CLAUSEN'S; Special Programme for Training in Tropical Diseases
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Research and

(3)

The World Health Organization
1211 Geneva 27
Switzerland

Sheikh Hamdan Ben Mohamed Al Nahyan
Deputy Prime Minister of the United
Arab Emirates
Abu Dhabi
United Arab Emirates

December 12, 1984

Dear Sir,

We take the liberty of soliciting your support for a unique venture in international collaboration. This venture in research and development is an investment in the future of mankind and will require years of work and sustained financial support. However, we are convinced that the results will have a profound impact on the health and well-being of humanity.

The Special Programme for Research and Training in Tropical Diseases (TDR) - co-sponsored by the United Nations Development Programme, the World Bank and the World Health Organization - seeks to develop the means to control six major tropical diseases which today afflict or threaten over one
... thousand million people living in developing countries. We attach for your information a booklet describing in more detail the work and achievements of the Special Programme.

In spite of the explosive growth of knowledge in the biological sciences over the past 30 years, little progress has been made towards the control of these diseases. In fact the menace is increasing.

Millions of children die from malaria before reaching their fifth birthdays, and millions of those who reach adulthood are incapacitated by one or more tropical infections. They are sentenced to spend their lives on the treadmill of illness and poverty with no hope of improving the lot of their families or their communities.

cc: The Minister of Health, Abu Dhabi
The Minister for Foreign Affairs, Abu Dhabi
His Highness Sheikh Hamdan Bin Rashid Al Maktoum, Minister of Finance and Industry, Ministry of Finance and Industry, Dubai
Permanent Mission of the United Arab Emirates to the United Nations Office and other Specialized Agencies at Geneva

... ENCLS: As stated

bcc: UNDP (2) World Bank EMRO (2) Att: TDR EMS/HQ

Sheikh Hamdan Ben Mohamed Al Nahyan,
Deputy Prime Minister of the United
Arab Emirates, Abu Dhabi

The devastating blow, to the individual and the family, of an acute attack of malaria at harvest time or of permanent loss of sight by the age of 25 from river blindness (onchocerciasis) is easy to understand. However, the social and economic impacts upon a community and a country when tropical diseases strike down hundreds of thousands of people, go far beyond the individual or gross statistics. In fact, epidemics of malaria, sleeping sickness and river blindness often drive self-sufficient communities into states of dependent poverty.

The destructive symbiosis of disease and poverty must, and can be replaced by the synergism of health and productivity. To bring this about, the tropical countries require both the tools for prevention and treatment of the tropical diseases and the scientific and technical capabilities to assure their effective application. These are the goals of TDR.

Over the past six years, TDR has challenged and stimulated researchers at institutions throughout the world to work together toward these ends. Thousands of scientists in universities, research institutions, government ministries and industry have responded and are now working as members of TDR teams - in fundamental research laboratories, in hospital clinics and in village health centres - to build the new tools and prepare them for use in the villages of the tropics. TDR has catalysed the linking of research activities into an effective worldwide network and has focused the new methods and knowledge of the biological sciences upon the tropical diseases.

The results have been remarkable and research carried out both within and outside the Special Programme has brought about significant progress. Some new tools for disease control have already reached the stage of actual application in the field, while others are close to it. Examples of major developments towards the control of the diseases include:

- A biological agent, Bacillus thuringiensis H-14, to control the flies that spread river blindness is being used extensively in West Africa and is being tested against malaria-carrying mosquitos.

- A new drug, mefloquine, for the treatment of malaria infections resistant to standard therapy has been registered for use.

- Vaccines which may treat and prevent leprosy are in the early stages of testing in man. However, the tests will take five to eight years to complete because of the slow natural history of the disease.

- Simple kits to measure the sensitivity of malaria parasites to drugs to assure the correct choice of treatment are being used widely.

- A simple test to diagnose sleeping sickness (African trypanosomiasis) at the village level, and thus permit early intervention, is ready for widespread application.

Among significant achievements at earlier stages of development are the following:

- o Vaccines against malaria are now a real possibility following the identification and production of the substances in the parasite responsible for man's immune reactions against them.

- o A totally new family of compounds for the treatment of malaria, based on a traditional Chinese remedy called Qinghaosu, has been synthesized and testing has begun.

- o Drugs for the treatment of river blindness, critical for the control of this disease, are being synthesized and tested.

- o Natural biological agents are being tested in the field, such as Bacillus sphaericus, which will destroy the larvae of disease-transmitting insects and recycle themselves and in this way prolong their effectiveness.

- o Simple and effective diagnostic tests - vital to all disease control programmes - are being developed for Chagas' disease, schistosomiasis, malaria and leprosy.

Scientists and institutions in over 120 countries participate in TDR and provide the vision, knowledge and facilities required for the work. So far, their progress has been outstanding, while the Programme's catalytic effects have kept costs low. In short, we believe TDR to be one of the most cost-effective investments in health and development and one which merits your support. However, bringing a new drug or vaccine from the laboratory to the needy family in the village takes many years of work, and for this TDR requires both adequate and sustained financial support.

TDR depends entirely upon voluntary contributions. From 1975 until 31 August 1984, 27 governments and 11 other organizations, together with the three co-sponsoring agencies, have contributed over US$ 155 million ... to the Programme (see attached table). However, available funds have fallen short of the minimum required (about US$ 33 million per year) to keep the Programme moving ahead. Unless contributions are increased and sustained, TDR will have to abandon many promising initiatives towards new and effective tools to control the diseases. Malaria, sleeping sickness, river blindness and leprosy will continue to spread and thwart any hope of self reliance for the people living in the tropics.

We are convinced that the partnership of modern science and the Special Programme can go far to break the cycle of disease and poverty. Scientists from both the public and private sectors are already doing their part and it is now up to governments and agencies to provide TDR with the funds necessary to complete the work.

We sincerely hope that you will give serious consideration to our request for the financial participation of your Government in the Special Programme and look forward to hearing from you at your earliest convenience. We should be grateful if you would send your reply to Dr Halfdan Mahler, Director-General of the World Health Organization.

Sincerely,

(Sgd.) H. Mahler

(Signed) A. W. Clausen

Bradford Morse
Administrator,
United Nations
Development
Programme

A. W. Clausen
President,
The World Bank

H. Mahler, M.D.
Director-General,
World Health
Organization

The World Health Organization
1211 Geneva 27
Switzerland

Mr Muhamed Az-Zaruq Rajab
Secretary-General of the General
Secretariat of the General People's
Congress of the Socialist People's
Libyan Arab Jamahiriya
Tripoli
Libyan Arab Jamahiriya

December 12, 1984

Dear Mr Secretary-General,

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cc: The Secretary of the General People's Committee for Health, Tripoli
His Excellency Kasem M. Sherlala, Secretary of the People's General Committee for Treasury, Tripoli
The Director of the United Nations and International Organizations Affairs, Secretariat of the General People's Committee for Foreign Affairs, Tripoli
Permanent Mission of the Socialist People's Libyan Arab Jamahiriya to the United Nations Office at Geneva and the International Organizations in Switzerland

... ENCLS: As stated

bcc: UNDP (2) World Bank EMRO (2) Att: TDR EMS/HQ
NWR&PC, Libyan Arab Jamahiriya

Mr Muhamed Az-Zaruq Rajab, Secretary-General
of the General Secretariat of the General
People's Congress of the Socialist People's
Libyan Arab Jamahiriya, Tripoli

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United Nations
Development
Programme

(Signed) A. W. Clausen

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President,
The World Bank

(Sgd.) H. Mahler

H. Mahler, M.D.
Director-General,
World Health
Organization

The World Health Organization
1211 Geneva 27
Switzerland

Mr Muhammad Hosni Mubarak
President of the Arab Republic of Egypt
Cairo
Egypt

December 12, 1984

Dear Mr President,

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cc: The Minister of Health, Ministry of Health, Cairo
The Minister of Foreign Affairs, Ministry of Foreign Affairs, Cairo
His Excellency Dr Moustafa Kamel El Said, Minister of Economy and Foreign Trade, Cairo
Permanent Mission of the Arab Republic of Egypt to the United Nations Office and Specialized Agencies at Geneva

... ENCLS: As stated

bcc: Dr Aleya Ayoub, Under Secretary of State, Endemic Disease Control, Ministry of Health, Cairo
Dr Mohamed Saif, Director-General, Tropical Medicine Institute, Cairo
UNDP (2) World Bank EMRO (2) Att: TDR EMS/HQ
WHO Liaison Officer in Cairo

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We are convinced that the partnership of modern science and the Special Programme can go far to break the cycle of disease and poverty. Scientists from both the public and private sectors are already doing their part and it is now up to governments and agencies to provide TDR with the funds necessary to complete the work.

Egyptian institutions and scientists are participating in the work of TDR. They have carried out 12 research and development projects and the

Special Programme has supported three training projects in Egypt at a total cost of US$ 341 000 to the Programme. Egypt has also taken an active part in the management of the Special Programme as a member of its Joint Coordinating Board in 1978 and 1979, and subsequently as an official observer to the Board. We are very grateful to your Government, its institutions and scientists for their important participation. However, in view of the tasks to be accomplished and the opportunities before us, we are asking you to support TDR financially as well as technically and in this way to work with us at all levels of the Programme to transform the opportunities of today into the new drugs and vaccines of tomorrow.

We sincerely hope that you will give serious consideration to our request for the financial participation of your Government in the Special Programme and look forward to hearing from you at your earliest convenience. We should be grateful if you would send your reply to Dr Halfdan Mahler, Director-General of the World Health Organization.

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Director-General,
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The World Health Organization
1211 Geneva 27
Switzerland

Mr K. U. Chernenko
Chairman of the Presidium of the
Supreme Soviet of the Union of
Soviet Socialist Republics
Moscow
Union of Soviet Socialist Republics

December 12, 1984

Dear Mr Chairman,

We take the liberty of soliciting your support for a unique venture in international collaboration. This venture in research and development is an investment in the future of mankind and will require years of work and sustained financial support. However, we are convinced that the results will have a profound impact on the health and well-being of humanity.

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cc: The Minister of Health of the Union of Soviet Socialist Republics, Moscow
The Permanent Representative of the Union of Soviet Socialist Republics to the United Nations Office and other International Organizations at Geneva

... ENCLS: As stated

bcc: Professor F. F. Soprunov, Director, Martsinovsky Institute of Medical Parasitology and Tropical Medicine, Moscow
Dr Lev S. Iarotski, Deputy Director, Martsinovsky Institute of Medical Parasitology and Tropical Medicine, Moscow
UNDP World Bank EURO (2) Att: Dr B. Nizetic, RPD

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The World Health Organization
1211 Geneva 27
Switzerland

H.R.H. Prince Abdallah Ibn Abdel Aziz
First Deputy Prime Minister
of the Kingdom of Saudi Arabia
Riyad
Saudi Arabia

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cc: The Minister for Foreign Affairs of Saudi Arabia, Ministry for Foreign Affairs, Riyad
The Minister of Public Health, Ministry of Public Health, Riyad
His Excellency Sheikh Mohammed Abalkhail, Minister of Finance and National Economy, Minister's Office, Riyad
Permanent Mission of Saudi Arabia to the United Nations Office and Specialized Agencies at Geneva

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bcc: UNDP (2) World Bank EMRO (2) Att: TDR EMS/HQ
WR&PC, Saudi Arabia

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- o Natural biological agents are being tested in the field, such as Bacillus sphaericus, which will destroy the larvae of disease-transmitting insects and recycle themselves and in this way prolong their effectiveness.

- o Simple and effective diagnostic tests - vital to all disease control programmes - are being developed for Chagas' disease, schistosomiasis, malaria and leprosy.

Scientists and institutions in over 120 countries participate in TDR and provide the vision, knowledge and facilities required for the work. So far, their progress has been outstanding, while the Programme's catalytic effects have kept costs low. In short, we believe TDR to be one of the most cost-effective investments in health and development and one which merits your support. However, bringing a new drug or vaccine from the laboratory to the needy family in the village takes many years of work, and for this TDR requires both adequate and sustained financial support.

TDR depends entirely upon voluntary contributions. From 1975 until 31 August 1984, 27 governments and 11 other organizations, together with the three co-sponsoring agencies, have contributed over US$ 155 million ... to the Programme (see attached table). However, available funds have fallen short of the minimum required (about US$ 33 million per year) to keep the Programme moving ahead. Unless contributions are increased and sustained, TDR will have to abandon many promising initiatives towards new and effective tools to control the diseases. Malaria, sleeping sickness, river blindness and leprosy will continue to spread and thwart any hope of self reliance for the people living in the tropics.

We are convinced that the partnership of modern science and the Special Programme can go far to break the cycle of disease and poverty. Scientists from both the public and private sectors are already doing their part and it is now up to governments and agencies to provide TDR with the funds necessary to complete the work.

Saudi Arabian scientists are participating in the work of TDR. We are very grateful to your Government and scientists for their participation and

we hope it will increase. However, in view of the tasks to be accomplished and the opportunities before us, we are asking you to support TDR financially as well as technically and in this way to work with us at all levels of the Programme to transform the opportunities of today into the new drugs and vaccines of tomorrow.

We sincerely hope that you will give serious consideration to our request for the financial participation of your Government in the Special Programme and look forward to hearing from you at your earliest convenience. We should be grateful if you would send your reply to Dr Halfdan Mahler, Director-General of the World Health Organization.

Sincerely,

(Signed) A. W. Clausen

(Sgd.) H. Mahler

Bradford Morse
Administrator,
United Nations
Development
Programme

A. W. Clausen
President,
The World Bank

H. Mahler, M.D.
Director-General,
World Health
Organization

The World Health Organization
1211 Geneva 27
Switzerland

Mr Li Xiannian
President of the People's Republic
of China
Beijing
People's Republic of China

December 12, 1984

Dear Mr President,

We take the liberty of soliciting your support for a unique venture in international collaboration. This venture in research and development is an investment in the future of mankind and will require years of work and sustained financial support. However, we are convinced that the results will have a profound impact on the health and well-being of humanity.

The Special Programme for Research and Training in Tropical Diseases (TDR) - co-sponsored by the United Nations Development Programme, the World Bank and the World Health Organization - seeks to develop the means to control six major tropical diseases which today afflict or threaten over one
... thousand million people living in developing countries. We attach for your information a booklet describing in more detail the work and achievements of the Special Programme.

In spite of the explosive growth of knowledge in the biological sciences over the past 30 years, little progress has been made towards the control of these diseases. In fact the menace is increasing.

Millions of children die from malaria before reaching their fifth birthday, and millions of those who reach adulthood are incapacitated by one or more tropical infections. They are sentenced to spend their lives on the treadmill of illness and poverty with no hope of improving the lot of their families or their communities.

cc: The Minister of Public Health of the People's Republic of China, Ministry of Public Health, Beijing
His Excellency Wang Bingqian, State Counsellor and Minister of Finance, Beijing
The Permanent Representative of the People's Republic of China to the United Nations Office at Geneva and other International Organizations in Switzerland
The Ministry of Foreign Economic Relations and Trade Department of Relations with International Organizations, Beijing

... ENCLS: As stated

bcc: UNDP (2) World Bank WPRO (2) Att: COR and Dr A. Shirai, TDR
WR&PC, People's Republic of China HRM

The devastating blow, to the individual and the family, of an acute attack of malaria at harvest time or of permanent loss of sight by the age of 25 from river blindness (onchocerciasis) is easy to understand. However, the social and economic impacts upon a community and a country when tropical diseases strike down hundreds of thousands of people, go far beyond the individual or gross statistics. In fact, epidemics of malaria, sleeping sickness and river blindness often drive self-sufficient communities into states of dependent poverty.

The destructive symbiosis of disease and poverty must, and can be replaced by the synergism of health and productivity. To bring this about, the tropical countries require both the tools for prevention and treatment of the tropical diseases and the scientific and technical capabilities to assure their effective application. These are the goals of TDR.

Over the past seven years, TDR has challenged and stimulated researchers at institutions throughout the world to work together toward these ends. Thousands of scientists in universities, research institutions, government ministries and industry have responded and are now working as members of TDR teams - in fundamental research laboratories, in hospital clinics and in village health centres - to build the new tools and prepare them for use in the villages of the tropics. TDR has catalysed the linking of research activities into an effective worldwide network and has focused the new methods and knowledge of the biological sciences upon the tropical diseases.

The results have been remarkable and research carried out both within and outside the Special Programme has brought about significant progress. Some new tools for disease control have already reached the stage of actual application in the field, while others are close to it. Examples of major developments towards the control of the diseases include:

- o A biological agent, Bacillus thuringiensis H-14, to control the flies that spread river blindness is being used extensively in West Africa and is being tested against malaria-carrying mosquitos.

- o A new drug, mefloquine, for the treatment of malaria infections resistant to standard therapy has been registered for use.

- o Vaccines which may treat and prevent leprosy are in the early stages of testing in man. However, the tests will take five to eight years to complete because of the slow natural history of the disease.

- o Simple kits to measure the sensitivity of malaria parasites to drugs to assure the correct choice of treatment are being used widely.

- o A simple test to diagnose sleeping sickness (African trypanosomiasis) at the village level, and thus permit early intervention, is ready for widespread application.

Among significant achievements at earlier stages of development are the following:

- Vaccines against malaria are now a real possibility following the identification and production of the substances in the parasite responsible for man's immune reactions against them.

- A totally new family of compounds for the treatment of malaria, based on a traditional Chinese remedy called Qinghaosu, has been synthesized and testing has begun. We are very grateful for your collaboration in this endeavour.

- Drugs for the treatment of river blindness, critical for the control of this disease, are being synthesized and tested.

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We are convinced that the partnership of modern science and the Special Programme can go far to break the cycle of disease and poverty. Scientists from both the public and private sectors are already doing their part and it is now up to governments and agencies to provide TDR with the funds necessary to complete the work.

Chinese institutions and scientists are participating in the work of TDR. They have carried out 25 research and development projects and the Special Programme has supported 26 training and institution strengthening projects in China at a total cost of US$ 1 517 000 to the Programme. The People's Republic of China has also taken an active part in the management of the Special Programme as a member of its Joint Coordinating Board from 1981 - 1983. We are very grateful to the Chinese institutions and scientists for their important participation, and to the Government of the

People's Republic of China for its financial contributions to TDR which amount to US$ 150 000 up to 31 August 1984. However, in view of the tasks to be accomplished and the opportunities before us, we are asking you to consider increasing the level of China's financial support to TDR and to work with us to transform the opportunities of today into the new drugs and vaccines of tomorrow.

We sincerely hope that you will give serious consideration to our request for the increased financial participation of your Government in the Special Programme and look forward to hearing from you at your earliest convenience. We should be grateful if you would send your reply to Dr Halfdan Mahler, Director-General of the World Health Organization.

Sincerely,

Bradford Morse
Administrator,
United Nations
Development
Programme

A. W. Clausen
President,
The World Bank

H. Mahler, M.D.
Director-General,
World Health
Organization

special programme for research and training in tropical diseases

The World Health Organization
1211 Geneva 27
Switzerland

Dr Nizar Al Shawi
Secretary General
Union of Arab Councils for
Scientific Research
P.O. Box 13027
Baghdad
Iraq

December 12, 1984

Dear Dr Al Shawi,

We take the liberty of soliciting your support for a unique venture in international collaboration. This venture in research and development is an investment in the future of mankind and will require years of work and sustained financial support. However, we are convinced that the results will have a profound impact on the health and well-being of humanity.

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... ENCLS: As stated

bcc: World Bank (2) UNDP (2) EMRO (2) Att: TDR EMS/HQ

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We sincerely hope that you will give serious consideration to our request for the financial participation of your Union in the Special Programme and look forward to hearing from you at your earliest convenience. We should be grateful if you would send your reply to Dr Halfdan Mahler, Director-General of the World Health Organization.

Sincerely,

Bradford Morse	(Signed) A. W. Clausen	(Sgd.) H. Mahler
Bradford Morse Administrator, United Nations Development Programme	A. W. Clausen President, The World Bank	H. Mahler, M.D. Director-General, World Health Organization

special programme for research and training in tropical diseases

The World Health Organization
1211 Geneva 27
Switzerland

H.R.H. Prince Khalid Al-Faisal
Director-General
King Faisal Foundation
P.O. Box 352
Riyad
Saudi Arabia

December 12, 1984

Your Royal Highness,

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The devastating blow, to the individual and the family, of an acute attack of malaria at harvest time or of permanent loss of sight by the age of 25 from river blindness (onchocerciasis) is easy to understand. However, the social and economic impacts upon a community and a country when tropical diseases strike down hundreds of thousands of people, go far beyond the individual or gross statistics. In fact, epidemics of malaria, sleeping sickness and river blindness often drive self-sufficient communities into states of dependent poverty.

... ENCLS: As stated

bcc: World Bank (2) UNDP (2) EMRO (2) Att: TDR EMS/HQ
WR&PC, Saudi Arabia

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Over the past six years, TDR has challenged and stimulated researchers at institutions throughout the world to work together toward these ends. Thousands of scientists in universities, research institutions, government ministries and industry have responded and are now working as members of TDR teams - in fundamental research laboratories, in hospital clinics and in village health centres - to build the new tools and prepare them for use in the villages of the tropics. TDR has catalysed the linking of research activities into an effective worldwide network and has focused the new methods and knowledge of the biological sciences upon the tropical diseases.

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Among significant achievements at earlier stages of development are the following:

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We sincerely hope that you will give serious consideration to our request for the financial participation of your Foundation in the Special Programme and look forward to hearing from you at your earliest convenience. We should be grateful if you would send your reply to Dr Halfdan Mahler, Director-General of the World Health Organization.

Sincerely,

Brad Morse	(Signed) A. W. Clausen	(Sgd.) H. Mahler
Bradford Morse Administrator, United Nations Development Programme	A. W. Clausen President, The World Bank	H. Mahler, M.D. Director-General, World Health Organization

special programme for research and training in tropical diseases

The World Health Organization
1211 Geneva 27
Switzerland

Mr Habib Chatty
Secretary-General
Organisation of the Islamic
Conference
P.O. Box 178
Jeddah
Saudi Arabia

December 12, 1984

Dear Mr Chatty,

We take the liberty of soliciting your support for a unique venture in international collaboration. This venture in research and development is an investment in the future of mankind and will require years of work and sustained financial support. However, we are convinced that the results will have a profound impact on the health and well-being of humanity.

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bcc: World Bank (2) UNDP (2) EMRO (2) Att: TDR
WR&PC, Saudi Arabia EMS

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Among significant achievements at earlier stages of development are the following:

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We are convinced that the partnership of modern science and the Special Programme can go far to break the cycle of disease and poverty. Scientists from both the public and private sectors are already doing their part and it is now up to governments and agencies to provide TDR with the funds necessary to complete the work.

We sincerely hope that you will give serious consideration to our request for the financial participation of your Organisation in the Special Programme and look forward to hearing from you at your earliest convenience. We should be grateful if you would send your reply to Dr Halfdan Mahler, Director-General of the World Health Organization.

Sincerely,

Bradford Morse	(Signed) A. W. Clausen	(Sgd.) H. Mahler
Bradford Morse Administrator, United Nations Development Programme	A. W. Clausen President, The World Bank	H. Mahler, M.D. Director-General, World Health Organization

מדינת ישראל

STATE of ISRAEL

With Compliments
and President Herzog's
best wishes to you,
Mrs. Clausen, for 1985

Beit Hanassi **Jerusalem**

December 1984

R1
cc: Mr. Hoath
1/09

לשכת נשיא המדינה
OFFICE OF THE PRESIDENT OF ISRAEL

40

Jerusalem, 26 December 1984

Dr. Halfdan Mahler
Director-General, World Health Organization
1211 Geneva 27
Switzerland

Dear Dr. Mahler,

President Herzog has asked me to assure you that he has read with care and interest your letter of December 10, 1984, setting forth the background and activities of the Special Programme for Research and Training in Tropical Diseases, co-sponsored by the United Nations Development Programme, the World Bank and the World Health Organization.

It is not within the President's province to act upon your request for financial participation in the Special Programme, but he has no doubt that the Ministries of Health and Foreign Affairs of the Government of Israel will give it due consideration.

With the President's best wishes,

Sincerely,

Shulamit Nardi
Assistant to the President

Copies to: 1. Mr. Bradford Morse, Administrator, U.N. Development Programme.

2. Mr. A. W. Clausen, President, the World Bank.

The World Health Organization
1211 Geneva 27
Switzerland

Mr Chaim Herzog
President of the State of Israel
Jerusalem
Israel

December 10, 1984

Dear Mr President,

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cc: The Minister of Health, Government of Israel, Jerusalem
The Minister for Foreign Affairs, Division of International Organizations, Government of Israel, Jerusalem
Dr Moshe Y. Mandelbaum, Governor, Bank of Israel, Jerusalem
The Permanent Representative of Israel to the United Nations Office and the International Organizations at Geneva

... ENCLS: As stated

bcc: Professor B. Lunenfeld, Counsellor for External Relations, Ministry of Health, Jerusalem
UNDP World Bank EMRO (2) Att: TDR EMS/HQ

The devastating blow, to the individual and the family, of an acute attack of malaria at harvest time or of permanent loss of sight by the age of 25 from river blindness (onchocerciasis) is easy to understand. However, the social and economic impacts upon a community and a country when tropical diseases strike down hundreds of thousands of people, go far beyond the individual or gross statistics. In fact, epidemics of malaria, sleeping sickness and river blindness often drive self-sufficient communities into states of dependent poverty.

The destructive symbiosis of disease and poverty must, and can be replaced by the synergism of health and productivity. To bring this about, the tropical countries require both the tools for prevention and treatment of the tropical diseases and the scientific and technical capabilities to assure their effective application. These are the goals of TDR.

Over the past six years, TDR has challenged and stimulated researchers at institutions throughout the world to work together toward these ends. Thousands of scientists in universities, research institutions, government ministries and industry have responded and are now working as members of TDR teams - in fundamental research laboratories, in hospital clinics and in village health centres - to build the new tools and prepare them for use in the villages of the tropics. TDR has catalysed the linking of research activities into an effective worldwide network and has focused the new methods and knowledge of the biological sciences upon the tropical diseases.

The results have been remarkable and research carried out both within and outside the Special Programme has brought about significant progress. Some new tools for disease control have already reached the stage of actual application in the field, while others are close to it. Examples of major developments towards the control of the diseases include:

- A biological agent, Bacillus thuringiensis H-14, to control the flies that spread river blindness is being used extensively in West Africa and is being tested against malaria-carrying mosquitos.

- A new drug, mefloquine, for the treatment of malaria infections resistant to standard therapy has been registered for use.

- Vaccines which may treat and prevent leprosy are in the early stages of testing in man. However, the tests will take five to eight years to complete because of the slow natural history of the disease.

- Simple kits to measure the sensitivity of malaria parasites to drugs to assure the correct choice of treatment are being used widely.

- A simple test to diagnose sleeping sickness (African trypanosomiasis) at the village level, and thus permit early intervention, is ready for widespread application.

Among significant achievements at earlier stages of development are the following:

- o Vaccines against malaria are now a real possibility following the identification and production of the substances in the parasite responsible for man's immune reactions against them.
- o A totally new family of compounds for the treatment of malaria, based on a traditional Chinese remedy called Qinghaosu, has been synthesized and testing has begun.
- o Drugs for the treatment of river blindness, critical for the control of this disease, are being synthesized and tested.
- o Natural biological agents are being tested in the field, such as Bacillus sphaericus, which will destroy the larvae of disease-transmitting insects and recycle themselves and in this way prolong their effectiveness.
- o Simple and effective diagnostic tests - vital to all disease control programmes - are being developed for Chagas' disease, schistosomiasis, malaria and leprosy.

Scientists and institutions in over 120 countries participate in TDR and provide the vision, knowledge and facilities required for the work. So far, their progress has been outstanding, while the Programme's catalytic effects have kept costs low. In short, we believe TDR to be one of the most cost-effective investments in health and development and one which merits your support. However, bringing a new drug or vaccine from the laboratory to the needy family in the village takes many years of work, and for this TDR requires both adequate and sustained financial support.

TDR depends entirely upon voluntary contributions. From 1974 until 31 August 1984, 27 governments and 11 other organizations, together with the three co-sponsoring agencies, have contributed over US$ 155 million ... to the Programme (see attached table). However, available funds have fallen short of the minimum required (about US$ 33 million per year) to keep the Programme moving ahead. Unless contributions are increased and sustained, TDR will have to abandon many promising initiatives towards new and effective tools to control the diseases. Malaria, sleeping sickness, river blindness and leprosy will continue to spread and thwart any hope of self reliance for the people living in the tropics.

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We sincerely hope that you will give serious consideration to our request for the financial participation of your Government in the Special Programme and look forward to hearing from you at your earliest convenience. We should be grateful if you would send your reply to Dr Halfdan Mahler, Director-General of the World Health Organization.

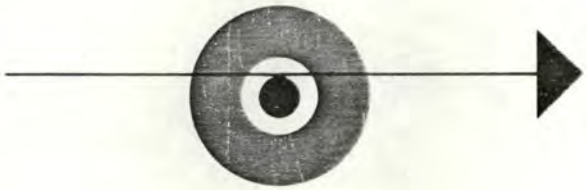
Sincerely,

Bradford Morse
Administrator,
United Nations
Development
Programme

A. W. Clausen
President,
The World Bank

(Sgd.) H. Mahler

H. Mahler, M.D.
Director-General,
World Health
Organization



special programme for research and training in tropical diseases

The World Health Organization
1211 Geneva 27
Switzerland

Mr Chaim Herzog
President of the State of Israel
Jerusalem
Israel

December 10, 1984

Dear Mr President,

We take the liberty of soliciting your support for a unique venture in international collaboration. This venture in research and development is an investment in the future of mankind and will require years of work and sustained financial support. However, we are convinced that the results will have a profound impact on the health and well-being of humanity.

The Special Programme for Research and Training in Tropical Diseases (TDR) - co-sponsored by the United Nations Development Programme, the World Bank and the World Health Organization - seeks to develop the means to control six major tropical diseases which today afflict or threaten over one ... thousand million people living in developing countries. We attach for your information a booklet describing in more detail the work and achievements of the Special Programme.

In spite of the explosive growth of knowledge in the biological sciences over the past 30 years, little progress has been made towards the control of these diseases. In fact the menace is increasing.

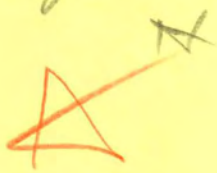
Millions of children die from malaria before reaching their fifth birthday, and millions of those who reach adulthood are incapacitated by one or more tropical infections. They are sentenced to spend their lives on the treadmill of illness and poverty with no hope of improving the lot of their families or their communities.

cc: The Minister of Health, Government of Israel, Jerusalem
The Minister for Foreign Affairs, Division of International Organizations, Government of Israel, Jerusalem
Dr Moshe Y. Mandelbaum, Governor, Bank of Israel, Jerusalem
The Permanent Representative of Israel to the United Nations Office and the International Organizations at Geneva

... ENCLS: As stated

12/10

you wanted to
read what you
signed



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Sincerely,

Bradford Morse
Administrator,
United Nations
Development
Programme

A. W. Clausen
President,
The World Bank

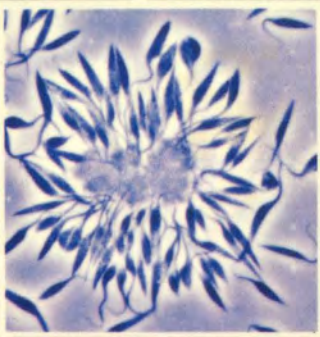
H. Mahler, M.D.
Director-General,
World Health
Organization

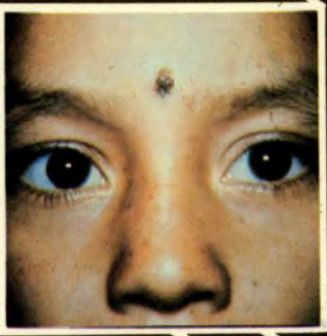
ATTACHMENTS TO EACH LETTER

UNDP/WORLD BANK/WHO
SPECIAL PROGRAMME FOR RESEARCH AND TRAINING
IN TROPICAL DISEASES

FINANCIAL CONTRIBUTIONS (in US$ up to 31 August 1984)

CONTRIBUTOR	TOTAL 1974-1979	1980	1981	1982	1983	TOTAL 1974-1983	1984 31.08.84
AFRICAN DEVELOPMENT BANK	250 000	250 000	250 000	-	-	750 000	
AUSTRALIA	516 662	253 460	297 125	389 970	690 780	2 147 997	621 530
AUSTRIA	239 701	120 000	43 484	28 249	54 826	486 260	50 251
BAHAMAS	500	-	-	-	-	500	
BAYER AG	-		-	10 000	-	10 000	
BELGIUM	1 868 745	528 355	388 249	321 839	587 648	3 694 836	
BRAZIL	-	-	20 000	20 000	20 000	60 000	
CAMEROON	2 566	-	4 047	-	-	6 613	
CANADA	1 452 916	606 849	702 694	816 727	1 058 707	4 637 893	1 210 944
CHINA	-	-	50 000	-	50 000	100 000	50 000
CUBA	2 193	1 909	1 987	2 500	2 000	10 589	
CYPRUS	239	-	-	-	-	239	
DENMARK	10 729 333	6 664 141	5 068 548	166 972	1 534 292	24 163 286	716 093
FINLAND	292 979	133 689	177 000	204 545	220 183	1 028 396	234 783
FRANCE	226 516	240 385	176 772	332 226	275 152	1 251 051	
GERMANY, FEDERAL REPUBLIC OF	1 501 297	1 129 943	978 261	1 165 938	912 374	5 687 813	543 578
IDRC	806 973	-	186 892	177 972	-	1 171 837	120 192
ILEP	302 600	72 293	88 393	86 663	82 831	632 780	17 723
INDIA	102 469	-	25 000	-	50 000	177 469	
IRAQ	5 000	-		-	-	5 000	
JAPAN	-	-	-	100 000	100 000	200 000	100 000
JSIF	1 351 300	1 379 616	400 000	259 851	250 000	3 640 767	
LEPROSY TRUST BOARD, NEW ZEALAND	34 772	9 804	-	18 566	6 536	69 678	5 000
MACARTHUR FOUNDATION	-	-	-	-	-	-	1 000 000
MEXICO	-	-	-	9 953	10 000	19 953	
NETHERLANDS	3 455 064	1 000 000	786 396	717 681	1 507 224	7 466 365	318 370
NIGER	2 252	-	-	-	-	2 252	
NIGERIA	239 865	92 238	89 286	-	-	421 389	
NORWAY	2 764 455	1 106 639	1 067 961	1 108 742	1 790 318	7 838 115	1 843 611
PAHEF	-	-	-	-	5 000	5 000	
ROMANIA	1 995	-	-	-	-	1 995	
SANOFI	-	-	-	-	39 216	39 216	
SWEDEN	7 017 488	2 879 424	2 355 250	2 500 000	1 582 747	16 334 909	1 628 061
SWITZERLAND	1 725 389	855 822	880 813	786 164	835 921	5 084 109	825 230
THRASHER RESEARCH FUND	-	-	-	10 000	10 000	20 000	10 000
UNITED KINGDOM	2 826 710	1 229 257	793 971	-	151 154	5 001 092	150 393
UNITED STATES OF AMERICA	2 372 912	4 000 000	4 001 000	5 030 000	3 000 000	18 403 912	2 000 000
WELLCOME TRUST	25 000	-	-	-	-	25 000	
MISCELLANEOUS	2 895	3 866	2 750	3 500	4 287	17 298	2 376
TOTAL	40 120 786	22 557 690	18 835 879	14 268 058	14 831 196	110 613 609	11 448 135
UNITED NATIONS DEVELOPMENT PROGRAMME (UNDP)	2 920 008	1 947 700	2 552 100	1 840 600	2 337 610	11 598 018	2 179 360
WORLD BANK (IBRD)	-	-	2 480 000	2 400 000	2 500 000	7 380 000	2 580 000
WORLD HEALTH ORGANIZATION (WHO)	4 501 500	1 050 000	1 050 000	1 050 000	1 050 000	8 701 500	1 282 500
GRAND TOTAL	47 542 294	25 555 390	24 917 979	19 558 658	20 718 806	138 293 127	17 448 995





VENTURE FOR HEALTH

VENTURE FOR HEALTH

UNDP/WORLD BANK/WHO
Special Programme for Research and Training in Tropical Diseases

WORLD HEALTH ORGANIZATION
1211 GENEVA 27-SWITZERLAND
1984

PREFACE

It is difficult for those living in temperate climates to comprehend the immense burden of disease carried by the people of the tropics. Children born and raised in rural Africa are liable to be infected by four or more different disease-producing parasites by the time they reach adulthood. Every village child at times suffers the paroxysms of malaria fever, and most families will mourn the death of one or two children from this disease. Mothers are not surprised when their children pass blood in their urine, as a result of schistosomiasis transmitted by snails in the viliage pond. Those living near the rivers where blackflies breed and spread onchocerciasis, or "river blindness", know that one in ten of their neighbours may be blind in the prime of life. The ravages of disease are an integral part of every day life, but the ways which are available to prevent or treat these diseases in the hundreds of millions of people affected by them are grossly inadequate.

The Special Programme for Research and Training in Tropical Diseases (TDR) is a coordinated attack by the world's scientific community upon diseases of the tropics. Under the sponsorship of the United Nations Development Programme, the World Bank and the World Health Organization, the Special Programme has stimulated and supported a worldwide research effort towards new and improved methods to control six major tropical diseases. The Programme is also strengthening the scientific and technical resources of the tropical countries to enable them to study the scope and nature of the diseases and participate fully in the development and effective application of new methods for their control.

This book describes some of the diseases and their impact upon the lives of those threatened and affected by them. It also describes some of the efforts of the thousands of scientists who are working with the Special Programme and who have created the opportunities to build the tools needed to control the diseases. However, a great deal still remains to be done to transform these

opportunities into safe and effective means for the prevention and treatment of the tropical diseases.

We believe that the success of these efforts now depends not so much upon human ingenuity and technology, for there is good evidence that the necessary scientific skills are available, as upon the resources which mankind is prepared to devote to solving some of its oldest, most severe, but often least known problems. Success depends further upon the commitment of governments, organizations and individuals in many countries, both temperate and tropical, to provide the support which is required. After eight years of steadily increasing activity the Programme has now generated more promising leads than can be financed by its current annual income of less than $25 million. This income is derived almost entirely from voluntary contributions by governments and other agencies and additional funds must be made available if the Programme is to succeed. We sincerely hope that you will help us to bring this about.

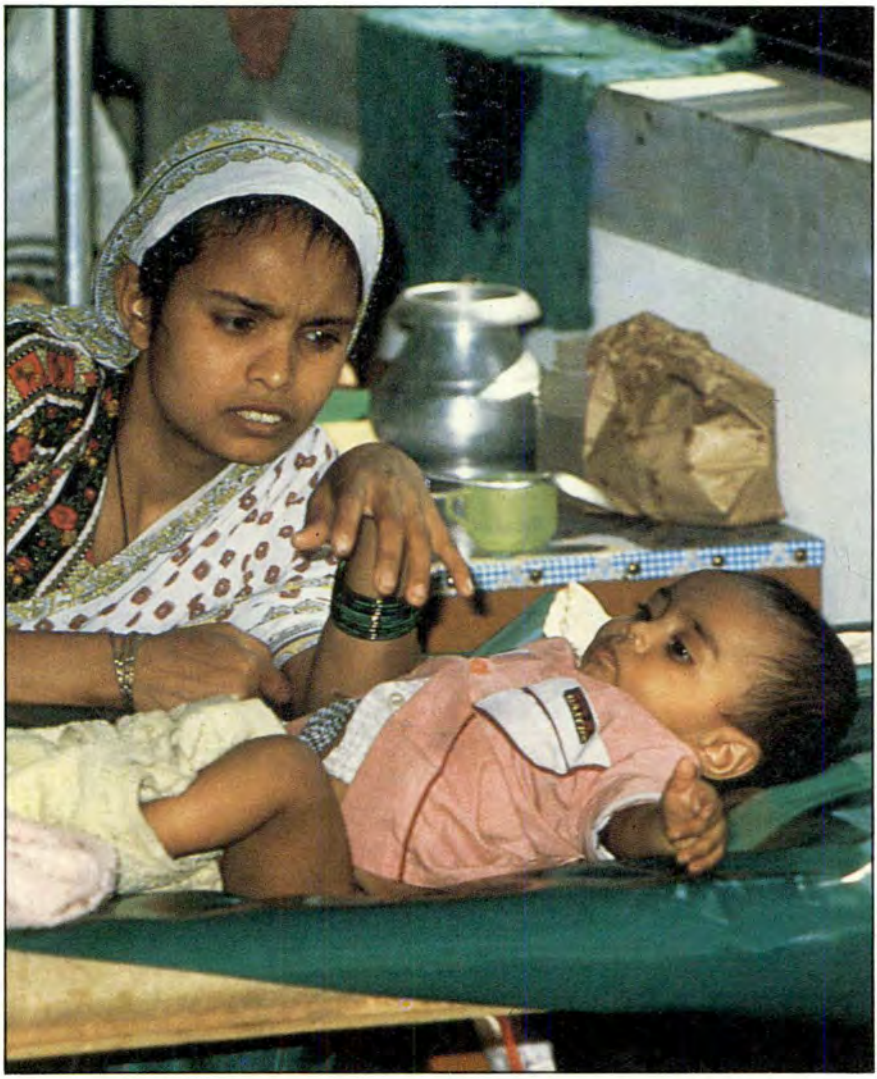
Mr A. W. Clausen
The World Bank

Mr B. Morse
United Nations Development Programme

Dr H. Mahler
World Health Organization

A WORLDWIDE NETWORK

Along the Upper Volta River Basin in West Africa, a powder made from a microorganism, *Bacillus thuringiensis,* is being used as a new way of destroying blackflies, the vectors of onchocerciasis, or river blindness. In Nigeria, a new strain of *Bacillus sphaericus,* another toxin-producing bacterium, is undergoing trials for efficacy against the mosquitoes that transmit malaria parasites.



Tropical infections are a major threat to children's health.

• In New York, a team of scientists have transferred a gene from malaria parasites to an easily grown bacterium. Colonies of these "engineered" bacteria produce a protein identical to that made by the parasites themselves, and this process will be used to prepare an experimental vaccine for the control of malaria.

• Brazil, Thailand and Zambia are the sites for trials of a new drug, mefloquine, developed in the United States and Switzerland, to treat patients infected with malaria parasites that have become resistant to the most commonly used antimalarial drugs.

• In Norway, a potential leprosy vaccine consisting of killed leprosy bacilli is being tested in volunteers. The early results are encouraging.

• In China, a substance derived from a traditional medicinal plant, *Artemisia annua,* has been found to be effective against potentially lethal cerebral malaria, and the Special Programme is assisting the Chinese authorities in the development of this drug.

• In Sao Paulo, Brazil, scientists from nine countries in the Americas have made plans to assess and standardize diagnostic tests for Chagas' disease, an infection that damages nerves of the heart and other vital organs and is often undetected in its early stages. The work is now in progress in eight of the countries.

• In the Philippines, midwives, filariasis control staff, social scientists and epidemiologists studied beliefs about filariasis among the local population. It was found that there were many misconceptions about the disease and how it is spread. A health education programme is now being planned to enable the villagers themselves to participate in improvement of disease control.

• In Jos, Nigeria; Bouaké, Ivory Coast; Bogor, Indonesia; Nairobi, Kenya; and Bangkok, Thailand, new Master's Degree courses in medical entomology are training scientists for research to improve vector control methods.

These activities, and the many others like them, are not isolated events, but part of a concerted global effort to conquer a group of tropical diseases that afflict or threaten more than half of the world's population. Six major groups of diseases are under attack—malaria, schistosomiasis (otherwise known as bilharzia or snail fever), filariasis (including river blindness or onchocerciasis), trypanosomiases (including both African sleeping sickness and the Latin American form called Chagas' disease), leishmaniases (a group of diseases having many forms ranging from self-healing skin ulcers to fatal generalized infections) and leprosy. These diseases represent major threats to health, but effective means of control are lacking for all of them. In 1976 the Special Programme for Research and Training in Tropical Diseases began work to tackle these problems.

◆

DAILY LIFE WITH DISEASE

Tropical diseases affect every aspect of human life, sometimes even beginning their damage before birth. They undermine efforts to achieve good health and a better life, and can sometimes disable entire populations. Nearly 2 400 million people live in areas where there is risk of malaria. There are an estimated 200 million cases of schistosomiasis, and the disease is gaining ground. Sleeping sickness constitutes a permanent hazard for at least 50 million people in Africa, and 20 thousand new cases occur yearly. At least ten million people in Latin America are infected with *Trypanosoma cruzi,* the parasite of Chagas' disease. The number of cases of leishmaniasis in the world is not known, but it is certain that at least 400 000 new cases occur each year. There are some 30 million cases of onchocerciasis, or river blindness, about 90 million cases of lymphatic forms of filariasis, and around 900 million people are exposed to filarial infections. The number of people with leprosy is estimated at about 11 million. The statistics are staggering but they cannot convey the degree of human suffering or the fragility of the human body's link to life when attacked by tropical diseases—often by several of them simultaneously.

Leprosy...

At the Acworth Leprosy Hospital in Bombay, some 250 patients are seen each day. Drugs are the mainstay of treatment, but the drugs which are generally available are becoming progressively less effective. Long-term treatment is required, but many patients do not return regularly for fear of becoming known as "lepers", and so losing their employment and becoming outcasts of society.

River blindness...

In parts of West Africa victims of river blindness walk to work in a line, each grasping the hand of the person ahead—all being led to the fields by a young boy who, although already infected, is still able to see.

Malaria...

Throughout the tropics, the child who has a chance to go to school may find he is numbered among the one-half or more of his schoolmates who have malaria. Some children come to class suffering from fever and pain; others are too sick to come—their education compromised from the beginning. In many parts of Africa, one child in five dies of malaria before reaching school age. Young men and women may suffer such severe attacks of fever that they cannot work the land. Pregnant women are especially vulnerable to the severe

effects of malaria, which may mean death to both mother and unborn child. Drugs, if available, may cure one attack, but cannot prevent reinfection. Resistance of malaria to drug treatment is spreading rapidly and there is a serious risk that the drugs which work today may not do so tomorrow. At the same time the mosquito vectors of malaria are becoming resistant to insecticides.

Chagas' disease...

In some villages in Latin America more than one-tenth of the people may be infected with Chagas' disease, a form of trypanosomiasis. A child bitten by a triatomine bug, the blood-sucking insect that transmits the *Trypanosoma cruzi* parasites, may not even notice the bite, and the swelling which follows may go unattended until it disappears. The infection then often remains dormant for many years, while the trypanosomes multiply, ultimately to cause severe damage to the nervous system, the heart or the digestive tract. A young man of 20 or 25 years with this disease may already be suffering from damage to the nerves of the heart. His arrhythmia—an irregular, slow heartbeat—prohibits hard work and may cause sudden death. Early diagnosis is important, since drugs effective against established disease are not available.

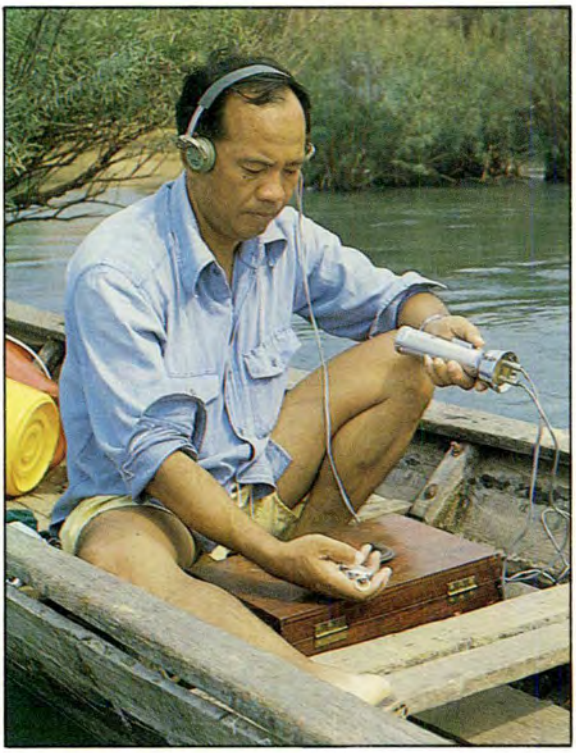
The triatomine bugs which transmit Chagas' disease become infected when taking blood from an infected human or other animal host; they transmit the parasite to a new host when they deposit their faeces at the site of their next blood meal or near an open wound. The bugs breed in trees and in cracks in the walls of dwellings made of mud, wood, palm leaves, straw or other readily available material. Over 150 species of wild and domestic animals have been found to harbour *T. cruzi*. Blood from infected donors used for transfusion can also spread the disease, and only recently has a quick test kit for the screening of infected blood been developed.

Schistosomiasis...

The glimmering water behind a modern dam—be it in Africa, Asia or South America— and the irrigation system it makes possible are signs of development and progress. But many of the farmers who work such newly reclaimed tropical lands are infected with schistosomiasis, an insidious disease caused by small worms which damage vital organs. Many irrigation projects have fostered the spread of this parasite by providing breeding grounds for the freshwater snails which transmit the disease.

These are a few examples of the effects of tropical diseases and some of the problems associated with their treatment. At their worst these diseases spell death. In less severe forms they maim, debilitate and incapacitate, both physically and mentally. For some tropical communities they represent continuous disaster, and for many they make aspirations for health and productive living unattainable.

Epidemiological survey for leprosy in India.



Measuring water velocity of a stream in Thailand during field research on mosquito larvae and malaria vector control.

INTERNATIONAL SCIENTIFIC COLLABORATION

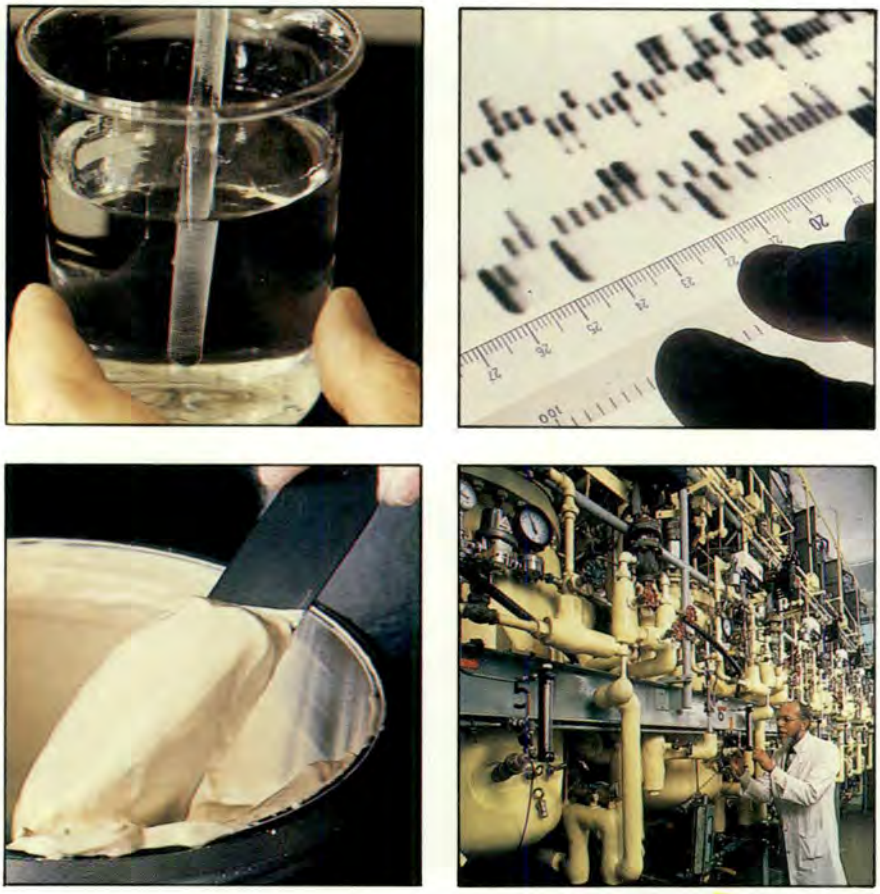
A few years ago research on tropical diseases was a neglected area. Few scientists were involved, and these came chiefly from temperate developed countries where interest in such research had waned following the end of colonial eras. The tropical countries themselves lacked the scientific and technical resources needed for this work. Thus, although tropical diseases presented some of the world's most severe health hazards there was no prospect of improvement, and indeed the situation has continued to deteriorate. Although these diseases chiefly affect the people of tropical countries, in a world where travel is increasing they also threaten the people and interests of non-tropical nations. For example, the rapid spread of drug-resistant malaria is now a matter of worldwide concern, since all those who enter these regions are at risk.

Research to design better disease control strategies and to develop and test new tools for control, such as drugs, vaccines and diagnostic tests, must necessarily take place in tropical countries where the diseases can be studied in their natural environments. Research is also needed in advanced biomedical centres to deploy the latest advances of biomedical sciences to develop new disease control tools. For maximum effectiveness these two very different types of research must be linked so as to stimulate scientific resourcefulness and ingenuity, whilst at the same time keeping the target of disease control firmly in view.

This task and challenge was recognized by the World Health Assembly in 1974 and led in 1976 to the establishment of the Special Programme for Research and Training in Tropical Diseases. The Programme is sponsored by the United Nations Development Programme, the World Bank and WHO, and executed by WHO.

The Programme's objectives

The Programme has two main objectives. The first is to harness all available technology to develop new tools and methods to improve disease control. The second is to strengthen research in tropical diseases in the countries where these diseases are endemic. Under the Programme over 3 000 scientists are working in multinational and multidisciplinary groups on the planing and conduct of research and development. In parallel an international group of experts works with institutions and governments of tropical countries to strengthen the foundations of national programmes of research on tropical diseases. The integration of so many efforts, and striking the right balance between activities, is the task of a small independent group of highly



Some of the steps of genetic engineering technology: 1 - Pure DNA is extracted from a treated cell solution; 2 - Reading the nucleotide sequence of genes (their "code") from band patterns on electrophoresis gel; 3 - Centrifuged bacteria form a paste containing the substance coded by grafted genes; 4 - Engineered bacteria are grown in fermentation tanks.

experienced scientists, the Programme's Scientific and Technical Advisory Committee.

In this way vast amounts of knowledge and skill have been brought to bear to plan and evaluate progress in research on six tropical diseases and at a cost of little more than that necessary for convening meetings of scientists. The research projects which implement these plans are carried out by scientists using the resources of established research institutions, the Programme providing only those additional funds which are necessary for the conduct of the project. No new capital investments are made and every opportunity is taken to collaborate with other agencies, programmes and institutions working in related areas of research. The Special Programme now involves scientists in over 125 countries.

The effectiveness of this new approach to research and development can be illustrated in many ways.

- The resources needed for screening potential new drugs against onchocer-

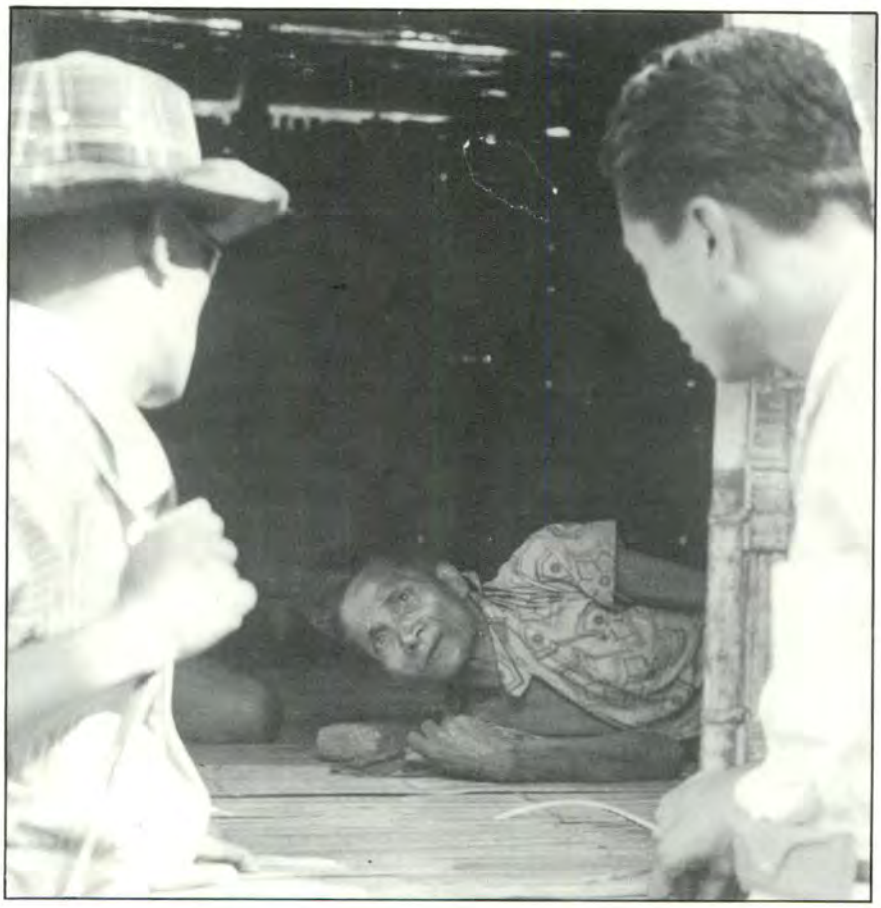
ciasis, or "river blindness", are scattered through many continents. New compounds are synthesized in Europe and Japan, and undergo a first stage of screening for effectiveness in Europe and America. The second stage of screening takes place in Australia using a local variety of cattle which have proven to be the best models for human disease. Finally, those compounds which pass the screens and safety tests are tested against human disease in Africa.

- The distribution and spread of drug-resistant malaria is monitored by scientists in dozens of countries using standardized tests and protocols developed by the Special Programme.
- The Special Programme acts as a source of biological materials which would otherwise be very difficult to obtain. For example, leprosy bacilli are needed for a variety of specialized studies; the Programme has established a bank of bacilli, and supplies scientists throughout the world.
- Much of the value of epidemiological disease surveys depends upon their comparability from one country and from one study to another. The Programme has standardized research protocols for such surveys and for the diagnostic tests used in them.

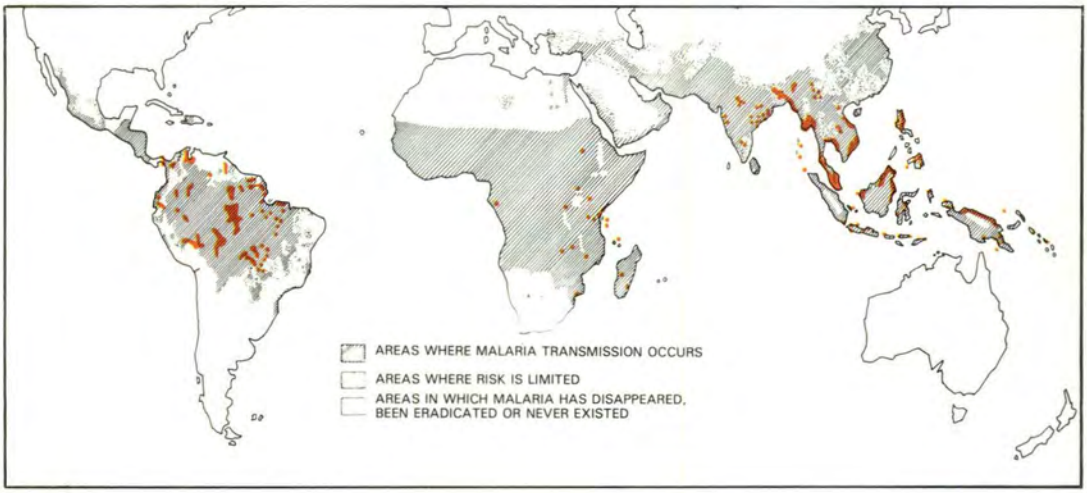
The Special Programme is pleased to acknowledge the collaboration of the pharmaceutical industry in the planning and execution of research. By the end of 1983 seventy-eight scientists from 41 companies had been involved in Special Programme projects and in planning the development of new drugs and vaccines. The Programme complements the skills and experience of industry in drug and vaccine development through the provision of facilities for the determination of effectiveness against disease in animal models, and through collaboration with tropical countries to provide facilities for essential pharmacological and clinical studies in man.

Training grants

Under its policy of strengthening research in endemic countries the Programme has awarded over 500 training grants and is providing financial and other support to more than 60 national institutions to strengthen their research capability according to their individual needs. The effects of these efforts are now becoming apparent. The proportion of Programme funding going to scientists and institutions in developing countries in the tropics has risen steadily from 29% in 1977 to over 55% in 1983, and more than one-third of the publications resulting from Programme research projects have come from scientists working in institutions of tropical countries.



One-half of the world's population lives in areas where there is risk of malaria, and it is estimated that more than 200 million people are infected.



Map snows the regions where malaria is endemic and, in red, the areas where malaria parasites have become resistant to chloroquine and related drugs.

THE KING OF DISEASES

In ancient India, malaria was known as the "King of diseases". One of the world's most widespread and severe diseases, it has plagued mankind since prehistoric times. In recent years, the relaxation of control measures, the resistance of malaria parasites to antimalarial drugs, and the resistance of the mosquito vectors to insecticides have combined to create a dangerous and potentially explosive resurgence of the disease.

For centuries malaria has been treated with various medicinal plants, notably the bark of cinchona, a tropical tree from which quinine was isolated in 1820. Chloroquine, a major antimalarial drug, was synthesized almost half a century ago, and other related compounds followed. With the advent of DDT as an effective and inexpensive insecticide, total eradication, even in tropical areas outside Africa, appeared feasible and became the objective of a World Health Organization programme started in the late 1950s.

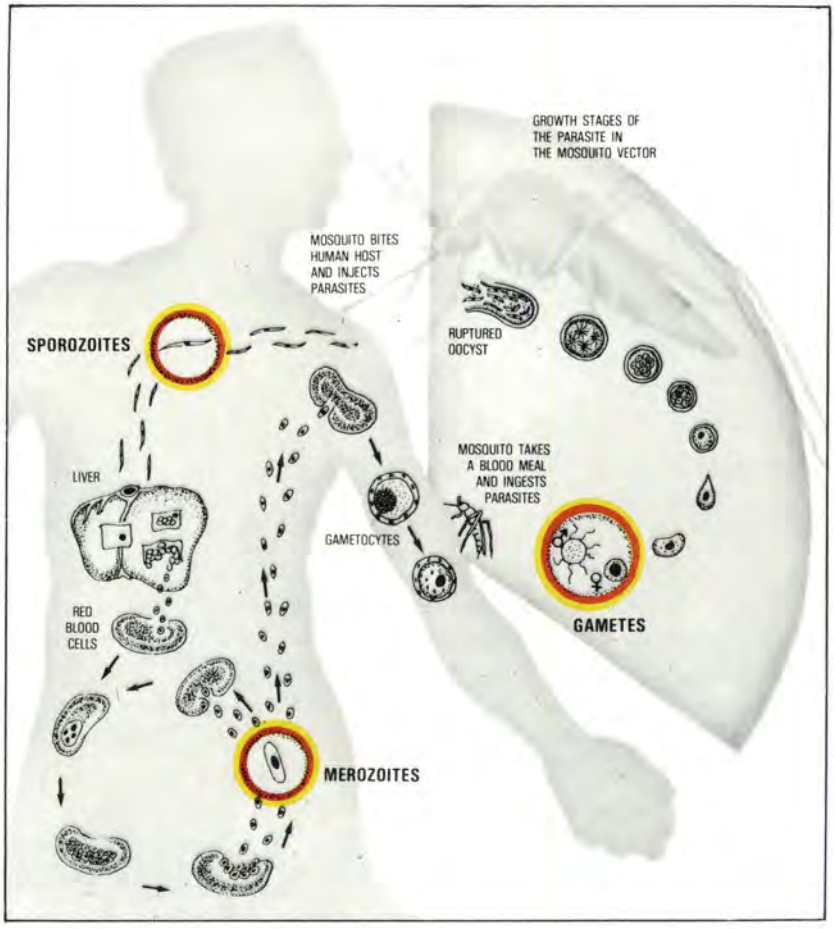
More than 50 countries undertook eradication programmes. Mosquito-killing insecticides were used to interrupt the cycle of transmission and drugs were employed to destroy the parasites in their human hosts. By the early 1960s, the disease had been eradicated in a number of countries in Europe and the Middle East and in parts of South America and the southern United States. By 1965, India had reduced the number of cases from tens of millions to about 100 000, and in Sri Lanka only 17 cases were reported in 1963.

Then malaria struck back. In 1969 about half a million cases were reported in a total population of 12 million in Sri Lanka, and in 1976 some 6.5 million cases were reported in India. In the WHO South-East Asian Region the number of reported cases rose from 1.8 million in 1972 to 3.7 million in 1980. In tropical Africa, where the infrastructure for an eradication programme was lacking, the disease has always remained highly endemic, and it is estimated that more than 200 million people are infected.

What are the reasons for these severe setbacks?

Large numbers of mosquitoes were out of reach of the DDT spraying campaigns and others gradually became resistant to this insecticide, which was also widely used in agriculture. Some sought new breeding places or began to avoid the places sprayed with DDT. Spraying campaigns were often too difficult or costly to carry out. Other insecticides came into use—usually more expensive chemicals such as dieldrin, malathion, temephos and permethrin, but resistance has now become widespread to these agents. Sometimes initial success was followed by a relaxation of efforts, leaving the door open to renewed breeding of mosquitoes and resurgence of disease.

Just as mosquitoes became resistant to insecticides, parasites became resistant to drugs. A number of antimalarials—quinine, chloroquine and other



Life-cycle of the malaria parasite. Targets of potential vaccines are highlighted–sporozoites, merozoites and gametes.

related drugs, primaquine, proguanil and pyrimethamine—have been used for many years, some taken regularly for prevention, others for treatment. The most useful compound has been chloroquine, but *Plasmodium falciparum,* the most dangerous of the malaria parasites, became resistant to it in large areas of South-East Asia, South America and the Western Pacific. Resistance has spread to the Indian sub-continent and has now appeared in Africa, where the danger is greatest because in Africa *P. falciparum* is the main malaria parasite, chloroquine has been the mainstay of treatment, and mosquito control is not possible on a large scale.

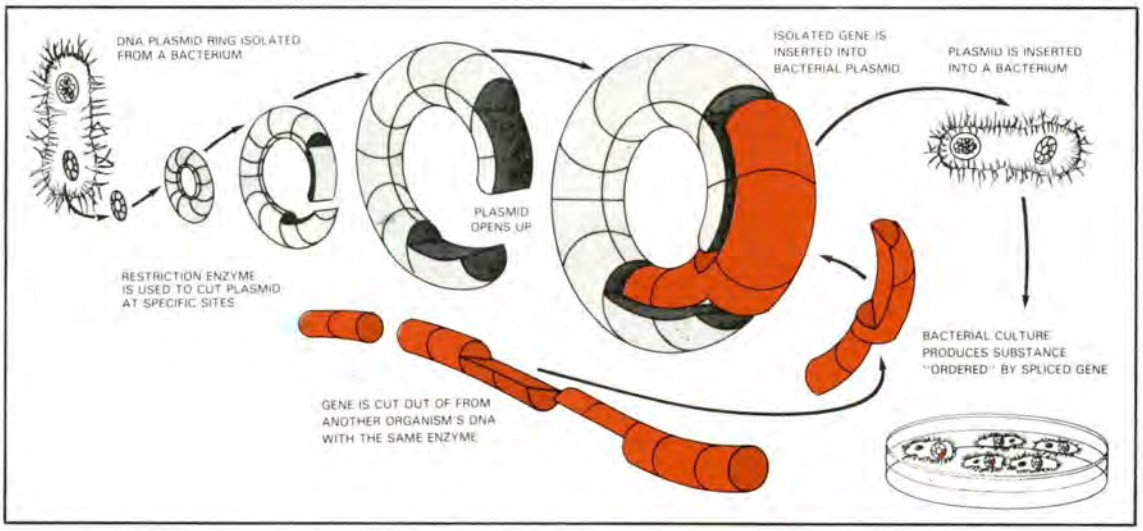
The promise of vaccines

There is no question of achieving the global eradication of malaria in the foreseeable future, but new tools now being developed under the Special Programme may pave the way to better control. Vaccines are one such tool. Un-

til recently, the development of a malaria vaccine was not considered realistic. Now several potential vaccines are being developed and some of them should be ready for trial within the next few years.

The immune defences of the body are much less effective against malaria than against many viral and bacterial infections, where infection (or vaccination) confers long-lasting immunity to subsequent attack. One of the reasons for the severity and persistance of malaria is that the parasites partially isolate themselves from the host's defence by residing within body cells, chiefly liver and red blood cells. However, there are times during the life-cycle when the parasites are more accessible, and therefore more vulnerable. Vaccine development concentrates on these vulnerable periods.

One of these occurs during the brief period after the parasite (in its sporozoite stage) has been injected into man by the mosquito vector and before it enters the host's liver cells. It has been known for some time that antibodies to sporozoites can protect against infection by blocking this entry. Immunization might therefore be achieved by vaccination with sporozoite proteins, i.e. using these proteins as antigens to induce protection. Until recently there was no way of obtaining sufficient quantities of antigens for experimental studies, let alone for vaccines for general use. Recently, however, the gene that codes a protective sporozoite antigen has been identified, and genetic engineering has been used to insert this gene into a bacterium. Bacteria modified in this way manufacture the sporozoite antigen; they can be cultivated easily, thereby opening the door to vaccine development in animal models, and subsequently in man.



Genetic engineering technology. Schematic drawing shows how a microorganism (here a bacterium) is "manipulated" and turned into a production plant for a desired biological substance.

Antimalarial drugs may be added to ordinary kitchen salt, but such systematic use may lead to parasite resistance to these drugs. Different strategies, new drugs and drug combinations must be studied to avoid, or at least delay, resistance.

The microbiologists at New York University Medical Center who did this work used as a model the sporozoite of *Plasmodium knowlesi,* a monkey malaria parasite. The chemical structure of the immunogenic part of the major sporozoite antigen has now been worked out and it can be produced by chemical synthesis. Studies on the corresponding antigen of the human malaria parasite, *Plasmodium falciparum,* are under way. Similar principles are being applied to the search and production of protective antigens from malaria parasites at other phases of their life-cycle.

The merozoite stage, which results from a multiplication of the parasite in the liver and in red blood cells, is another focus of vaccine research. Merozoites invade red blood cells and so perpetuate the blood phase of the infection that provokes the major symptoms of malaria—high fever and rigor. Merozoite antigens have recently been isolated and found to induce immunity to malaria in mice, and similar studies are in progress on the merozoites of human malaria parasites. A successful merozoite vaccine could prevent the severe clinical effects of disease.

Another possible vaccine would be one that acts against the gametes (sexual stage) of the parasite. Gametes mature in the mosquito's stomach after

A malaria patient being carried to the dispensary.

ingestion of infected blood; there they fuse, and further development leads ultimately to the production of the sporozoites that transmit the infection when the mosquito bites again. The fusion of gametes in the mosquito can be prevented by antibodies to gametes in the ingested human blood. Vaccination causing the production of such antibodies by the human host therefore carries the potential of interrupting malaria transmission by the mosquito. Such vaccination would be entirely novel in concept; it would not prevent disease in the vaccinated person, but would prevent the transfer of his infection to others.

It is not known what type of vaccine will become available first for human trials but it is now clear that immunization against malaria is a realistic goal. A sporozoite vaccine could potentially prevent infection by attacking the parasite at its earliest stage of development in man. A merozoite vaccine could be used to reduce morbidity and the mortality associated with falciparum malaria, particularly in children and pregnant women. A gamete vaccine could reduce or interrupt transmission of the disease. Several types of vaccines, or vaccines combining several antigens, may eventually be required.

Dr. Adetokunbo O. Lucas, Director of the Special Programme, believes that "from a public health point of view, a vaccine preventing severe illness and death among the highly susceptible would be a major boon, especially if the protection were to last a year or so. But even a short period of protection would help, since in some parts of the world, the transmission season lasts only a few months each year". The Nigerian epidemiologist concludes: "Therefore, a vaccine effective for six months could protect during the entire transmission season. Of course, there are problems of logistics in deliver-

ing any of these new tools to the community. But at present we have to give people drugs which they must take daily or weekly, and something that would need to be administered only once a year or even every six months would be a lot simpler".

The mefloquine story

A new antimalarial drug will be available sooner than a vaccine. The development of mefloquine, a much needed replacement for drugs against which malaria parasites have developed resistance, has been an outstanding example of collaboration among the Special Progamme, several research institutes and the pharmaceutical industry.

The story starts soon after the advent of chloroquine resistance in *Plasmodium falciparum,* when the Walter Reed Army Institute of Research (WRAIR) scaled up its extensive research programme during which more than 300 000 compounds were synthesized and tested for antimalarial activity. In 1971 an active compound was discovered, selected for further development, and given the name mefloquine.

In 1975, research scientists from the Swiss pharmaceutical company Hoffmann-La Roche and representatives of WRAIR participated in a Special Programme planning meeting on the chemotherapy of malaria. Interest was expressed in the rapid development of mefloquine, but neither the Special Programme nor WRAIR were in a position to develop the drug alone. Hoffmann-La Roche offered to produce a mefloquine preparation and to provide amounts sufficient for clinical trials free of charge to the World Health Organization. It took about two years to develop a process of synthesis on an industrial scale and to achieve an acceptable formulation of mefloquine, a costly and complex multi-stage process. The Special Programme and Hoffmann-La Roche then collaborated in a series of clinical trials in Brazil, Zambia and Thailand, which confirmed the compound's safety and efficacy in man. It was found that infections with falciparum malaria, even when resistant to commonly used drugs, could usually be cured with a single dose.

But just as resistance developed to chloroquine, so it is likely to appear to mefloquine. Two steps are being taken to delay this: firstly, combinations of mefloquine with other antimalarials are being developed, and a pharmaceutical formulation of mefloquine with sulphadoxine and pyrimethamine will be registered very soon; secondly, WHO is advising countries on the rational use of mefloquine and mefloquine combinations and cautioning against indiscriminate use which can lead to resistance.

Qinghaosu

Another promising antimalarial drug is undergoing trials in China. The use of the herb qinghao *(Artemisia annua)* for the treatment of malaria was first recorded in the *Zhou hou beiji fang,* "Handbook of Prescriptions for

Qinghao (Artemisia annua)

Emergency Treatments", written by the Chinese physician Ge Hong in 340 A.D.

Chinese scientists have renewed their interest in qinghao in recent years. They have isolated the active principle, Qinghaosu, and found it to be a compound completely different in chemical structure from all other known antimalarials. The two most important species of human malaria parasites, *P. falciparum* and *P. vivax*, even if resistant to chloroquine and other antimalarials, appear to be sensitive to Qinghaosu.

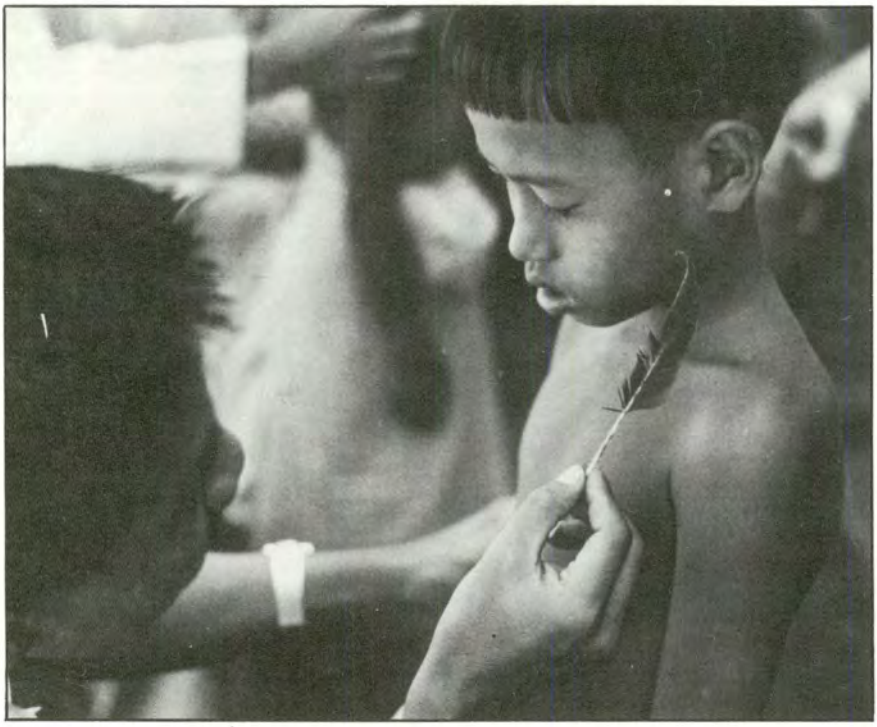
Extensive clinical studies of Qinghaosu and its derivatives have been carried out in China, notably in Yunan Province, Henan Province and Hainan Island. There is particular interest in two derivatives, artesunate and artemether, which appear to be of life-saving value in the treatment of cerebral malaria, the form that affects the brain and causes damage to the central nervous system, frequently leading to coma and death.

Other drugs

The number of effective antimalarial drugs now available or under advanced development is clearly inadequate in view of the problem of drug resistance and the severity of malaria as a public health problem. Biochemical processes have been identified in the parasite which are absent in the host and these should provide useful leads for the identification of totally new types of antimalarials. There is now renewed interest among industrial and academic scientists in the development of new drugs, and a number of promising compounds have been identified.

Malaria is a formidable adversary, and problems of its control and therapy are severe and likely to become worse. Vaccines and new drugs will be important in the future, but they alone may not be sufficient. Other lines of research are in progress. One of these, the development of biological control agents for mosquitoes, is described later. In addition to better technical tools, research is needed into the operational, epidemiological and sociological aspects of malaria control. This work is under way.

Instruction in simple physiotherapy and group exercise are organized for leprosy patients whose hands are affected.



A Burmese child being examined for loss of sensitivity of the skin, which is an early sign of leprosy.

LEPROSY: NEW HOPE

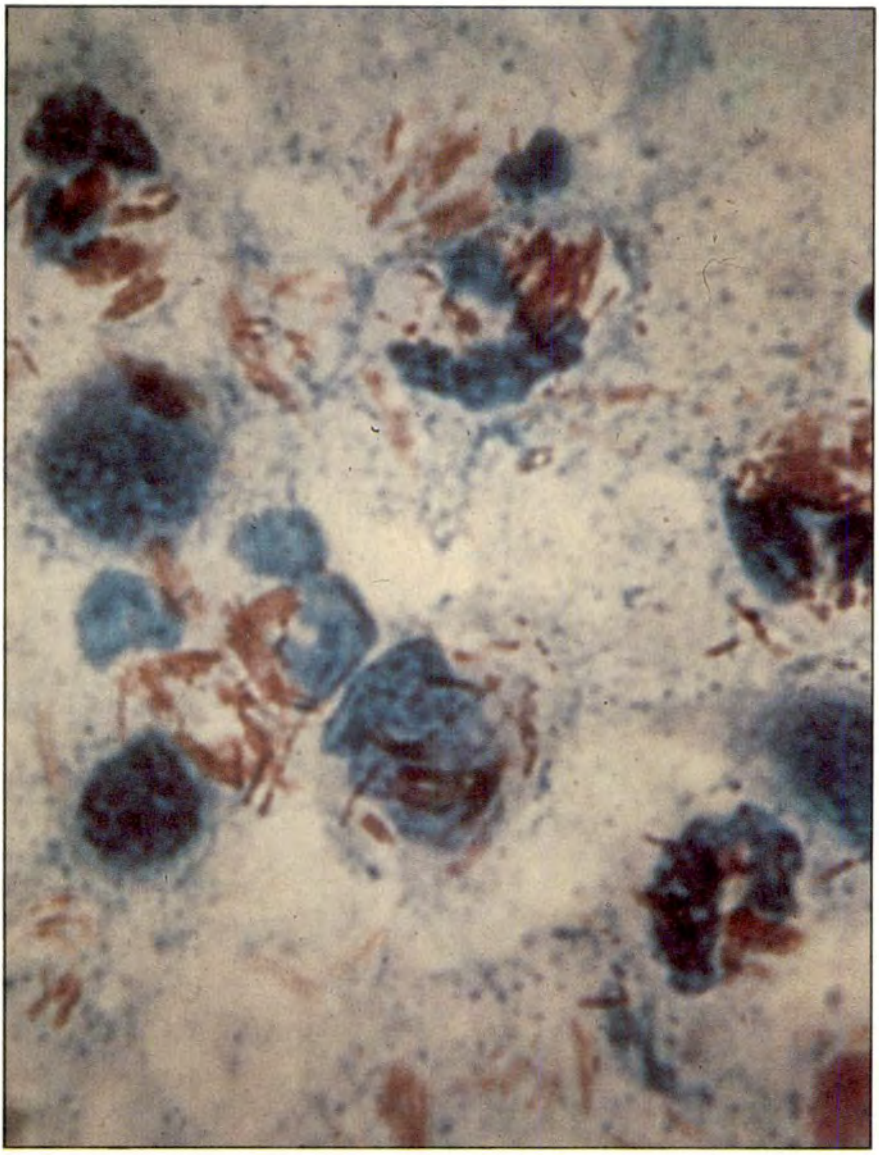
For the public, leprosy is one of the most misunderstood of the infectious diseases; and for the patient, one of the most tragic. Throughout the ages the disease has been looked upon with horror and in 18th century Europe, leprosy patients were still liable to be locked up in leprosaria, or had to wear bells to warn people of their approach. To this day leprosy patients are often ostracized from society and made to feel guilty for having the disease. Because of these attitudes there has been an attempt to abandon the term "leprosy" in favor of "Hansen's disease", after the Norwegian physician Armauer Hansen who first identified *Mycobacterium leprae* more than a century ago.

One misconception about leprosy is the notion that it is a disease only of the past. There are more than 11 million people with this disease in the world today, mostly in tropical regions of Africa, Asia, especially India, and Latin America. Another erroneous belief is that the disease is easily contracted. In fact, few persons exposed to patients develop the disease, even though the infective agent may have been transmitted to them.

For the past thirty years leprosy has been treated effectively with the drug dapsone administered over very long courses, often for the lifetime of the patient. This advance has benefited millions, but there are now severe problems. Resistance of *Mycobacterium leprae* to dapsone has appeared on a worldwide scale, and in some studies resistance has been found in as many as one-third of new patients. Another problem is that drugs, even when they do work, cannot restore the mutilations caused by disease. There is also the chilling fact that only one in four leprosy patients ever receives systematic treatment and, since leprosy does not kill directly, most patients have to live out their lives as best they can without the benefit of effective therapy. Research is in progress to improve drug treatment, to develop tests for the diagnosis of infection before the appearance of disease and to develop a vaccine. People's attitudes and perceptions of leprosy are also under study, in the expectation that improved understanding of the disease will help to remove the stigma which is so great a barrier to treatment and control.

To improve chemotherapy, several different combinations of drugs have been assessed and have shown varying degrees of effectiveness. The effective combinations are more costly, but they are also more cost-effective than dapsone and they do not require life-long administration. The new multi-drug regimens are now recommended by WHO for use in leprosy control programmes. In addition the activity of several new compounds is being assessed in animal models.

Immunological studies have shown that there are constituents of *M. leprae*



Acid-fast (red staining) M. leprae *with tissue cells.*

which are not present in other mycobacteria. The detection of these constituents, or antibodies to them, could provide evidence of early infection. Tests for subclinical infection now being developed on this basis could also help to solve an important enigma of this disease: how infection spreads and maintains itself in human populations.

A leprosy vaccine

There is now hope that vaccination against leprosy can be achieved. There was a major advance in 1971, when researchers in the United States discovered

that injection of *M. leprae* into nine-banded armadillos caused massive infection, especially of the liver. A single gram of armadillo liver tissue can yield as many as 10 billion bacilli, which may be enough to produce from 100 to 1 000 doses of vaccine.

M. leprae in these amounts was sufficient to begin a worldwide research effort in vaccine development. The Special Programme has supplied researchers with leprosy bacilli, funded and coordinated their efforts, and made it possible for them to meet to compare results and explore new ideas.

"Armadillo farms" were established to grow *M. leprae,* ways were found to harvest and extract the bacilli from armadillo tissues, and the protective properties of killed bacilli were studied in animal models. There is now good evidence that a preparation of killed *M. leprae* does protect animals from infection.

A vaccine comprising killed *M. leprae,* prepared by the Wellcome Research Laboratories in England under contract with the Special Programme, is now undergoing trials in volunteers in Norway. Such tests are conducted in areas remote from the disease so that the results are not confused by previous exposure and possible immunity to infection. Studies focus on the immune response, the determination of the most appropriate dose and, of course, on the safety of the vaccine.

There is very encouraging evidence from recent research that a leprosy vaccine could be used for treatment as well as prevention. Dr. Jacinto Convit in Caracas, Venezuela, found that inoculation of killed *M. leprae* with the tuberculosis vaccine (BCG), together with chemotherapy, was effective in treatment of patients with severe lepromatous leprosy. Dr. Convit feels that if existing disease can be arrested in this way, there is even more hope that a vaccine may be effective in preventing the disease.

The Special Programme is now entering the phase of field trials of leprosy vaccines. Leprosy is a disease of low incidence, with a long incubation period, so that assessment of the protective efficacy of vaccines will require observations on large populations over many years. For this reason as much information as possible about vaccine efficacy will be obtained from preliminary small-scale studies, and the design of large-scale trials will be based upon these initial findings.

The development of leprosy vaccines to their present stage is the direct result of collaboration between scientists in many different disciplines, which include cell biology and fractionation, the immunology of infectious processes and clinical immunology, vaccine design and safety, and epidemiology. To conduct this research the Programme by the end of 1983 had provided research contracts to 65 scientists in 23 countries, and vaccine development is progressing on schedule, according to a plan originally drawn up in 1974. This is both a tribute to the foresight of the scientists who made the plan, and a practical example of what can be achieved by an international collaborative research network.

A conical trap, one of several different types of traps developed to catch tsetse flies.

 Several kilograms of dead flies are emptied from the trap.

NATURE'S OWN TOOLS

The infective agents of the six tropical diseases, with the exception of leprosy, are transmitted from one individual to another by various animal vectors, which include mosquitoes and other blood-sucking insects, and freshwater snails. Control of vectors can be a practical way to slow or stop the transmission of infection and is therefore an essential part of disease control.

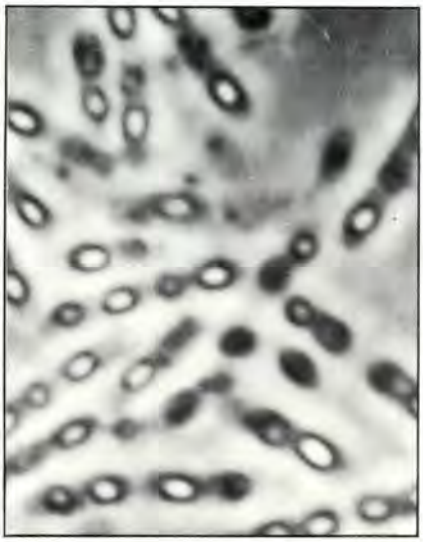
Vectors such as mosquitoes, blackflies and snails can be killed by chemical pesticides, and insecticides such as DDT have been widely used with considerable success. But there are disadvantages: chemicals can be expensive, the target vectors can develop resistance, a variety of non-target organisms may be affected, and the intensive use of chemicals (particularly for agricultural purposes) has given rise to concern for damage to the environment.

An alternative approach to vector control is to use a biological agent, that is, an organism or its product which preys on or destroys insect vectors under natural circumstances. Such an agent is less likely to be an environmental danger and may have other advantages such as low cost and the possibility of being produced locally.

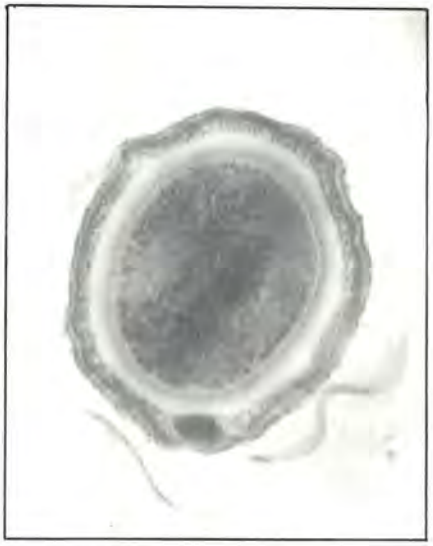
The two dozen or so organisms now being studied as potential vector control agents include viruses, bacteria, fungi, protozoa, nematodes, flatworms, fish, and insects such as predatory mosquitoes. Top priority has been given to one bacillus that has now become the object of worldwide research: *Bacillus thuringiensis* Serotype H-14, or *B.t.* H-14. This agent was developed to a great extent by industry and the Special Programme and has been tested in both temperate and tropical environments. It has been found to be remarkably safe, yet it is highly toxic to the larvae of two important disease vectors, the blackflies which transmit river blindness and the mosquitoes which transmit malaria and filariasis.

These effects are due to a specific toxin of the bacillus, present in bacillary spores. (Spores are the forms of bacilli especially adapted to withstand drying and other environmental hazards). The *B.t.* H-14 vector control agent consists of spores which are produced by large-scale fermentation, and then appropriately formulated to reach the vector under attack.

B.t. H-14 came to the attention of the Special Programme after Israeli scientists isolated a bacillus from ponds where mosquitoes were breeding. The spores of the bacillus were found to be highly toxic to mosquito larvae. The bacillus was subsequently identified at the Pasteur Institute, Paris, as *B.t.* H-14. Further research, sponsored in part by the Special Programme, confirmed the efficacy of *B.t.* H-14 against the larvae of mosquitoes and blackflies, and showed that the spores were specific in their attack on these



Phase contrast micrograph of Bacillus thuringiensis H-14 *shows toxic crystals (dark spots) in the spores.* B. t. H-14 *is used for mosquito and blackfly control. Local production is being developed.*



Electron micrograph of B. sphaericus, *another larvicidal microorganism being studied for vector control.* B. sphaericus *can multiply and survive in the field and may be effective for longer periods.*

larvae and harmless to both cold-blooded and warm-blooded animals, including man. In fact, fish even feed on it.

Moreover, neither resistance nor cross-resistance developed during any of the tests, and the toxin was shown to be stable at tropical temperatures—an important feature for storage. The Special Programme supported studies to establish the safety and efficacy of different forms of the preparation. It obtained industrial collaboration for production and conducted laboratory and field trials to determine the appropriate dosage.

B.t. H-14 is now in use for blackfly control in the Onchocerciasis Control Programme in West Africa, in areas where the larvae of flies have become resistant to chemical insecticides, and in other areas for pest mosquito control. Its suitability for controlling vector mosquitoes is now being studied. A drawback of *B.t.* H-14 is that its spores do not usually replicate themselves in the environments where they have been used, so that they are effective for only a short time and must be re-applied frequently for continuous effect. Bacilli which replicate would be expected to be effective for much longer periods. Strains of another larvicidal bacillus, *Bacillus sphaericus,* which can replicate, have been discovered in Indonesia, Sri Lanka and Nigeria, and preparations of these strains are now reaching the final stages of pre-industrial development.

Genetic engineering now opens up new possibilities for improvment of bacillary larvicides. It may be possible to increase toxin production, or to insert genes for toxin production into organisms which replicate more readily. The Special Programme is considering these approaches. If better agents are produced in this way they would be subjected to rigorous safety testing, similar to that used for existing agents.

The small fish, Tilapia zilli, *feeds on mosquito larvae. When introduced in traditional Somalian water reservoirs, it destroys nearly all larvae.*

Please don't eat all the fish

Field trials of another biological vector control agent—in this case fish—have been completed in Somalia. Nomadic pastoral populations of semi-arid northern Somalia use large man-made reservoirs called "barkits" to conserve water for the dry season, and these reservoirs form important breeding sites for mosquitoes transmitting malaria. A fish known as *Oreochromis spirulus spirulus* or *Tilapia zilli* that feeds on mosquito larvae was introduced into the barkits. Studies on more than 1 000 barkits in 26 villages showed that larvae were virtually wiped out by these fish.

The fish are hardy and they can be reared and stocked in ponds and pools during the dry season, when many barkits are empty. An added bonus is that they grow large enough to be worth eating. This and the noticeable reduction in the number of mosquitoes and of malaria have no doubt contributed to quick community acceptance of this simple biological method of vector control. There is a prospect that larvivorous fish, used in combination with the treatment of known cases, will interrupt malaria transmission in the special circumstances of northern Somalia.

The Special Programme is now seeking other biological control agents. A list of candidate agents has been prepared, and research workers of tropical countries are being trained in the methods of searching for and identifying useful organisms.

Factors such as daily activities and housing conditions are being studied to determine their role in disease transmission.

DISEASES ON THEIR OWN GROUND

One promising line of research on tropical diseases is concerned with new technological developments, such as new drugs, vector control agents and vaccines. A second line of research is directed towards improvement of operational strategies and programmes for disease control. Such research includes studies of the epidemiology of diseases, operational research and evaluation of social and economic factors relevant to disease control. With its global setting, the Special Programme has exceptional opportunities to pursue these lines of research and to link them with new technological developments. For example, following the development of a new diagnostic test for African trypanosomiasis in a European research laboratory, the Special Programme assessed it in the field and undertook further development of the test in the laboratory to solve a problem of stability which became apparent during the field testing.

Taking stock of the enemy

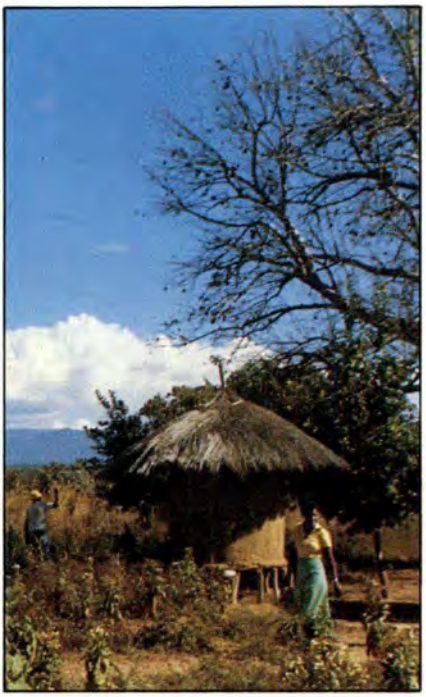
As more knowledge is obtained about the distribution of diseases and of the parasites and their vectors, the available tools can be used more efficiently for controlling them. However, the epidemiologists who analyse and interpret this type of information are in short supply in many developing countries of the tropics.

Plans for disease control are often hampered because not enough is known about the local distribution of diseases. In collaboration with Ministries of Health and national scientists, this gap is now being filled. Teams of epidemiologists are now working in the affected communities, and in some cases throughout entire countries, to provide the basis for planning or revising national control strategies. This effort is now paying dividends. On a global scale, there is now a better idea of the dimensions of the problem of the leishmaniases—a group of diseases which had tended to be overlooked in the past. National surveys of Chagas' disease are now being conducted in several countries using a standardized protocol. Such international collaboration and exchange of information help adjacent countries to fight a common enemy that ignores national boundaries.

In the past, cases of drug-resistant malaria were reported from various places, but a clear picture of the distribution of resistance could not be discerned from these isolated reports. Now, in 32 countries scientists and technicians trained by the Programme are using a standard protocol and special kits to monitor this problem.

Features of tropical diseases such as the uneven geographical distribution of cases within affected countries, the occurrence of focal outbreaks, and

Research has shown that domestic and wild animals are "reservoirs" of trypanosome parasites and an important link in the transmission cycle of sleeping sickness.



Disease control strategies geared to locations and populations.

variations in incidence with season and with other events can often provide valuable clues on the relationship of the parasites to their environment. Such clues can be exploited to the disadvantage of the parasites and their vectors. For a long time the waxing and waning of the West African form of sleeping sickness due to infection with *Trypanosoma gambiense* remained a mystery. Now epidemiologists working with immunologists and geneticists have tracked the parasite to a reservoir in domestic and wild animals. Transmission from this reservoir could be responsible for new flare-ups of disease in man. Similar clues are being sought for other diseases to provide a better understanding of transmission and a more rational basis for control.

Working with the people

Sometimes disease control programmes fail because of lack of understanding and cooperation by the local population. In the Philippines social scientists found that people gave various names and ascribed various causes to the different symptoms of filariasis, and that in general they associated the disease with working in water and carrying heavy loads. Based on this finding a local health education programme has been set up to increase community participation in the work of detection and treatment.

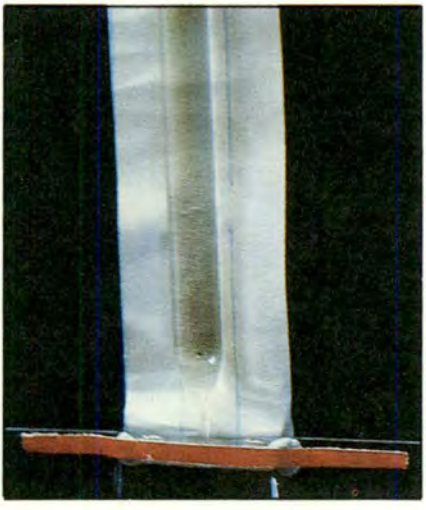
In Nigeria sociologists, local health workers and traditional healers are studying people's knowledge and understanding of different tropical diseases and the ways used to control them. Based on the findings appropriate health education is being planned for children and adults, including the preparation of an educational primer.

Better strategies for control

In Thailand an economist worked with the malaria control programme to evaluate the costs and effectiveness of different procedures for malaria surveillance. It was found that on both counts malaria clinics were much superior to home visiting, and a method for costing of surveillance was developed for future use.

In the Dominican Republic social scientists are working with the Malaria Division of the Ministry of Health to study social and economic factors associated with the transmission of malaria. Findings will be used to improve the strategies of control programmes; these are already being reviewed in the light of special problems which were found to be associated with migration and economic status.

Research on disease control strategies, which are often specific to locations and populations, will require many different studies in different countries. The Special Programme faces this challenge in several ways. Firstly, it considers that research must be regarded as an essential part of every disease control programme and encourages national authorities to appreciate its importance. Secondly, in view of the great shortage of epidemiologists, sociologists and economists working in the health sector in tropical countries, it has instituted postgraduate training programmes in these disciplines. Thirdly, it conducts its own research on these topics, both to obtain information directly relevant to disease control in certain locations and to develop and improve research methods for more general application.



Field study of a trypanosomiasis diagnostic technique carried out by the Ndola Centre in Zambia: 1 - Routine screening of a population at risk; 2 - Taking a blood sample; 3 - The "mini anion exchange column" technique takes advantage of different electric charges to separate blood cells and trypanosome parasites; 4 - The trypanosomes pass first, and the eluate is centrifuged and deposited on a microscope slide; 5 - Microscope examination reveals presence or absence of trypanosomes.

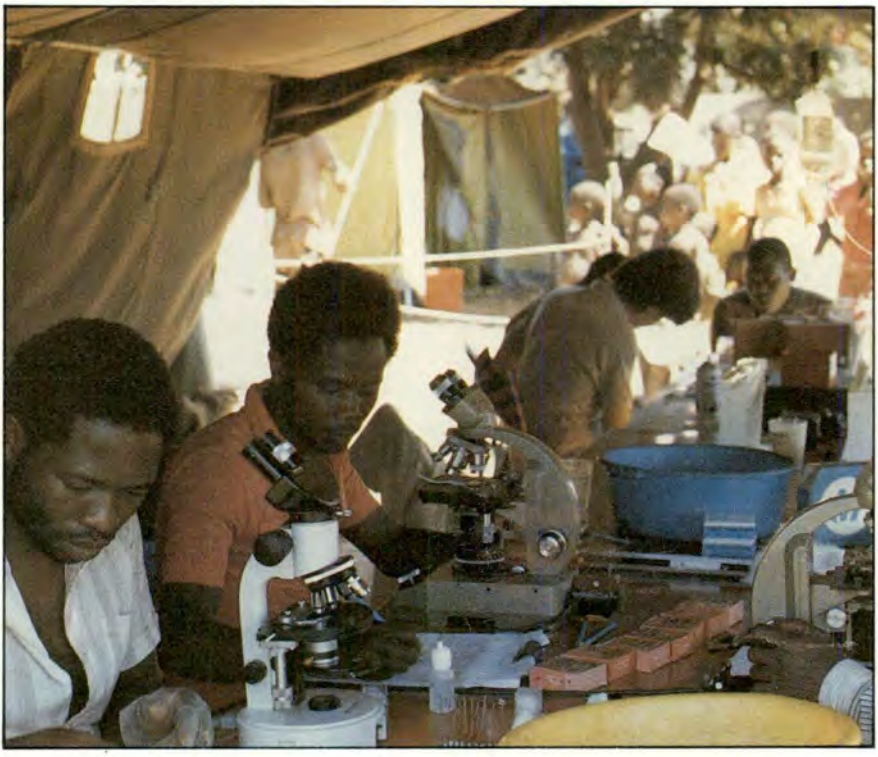
PARTNERS IN RESEARCH

A great variety of studies are required to improve the control of tropical diseases and many of these must necessarily take place in the countries where the diseases are endemic. New tools for control must be field-tested; clinical, epidemiological, human behavioural and vector control studies are examples of work which can only be conducted on site in tropical countries. The conduct of such research is the responsibility of tropical countries and their scientists. Moreover, diseases and populations at risk are not unchanging. If disease control is to be achieved and maintained, tropical countries themselves must be competent to tackle new problems as they arise. The Special Programme has from its beginning recognized the importance of assisting tropical countries to acquire the competence in research which is needed to undertake these tasks.

How best can this assistance be provided, in view of the magnitude and diversity of the needs? The Special Programme has adopted the following policies and guidelines:

- The Programme seeks to create a network of research institutions in tropical countries which jointly possess expertise in all the areas of research which are required to improve disease control.
- The Programme identifies institutions for membership of the network on the basis of their resources and the institutional and national commitment to research.
- In the first stage of building the network the Special Programme has assisted a number of institutions which already possessed a degree of scientific competence. Now in the second stage, these strengthened institutions are beginning to assist in the strengthening of other institutions in tropical countries.
- The Programme provides support to institutions in two general ways: through financial grants and by training of scientists, research managers and other staff. The Programme especially aims to reduce the scientific isolation which hampers research in many institutions.
- Because the development of capability in research is a long-term endeavour, all major institutional support is based on a long-term institutional development plan endorsed by both institutional and national authorities. An agreement is also reached for a progressive transfer of financial responsibility for the new activities from the Special Programme to national authorities.
- Scientists of tropical countries receive priority under the Programme for support for research and development projects that are consistent with quality and rapid progress in research.

A period of a few years is a very short time to assess the success of such policies. There are, however, encouraging signs of progress. National



An epidemiological survey in the countryside carried out by the Ndola Centre.

authorities are assuming increased responsibility for institutions which have been assisted by the Programme. For example, the operating expenses of the Tropical Disease Research Centre at Ndola in Zambia were originally entirely supported by the Programme, which also provided international professional staff. Now this Centre is a Zambian Centre, with a Zambian Director and an increasing number of Zambian professionals, as well as major financial support from the Government of Zambia.

Over 500 grants

Scientists and technicians from tropical countries are receiving training through careful placement in first class institutions in both developed and developing countries. By the end of 1983 over 500 research training grants had been awarded. Ten Master's Degree courses dealing with field research in entomology and epidemiology have now begun in Africa, Asia and Latin America with Programme support, and similar courses are being planned on health aspects of the social sciences.

Close working links between research and disease control programmes in tropical countries are essential if the full benefits of research are to be realized. The Programme helps build this linkage, for example, by promoting workshops to bring together the heads of research and training institutions

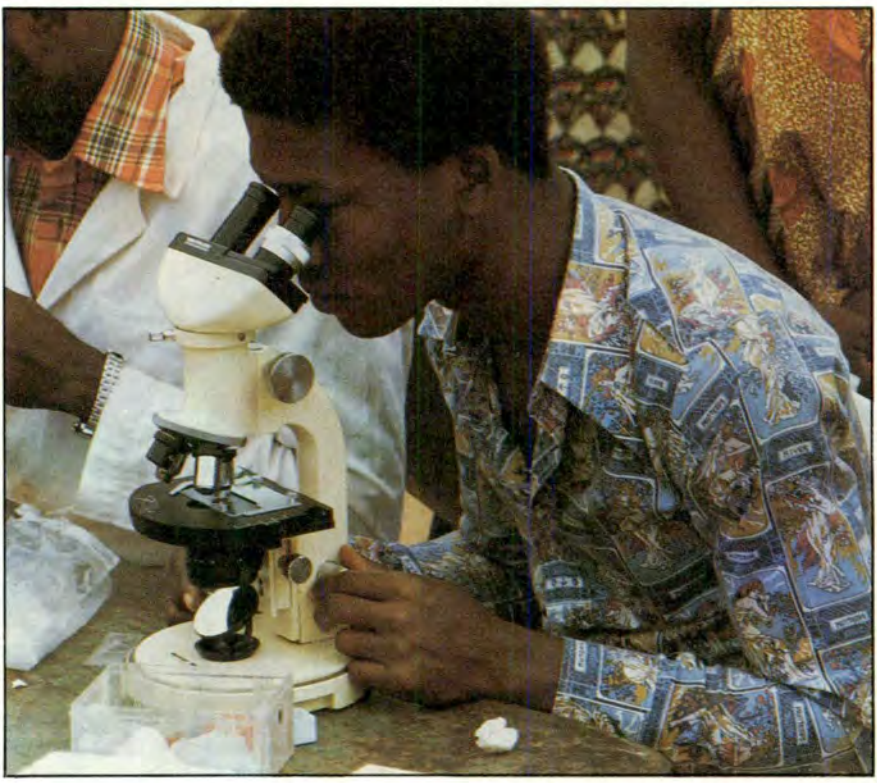
Laboratory researcher in Bankgok inoculates snails with schistosome parasites. The infected snails provide parasites needed for research.

with the senior officials responsible for disease control.

Thirty-eight research institutions in tropical countries which have been strengthened by the Programme have competed successfully with the world's scientific community for Programme funding. Of over 2 000 papers published in the scientific literature that acknowledge Special Programme support, 30% come from tropical countries. Some of these describe major advances; for example, scientists at the Institute of Medical Research in Kuala Lumpur in Malaysia have discovered how to cultivate filarial parasites through several stages of their life-cycle outside the body. This advance opens up new prospects for research on diagnostic tests, therapy and possibly vaccines.

The process of strengthening research on an international scale is a complex task. The needs are quite varied and they change with time, so that plans and progress must be kept under constant review. The Special Programme has set up an evaluation system for each institute receiving major support. This system is designed both to provide the Programme with an assessment of progress and to help the institution itself to develop and, if necessary, modify its work in the light of experience.

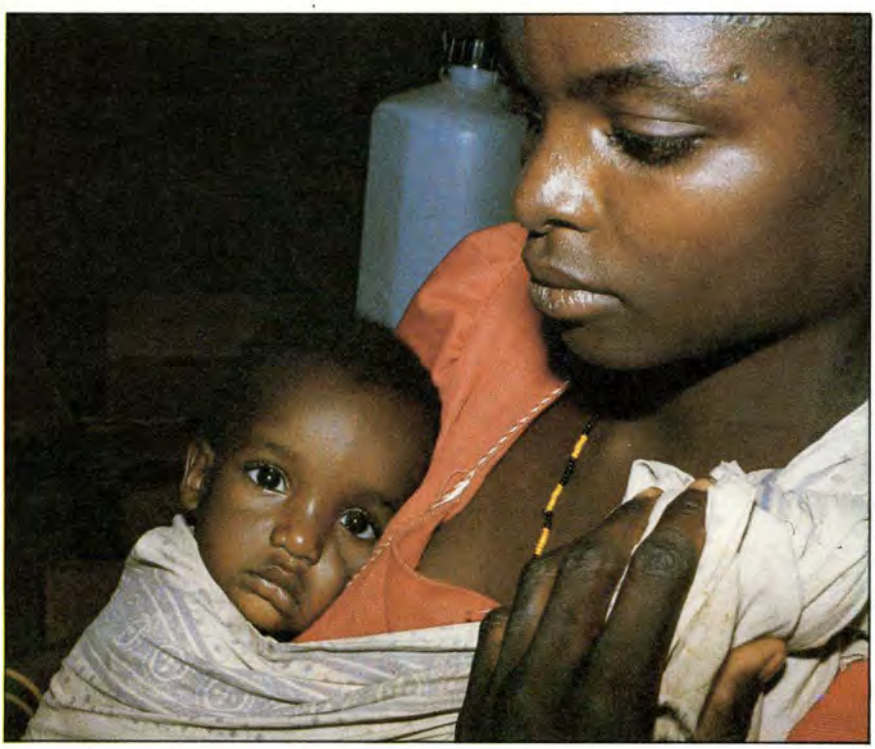
Three quarters of a century separate these two photographs. Above, physicians in the former French Congo colony in 1907 examine sleeping sickness patients. Below, a young African researcher examines a blood sample for malaria parasites.



TOMORROW

Ten years ago there was little research to improve the control of major tropical diseases. There has been a dramatic change since then. A large number of scientists and a very wide range of disciplines are now involved, from fundamental biology to epidemiology, sociology and economics. This change is reflected in the world's scientific literature. Reports of research findings are to be found not only in the more specialized journals, but frequently in prestigious broadly-based journals such as *Nature* or *Science*. Parasites and parasitic diseases have become important models for the study of biological systems; African trypanosomes, for instance, now constitute an important model for the understanding of gene expression.

There are several reasons for the emergence of tropical diseases to the forefront of biological research. The Special Programme for Research and Training in Tropical Diseases and other programmes of a similar nature have served to aid and stimulate this change through funding and through scientific collaboration. The remarkable recent advances in biological sciences have also contributed in a major way; molecular biology, genetics and immunology



in particular have recently developed concepts and technologies which have proven especially relevant to the study of tropical diseases. The future for technological advance has never seemed brighter.

What will be the impact of these remarkable changes? It is now very probable that, given sufficient financial resources, a whole variety of new control tools and methods can be developed to the stage of proven efficacy. Will they serve to improve the health of deprived tropical populations, or will they serve only to make the tropics a healthier place for a privileged minority or for affluent visitors? To achieve radical improvements the products of research, and the research process itself, must be fully integrated into plans and systems for disease control in the endemic countries.

The World Health Organization has adopted as its objective "Health for All by the Year 2000". By that time all people should have access to health care systems which are relevant to their needs and appropriate to their circumstances, and which can deliver effective methods for disease control, including both prevention and therapy.

The scope of research in the Special Programme reflects the breadth of approach which is required. It would be a mistake, however, to imagine that once these methods are established diseases will rapidly and permanently be brought under control. Changes in infectious agents, vectors and human populations will inevitably produce changes in disease which will call for further research. As many countries now well appreciate, disease control programmes are inadequate without a continuing research component. A necessary condition for the long-term promotion of health of the peoples of tropical countries is that research on tropical diseases continue, and that the tropical countries themselves acquire a research capability which is appropriate to their needs and resources.

CREDITS

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