiveness.

Within the last eight months, the World Health Organization convened an expert committee on "New Approaches in Health Educa-

tion for Primary Health Care" involving distinguished specialists in public health, anthropology, media, education, etc., from different parts of the world. During the last World Health Assembly, WHO subsequently organized technical discussions on the subject of "New Policies in Primary Health Care" in which some three hundred participants from governments and organizations took part. Both of these meetings strongly endorsed an integrated strategy using both the interpersonal and the mediated communication. On the one hand, media work (both traditional and modern) can help spearhead health work and sustain public interest. On the other hand, interpersonal follow-up, with the educational process focused on in-depth action, picks up where information leaves off. Media work, without linkages to the existing services and face-to-face contact, would create what might be called a "fireworks syndrome," by analogy with a display of attractive fireworks which fizzle out after a few seconds in a darkened sky. On the other hand, person-to-person work, while recognized as the most effective method of learning, will benefit greatly from close partnership with the media which can stimulate and help to sustain interest in health problems on the part of individuals, families, and communities. Media can open minds and doors through which person-to-person learning can move. Information and Education for Health, in WHO, exists to promote primary health care (of which the Diarrhoeal Diseases Control Program forms an integrated part). Together, they involve a continuum of action, from advocacy and development of awareness to working with individuals and within communities in elaborating plans, carrying out activities, and monitoring action.

One has often heard that health workers should learn from the success of commercial marketing, where razzle-dazzle advertising campaigns seem to mesmerize audiences and create public demand. But before a media campaign is launched, commercial marketing requires meticulous research into public taste and interest and, following the media blitz, an army of sales agents with tangible products in hand to follow up with interpersonal communication. Thus, it is clear that commercial marketing itself employs the integrated approach. In noncommercial health and development activities where media have been used to create demand, the second stage of follow-up in the community is too often neglected. Creating awareness without the capacity to deliver the services will be very counterproductive.

Before we discuss educating the public about diarrheal diseases and oral rehydration therapy, or about any given issue, for that matter, perhaps we should first try to understand how a particular public acquires its information and becomes

educated on a given subject. Human behavior must be seen in a social context. In the case of ORT, what do people know about diarrhea? Where do people get their health information? Why do mothers stop feeding liquids to their sick children? What and who influence their attitudes? One can guess that tradition plays a role, that their elders (whether religious or community) set the pace, that teachers may hold a special position among the young, that economic factors dictate certain actions and new fashion affects many. Of course, in different localities, the answers to some of these questions vary. But the need to learn from the people cannot be overemphasized. This is a form of communications epidemiology, to use a term familiar to public health professionals.

The role of the media in the education of the public, as seen by WHO, can be summarized as follows:

- to help strengthen political will by appealing to policymakers;

- to raise general health consciousness and clarify options concerning actions that have a strong bearing on health levels;

- to inform decision makers and the public about the latest developments and limitations in health sciences and publicize relevant experiences for replication;

- to help deliver technical messages;

- to foster community involvement by reflecting public opinion, encouraging dialogue, and facilitating feedback from the community.

In my opinion, we have not yet tapped the potential of the popular entertainment program, one component of the mass media that can exercise a powerful influence on social norms. While some innovative health educators have successfully used the entertainment format to help convey technical messages, a more systematic and wider use of the entertainment medium is called for. Entertainment, if successful, is almost always culturally specified, and, more important, it can convey messages in real-life circumstances and with enough emotional appeal to win greater acceptance.

The two WHO meetings called for a new orientation for Public Information and Education for Health. They urged that health education workers should be learner-facilitators as well as teachers and participants. They must work to stimulate community involvement, tapping lay resources. Health education is seen as the approach par excellence when it comes to encouraging and enabling communities to identify their health problems, select solutions, set targets, and translate these into simple and realistic goals that they can monitor themselves. They must work with nongovernmental organizations and community groups who have their own channels to the people.

So, when we turn to the control of diarrheal diseases, it is clear that health education must also be used to facilitate intersectoral action. We need to remind ourselves that the Diarrhoeal Diseases Control Program, along with ORT, is but one of many interrelated actions required for PHC which are jointly recommended and championed by WHO and UNICEF as the approach for providing essential health services for all.

We urge that ORT education should not be divorced from advice about the danger of polluted water, contaminated food, and other essential information about prevention. And the same channels of information and approach to education should be used later for other elements of primary health care. For what is the use of saving children from diarrhea if they only contract other communicable diseases or die of malnutrition due to ignorance?

Finally, it is important for us to learn from past experiences; the painful lessons of the 1950s and 1960s showed that apparently successful technical programs, whether tuberculosis control or the fight against some other disease (if I may use the same metaphor again), were no more than "fireworks" in a dark sky. Only if attention were paid to building up the health system infrastructure so that the gain made by the specific program could be sustained, consolidated, and enlarged was there a chance of turning the fireworks into a permanent light.

It is clear from some of the ORT experiences that we can reduce diarrheal deaths; that we *can educate mothers* to handle and manage the simple technology of ORT; that the media, if supported by follow-up, can be useful in the education process. And ORT against diarrheal disease is dramatic and meets a felt need. It must therefore be pursued vigorously, not only as a program by itself, but also as an entry point for the broad range of activities. And since we want to work for the better health of the people in a development way, it is crucial to recognize that ORT is but one, albeit an important and urgent one, of the primary health care elements. For the danger of the "fireworks syndrome" is real, too perilous to ignore — indeed, in time, it may well endanger the very purpose of the program. It will be up to us to make sure that we succeed in informing and educating the public in ORT in such a manner that it is integrated into the rest of the health care services.

## SUPERVISION AND EVALUATION OF ORT PROGRAMS

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Infants born today in the less-developed countries face an unacceptably high risk of death during their first five years. Infants in the low-income countries have mortality rates that range up to nearly 250 per 1,000 live births.<sup>1</sup> Even in middle-income countries, infants commonly have a much higher mortality rate than in the more industrialized countries. Likewise, children one to four years old in the less-developed countries also have substantially higher mortality rates. These high childhood mortalities result in a markedly reduced life expectancy for the three billion people of the less-developed world.

That the ten- to twenty-fold higher mortalities in less-developed countries are rooted in social and economic disadvantage is beyond question. The possibility of relatively rapid improvement in these health indicators is illustrated by the reduction in mortality in New York City during the last fifty years. Even more rapid reductions in mortality have been seen in middle-income countries that made a political and economic commitment to public health in the last several decades.

While gradual improvements in health can be expected coincident with economic development, the desire to make even more rapid progress in the face of limited resources mandates the identification of priority health problems to which control measures can be directed. If one health goal is reduction of high infant and childhood mortality, it is necessary to examine the proximate causes of death of children. When this was done on a global level by Walsh and Warren<sup>2</sup>, it was suggested that infectious diseases and malnutrition accounted for nearly all of the excess mortality of children in less-developed countries. And, of the infectious diseases, diarrhea was most prevalent and associated with the greatest number of deaths. Indeed, it has been estimated that there are nearly five million deaths from diarrhea each year among children in the less-de-

veloped countries.<sup>3</sup>

Individual countries will need to establish priorities to determine how to direct their health resources. This should be done on the basis of the best information available on the importance of each health problem and the feasibility of control. In addition to its use in establishing priorities, information on diarrheal mortality and morbidity rates are critical in the planning and implementing of an oral rehydration therapy program.

Since accurate cause-specific mortality data are rarely available in less-developed countries, many countries have taken the approach of conducting baseline surveys at the start of a program. These simple surveys were designed to obtain accurate information with a minimum expenditure of time and money. They permit calculation of such indices as overall and diarrhea-associated mortality and diarrheal morbidity in children under five years old. Surveys done in Asia, Africa, and Latin America have found a high correlation between overall childhood mortality and diarrhea-associated mortality. In areas with a high mortality, from 25% to 50% of deaths were associated with diarrhea. Also, from these survey results it is apparent that a high diarrheal mortality rate usually goes along with a high diarrheal incidence rate. Some surveys found diarrheal attack rates as high as seven episodes per child per year — a figure very similar to those derived from prospective community-based studies in Asia and Latin America.

Thus far, I have talked about the importance of diarrhea as a health problem and the high rates of diarrhea-associated mortality in many less-developed countries. Although it may not be immediately obvious how this discussion is related to my topic of supervision and evaluation of ORT programs, I had two purposes in beginning this way. The first was to define the problem that we are addressing with the ORT program. The problem is the high childhood mortality due to acute diarrhea. This permits us to establish the objective of a control program, which would be to "reduce mortality due to diarrhea in children under age five." The second purpose was to stress the need for baseline information on the extent of the problem. This permits us to plan the program properly and to evaluate its achievements.

The management of an ORT program encompasses five areas: planning, training the health workers, educating the public, monitoring, and evaluating the program. Many of these areas are interactive, and each is indispensable in the management of a program. Since training and education have already been covered, I will not discuss these areas. I will, however, discuss planning, since I believe it is fundamental for proper monitoring and evaluating.

In planning an ORT program, it is useful to set

specific targets. Since mortality reduction is the objective, an appropriate target may be, for example, "By 1986, to reduce mortality due to diarrhea in children under five years old by 25%." This target can be calculated by following a series of steps. Briefly, the steps are to:

1. Calculate the current diarrheal mortality rate for children under the age of five.

2. Calculate the current and future access to health facilities and health workers providing ORT. (Access is defined as the opportunity to obtain or use something. People who have access to health services are those that can easily obtain the services. One way to determine access is to calculate the number of people who live within a reasonable distance of a health facility or in a community with a village health worker.)

3. Calculate the current and future use of the services of health facilities or of village health workers. (The usage rate is the proportion of children with access who actually obtain some health services.)

4. From the calculations in steps 2 and 3 and a projection of the population, it is possible to determine the current and future coverage of the population with ORT. (Coverage with ORT is the number or percentage of the diarrhea cases treated with ORT.)

5. Since it has been demonstrated that properly applied ORT programs can achieve a 50% or more reduction in diarrheal mortality, it is possible to calculate the expected reduction in the diarrheal mortality of children under the age of five by the end of the specified time period. This becomes the target for mortality reduction.

Obviously, it takes more than these desk top calculations to achieve a reduction in mortality. It takes a series of specific activities designed actually to increase ORT access and usage, resulting in a greater effective coverage. Thus, it is critical to specify and plan these activities when designing the program. It is also important to make these plans quantitative by establishing desired outputs for each activity. Examples of these activities and outputs are as follows:

1. Produce or obtain x number of oral rehydration solution packets. The number of required ORS packets can be calculated based on the anticipated ORT coverage for each year of the program. They must be produced in the country or obtained from outside.

2. Establish use of ORT in x number of health facilities or by x number of village health workers. This would be necessary to increase access to a greater proportion of the population.

3. Distribute ORS packets. Distribution encompasses many substeps, including establishing x number of central, regional, and local storage facilities, procuring vehicles, and preparing distribution plans. The final output measure is the number of packets to be distributed to the

place where they will be used, such as health facilities and villages.

4. Train health workers. This activity also includes many separate steps, each of which could have a specified output. Examples would be x number of training materials, x number of courses held, and x number of workers of various levels trained.

5. Develop and use promotional and educational materials. As Dr. Smith discussed, it is important to promote ORT to the community and to the health workers.

The ability of the program to accomplish these activities and outputs will determine if the mortality reduction targets can be achieved. Thus, it is obvious that it is important to monitor and evaluate progress in carrying out these activities. At the local level, it is desirable to monitor the results of the activities of the program. Monitoring and evaluation are related, but distinct in the way they are used here. Monitoring is the continuous process of assessing the operations of the program, such as the performance of health workers or the usage of oral rehydration therapy. Evaluation is periodically (for example, once a year) comparing what has been achieved to what was expected to be achieved, that is, determining the extent to which the targets and outputs have been met.

The specific items that will be monitored should be selected carefully. They may be items that are most important to the success of the health services or items that are the most difficult to do. Examples of items that could be monitored to determine the performance of health workers would be:

1. Can they correctly assess dehydration? This judgment is a function of training and experience and is necessary so that patients can be referred for intravenous therapy when needed and so that the correct amount of ORS can be given.

2. Can they prepare ORS? Regardless of whether ORS is to be prepared from a packet or from simple measures of sugar and salt, there is an optimal concentration for the solution. Health workers should be able to prepare a solution within an acceptable range of concentration.

3. Can they administer ORS? Health workers at all levels should be able to administer ORS, that is, provide correct volumes of solution, encourage the child to drink, etc.

4. Can they instruct mothers on ORT? Health workers must be able to instruct mothers on the preparation of ORS, on the provision of correct amounts of ORS and of other fluids, and on the need for continued appropriate feeding of the child.

5. Can they keep records? Health workers need to maintain simple records of what they do. Without these, it is difficult for the supervisor to assess the workers' activities.

For other aspects of the program, there are other items that can be monitored. For example: mothers' understanding of the causes and risks of dehydration, mothers' understanding of how to prepare and give ORS, or the availability of ORS packets and supplies.

After determining what items should be monitored, it is appropriate to consider how this can best be done. Possible methods include:

1. Observe health workers. One of the best ways to insure that the health worker is able to treat a child with diarrhea is to observe the worker. It is important to make it clear to the workers that you are observing to help improve their work, not to criticize it.

2. Talk with health workers. This can be used to find out what they know and what problems they have recognized.

3. Request demonstrations by health workers. To find out if workers have acquired certain skills, it is often easiest to ask them to demonstrate the skills. For example, they can be asked to demonstrate the preparation of an ORS solution.

4. Review records. If the records system is properly designed and the records accurately maintained, it is possible to use them to determine if the treatments used are appropriate. It will not be possible to tell how well the treatment is being provided, although a rough idea of this aspect can be obtained by calculating the case-fatality rate at the facility. If a high proportion of patients with diarrhea die, it is likely that the treatment is not being provided correctly.

5. Talk with mothers. Talking with mothers at the time that their children are receiving treatment will help to determine if mothers understand what they are to do. Visiting the homes of patients who have had diarrhea will also provide the opportunity to find out if the patients were treated correctly and if the mothers are satisfied with the ORT services.

It is useful for the supervisor to have checklists for monitoring health workers. These should only include the items that are considered to be important, and they should be easy to use.

When problems are identified, the supervisor's judgment is required to decide what to do. This judgment is based on his assessment of the problem. For each problem he should consider the following questions: How urgent is it? How serious is it? Is the problem getting better or worse? Are several problems related to each other?

If the problem is important, it should be described by the supervisor. The supervisor should note when the problem occurs, with whom it occurs, whom it affects, where and how often it occurs, and when it started occurring.

After a problem has been identified and described, a solution must be found. This requires knowing what is causing the problem. Common

causes include lack of skill or knowledge, lack of motivation, and obstacles such as lack of time or insufficient resources.

The solution to the problem, of course, will depend on the cause and the most realistic and affordable response. After implementing the solution, it is important that the supervisor recheck to see if the problem has been corrected.

Next, we need to discuss monitoring the usage of ORT. Monitoring in this case refers to regularly checking the extent to which ORT is being used in a health service area or village. Several principles of monitoring are that appropriate data on usage should be obtained and analyzed in a timely fashion at the local level and appropriate action taken as soon as possible.

To find out how many times the ORT services were actually used in a time period — for example, a month — it is necessary to have certain data which include:

1. The names of patients with diarrhea. Although this is not really needed to determine the usage rate, a common problem is separating first from follow-up visits for ORT. In calculating usage, only the first visits should be counted, and having the name available usually permits this distinction to be made.

2. The date of the visit. This information is needed to see which month to include it in.

3. The age of the patient. This figure is necessary so that only patients in the target population, such as children under five years old, can be counted separately. This permits calculation of the usage rate in both the total and the target population.

4. The service provided to the patient. Service may include no ORT, ORT alone, or ORT with IV. For the most complete analysis, these can be tabulated separately. Alternatively, only the total patients receiving ORT could be counted.

This information should be used to prepare monthly usage forms and to prepare monthly usage graphs. These data can be used to determine if there is a substantial increase or decrease in usage from one month to the next and if sufficient progress is being made toward achievement of the usage target. Corrective action should be taken if necessary, and feedback should be provided to the health workers.

Monitoring or supervision, then, is a continuous process designed to ensure that program operations at every level are proceeding according to plan. Monitoring should be done at the local level, if possible by persons residing there, and should be as frequent as practical — for example, weekly. This process makes it possible to make rapid corrections if the activities are not on course or schedule.

Evaluation is similar to monitoring in the steps required. These include the determination of what data are needed, the collection of data, the

analysis of this data, the evaluation of achievements, and the taking of action in response to the achievements.

Since we want to evaluate a wide range of targets and activities, it is not possible to discuss all in detail. However, the data needed for the evaluation should be obvious because of the nature of the quantified targets and activities. For example, to evaluate a mortality reduction target, it will be necessary to determine the diarrheal mortality rates in children under age five at the beginning and end of the evaluation period. To do this, we need the numbers of diarrheal deaths and children in the population each year. If this is not available through a routine information system, it may be necessary to do a special survey to assess the mortality rate. This would be similar to the surveys discussed earlier.

Likewise, evaluation of program activities and their desired outputs should be done on an annual basis. At times, this can be accomplished by using data from routine information systems and previous supervisory visits. At other times it may be necessary to do special studies to collect data related to activities. One study might determine whether health facilities are actually receiving sufficient supplies of ORS. Another study might estimate the proportion of health workers or mothers who can correctly mix ORS. Most of the activities of the program should be evaluated on an annual basis.

One useful method of evaluating a program is a formal comprehensive program review, carried out by a group of both national staff and outside staff. This review would assess the contribution of the ORT program towards achievement of the country's overall health goals; measure the degree of effectiveness and efficiency of the program in achieving its objectives and targets; identify operational and technical problems; and recommend possible solutions to problems. This review could also include a survey to assess diarrhea-associated mortality. Although substantial reduction in diarrheal mortality would be expected within one to two years in local areas with effective ORT progress, it may take three to five years to accomplish a measurable reduction in mortality on a national or even regional scale. Thus, these surveys and comprehensive reviews would be appropriately carried out after three to five years of program operations.

## REFERENCES

1. Evans, J. R.; Hall, K. L.; Warford, J. "Shattuck Lecture — Health care in the developing world: problems of scarcity and choice." *New England Journal of Medicine* 305 (1981):1117-27.
2. Walsh, J. A. and Warren, K. S. "An interim strategy for disease control in developing countries." *New England Journal of Medicine* 301 (1979):967-74.

3. Snyder, J. D. and Merson, M. H. "The magnitude of the global problem of acute diarrhoeal disease: a review of active surveillance data." *Bulletin of WHO* 60 (1982): 605-613.

## SUPERVISION OF ORT

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How do you mix ORT packets? How do you mix salt and sugar solution? At what rate should ORT be given? How long should ORT be administered?

The preceding are four important and critical questions frequently answered incorrectly by health staff. Three possible explanations can be given for this lack of correct information. First, there is no standard measure for mixing oral rehydration solution. Second, poor training can result in the lack of knowledge and skills. Finally, supervision is often inadequate or insufficient.

### Lack of a standard message

During a recent evaluation of a national diarrhea control program, I encountered six different messages for mixing ORS. These included:

	Salt	Sugar	Water
1.	1 pinch	1 fist	1/2 L
2.	1 pinch	2 scoops	1/2 L
3.	2 pinches	4 scoops	1 L
4.	1 tsp.	8 tsp.	1 L
5.	Large plastic spoon		1 L
6.	Small plastic spoon		1 Cup

With so many messages, it is not surprising that health staff and mothers were frequently confused as to how to mix salt and sugar solution.

In another evaluation, confusion arose from mixing two "correct" messages, one on ORT preparation and one on volume of administration. The first message stated that eight bottle caps of sugar, one bottle cap of salt, and three local bottles of water should be utilized in ORS preparation. A second message explained that one bottle per day should be administered to infants under six months, two bottles per day to infants and children six to eighteen months, and three bottles per day to children over eighteen months. Some mothers with infants under six months confused the mixture and volume messages and were using an 8-1-1 (eight caps of sugar, one cap of salt, and one bottle of water) mixture which was not only ineffective, but dangerous. To be effective, messages must be simple, clear, and unequivocal.

## Poor training

Evaluation of the performance of individuals "trained" in the use of ORT frequently identifies two problems: inadequate or incorrect knowledge of assessment of hydration and appropriate therapy and/or inadequate skill in communicating such knowledge to mothers. In a recent country survey, 30% of health staff who were treating patients with diarrhea answered incorrectly one or more of the four opening questions. In addition, field workers often failed to communicate methods of treatment adequately to mothers. All of you who have seen a health worker lecture a mother on mixing ORS — with no ingredients, water, or volume measure — know this problem. As most training in the developing world takes place during continuing education and/or on-the-job training, training deficiencies are frequently failures in supervision.

### Inadequate supervision

Let us examine supervision as it is currently carried out in the developing world.<sup>1</sup>

In Papua, New Guinea, supervision of 3,300 health posts was found to be weak and irregular because of problems in communication, in transport, and with manpower.

In Sri Lanka, where one-third of supervisory positions are vacant, supervision was irregular.

In Uganda, lack of transport and limited resources forced most health workers to work in isolation without any supervision.

In Venezuela, planned supervision of rural clinics by physicians was ineffective because of the demands of clinical duties and because of physicians' lack of interest. Mobile supervision, as it has been traditionally practiced, is becoming obsolete because of the rising cost of vehicle purchase and maintenance, inadequate-to-nonexistent supplies of petrol, and insufficient funding for field travel.

If ORT is to be effective, new approaches to supervision must be developed. How do we develop these new approaches? In thinking about this undertaking, we must consider the following questions. Who is the most appropriate supervisor? What activities should be supervised? How should supervision be carried out? How frequently should supervision take place? What is the role of district and regional staffs?

### Who is the most appropriate supervisor?

There are, I believe, three principles which can assist in answering the first question on selecting the most appropriate supervisor.

1. Each health worker should have only one supervisor.

2. The supervisor should, whenever possible, be a resident in the area where the work is carried out.

3. Supervision should depend on locally available, appropriate transport, such as foot, bicycle, public transport, or, in rare cases, motorbike.

Using these principles, Table 1 identifies a supervisor for each of three levels of services. The concept of local supervision, especially the designation of the village supervisor, is controversial. In certain areas of India, communities already have the authority to dismiss "their" community health worker. Delegating the responsibility of supervision to the local level will help bring about the community involvement essential for diarrhea control.

mobile CDD expert. A checklist is recommended.

### Health Facility CDD Checklist

1. Is staff available as scheduled?
2. Are necessary supplies and equipment in stock?
3. Does the provider accurately assess the status of a child with diarrhea?
4. Does the provider know the correct treatment procedure?
5. Is he/she effective in teaching mothers how to treat their children?
6. Is usage increasing with time?

**Table 1**

### SERVICE PROVIDER AND SUPERVISOR FOR ORT DELIVERY IN COMMUNITIES, HEALTH CENTERS, AND HOSPITALS

	<i>Community</i>	<i>Health Center</i>	<i>Hospital</i>
Providers of Service	Community Health Workers Village Volunteers Mothers	Dispenser Health Aid Nurse	Physician Nurse
Appropriate Supervisor	Village Chief Chairman, Village Health Committee	Health Center In Charge	Physician In Charge

#### What activities should be supervised?

Although there are a large number of diarrheal control activities, effective supervision depends on identifying a small number of critical indicators. To assist supervisors in checking all key activities, a checklist, like the following list for village supervisors, is useful.

#### Checklist for Supervising Village Delivery of ORT

1. Is a person with knowledge of diarrhea treatment available at all times to help mothers treat children with diarrhea?
2. Are essential supplies available in the village?
  - ingredients (packets and/or salt and sugar)
  - standard measures
  - diagnostic checklist
3. Does the health worker know six signs of dehydration?
4. Can the health worker mix ORT correctly?
5. Do mothers use the service?
6. Does the provider teach mothers how to prevent diarrhea?

Regular checking of these six points by the village chief or chairman of the village health committee would strengthen community support for appropriate treatment of diarrhea. If problems are identified and cannot be resolved at the local level, assistance of health center staff in problem analysis and problem solution can be obtained.

At the health facility level, we are again suggesting a local resident supervisor instead of a

7. Does the provider stress prevention in each contact?

#### How should supervision be carried out?

Recognizing the limited time available to a supervisor to monitor diarrhea treatment, how can this time be best spent? The WHO CDD supervisory skill module on monitoring performance suggests five methods:<sup>2</sup>

- Observe health workers.
- Talk with health workers.
- Review records.
- Talk with mothers as they leave the clinic.
- Visit treated cases in their houses.

Items 1, 2, 4, and 6 on the Health Facility CDD Checklist can be quickly assessed by talking to the health worker. The other items (3, 5, and 7) can be checked by watching workers treating patients and by interviewing mothers as they leave the clinic.

#### How frequently should supervision be carried out?

Traditional mobile supervision has usually been carried out by nonresident supervisors at monthly or quarterly intervals. Transferring the responsibility to a resident supervisor should, in most locations, allow weekly supervision. Such supervision should usually require one-half hour per week. This is a relatively small commitment of time for a disease that is responsible for 20% of under-five mortality. If problems are identified, such as inability to accurately assess a child with diarrhea, corrective training will require additional time.



### What is the role of district and regional staff?

Let me suggest two priorities. First, we should teach resident supervisors how to supervise. Second, we should serve as consultants to local supervisors in analyzing and solving identified problems.

Success in implementing the findings of this conference will in large part depend on developing new, appropriate, and feasible methods of supervision.

### REFERENCES

1. Ofosu-Amaah, V. *National Experience in the Use of Community Health Workers*. Geneva: WHO, 1983.
2. *Monitoring Performance*. WHO Control of Diarrhoeal Diseases Supervisory Skill Module, Field Test Version 1982.

## EVALUATION OF ORAL REHYDRATION THERAPY\*

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In the short time available today for prepared remarks, it will be possible to give only the briefest summary of the findings of our research into the impact of two mass media-based interventions. Therefore, I will summarize these in a few paragraphs and then try to share with you some of what we have learned about how to choose questions and methods for evaluation.

I and my colleagues have been evaluating projects in Honduras and The Gambia that use an integrated campaign of radio, interpersonal contacts through health workers, and print materials to teach mothers to use oral rehydration therapy and to practice certain preventive health behaviors. The campaigns, called the "Mass Media and Health Practices" programs, are funded by the Offices of Education and Health in USAID's Bureau of Science and Technology and implemented by the Ministries of Health and the Academy for Educational Development.

Our evaluation examines the results of the campaigns in four basic areas: (1) exposure to the campaign itself; (2) learning and attitude change resulting from the exposure; (3) behavioral changes, particularly related to use of oral rehydration therapy; and (4) health status changes among children as a result of their parent's behavior changes. We presently have data from the first year of each project. We followed a panel of about 750 families in each country with monthly visits for interviews or anthropometric measurement. In addition, we have used ethnographic

methods, direct observation, special studies, and other methods to gather information. We have found that the campaigns have achieved very broad exposure and have produced dramatic changes in knowledge, attitudes, and behavior. Our analyses of the effects of those behavioral changes on morbidity, growth, and mortality are not yet complete.

People had high levels of access and exposure to the channels used by the campaign. For example, in Honduras, 71% of the families had a working radio, and 44% of the mothers remembered hearing a campaign spot during the day prior to the interview. Print materials were designed to get around problems of limited literacy and were very aggressively distributed. An instruction sheet for home mixing of water-sugar-salt solutions was distributed in The Gambia and also used as an entry certificate for participation in a campaign-run lottery. Seventy-one percent of rural Gambian mothers could show us their copy of the flyer.

The campaigns also produced strong gains in knowledge. In Honduras, the oral rehydration solution is called Litrosol, and it did not exist before the program began. Within a year of starting, however, 92.5% of mothers could name Litrosol as the medicine being promoted by the campaign. In The Gambia, a relatively complex formula was taught for home mixing. At the beginning of the campaign, only one of eight hundred mothers knew the formula; within nine months after starting, 64% of the mothers got all of the components of the formula correct.

The behavioral changes promoted by the campaign have also been adopted. After a year in Honduras, 26% of all cases of diarrhea in children less than five years of age were being treated with Litrosol, and roughly half of the mothers had tried Litrosol at least once. In The Gambia, use of a water-sugar-salt solution is being promoted as an early, in-home response to diarrhea. For mothers who actually treat their child's case at home, the water-sugar-salt mixture quickly became the treatment of choice — it rose from 21% of home treatments to 89% within nine months. This represents a rise from 4% of all cases of diarrhea among children to 48% that are receiving water-sugar-salt treatment at home.

Our conclusion as evaluators is that these results reflect remarkably strong effects resulting from the carefully designed interventions, and that it can be concluded that communication interventions can produce quite significant behavioral changes. These projects may demonstrate a useful model through which the complex behaviors and mixing and administration by ORT can be disseminated.

Now that I have told you a little about our approach and results, I would like to comment on what we've learned about the methods and the

value of evaluation in programs like these. Ours was a very special case in which an intense, large-scale, and long duration evaluation was mounted in order to test out the methods used by these projects. This led us to define a set of research questions that required a large sample, repeated measures, and very detailed questioning. The result has been to give a large data set following individuals over time so that we can establish temporal, if not causal, links between exposure to messages, learning, behavior change, and, ultimately, health status change. It has been an arduous and expensive activity, but the outcome has been worthwhile — we can now make accurate estimates of population parameters and still analyze the process a single individual follows in adopting or rejecting the campaign behaviors.

However, the message I want to stress today is that this approach is anything but typical of that from which most projects would benefit. For most evaluations of operational projects, neither the questions we focused on nor our methods of asking them could be wholly appropriate. The kind of information of most value to operational projects is likely to be information about how a given effort is working or how two different approaches to the same problem compare, rather than information describing the amount of impact on population parameters. For people responsible for a specific project, information about the project's effects must be timely, inexpensive, and probably need only catch the major trends or avoid serious mistakes. In general, this argues for trading off "scientific" rigor for utility. It is usually more important to be collecting some kind of information on which to base management decisions than to be collecting very precise data in a narrow range of topics because that is all one can afford. It is a happy accident that monitoring and formative evaluation data collection efforts are usually cheaper than major survey undertakings.

A program director should ask a series of questions to arrive at a notion of what evaluation would be useful to do. The first step is to ask, "What are the questions to which I want answers?" This may not be as simple as it seems. For instance, does one really want an accurate estimate of the percentage of population using oral rehydration therapy, or would it be more useful to know something about the *characteristics* of people who are *not* using it so that you can target them more accurately? Would it be better to know how many field workers have oral

rehydration therapy packets to distribute, or why those who don't have them haven't received them? The answers to any of these questions may be useful for different purposes for a program manager — the point is not that one or the other is right, but that they are quite different. They imply different measurement techniques as well, which is why one cannot start planning an evaluation at the level of a research design or data collection method, but must start with the questions. The second step is choosing which questions to try to answer. For evaluations that feed back to the program implementer, the prime criterion probably ought to be utility of the information. It may be more useful to discover whether liter bottles are available to rural mothers than to find out the exact incidence of diarrhea. Obviously, other factors will enter into the choice of questions. A program manager has multiple objectives — for example, improving the effectiveness of his efforts and defending his projects in budget battles. Different information is appropriate for each objective. The cost of getting the data and the timeliness with which it might be available must also be considered.

At the third step, one consolidates these decisions into a research plan. From consideration of what questions to ask, what utility the information might have, and whether the cost and timeliness of the data are worth the investment, will come a set of activities that meet the unique needs of the specific project. The questions and cost issues will probably dictate fairly clearly what methods are most appropriate, and from that a general evaluation plan will emerge. Such a plan will almost certainly have a higher impact and be less expensive than one developed by specifying a design first or by accepting the "usual" global questions evaluated in relation to rural health projects.

The issue of overriding importance is to gather the information that will help achieve your objectives. The evaluation that I described in the first part of this paper has objectives of amassing scientific evidence about the effect of the mass media and health practices interventions. Hence, the rigorous, large-scale research plan it follows is appropriate to its needs. However, for most program implementers, an entirely different approach would be preferable. That approach would stress getting quick, cheap information to guide decision making rather than using large sample studies to estimate population parameters.

## **SUPERVISION AND EVALUATION IN THE IMPLEMENTATION OF ORT PROGRAMS: CONSTRAINTS AND SOLUTIONS\***

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The principal objectives of the supervision and the evaluation of oral rehydration program implementation efforts are to improve the coverage and quality of oral rehydration therapy services and to control the costs of production, quality testing, promotion, and distribution of the salts. These activities should be a routine part of ORT programs at all levels of care, from the household and community level to regional and national programs.

Nevertheless, the experiences of the past few years have highlighted a number of constraints to the successful achievement of these operational objectives. The principal constraints which have been identified are the following.

*Political support for systematic supervision and evaluation is lacking*, particularly in areas where such support would require additional expenditures, reduce the time of physicians and nursing personnel in the clinic, or expose experimental programs to criticism. In this sense, supervision and evaluation remain activities which, although considered important in theory, are threatening in practice.

Although the literature on management provides considerable information about the practice of supervision, *the public health literature, particularly that in developing countries, provides few models or guidelines for effective supervision and evaluation*. It is commonly assumed that they are skills that all professionals possess, yet they are rarely considered an integral part of training either in professional schools or on the job.

Another major constraint is that *information collected either through formal health information systems or occasional visits to project sites rarely is utilized systematically* to identify problems and formulate alternative strategies for service delivery. Moreover, the observation of the behavior of indicators across time is rarely considered an essential element of supervision or evaluation, particularly at the regional or local events. The current status of indicators is more frequently compared with local programming or national norms without reference to the trends in

performance.

*The in-service training and motivation of personnel to adopt and promote new health practices is often deficient at all levels* of the public health systems in developing countries. Even when the importance of an issue is recognized, for example, as in the case of ORT or breastfeeding, generally the frequency and content of the communication required between health workers and supervisors are not well defined or clearly understood. This comprehension is more critical in those tasks which require coordination and actions between service levels, such as in the case of referrals or the movement of supplies.

Finally, *the constraint of restricted human and financial resources is increasingly common in most rural health systems in developing countries*. Adequate supervision and evaluation require the time of qualified personnel, transportation to the sites of service delivery, and access to the supplies and materials necessary for effective performance. Programs which cannot make these commitments of resources are unlikely to provide the supervision required to maintain the quality of services.

Despite the somewhat disheartening description I have just presented, there are a number of low-cost, feasible strategies which can be adopted to resolve some of these constraints.

First, I believe that essential political support can be obtained if the direct benefits of the use of ORT can be documented in each country and the flow of information to the political decisions is clear, consistent, and unflinching. The benefits of supervision in the implementation process of ORT programs are not difficult to document, but they must reach those persons who can provide the support required. To reduce the perceived threat, the program evaluation must be cast in the larger perspective of program development and feasible methods provided for improving program performance (e.g., improving procedures for identifying families or children in need of service).

Second, personnel at all levels require simple and concrete tasks to complete during supervisory visits. Training manuals should be prepared in each setting which include the steps necessary for adequate supervision and the action-oriented decisions to be made on the basis of the information available. These supervisory guidelines should be designed on the basis of program priorities, be integrated into the service structure, and include a minimum set of indicators to be used for the supervision and evaluation of comprehensive services at each level. For example, at the primary level, it may contain information on and action alternatives for vaccination, oral rehydration, nutrition (breastfeeding, growth charts, and food supplementation), and family planning. Supervision should be an inte-

gral part of routine service delivery and not a function of vertical program demands.

Third, continuing education on the job should be an essential part of the service plans and budgets of national agencies. Personnel should expect periodic renewal to be a part of their job and perhaps even a requirement for continuing to be qualified for the posts they occupy. Managers of health programs should be expected to use supervision and evaluation information as the basis for the selection of themes and the identification of resource personnel. When the objectives on the training are clear relative to the goals of the organization, its operation is often easier to maintain.

Finally, the status of financing for all health activities must be reviewed, not only that of supervision and evaluation. With the gradual erosion of national budgets, essential services must be redesigned to be financially self-sufficient. Ministries will eventually have to charge for services for which beneficiaries are able and willing to pay to permit flexibility in accounting, to apply savings in one area to services in another, and to depend to a larger extent on the participation of the community in the delivery of services.

## REFERENCES

1. Lechtig, A.; Townsend, J. W.; Pineda, E.; Arroyo, J.J.; Deman de Andrade, H.; Baldizon, S.; Gutierrez, R.; Duarte, R.; de Leon, R. *Bases Técnicas. Sistema Integrado de*

*Nutrición y Atención Primaria de Salud, SINAPS. Vol. 1. Instituto de Nutrición de Centro América y Panamá (INCAP)/Ministerio de Salud Pública y Asistencia Social de Guatemala, 1982.*

2. Aldana, D.; de Leon, R.; Lopez, M. A. "Informe final del programa PRINAPS a USAID, Oficina de Población." Ministerio de Salud Pública y Asistencia Social de Guatemala, Junio 1982.

3. Bermudez, E., Garcia, M. R. "Comparación de la eficacia de Sales de Rehidratación Oral utilizadas por SINAPS versus las Sales recomendadas por la OMS." Guatemala: Trabajo Monográfico, Magister Scientiæ Centro de Estudios Superiores en Nutrición y Ciencias de Alimentos CESNA, Universidad de San Carlos de Guatemala, Facultad de Medicina/INCAP, Noviembre, 1982.

4. Reyna Barrios, J. M. "Rehidratación Oral en el Hospital San Juan de Dios de Huehuetenango, Guatemala." En: *Resúmenes XIV Congreso Nacional de Pediatría*. Ciudad de Guatemala, Guatemala: Asociación Pediátrica de Guatemala, 1981.

5. OMS. "Preparación de indicadores para vigilar los progresos realizados con el logro de la Salud para Todos en el Año 2000." Ginebra: Serie Salud para Todos, No. 4, 1981.

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SESSION SEVEN  
PROGRAM  
ACHIEVEMENTS AND  
DIRECTION

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*Closing Ceremony (L to R): Dr. W. Greenough, Director, International Centre for Diarrhoeal Disease Research, Bangladesh; Dr. L. Chen, Representative, Ford Foundation, India; Mrs. N. McPherson, Member, ICORT Technical Advisory Committee, Agency for International Development, USA; Mr. M. Peter McPherson, Administrator, Agency for International Development, USA; Dr. C. Pease, Chairman of ICORT Technical Advisory Committee, Agency for International Development, USA*

As the ICORT program drew to a close, conferees discussed future directions for oral rehydration therapy. Papers presented in Session Seven examine program achievements, program constraints, and directions for future research. Speakers discuss the close association between health and development, consider issues facing wider ORT implementation, and call for an international commitment to the availability and access of oral rehydration therapy.

Dr. George Curlin outlines the advantages of oral rehydration therapy and cites examples of

how these have been used in different countries. ORT's usefulness at all levels of health care was evident in the success of ORT programs in Haiti, where the use of ORT resulted in a significant reduction in diarrhea mortality in hospitals; in Costa Rica, where costly inpatient hydration wards were closed when ORT was used routinely in outpatient facilities; in India, where ORT use in villages led to a 75% reduction in diarrheal disease mortality rates; and in Egypt, where use of home-based ORS resulted in a considerable drop in dehydration-related mortality.

If ORT programs are to achieve success, several problems must be resolved. Dr. Richard Heriman identifies three problems facing ORT programs, explains the reasons they exist, and offers some possible solutions to them. These problems include the fact that target populations are not always clearly identified, that diarrhea is often not treated properly at home, and that children are not receiving ORS.

Noting that much of the present research on oral rehydration therapy is "of the operational sort," Dr. William Greenough highlights several areas where future research is needed. He calls for an examination of rice-based and cereal-based ORS and the use of other foods readily available in the home, as well as for studies of the digestion and absorption during diarrhea of different cereals and proteins.

Mr. Ernest Stern stresses the need for an integrated approach to health care and delivery. He explains that, in lending monies for health sector work, the World Bank stipulates that the country receiving the funds assess its own health situation, identify needs and costs of interventions, and determine the most cost-effective approaches. The World Bank's loans are given to assist a country to develop its own capabilities, integrate its health interventions, and accelerate its socioeconomic development.

Diarrhea is a major killer. Oral rehydration therapy is an effective, powerful response that can make a difference in the treatment of diarrheal diseases. The composition of oral rehydration solution is now generally accepted by health professionals. These are the points of consensus, according to Dr. Lincoln Chen. Summarizing the conference proceedings, Chen states that the agenda for the future is not so much *what* to implement, but *how* to implement. In this regard, he identifies eight issues that are fundamental to ORS access.

Mr. M. Peter McPherson closes the ICORT program with a call to governments in developing countries "to increase their efforts to save children's lives through the use of ORT." Countries should pledge themselves "to an effort to attain near universal availability of the therapy within ten years." As conferees depart for their home countries, McPherson suggests that a reasonable goal is the worldwide doubling of the use of oral rehydration therapy each year for the next five years.

## PROGRAM ACHIEVEMENTS

DR. GEORGE CURLIN  
*Director, Office of Health  
Agency for International Development  
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It is difficult to enumerate briefly the achievements in oral rehydration programs, but not because of a scarcity of notable advances. The difficulty lies in selecting from among the many achievements made in the relatively short history of this technology.

The early days of the development of ORT produced a remarkable achievement which is often overlooked as we struggle with problems of implementing ORT programs. The translation of elegant gastrointestinal physiology research into a practical, low-cost, and effective therapy for a major group of diseases is, in itself, a remarkable achievement. We often forget the careful and inspired basic research forming the basis of the technology which has proven to be remarkably successful under relatively primitive field conditions. Oral rehydration therapy is the product of sound, painstaking, scientific enquiry, and the remarkable — and, unfortunately, rare — process of moving swiftly from the laboratory bench to the bedside and continuing on into the village home to deal with a common, life-threatening group of diseases is a triumph of science and will.

In cataloguing the achievements of ORT, it is important to keep in mind some unique features of this technology on which its wide application depends. First, it is effective against all of the common infectious dehydrating diarrheas. This feature of the technology is essential for success in programs which deal with diarrheal diseases as a single group of illnesses. It permits programs to do, without cumbersome and expensive routine, laboratory diagnosis and treatments which are specific for each etiology.

A second feature of oral rehydration therapy on which its broad application depends is its usefulness at all levels of health care, and most of the achievements I will mention center around this feature. For example, this week we heard of the experience in Haiti where the introduction of ORT reduced dramatically the diarrhea mortality in hospitals. In Costa Rica, we know that expensive inpatient rehydration wards were closed

when ORT was put into routine use in outpatient rehydration facilities. Thus, the introduction of oral rehydration therapy reduced mortality in a setting in which traditional intravenous therapy had failed to bring diarrheal disease mortality to acceptably low levels, and its introduction resulted in substantial savings in hospital treatment costs where mortality was already controlled with expensive intravenous therapy. We should not overlook the achievements of ORT programs in the hospital setting, and national diarrheal disease control programs must not neglect to promote its use at all levels of the hospital referral system. This is true also in industrialized nations, including the United States, where issues of health care costs dominate serious discussion of health sector planning.

Because only simple technology is required for use, oral rehydration therapy has brought effective mortality reduction within reach of peripheral clinics and dispensaries. Clinics equipped to provide ORT will no longer be simply an entry point into an often tenuous referral system for patients seriously ill with diarrhea. How satisfying it must be for the staff and the patients and their parents alike for definitive treatment of a common, life-threatening disease to be available near their home.

Oral rehydration therapy can be used effectively beyond the confines of the clinic-based health system, and a major achievement has been dissemination of the technology in this setting. Community health workers, both paid and volunteer, are able to deliver services in villages effectively. For example, we heard of the experience in India where health workers were able to effect a 75% reduction in diarrheal disease mortality rates when they used ORT in the village. Oral rehydration therapy frees workers from the clinic and allows them to combine treatment with the other important village-based preventive health services. Providing ORT lends credibility to these workers, and treating a child in the home provides an opportunity to reinforce with parents the important hygiene and nutrition messages which are essential features of successful diarrheal disease control efforts. In both the peripheral units of the health system and the community, ORT has proven to be a boon to acceleration of development of primary health care systems, which will be the approach required for health systems to make substantial contributions in the ambitious goal of health for all in the next seventeen years.

Another feature of oral rehydration therapy is that it can be used in the absence of a health worker, and perhaps the greatest impact this technology will have on diarrheal disease mortality will be achieved by administration of ORT by mothers in the home early in the course of diarrhea. We heard of the remarkable experience

in Egypt, among others, in which homemade ORT solutions dramatically reduced mortality from dehydration. Effective oral rehydration therapy at this grass-roots level can be low-cost, pre-packaged mixtures or homemade mixtures of ingredients found in the family kitchen. I do not wish to debate which of these approaches is best, for we know there are advantages and disadvantages of each. The fact is that either is effective. Parents themselves can intervene with potentially life-saving treatment, and this is a remarkable achievement. Some claim that programs which promote household use of ORT place families beyond the reach of the health system, but, in fact, successful home-based programs actually involve parents as active partners in that system. Parents can and should be the ultimate extension workers of an effective primary health care system.

Other achievements bear directly on programs which rely on the decisions of consumers to use ORT, for if individuals are to decide to use ORT, it stands to reason that information about the technology must be targeted directly to them. The successful experience with mass communication to educate the population about diarrheal diseases and ORT, and the successful approaches to advertising commercially available ORT packets and instructing parents to use ORT properly, suggest we can expect to extend the notable advances along these lines in the future. We have only begun to see the impact which can be expected from the application of the powerful mass communication tools combined with the ubiquitous availability of oral rehydration mixtures, either as packets of oral rehydration solution through commercial channels or as home kitchen ingredients.

An early achievement, which was registered over a decade ago, was the demonstration that oral rehydration therapy can control diarrheal disease mortality — even in a cholera epidemic — under the extremely primitive conditions which exist among refugees of man-made disasters. All of us hope this technology will not have to be applied under these circumstances, but, unfortunately, it appears likely that one of our finest technical advances will continue to find application in these truly regrettable situations. Oral rehydration therapy is a proven intervention which should be included in each program designed to meet disaster relief and refugee situations.

Most of the achievements have been made in application of ORT in diarrheal disease control programs. However, there are achievements which are of interest primarily to medical scientists. For instance, it is no small feat that we have been able to agree on a single formula for ORT which balances concerns of safety and efficacy, and there are other examples.

Finally, a major achievement, which seldom attracts a great deal of attention when discussions center on technical aspects of ORT, has been the development of carefully planned national diarrheal disease control efforts in many countries. Most countries have launched their programs, and many of the papers presented in this conference have reported the early results of these efforts. The achievements of physicians, public health officials, and community leaders in securing the commitment of political leaders to launch ambitious national programs is, in itself, the most essential ingredient for programs which will have sustained success in the control of diarrheal diseases.

I have touched on only a few of the many achievements of oral rehydration therapy. None of the examples represents the best that could have been expected, for in each case further improvement in performance is possible. Many problems remain, but it is important to count the several significant advances which have already been made. These achievements suggest we know enough to move forward on many fronts, secure in the knowledge that we are on the right track. Our cumulative experience with ORT indicates that anything less than our most vigorous effort will fall far short of what we can do for the millions of children who will die of diarrhea while we have in our hands the means to prevent the tragedy.

## ORT: PROGRAM CONSTRAINTS

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Oral rehydration therapy is a health intervention of known effectiveness in the treatment of dehydration caused by diarrhea. In children under five years old, in older children, and in adults this treatment can be lifesaving, and it is safer and cheaper than intravenous rehydration.

ORT has been known and advocated for more than ten years. The fundamental research showing the role of glucose in permitting the absorption of electrolytes was done in the 1960s. The seventies gave us the results of extensive field testing of ORT that showed that ORT was dramatically effective in reducing mortality from cholera and that it was equally effective in correcting dehydration in children with noncholera diarrhea.

It became clear that we now had a health intervention that could have a dramatic impact, namely, to prevent children from dying of diarrhea. What has happened since this most important discovery? One could expect that such an

apparently simple answer to a major health problem would be hailed with the same enthusiasm as the discovery of penicillin. But today, nearly two decades after the pioneering work was done, it may be that less than 10% of the children in the developing world are receiving ORT when they need it.

This paper examines some of the present problems that have to be overcome before ORT can be made available on a worldwide scale. I prefer to use the word "problems" rather than "constraints." Without going into semantics, it would seem that problems have solutions whereas constraints one has to live with. It is our hope that we can solve the problems facing ORT programs.

The World Health Organization's Program for Diarrhoeal Disease Control started in 1978. ORT was, and is, the major strategy for reducing diarrhea mortality in children under five years who represent the program's main target group.

It is interesting that the Alma Ata declaration of primary health care was also in 1978, and the WHO resolution on "health for all by the year 2000" was in 1977. All these events are related. Health for all can only be reached by implementing primary health care. As mentioned later, only by implementing primary health care can the necessary coverage of the population by health care be provided. Without this *coverage*, children cannot receive ORT.

That, in broad terms, is the *key problem* for which there are many causes. Of course, this fundamental problem of providing health care to the population affects not only ORT, but all the elements of PHC. More specifically related to ORT is the fact that it is *something new* — at least, for many health workers it is new. As with all new health technologies, however simple they may appear to be, their introduction into existing health care systems is hampered by problems that only begin to appear once one starts to work in real situations.

So let us start then with the global problem: that children under five years with diarrhea are not receiving ORT. In the following paragraphs, this global problem will be broken down into more specific problems and their causes. By doing this, we may then arrive at some practical suggestions for the future.

The problem of reaching the target population with ORT will be considered as being made up of the following components, and each of these will be discussed:

—the target population is not clearly identified.

—diarrhea is not being treated properly at home.

—children who need them are not getting oral rehydration salts.

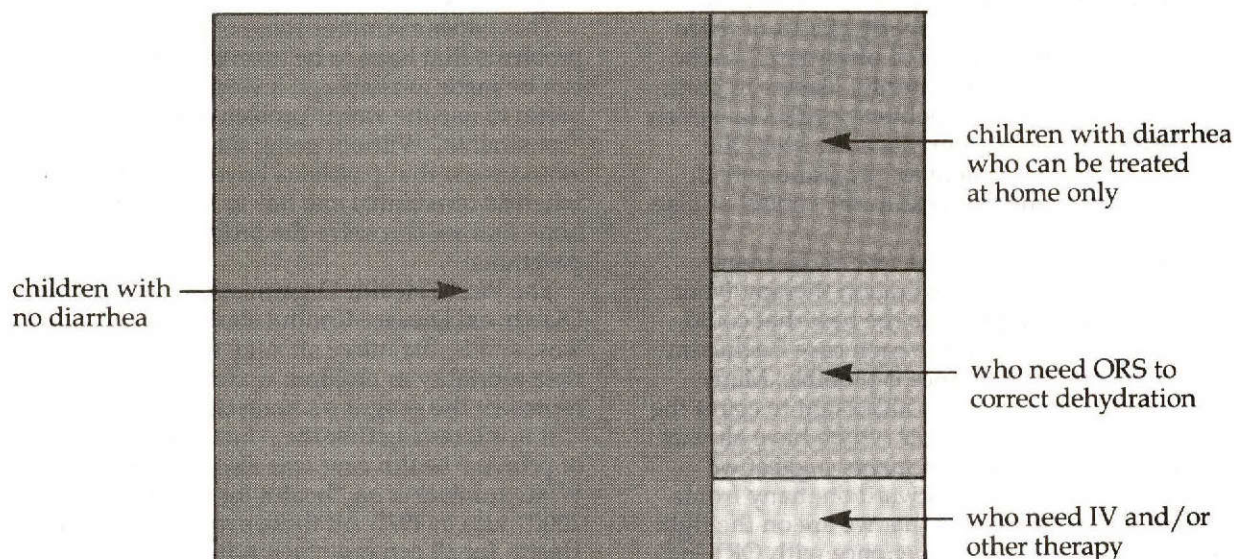
See Table 1 at the end of this paper.



### The target population is not clearly identified

Having already indicated that the target population for ORT should be children under five years with diarrhea, it may seem paradoxical that identification of this group should be a program problem. Nevertheless, lack of information on

this group of children is a major difficulty for countries trying to introduce ORT as part of their diarrheal disease control programs. Let us consider the following figure. The large square represents all children under five years at a certain time:



In order to identify clearly which children need ORT, we need to know the size of all the rectangles. At present, we do not have all of this information. That is, we do not have information on the number of episodes of diarrhea in children under five in many countries, nor do we know what proportion of episodes recover successfully with home care, what proportion of episodes become dehydrated and require oral rehydration salts, and what proportion of episodes become severely dehydrated and require intravenous therapy at an appropriate health facility.

For many developing countries, the population of children under five years is known and can be estimated. The number of episodes of diarrhea in children can be estimated using a simple survey technique.<sup>1</sup> It is, of course, not possible to use existing reporting systems to estimate incidence, as the majority of cases are not reported. The most important information concerning episodes of diarrhea needing ORT is not available, except in certain study areas or research projects.

Both on a global level and for individual countries, certain estimations have been made concerning diarrhea mortality and morbidity. For the purposes of starting ORT as part of CDD programs, global or national estimates can be used for planning. Certainly ORT should not wait for lengthy studies to be completed. But clearly, at some stage, accurate information on what one might call the applied epidemiology of diarrhea will be needed. From a health manager's point of view, this type of research must have a high priority if correct planning decisions are going to be

made. The operational implications of being able to increase the number of episodes treated at home with "home remedies," and thus reduce the requirements for ORS, are of the greatest importance.

The following example demonstrates the importance of such information to a control program:

A country has a population of one million children under five years who can be covered by health care. Each child has two episodes of diarrhea per year. If all cases require ORS and two packets are needed for each case, then four million packets of ORS will be required. This will cost U.S. \$32,000 (at \$0.08 per packet). If it is known that 25% of cases will get better with care at home and that promotional efforts for home treatment can increase this to 50% of cases, then only two million packets of ORS will be required, at half the cost to the government, assuming that home care costs the government nothing. This does not take into account the cost of promotional activities, but against this could be considered the savings in staff time and reduction in numbers of cases requiring IV therapy.

Studies to define the target population for ORT are clearly very important for countries embarking on ORT. But doing studies should not be the excuse for delaying action. We hope that, perhaps with a few such studies, much of this information can be made available to countries. It is, of course, not necessary to delay the start of ORT activities while waiting for this information. At

the beginning, one should jump over the problem, but certainly not ignore it.

### **Children with diarrhea are not being treated properly at home**

In the previous paragraph the importance of home treatment of diarrhea was mentioned. There are two very important aspects of proper home care of diarrhea. The first is that a proportion of diarrhea episodes are sufficiently mild to need no special care. Much more important is that by increasing the giving of suitable fluids and proper feeding, dehydration can be prevented, thus removing the need for ORS. It is this aspect that may profoundly affect the implementation of ORT programs in the future.

It is a strange fact that, in many societies, child care practices have evolved that are detrimental to health and contribute to child mortality. In the case of diarrhea, in many societies the traditional care given is to stop feeding, including breastfeeding, and in many cases to withhold or reduce fluids. These practices may include also the giving of traditional remedies for diarrhea. Some of these remedies may in fact be useful. So, in many societies, care of children with diarrhea is inappropriate, or at best a mixture of good and bad. Stopping breastfeeding is bad; giving soups or tea is good.

If ORT is to succeed, proper home care of diarrhea must be an essential part of the program. The WHO/UNICEF Joint Statement on ORT clearly states this fact. Studies to define existing traditional practices for treating diarrhea at home should be conducted, and it is especially important to identify the most feasible home fluid that can be used, be it soup, tea, or homemade sugar-salt solution. We need to be careful here not to make the solutions complicated or difficult to prepare. Household solutions may be better than salt-sugar solutions in this respect.

A rather sad comment on traditional practices in the care of diarrhea at home is the fact that many health workers are unwitting accomplices in promoting improper care. Parents are advised to stop breastfeeding, to withhold food, to rest the bowel, and so on. Thus, traditional malpractices are being reinforced. In addition, health workers may prescribe inappropriate medication and give mothers the feeling that drugs are essential. One of the reasons why children with diarrhea are not properly cared for at home is perhaps the fact of the very commonness, the banality, of diarrhea in childhood. The danger of dehydration is not known in most societies. It is indeed tragic to see mothers withholding fluids from children with diarrhea who are literally dying of thirst.

To obtain proper home care of diarrhea, a major investment in communication and health education will be needed. Health workers must be

trained and given health education materials. Most important, health workers must be properly supervised. The public needs to be informed about diarrhea. For most developing countries, information on diarrhea and ORT is just not available. Health workers do not inform; the media do not inform; and community leaders do not know about diarrhea. Already, there is some evidence that major efforts in promotion and communication through the mass media and other methods can have a major impact on care of diarrhea in the home. Ideally, such promotion and communication would be part of the two-way exchange of information between the health services and the community that is a feature of primary health care; but I feel that those of us responsible for ORT should not wait, but use ORT and CDD programs to start communicating.

### **Children are not getting oral rehydration salts**

The use of ORS packets is also an essential part of ORT — so that dehydration can be treated. Despite all the efforts that are being made, particularly by WHO and UNICEF, children who need them are not getting ORS. So why are the ORS packets not getting to the children? There are four main reasons:

- diarrheal disease is not given high priority.
- coverage by health care is not adequate.
- ORS is not available.
- health workers do not give ORS.

*Diarrheal disease is not given high priority.* Although recent promotional efforts by the WHO/CDD Program and other agencies on the seriousness of the diarrhea problem have been quite successful, many health managers do not give it a high priority. This is usually because the extent of the problem is not known. As mentioned earlier, the target population needs further study.

However, it is usually not difficult to get information on the seriousness of the problem in a country. Once one can point out to the senior health officials that diarrhea is a major cause of child illness and death and that these deaths could be avoided by using ORT, then the necessary priority is easily given.

To convince health managers of the importance of diarrhea, a simple exercise should be carried out to determine national priorities on mortality and morbidity; we advocate this as a first step in developing CDD programs. It also is important to convince others, such as health workers and the public, that diarrhea is a major problem.

*Coverage by health care is not adequate.* This is perhaps not the appropriate occasion to explore this problem in depth. All health programs face this problem. As advocated by WHO, primary health care is perhaps the most logical and feasi-

ble way of increasing coverage. The implementation of ORT may be said to be inextricably linked to efforts to increase coverage through implementation of PHC. However, we do not need to wait for health services and communities to organize themselves for PHC. Rather, those responsible for CDD and ORT can link up with PHC implementation. We should identify possible deliverers of ORT, even where health services do not reach. Where there are community health workers, this is a logical first line for delivery of ORT and ORS. But there may be alternatives that can be used: traditional healers, traditional birth attendants, religious leaders, teachers, and so on. The commercial sector is also potentially of great importance in many countries. Provided that adequate measures to ensure proper use are taken, the production and distribution of ORS by the commercial sector can greatly increase ORS availability.

So, in order to improve ORT coverage of children, all means of providing ORS must be used. If home treatment of diarrhea is correctly promoted, then families will know when ORS should be used as part of ORT. It is interesting that once knowledge and acceptance of ORS is widespread in the community at large, the need will be filled somehow — either through the health services or through the commercial sector, or both. Once the demand has been created, it is an important responsibility for CDD program managers to ensure that the deliverer and user of ORS are trained in its proper use.

*ORS is not available.* Even where coverage by the health system exists, ORS may not be used because it is not available. Provision and distribution of ORS to existing health services should surely be a priority for all health ministries. But, here again, careful planning is required, and efforts should be made to ensure that there will be a continuous supply of ORS to health workers. Given the logistic problems in providing essential drugs, ORS distribution may not be an easy task. I think here that a special note of caution is required for suppliers of ORS. It is not useful to supply a country with x million packets of ORS that are delivered to the Ministry of Health, and then to hope that this will mean ORS will be given to children with diarrhea. Where there is no CDD program to ensure acceptance of ORT by the public, to ensure that health workers know how to use ORS, and that ORS is properly distributed, the packets will be wasted.

The widespread distribution of antidiarrhea drugs by the pharmaceutical industry is another major fact working against ORS. In Indonesia, for example, there are ninety-four separate antidiarrhea preparations on the market, nearly half of these available without prescription. By contrast, there are fourteen producers of ORS. If the in-

dustry could take an initiative in reducing production of such drugs and in increasing ORS production, this would give ORT a great boost.

The technology of ORS production is now being standardized and simplified. There will soon be an appropriate production method for all countries who wish to produce their own ORS. In many developing countries, there is a flourishing pharmaceutical industry with an extensive network of pharmacies and other commercial outlets. Use can be made of this system to produce ORS both for the government health services and for the commercial sector. Many ministries of health and international agencies are not aware that often the most efficient and effective way of obtaining ORS is to contract with the local pharmaceutical industry.

*Health workers do not give ORS.* There may be a number of reasons why health workers are unable to give ORS. They may not know about ORT; they may prefer inappropriate methods of treatment; or they simply may not have time to give ORT. Training can teach health workers how to use ORT. But equally important is adequate supervision and support to ensure that health workers have the time and facilities to give ORT.

All these problems are familiar to those of us who work in health services. The WHO/CDD Program itself has devoted considerable efforts to developing training courses and other methods for the introduction of ORT in health services. We have management training courses, technical training courses, and, more recently, a first-line supervisors' course, so that CDD activities including ORT can be introduced at field level. These courses include methods for ORS logistics. In addition, we have a relatively simple morbidity/mortality survey technique and a method for evaluating CDD programs. By mentioning these, I am not just making propaganda for the WHO/CDD Program, but indicating that we feel that countries can make an excellent start for ORT by introducing it into their existing health services. Let us start to make sure that diarrhea is properly treated in health centers and hospitals. Let us change bad therapy to good therapy in these facilities. If every country in the world can do this, there will already be a major contribution to diarrhea mortality reduction.

### Summary

In a very brief way, I have tried to analyze why, at the present time, children with diarrhea are not receiving ORT.

I have suggested that the treatment or care of diarrhea has to start in the home with correct feeding practice and use of home fluids. This has to be supported by the use of ORS to treat dehydration and, of course, referral for IV and other treatment when necessary. The reasons why these things are not being done have been

described, and ways to solve the problems have been suggested. To emphasize the possible solutions, I would like to repeat again that:

— we need to inform and involve families so that they know how to care for diarrhea at home, and this treatment should be simple and appropriate;

— we can start immediately to make sure that ORT is given in existing health facilities, to make sure that diarrhea is properly treated by health services;

And at the same time as we are implementing the above, we need to get more and better information on the target group, that is, children with diarrhea, so that we can more accurately define the size of the population requiring different forms of therapy.

Only if we do this can we reach the WHO Program goal of decreasing diarrheal deaths by some 1.5 million per year by 1990 and double that by the year 2000.

**Table 1**

**CHART SHOWING CAUSES AND POSSIBLE SOLUTIONS TO THE PROBLEM OF PROVIDING ORT TO CHILDREN WITH DIARRHEA**

<i>Main problem</i>	<i>Major causes</i>	<i>Contributing causes</i>	<i>Possible solutions</i>
Children < 5 years with diarrhea are not receiving ORT	Diarrhea is not treated properly at home	Traditional practices are harmful	Study traditional practices in home care of diarrhoea Identify suitable home remedies Promote correct and appropriate home treatment
		Health workers give inappropriate advice	Inform/train health workers
		Information is not available	Develop communication methods
		Diarrheal disease is not given high priority	Improve coverage by implementing PHC and using other delivery systems
		Coverage by health services is not adequate	Identify national priorities for health problems Provide ORS and establish logistic system
		ORS is not available in health services	Train health workers. Ensure proper supervision of health workers
	ORS is not being given	Health workers do not give ORT	

**DIRECTIONS OF FUTURE RESEARCH ON ORT**

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International Center for Diarrhoeal  
Disease Research, Bangladesh  
Dhaka, Bangladesh*

There are many important areas for research at all levels and by all disciplines in diarrheal illness. It will not be possible to be comprehensive in the time I have available. I shall therefore

focus on where I believe research will yield the largest gains in the near future. Since we are principally here to consider oral rehydration therapy, I shall try to tell you where the largest gains may be.

During the past several days, we have heard the story of oral rehydration therapy — what it is, what it can accomplish, and how it came into being. Now I would like to look forward to what we can expect from further research and where those efforts must be directed to realize the fullest potential of this exceptionally simple and powerful form of treatment to prevent death or

severe disability, which has placed within homes what used to require hospitals, doctors, and nurses.

The story of ORT really begins with folk practices in many countries which have as yet received little attention. Various soups containing cereals or starch from root vegetables, with or without added protein, and with unknown amounts of salt — probably to taste — have been used for centuries to treat people with diarrhea. As with many of the most useful advances in modern medicine, preceding knowledge and sound empirical practices have held secrets only unlocked by careful scientific research. The research prelude to ORT occurred in the Biochemistry Laboratory of Oxford University in 1949, when R. B. Fisher and D. S. Parson observed that glucose enhanced the absorption of fluids from the small intestine. This effect was explained and the concept of carrier-mediated transport in the intestine established by Dr. Peter Curran at the Biophysical Laboratories of Harvard University in 1960. Soon after, it was further defined by Schultz and Zalusky at the U.S. Air Force School of Aerospace Medicine. In cholera patients in Dhaka and Calcutta, these findings from the laboratory were translated into effective oral rehydration solutions. In 1968, the mechanism of diarrhea in cholera was discovered by Dr. Michael Field at Harvard University with colleagues at Johns Hopkins University. The cholera toxin was shown not to interfere with carrier-mediated transport, and, thus, the scientific basis for ORT was completed.

One might ask, with such a simple, inexpensive, and elegant therapy, what need is there for improving it? The answer lies in a 1977 editorial by Michael Field in *The New England Journal of Medicine*. Field's editorial foreshadowed an important improvement. Introducing his essay with a verse from a children's book by Maurice Sendak, Field pointed out that using natural foods which contain polymers of glucose (starches) and amino acids (proteins) could be optimal for ORS. The reasons are quite simple. Small molecules, such as glucose and amino acids, have a high osmotic activity when dissolved in water. When in concentration greater than that of the blood and body fluids, they draw fluid from the body into the lumen of the gut, thus further dehydrating an already depleted patient. This is opposite from the desired effect for treating fluid loss. Large molecules do not have strong osmotic effects and can be taken at a high concentration without the undesired effect of further depleting the body fluids.

Fortunately, in most patients with diarrhea, the digestive enzymes required to break down starch from cereals into glucose are present in excess. Thus, the normal digestive system of the body can accomplish, even in acute diarrhea,

what has to be done to carry salt and water into the blood. Proteins can also be split into their constituent amino acids by digestive enzymes. Amino acids also serve as carriers to assist rehydration. The body, then, in theory, could use natural foods to achieve two important goals, (1) to replace fluid losses in acute diarrhea, and (2) to enhance nutrition even while diarrhea is occurring.

Thus, the body, even in diarrhea, can accomplish what requires a commercial process if glucose is prepared as a purified component for oral rehydration solution, as is now done. The commercial process increases costs, reduces the potential nutritional content of ORS, and introduces the risk of excess osmoles which can increase dehydration.

In 1981, in Bangladesh, we knew of the folk practice of using rice soups for children with upset stomachs and diarrhea. This was put together with Dr. Field's suggestion, after it was found in studies in Dhaka by the Mollas that both the digestion and absorption of starch from rice was little affected by acute diarrhea. Cholera patients were treated using cooked powdered rice mixed with salts of the WHO/UNICEF formulation, but omitting glucose. When compared to glucose ORS, the rice ORT was better accepted. Even more important was the fact that there was less fluid lost and a shorter duration of diarrhea. In studies of babies in Calcutta, this approach was further optimized, producing even better results; and the term "super ORS" was coined by Dr. Mahalanabis.

Field trials of rice-based ORS in progress today in Bangladesh demonstrate an excellent acceptance by the rural people. We anticipate that, by 1984, cereal-based ORS will be validated as a practical modality in at least one country. The challenge then will be to accomplish the following goals:

- test rice ORS in other countries;
- determine whether potato, wheat, maize, millet, and other sources of starch can also be used with good results;
- devise training methods and materials that are country-adapted to achieve home use of cereal ORS;
- consider the concept that only the salts be packaged or tabletted to be used in cereal soups for diarrheal ORS.

Given the early results, it is urgent to plan practical testing and evaluation as soon as possible. Research must be directed at how to motivate people to prepare ORS at home and carry out ORT early in diarrhea. With the advent of cereal-based ORS, the required ingredients for effective home treatment are available in every household in the world, except in areas where there is famine and a severe lack of food grain. If the complete salt formulation is not available, the

use of table salt is nearly as effective, and other losses can be made up from fruits and vegetables rich in potassium. The kidneys of a well-hydrated person can correct other imbalances, as long as sufficient replacement of body fluids is achieved.

Thus, research must now be more directed toward how to achieve use at home with available foods. Attention should equally be given to optimal adaptation of the complete ORS to the new circumstances. With the possibility of smaller packets with stable salts and no glucose, many problems are solved, such as reduced cost of shipment from a distance due to added weight of glucose, shortened shelf life due to reaction between glucose and the salts, and the use of unclean water for mixing ORS, since the preparation for all cereal-based solutions requires boiling water.

Concurrent and vital to effective application of cereal ORT is basic research on the digestion and absorption of different cereals and proteins during diarrhea of different causes. There is presently very limited knowledge in this area. The translation of the cereal ORS into feeding after recovery from diarrhea requires much work and thought. One of the most important added benefits of this approach will be improved nutrition for children of developing countries who face frequent attacks of diarrhea. Already, in a completed field trial of home-based ORS using crude cane sugar instead of glucose, improved nutrition has been shown. Larger gains are expected with the cereal-based ORS.

The discovery and implementation of cereal ORS will achieve a common approach to the problems facing children in developing countries. Dr. Jon Rohde defined the problems during acute diarrhea as fluid electrolyte malnutrition (FEM) and those following, protein energy malnutrition (PEM). The new cereal ORS now provides a continuous and combined approach to both these consequences of diarrhea.

Finally, the addition of protein sources to cereals in ORT and for nutrition can also be expected to enhance the effectiveness of the treatment of acute diarrhea and nutritional improvement afterwards. Attention should be directed at this as a final step toward the most effective approach during and after diarrhea.

I have not discussed the issues of the salt concentration or composition. There is a growing consensus that, with sustained good hydration, a wide range of composition may be quite acceptable. The overall focus of any research should keep in mind the practical situation of the home in rural developing countries, rather than the depleted dehydrated child seen at hospitals when good early home care has not been given. It must also be remembered that chemicals needed for replacement are present in foods and do not

always need to be provided in a pharmaceutical manner traditional for doctors and hospitals.

Since food-based ORS depends on normal digestive processes, a great deal of research is needed to better define digestion during and after diarrhea. These studies must especially focus on the very young who are at greatest risk.

In very severe diarrhea, drugs which can diminish fluid loss will be valuable. They must be free of complications and inexpensive, since, particularly in cholera, the rate of fluid loss can still exceed the ability of a person to drink sufficient fluid to compensate.

Much of the research required now is of the operational sort. There will be an urgent need to study the best way to distribute current packaged ORS or smaller tablets or sachets of complete salts without glucose. All channels should be explored — governmental, private, formal, and informal.

Studies on field effectiveness and costs using various approaches are required when different approaches are used to train those at risk. The division of responsibility between health providers and home care needs attention, and where doctors and health workers are few, maximum self-care at home should be the goal.

Many answers require accurate information on morbidity and mortality due to diarrhea. Such data is presently almost nonexistent in health systems of developing countries.

Finally, careful attention by social scientists to acceptable practices in those afflicted will speed application and avoid pitfalls. Thus, the biological and medical sciences must cooperate with those expert in operational research and social science to achieve optimal progress.

## HEALTH AND DEVELOPMENT

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I am grateful for the opportunity to address this international conference on oral rehydration therapy — a subject vital to health in developing countries. Diarrheal diseases continue to be a major public health problem and a leading cause of illness and death in children under five throughout the developing world. This conference has highlighted the potential that oral rehydration offers for controlling these diseases. It is essential that this technology now be incorporated as rapidly as possible into effective, broad-based health delivery systems.

The last two decades have witnessed significant improvements in infant health in the low-income countries.<sup>1</sup> An average of 91% of infants

survived the first year of life as compared to only 84% in 1960. Reductions in infant mortality have been the major contributing factor to the increased life expectancy in these countries over the same period and the willingness of an increasing proportion of families to reduce overall family size.

Nevertheless, for the low-income countries<sup>2</sup>, excluding China and India, infant mortality rates remain more than ten to fifteen times higher than in the industrial market economies. The death rate in children one to four years of age in these same countries is more than twenty to thirty times that in industrial market economies. And the average life expectancy at birth is twenty-six years less. These huge disparities are all the more unacceptable because the majority of the direct causes of these infant and child deaths — neonatal tetanus, diarrhea and dehydration, childhood infectious diseases, malaria, and respiratory infections — can be effectively and relatively inexpensively controlled by existing measures.

Oral rehydration therapy is a prime example. It adds a major weapon to the low-cost health system armory to combat ill health, particularly for the large portion of the world's children under five years of age who may have three or more potentially life-threatening diarrheal episodes each year.

ORT represents the essence of appropriate technology. It *promotes increased self-reliance* by providing families with a sense of control over their environment and strengthening their ability to protect their children's health. It is *adaptable*, since it can be used in the formal health sector as well as at home, and it can be produced in a variety of settings as dictated by local circumstances, ranging from pharmaceutical industries to villagers. It can substantially *reduce overall health care costs* most profoundly when used as part of an early diagnosis and treatment regime which can be expected to reduce the proportion of severe cases significantly. Even in that small proportion of severe cases where intravenous fluids are initially indicated, ORT can quickly replace this much more costly and complex therapy. It is *widely applicable* to countries at all levels of development.

### **The need for an integrated approach**

The development of an appropriate technology is the first vital step in improving the quality and scope of health care. The development and refinement of this technology stands as testimony to the commitment, creativity, and perseverance of a large international body of scientists and health professionals, many of whom are assembled here. We must now focus on how this technology can be disseminated effectively and adopted within national health care delivery systems.

The complex interrelationships between diseases and the multiple causes underlying excessive infant and child mortality in the developing world demand an integrated response. Redressing just one direct, albeit key, cause of death is insufficient to achieve desired reductions in mortality if the contributory causes remain. The child saved from death by dehydration remains at high risk of illness and death from numerous other causes, among the most important of which is malnutrition.<sup>3</sup> We need, therefore, to establish health delivery systems which can deal with an array of interrelated problems and can accommodate change over time as the dominant pattern of illness in the population shifts and new technologies emerge. And, of course, they must be cost-effective and affordable.

### **Appropriate delivery systems**

The accumulating evidence that relatively simple existing technologies can significantly improve infant and child health status challenges us all to get on with the perhaps even greater task ahead — that of designing, implementing, and managing appropriate systems which ensure that these technologies are delivered when and where needed. The existence of a technological advance does not necessarily imply its availability. In fact, the vast majority of the population of the low-income countries remains relatively untouched by these promising technologies. Among the poorest population groups, key modern health services too often remain inaccessible geographically, economically, and socioculturally.

The need to develop appropriate delivery systems has been widely recognized within the international health community. Systems development constitutes the core of many of the diverse disease control programs which have been launched throughout the developing world with impetus from and under the leadership of the World Health Organization. The program for control of diarrheal diseases, as has been noted at this conference, has devoted substantial human and financial resources to both operations research in pursuit of cost-effective interventions as well as to strengthening program planning, manpower training, and ORT production and logistic capability.

The still largely underdeveloped state of national health systems in the poorer countries, however, continues to be a major obstacle to the efficient operation of existing programs and the effective use of new technologies.

The tendency in developing countries to imitate the high cost, curative care bias of the Western industrial nations diverts resources from more urgent and appropriate health care needs. The lion's share of health sector expenditures in the Third World is targeted on the service needs of the few to the relative neglect of the many. For example, Bank-supported studies indicate that:

in Malawi, the two largest urban areas, with 20% of the total population, in 1981 received over 60% of the recurrent government budget for health services; in Senegal, the hospital budget represented 51% of total recurrent public health expenditures in 1981/82 as contrasted to 29% of outlays on all regionalized services; in the Philippines, the 53% of the Ministry of Health's current budget spent on hospitals in 1982 contrasts sharply with the 29% expended on field health services; and Botswana's hospitals accounted for 42% of recurrent health outlays by central and local government in 1978, or nearly double that allocated to lower levels of care.

Substantial capital investments — sometimes by well meaning donors — in equipment and facilities, particularly hospitals, have in many cases locked countries into unsustainable recurrent cost requirements. Capital replacement can be a very costly substitute for adequate maintenance and repair of such investments. Given the general lack of resources for health, increasingly rigorous efforts to obtain cost-effective solutions reflecting the trade-offs between capital and recurrent costs and addressing the needs of the mass of the population are required if a major impact on the world's health problems is to be effected.

The initiation and viability of primary care-oriented systems will, therefore, be dependent to a large extent on the redirection of existing sectoral policies and programs. This redirection must be not only by the concerned governments, but also by the multitude of bilateral, multilateral, and domestic and external nongovernmental organizations whose activities influence the long-term pattern of health development.

### **The World Bank's strategy**

Although the World Bank has long supported activities which contribute to improved health, mainly but not entirely through population projects, it was not until 1979 that it was decided to lend explicitly for health. Health sector work, in which we have improved our understanding of health needs in a number of developing countries, has laid the foundation for a lending program of about \$250 million annually over the next few years. I would like to emphasize that while we, of course, strive to bring about improvements in health for their own sake, an equally important reason for the Bank's increasing involvement in the health sector is that, through common delivery systems as well as the physical and behavioral interrelationships involved, investments in health yield huge developmental benefits through its impact on fertility reduction. This alone would justify our concern with health and, therefore, with ORT.

The projects we are supporting form part of a general Bank strategy which is characterized by

a three-pronged approach:

1. The first prong is *institution-building*. In developing our lending program, the main focus of our efforts has been on building and strengthening country capabilities at all levels of the health system in five areas fundamental to the successful application of any technology: organizational and financial management and planning, analysis of perceived needs and consumer education, mobilization of resources, manpower development, and monitoring and evaluation — key elements of all first generation, Bank-supported health projects.

2. The second prong is *packaging of interventions*. Bank projections are that the low-income countries will have available little more than \$4 to \$5 per capita to spend annually in the public sector on health through the balance of this century. The scarcity of resources makes explicit choice among competing health care needs all the more imperative, though difficult. Within the Bank's health sector work and lending activities, we have emphasized a quantitative epidemiologic approach to health decision making. This requires, for a particular country, an assessment of the prevailing health status (the incidence or prevalence as well as the severity of various diseases), the underlying causes of those diseases, and identification of specific targets for reduction of morbidity and mortality. The least cost package of interventions necessary to achieve the desired improvement in health status should then be selected. In this process, family planning interventions tend to play a dominant role.

Building health programs on a solid quantitative and analytical base is both information and time-intensive. Our firm belief, however, is that such analysis is the basis of sound health programming, and it is within this general framework that Bank economic and technical support has been provided to thirty-three governments in the conduct of population, health, and/or nutrition sector analyses since our health program commenced in late 1979.

It has become increasingly clear that we must tailor our project approach to each country's specific needs. Selection of the health interventions to be supported and how they should be packaged and delivered will be country- or even area-specific. Nevertheless, a common set of requirements consistently emerges for low-income countries — control of diarrheal, respiratory, and other childhood infections; stimulation of appropriate infant and child feeding practices; growth and development monitoring; and control of factors adversely affecting the health of women during their reproductive years. Behavioral changes in relation to health, nutrition, and family planning will be the key to achieving desired improvements in health status.

Within this framework, given the strong link-



ages between high fertility and high maternal and infant mortality, child spacing commands priority. Frequent, successive pregnancies exact a high maternal health toll. Maternal mortality rates are estimated to be up one hundred to two hundred times higher in the low-income countries than in the industrialized world,<sup>4</sup> and total fertility rates are commonly three times greater than in industrial countries. The mother is central to implementation of all key interventions within primary care programs — both as provider, as in the case of ORT, and as key decision maker in most countries as to when and where to seek child health care. Protection of her health is essential, therefore, not only to her own welfare, but to that of the entire family.

Birth spacing also can be expected directly to enhance child welfare, as World Fertility Survey data show.<sup>5</sup> Nearly one-half of the children born in low-income, high fertility, high mortality countries each year represent births of less than two years' interval with the preceding sibling. Yet, among the poorest countries the relative risk of these children dying before reaching the age of five are two and one-half times greater than for a child born at least four years after the previous birth. Even in those developing countries with more moderate infant and child mortality rates, the risk of death is still 30% to 50% greater for infants of short birth intervals as compared to those widely spaced. Analyses have demonstrated causal relationships between birth interval and child survival. This direct impact of high fertility, dramatic though it is, is but one element of a more general problem, namely, the threat to economic development and well-being implied by unrestricted population growth. Thus, interventions promoting birth spacing are of paramount importance, not only as an element in the web of factors affecting maternal and child health, but also because of their contribution to controlling such growth.

3. This brings me to the third prong of the strategy — *accelerating socioeconomic development*. The successful delivery of key technologies such as ORT must not be perceived as the end of the road. ORT is still curative care. Thus, while it may prove to be a cost-effective, short-term response, over the longer term disease *prevention*, focusing on the key underlying causes of illness and deaths, should command higher priority.

Unravelling the seamless web of poverty and associated ill health will require a long-term commitment by governments as well as by the diverse public and private organizations involved in development, many of which are represented here. Health development demands more than the application of technology. Its direction and pace will be integrally linked to the national planning process and the political, social, and economic policy choices each country makes.

Population is the denominator in the most widely used indicators of economic development. The prospect of diminishing returns to labor and continued high unemployment rates suggests that lowering population growth rates is an essential prerequisite to progress.

Health development will necessitate significant policy and institutional reforms and substantial investments in key sectors widely recognized as important to achieving desired health status improvements and fertility decline, notably, agriculture and food, water supply and environmental sanitation, education, particularly female education, and housing. Such investments may be included as components of rural and urban development programs. To maximize the potential benefits of investments in these areas, the Bank has frequently included components which specifically address health objectives, such as population, health, and nutrition education. More generally, assistance in projects and policies designed to stimulate economic growth and employment generation will continue to be an essential element of the World Bank's contribution to the alleviation of population and health problems.

The general Bank strategy, described above in terms of the three-pronged approach, is illustrated in virtually all Bank-supported health projects. Following extensive sector work, they all aim at facilitating institutional changes which emphasize the orientation of health care delivery systems to meet the needs of the most disadvantaged groups, whose health problems are typically most acute.

The packaging of interventions, based upon a system-wide review of demographic and epidemiological priorities and identification of cost-effective solutions, is illustrated in a project in Mali, where a large-scale, population-based epidemiologic survey, combined with evidence about household expenditures on health, helped to identify priorities and assess the financial feasibility on the selected interventions. Similarly, in Peru, considerable care has been taken to identify those communities where the epidemiological needs are greatest and to give them priority in the project design. This choice parallels decisions made in other sectors to emphasize these same population groups in the provision, for example, of water supplies, education, and income-generating activities. The search for the least cost means of providing health care and the choice of appropriate financing mechanisms are major features of this project. Indeed, cost-effective approaches are sought in all projects: for example, in Malawi, the project should result in considerable savings in the cost of pharmaceuticals; and in Brazil, savings in delivering urban health services will be achieved. More generally, in all projects, institutional reform, training, and

educational programs as well as investment in actual health facilities are designed to build institutional capacity to identify and respond to the most urgent health needs and to facilitate the introduction of family planning services.

Overall, in Bank-supported projects, we aim to create an environment in which appropriate choices and appropriate technologies will emerge from the institutions we have helped to build: the increasing use of oral rehydration therapy in project areas will be some evidence of progress, not only in addressing the immediate problem, but in freeing up resources to attack the more fundamental causes of poverty and ill health in the future.

## NOTES

1. The World Bank defines low-income countries as those with a 1980 per capita gross national product (GNP) of \$410 or less.
2. For all low-income economies, the average infant mortality rate in 1980 was  $94/1000$  live births; the child death rate was  $12/1000$  children aged 1-4 years; and the average life expectancy at birth was 57 years. If China and India are excluded, the low-income countries' key health status indicators change significantly, with an average 1980 infant mortality rate of  $130/1000$ , child death rate of  $22/1000$ , and life expectancy at birth of 48 years. In contrast, by 1980 the industrial market economies had reduced infant mortality rates to an average of  $11/1000$ ; had reduced child death rates to  $1/1000$ ; and had achieved an average life expectancy of 74 years.
3. Malnutrition is a pervasive and insidious problem: a Pan American Health Organization-supported study of childhood mortality in Latin America implicated malnutrition as the most important contributor to excessive mortality in under fives. While fecally-related and airborne diseases exceeded malnutrition as the primary cause of death, immaturity (whether prematurity or low birth weight) and nutritional deficiency were the underlying or associated causes of death in 57% of the children studied. See R. Puffer and C. Serrano, *Patterns of Mortality in Childhood* (Washington, D.C.: Pan American Health Organization, 1973).
4. World Health Organization, *Sixth Report on the World Health Situation: Part One Global Analysis* (Geneva: 1980), p. 129.
5. Shea Oscar Rutstein, *Infant and Child Mortality: Levels, Trends and Demographic Differentials*, World Fertility Survey (International Statistical Institute) to be released June 1983, as reported in *People* 10(2) (1983):16-17.

## CLOSING SESSION

### SUMMARY OF CONFERENCE PROCEEDINGS

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How does one summarize a conference that has had 550 participants from a hundred countries, thirty-five hours of presentations, and forty-six scientific papers weighing over three kilograms? The task is hazardous. A summary cannot be comprehensive and risks repetition. The process is necessarily selective, aimed at balance, yet focus. Fortunately, for both the speaker and audience, there has been insufficient time to prepare slides!

In the end, this summary is merely one person's effort. More important is the judgment of each individual participant and what we each take from and do after this experience.

The most outstanding feature of this conference has been broad-based consensus — indeed, near unanimity — on several major points:

— First is the *significance* of diarrhea as a killer and debilitator, particularly among poor and disadvantaged children. Parenthetically, this fact may seem obvious, but would not have been so at similar gatherings even six years earlier.

— Second, oral rehydration therapy is a simple and powerful response. It is economically affordable, self-sustaining, safe, improves access and self-reliance, and is useful for diarrhea of all etiologies in all age groups.

— Third, oral rehydration therapy can make a difference — a significant difference — not just theoretically, but practically, in field settings around the world. The experiences reported at this conference unequivocally confirm that oral rehydration therapy can: reduce mortality, sometimes dramatically, in communities, clinics, and hospitals; promote child growth and sound nutrition; lessen the morbidity burden; reduce hospitalization attendance, duration of stay, and cost; and generate ancillary benefits, such as minimizing the indiscriminate use of ineffective or harmful drugs.

— Fourth, the scientific principle underlying oral rehydration therapy is well established and the basic chemical composition generally accepted. The basic ingredients are sodium, po-

tassium, bicarbonate, and a suitable carrier substrate, such as glucose. Among these, appropriate concentrations of sodium and glucose are essential in all oral rehydration solutions. Potassium and bicarbonate are also necessary; their absence in some solutions when used for severe diarrhea may lead to prolonged acidosis and hypokalemia. But the practical implication remains unclear. Like many issues that have surfaced, we repeatedly face the difficult trade-off between optimizing technology while maximizing access, use, and impact under many different circumstances.

—Fifth, and most importantly, the agenda is not what to do, but *how to do it*. Most action programs today are pilot, demonstration, or experimental. Several are large-scale. But the challenge remains: how to propagate the use of this new technology in villages and slums where it is needed. One point that emerged was that access to this technology is crucial. People do have common sense and would readily change their behavior and use oral rehydration if the technology is demonstrably beneficial and accessible.

The remainder of this summary discusses eight issues considered fundamental to determining oral rehydration access-with-effectiveness.

1. Rehydration alone is insufficient. Diarrhea is both an infectious as well as a nutritional problem. Oral rehydration as a response, therefore, necessarily must be nutritionally enhancing. This may involve nutrient enrichment of the electrolyte solution, promotion of breastfeeding, sound feeding practices during diarrhea and convalescence, and dealing squarely with the vexing problem of prevention — personal and household hygiene, water, and sanitation.

2. The mother is a partner in oral rehydration delivery. In child care, the mother possesses many advantages, not the least of which are her motivation, her ever-presence, and her capacity to undertake immediate and timely action. The mother is the first-line responder to all children's illnesses, including diarrhea. When adequately trained (particularly through direct demonstration), mothers can mix salts and fluids into safe and effective home-based solutions using either packets or local ingredients with locally-adapted mixing methods. Home-based programs require an understanding of the user's perspective, the constraints that a mother faces, and the resources at her command. Interventions must aim to support a sustained, interactive, communicative relationship with the mother. She is particularly important if the focus shifts from exclusive treatment of dehydration to integrated dehydration and nutrition interventions, because nutrition cannot be improved without the mother taking an active role.

3. The health system should introduce oral re-

hydration in the field, clinics, and hospitals, backed wherever possible by intravenous fluids. The health system should also undertake the production and dissemination of packets. Packets contain an optimal composition of salts, but their distribution depends on strong logistical support.

At the periphery of the health system, community field and clinic-based workers should receive adequate training and supervision. In hospitals, doctors need reinforcement in the use of oral rehydration, backed by intravenous fluids. Health facilities may be used as training centers, aimed at transferring skills to the community. Diarrhea and oral rehydration should be emphasized in medical school curricula. Proper application of oral rehydration in hospitals can contribute to an overall reduction of diarrhea mortality, and the goal of eliminating dehydration deaths in hospitals is an achievable goal worthy of implementation. Finally, recent studies have demonstrated the many advantages of oral rehydration in hospitals of developed countries. Oral rehydration, therefore, should become a global effort. Because doctors are influenced by the practices of their elite professional counterparts, the legitimization and use of oral rehydration in hospitals in the developed countries should receive high priority.

Linkages between the home and the health systems are important. When considered together, they face the challenge of complementarity with synergism and minimization of conflict and duplication. Regrettably, in most rural areas in the developing world, duplication is rarely the problem. Home-based therapy is an appropriate initial response for all diarrhea cases. The health system capacity to deal with referrals of severe cases should be strengthened. An unresolved linkage issue between the home and the health system is the consistency of the oral rehydration message. Some programs advocate identical oral rehydration solutions for all facilities — from home to hospitals. These may be packets or local mixtures. Others see a continuum between home-based local mixtures, packet distribution, and oral and intravenous fluids in advanced facilities.

5. Another issue is integration. Should priority be oral rehydration versus comprehensive diarrhea management versus primary health care versus socioeconomic development? There are at least three contrasting views. One view: oral rehydration addresses only a single problem. The development of a vertical operational structure is not cost-effective, is counterproductive, and detracts from the long-term strengthening of primary health care. Another view: oral rehydration itself is of high priority, do-able, and cost-effective. Separate structures are justifiable where primary health care infrastructure is either absent

or underdeveloped. A third view: oral rehydration versus primary health care is a false dichotomy. Everyone concurs that primary health care is the ultimate goal; the means in terms of steps, timing, and paths may and ought to vary depending upon local circumstances. Oral rehydration therapy is an entry, a rallying point for primary health care. Because it is effective, it can help cement confidence between a health system and people it serves. Primary health care itself advocates prioritization, cost-effectiveness, self-reliance, and community participation. When these criteria are applied, oral rehydration comes out near the top of the list. If the dichotomy is moved from abstraction into operations in the field, differences between the two diminish.

A final, often neglected, yet important and relevant question is: does the health care structure — whether oral rehydration or primary health care — have the capacity to change, to grow, to mature over time in response to problem-solving?

6. Access to oral rehydration requires several channels and multiple support structures, and to have such requires moving beyond the health system. A single path linking of mother-and-child to health system field worker to clinics and hospitals is fragile, incomplete, episodic, and even under optimal circumstances may never provide complete access. Parallel delivery structures need to be strengthened, among which are: primary schools, religious bodies, nongovernmental and voluntary agencies, community groups, traditional health systems (including midwives and healers), and the private commercial sector (such as pharmacies). The private sector has been successful in generating demand and making available a wide range of goods — some useful, some less so, and some harmful. Why not direct this powerful force towards socially useful purposes? Social marketing could generate demand and increase availability of oral rehydration. Caution, however, should be exercised in blending together the profit and social motives into an effective instrument of improving health.

7. Oral rehydration, at its core, consists of changes of attitude, behavior, and practices — among mothers (discussed earlier), decision makers, governments, and the public at large. All must be convinced of the human, practical, and economic imperatives of oral rehydration. The most important group may be the health professional, especially the doctor. Doctors maintain technical and often administrative control over health technologies and systems. They can be a barrier of noncooperation or a significant source of support to the propagation of oral therapy. Propagation of oral rehydration would be difficult without the backing of the medical profession. Doctors must be shown that oral

rehydration is appropriate and effective. Their interest in diarrhea as a major public health problem should be encouraged.

Changes of attitude, behavior, and practice can be stimulated and reinforced by sound communication and mass media programs. The vehicles of radio, newspapers, billboards, and materials for illiterates can exert powerful influences. Much creative work can be done. Our ability to generate technical change appears to far surpass our capacity to understand and direct social and behavioral change.

8. Policy, planning, research, and evaluation. An immediate need is the development of simple, reliable indicators and methodologies to measure, analyze, and interpret the diverse oral rehydration field experiences that are taking place throughout the world. Some label this action research or operations research; it may involve in-depth qualitative case studies or rigorous quantitative methods. These methods should focus not only on inputs (number of workers) or activities (number of packets distributed), but also cost (time and money) and output (nutritional status, morbidity, mortality). Critical examinations of performance are essential as oral rehydration activities proliferate. As their diversity multiplies and scale expands, we will require a systematic capacity to scrutinize, build upon, and generalize on what works. As important, we will need to debunk and discard what doesn't work. And we will need to understand why and how. A lesson from history here is appropriate. It took 130 years from the first attempt at intravenous rehydration until we reached a stage when it had matured into a scientifically accepted technology. In our enthusiasm for implementation, let us not allow another century to lapse before we can accumulate and develop our knowledge base to bring oral rehydration effectively to the people.

Other research is also needed. Among these are amino acid fortification to enhance absorption and cereal-based solutions, using locally available salts and nutrients. Some examples are rice powder, carrot soup, and fluids made of other local cereals. The advantages of these solutions are low osmotic levels, decreasing diarrhea volume and duration, and increased accessibility and cost-effectiveness. These should be subjected to field trials in real world situations as soon as possible. There is also no substitute or short-cut for basic research. Basic research, using modern scientific methods, is needed to delineate the mechanism of diarrhea. Pharmacologic agent(s) to turn off diarrhea should be developed. New and effective vaccines are needed. One lesson about basic research (which the ICDDR,B experience illustrates) is that we are today harvesting the benefits of two decades of carefully planned and nurtured, basic-applied re-

search investments. Such support is weak and less productive if it is episodic or ad hoc. The ICDDR,B experience also teaches us that we need to apply our most sophisticated scientific capabilities to the right problem in a context where the problem is most prevalent.

Much progress has been made. Much, much more needs to be done, and done soon. Oral rehydration therapy is increasingly capturing the imagination of the policymakers, the scientists, and the public. It has gained legitimacy, even in the medical profession!

Some caveats are indicated, however. Oral rehydration is *not a panacea*. While recognizing its importance, we must avoid oversell. Diarrhea is only one, granted important, disease among several major health problems. Diarrhea is also both a symptom of and a contributor to poverty and underdevelopment. Oral rehydration therapy should not be used as an alternative or palliative to avoid addressing the fundamental problems of poverty. Finally, choices must be made. Conferences often conclude that everything should be done. But we cannot do it all. Choices and tradeoffs will need to be made at all levels. Especially relevant to field application is the adage: the best is the enemy of the good.

The premium today is on pragmatism. What works? Progress will depend on local ingenuity, adaptation, and what I call "creative health entrepreneurship." Approaches to oral rehydration necessarily will vary between different communities in different countries. The mix of approaches will differ, as decisions should be made locally. The process of making things work will call for learning by doing. This needs fostering and can be promoted through dialogue, exchange of ideas, and sharing of experiences. To this purpose, this conference has made a significant contribution.

## CLOSING REMARKS

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It is again a great pleasure to come before this distinguished and dedicated audience. This meeting, the International Conference on Oral Rehydration Therapy, has been a unique event.

It has brought together some of the greatest scientific minds in the field.

It has united statesmen with physicians and program administrators. It has provided an opportunity for scholars to learn from men and women of action and vice versa.

We have discussed at length the technology involved. We have understood how the salts

work to rehydrate a person who is suffering from diarrhea. We know that in most instances it works as well as intravenous therapy. It works at a fraction of the cost, with minimal trauma for the child, and with less risk of complication.

We have discussed some of the next steps in research. We are aware that a serious search is underway for a formula which could reduce the amount of diarrhea per episode and of the research to find a more stable mixture. However, we are also aware that the current formula is safe and effective.

We have spent a great deal of time discussing the problems of making this safe, effective therapy available for every mother who needs it for her child. We are aware that availability is not an easy problem to overcome, but one that can be solved.

We have discussed the linkage of diarrhea and disease with the whole syndrome of malnutrition and substandard sanitation facilities as a cause of death.

We discussed ways to incorporate the therapy into a primary health care package which includes breast feeding, growth monitoring, immunization, family planning, and also some minimum sanitation.

I agree with the concern of dealing with these problems and the importance of doing so.

However, I say to you that the Green Revolution did not wait for fertilizer production to be put into place or for credit to finance the necessary seed purchases. That hybrid seed with incredible yield was, in many parts of the world, the engine which drove change and which pulled fertilizer, plants, and credit behind it.

We may be able to do the same thing with oral rehydration therapy.

We have heard continuously over the last few days about the appeal of the therapy to the mothers who use it. We can save their children, *now* while they are acutely sick, and we can win their faith when we do so.

There must be follow-up — we cannot wait.

I and my colleagues have consulted extensively with leaders and participants of this conference, and I would like to set forth a statement to the governments and peoples of the world of what I believe to be the sense of this conference.

FELLOW CITIZENS — We have a deep concern about a global problem of staggering proportions: the problem of diarrheal disease.

Five million children a year who die could be saved, and we believe we must act now.

Oral rehydration therapy provides a technology, magic in its simplicity, which can save these lives. The combination of sugar, water, and salt can be available everywhere for little cost.

The problem is largely one of communication and delivery systems. We know that, with

action, the mortality rates can immediately drop.

Accordingly, we call upon governments in developing countries, donors, and private groups around the world to increase their efforts to save children's lives through this therapy. We wish all to feel our sense of urgency, our sense that we can save millions of children.

To that end, we ask the world community and we pledge our efforts to make substantial progress to having the therapy widely available within five years. We challenge each developing country government to determine specific goals for ORT use in their land. World-wide doubling of the use of ORT each year for the next five years is a reasonable goal.

Further, we ask the world community and we pledge ourselves to the effort to attain near universal availability of the therapy within ten years. These are practical goals, goals that must be achieved.

That concludes my statement of the sense of the conference, but we need to discuss the next steps to achieve our goals.

I believe by the end of 1984 the sponsoring organizations of this conference should organize a follow-up meeting or meetings. That meeting would be quite different than the one we are now attending. The primary focus would be on national health leaders and on an invitation to governments to report to each other the progress they have made in putting into place an ORT program and their plans for the future.

Also, we would invite all donors to come and report on their efforts.

It seems to me that the United Nations Development Program, a long supporter of the International Diarrheal Research Center, might wish to play a major role at that meeting. As we all know, the UNDP has residential representatives in most countries in the world.

The United Nations Fund for Population Activities may also wish to be deeply involved in this meeting or meetings.

The World Bank and other regional banks, of course, play a very important role as donors and need to be extensively consulted.

It may be that there should be regional meetings or workshops instead of a worldwide forum.

If there is a worldwide meeting, it need not be in the United States. Some other donor may wish to host the meeting, but the United States certainly stands ready to serve as host again and clearly intends to put substantial resources into the overall effort.

The goal of the meeting or meetings would be to stimulate governments at the highest level to focus on this problem. My own experience is that preparations for such meetings result in very high levels focusing on matters which may oth-

erwise not be brought to their attention. Obviously, there is a great deal of work to be done and consultation to be undertaken in connection with this proposal, but it is the intent of the sponsors of this conference to begin to go to work on the idea.

There is, of course, much that you participants of this conference can do. You are important people in your countries, and you must return home and make a point of sensitizing decision makers at the highest levels of your government to the importance, both from a humanitarian point of view and politically, of ORT.

The Agency for International Development is prepared to do the following:

*First* — Continue its long-standing support for diarrheal disease research in the critical areas you have identified. We will work in cooperation with the International Center for Diarrheal Disease Research in Bangladesh, in collaboration with the World Health Organization, and through other institutions.

*Second* — We will include oral rehydration therapy to the maximum extent possible through our primary health care programs around the world.

*Third* — Next week, I will contact AID representatives abroad to inform them of the conclusions of this conference and to urge them to seek opportunities to initiate or strengthen ORT activities in programs both ongoing and new, through whatever delivery mechanisms are most appropriate.

*Fourth* — We have recently approved a new worldwide program whose purpose is to promote the use of sets of effective health technologies, such as oral rehydration therapy. We expect this program to give great impetus to ORT programs in the developing world.

*Fifth* — We are working with the Peace Corps to develop a collaborative program to further promote the use of ORT at the community level.

AID will lend its support to more effective mechanisms for consulting and coordinating activities among ourselves and with other donors. It is not our intent to act as coordinator, but rather to help strengthen the mechanism already in place.

Also, one of the lessons of this conference is that we need a better information exchange network, and AID stands ready to help finance such a network.

Let me say that we have attended a conference of deep significance, one that, no doubt, will have a significant impact — not because of what we have done here, but because of what we will all do when we go home.

To conclude, let me read again from my statement of the consensus of the conference:

We ask the world community and we pledge our efforts to make substantial progress to

having the therapy widely available within five years. We challenge each developing country government to determine specific goals for ORT use in their land. Worldwide

doubling of the use of ORT each year for the next five years is a reasonable goal.

These are practical goals, goals that we must achieve.

