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WHO/ACTM WORKSHOP ON
LYMPHATIC FILARIASIS CONTROL

PROCEEDINGS OF THE
FIRST INTERNATIONAL CONFERENCE ON THE
CONTROL ON LYMPHATIC FILARIASIS

BALI 14 - 17 JUNE 1996



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THE AUSTRALASIAN COLLEGE OF
TROPICAL MEDICINE
Volume 2

**WHO/ACTM WORKSHOP
ON THE CONTROL OF
LYMPHATIC FILARIASIS**

**PROCEEDINGS OF THE
FIRST INTERNATIONAL CONFERENCE ON THE
CONTROL OF LYMPHATIC FILARIASIS**

Bali 14 - 17 June 1996

Edited by
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Bringing these proceedings to completion has involved the efforts and skills of a number of individuals working as an editorial team. The people involved and their affiliations are listed below in alphabetical order.

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**Dedicated to Dr C. P. Ramachandran
on his retirement**

* * * * *

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LIST OF ABBREVIATIONS

AusAID	Australian Agency for International Development
ACTM	Australasian College of Tropical Medicine
AAID	Australian Agency for International Development
CTD	Control of Tropical Diseases
DEC	Diethylcarbamazine
DPHTM	Department of Public Health and Tropical Medicine
ELISA	Enzyme Linked Immuno Sorbent Assay
GIS	Geographic Information Systems
ICT	Immuno Chematographic Testing
IMR	Institute of Medical Research
NGOs	National Government Officers
PNG	Papua New Guinea
PCR	Polymerase Chain Reaction
SEARO	South East Asia Regional Office
TDR	Tropical Disease Research
UN	United Nations
WHO	World Health Organization
WPRO	Western Pacific Regional Office

FOREWORD

by

**DIRECTOR
DIVISION OF THE CONTROL OF TROPICAL DISEASES
WORLD HEALTH ORGANISATION**

The recent successes of the research programme in filariasis have now put filariasis in the enviable position of seemingly having available all of the tools necessary to effect control programmes so successful that we can even contemplate eliminating this infection from most or all endemic countries. Indeed, it is the "implementation" part of the job that now provides the challenge for CTD.

The new filariasis control or elimination strategy adopted by CTD in 1994 has two principal features: first, a focus on treating the human population (instead of the traditional focus on vector control); and second, community-wide "mass" treatment (instead of "selective treatment" of microfilaraemics diagnosed individually).

For the treatment itself, several regimes are available but the most useful are likely to be those based on once-yearly, single doses of one drug or two drugs given at the same time (selecting among DEC, ivermectin and albendazole). The use of DEC-fortified salt as a substitute for regular table or cooking salt can also be a useful tool in certain areas.

To implement this strategy, CTD carries out the following four major types of activity:

- (1) identifying countries with both the need and the commitment to develop (or enhance ongoing) filariasis control efforts;
- (2) working with these countries (including the provision of technical support when necessary) to develop revised national control strategies and plans of action;
- (3) assisting the countries in resolving critical programme needs, and
- (4) establishing networks for programme support, coordination and monitoring.

1. Countries

Todate, CTD has worked directly with 12 countries and been involved indirectly with two others in the five WHO regions with endemic filariasis. These are American Samoa, Bangladesh, Brazil, Egypt, Fiji, French Polynesia, Ghana, India, Indonesia, Myanmar, Papua New Guinea, Philippines, Samoa and Tanzania.

2. National Plans

Of these 14 countries, five have already completed revised national control strategies and plans of action. These are Egypt, Fiji, French Polynesia, India and Samoa. Efforts to generate such plans are actively underway in the remaining nine, and it is anticipated that these should be complete during the upcoming year.

Even more significantly, two countries, Samoa and Fiji, have already begun implementing revised strategies based on two drug treatment (ivermectin + DEC). French Polynesia is actively pursuing its strategy of giving single-dose DEC twice yearly; and when ivermectin is appropriately registered for lymphatic filariasis in France, it is anticipated that it too will switch to the two drug, once-yearly regime.

3. Needs

Helping to find funding support is extremely important for each of these control programmes, and it really must be done on a specific, country-by-country basis. In general, it is important to recognise that funding for *filariasis control leading to elimination* certainly is not an "impossible dream". Indeed, many donors today are particularly interested in investing in *solvable* problems, and a disease like filariasis - where one can actually think in terms of elimination - is, therefore, very attractive in its own right. Additionally, when its techniques for control can become "packaged" with those of other public health measures, or when the same drugs useful for filariasis control also cure multiple other infections at the same time (as, for example, when ivermectin and/or albendazole is used), such efforts become still more attractive for funding.

More specifically with respect to funding, in coordination with CTD and its Collaborating Centre at James Cook University, the Australian Government through AusAID's Pacific Region Program for Vector Borne Disease Control has included filariasis control/elimination as a major target activity of that Program, such that this Program can probably provide a major part of all the

funding necessary for filariasis elimination in many of the South Pacific island nations. Similarly, the Arab Fund for Economic and Social Development will soon consider a proposal from Egypt for support of their proposed elimination programme, and in Papua New Guinea several multinational companies working there currently are contributing substantially to the local filariasis control/elimination efforts.

A further programme need with which WHO can often be helpful is by working with pharmaceutical companies to ensure the best pricing to countries for necessary medications. Certainly, this applies to ivermectin (currently donated free from its manufacturer, Merck and Co. Inc. to countries collaborating with CTD in efforts to demonstrate the feasibility of eliminating filariasis using ivermectin in conjunction with either DEC or albendazole); it also applies to albendazole (currently provided at very favourable pricing by Smith Kline and Beecham) and even to those producers of generic DEC.

Finally, there are other important technical aspects of supporting national control programmes that CTD has become deeply involved with. For example:

- (a) ensuring the provision of antigen-detection kits which are reliable and available at an affordable price;
- (b) promoting the development of epidemiological techniques for assessing prevalence and distribution of filarial infection and of monitoring the effects of control efforts, and
- (c) training in GIS techniques for managing the data relevant to the filariasis control efforts.

4. Networks

Any global effort to control or eliminate filariasis certainly cannot succeed without the establishment of an active network of individuals focussed on control who can problem-solve and support each other, as well as coordinate and monitor progress and activities in each country. It is planned that a consortium of Collaborating Centres focussed on filariasis control can be established through the five endemic WHO Regions to help to serve this need. In Asia, in addition to Collaborating Centres which have been established for years in both Shandong and Shanghai, China, a new Collaborating Centre at James Cook University in Townsville, Australia which hopefully can play a major coordinating role as efforts towards filariasis control in the Western Pacific Region continue their dramatic acceleration.

The global filariasis control/elimination programme is, to be sure, in its infancy and needs all the help and encouragement that it can find at this critical juncture. While CTD assumes a focal role in this early implementation-phase of activities, it is clear that the advice, help, shared responsibilities and constructive suggestions of every interested person will be necessary to activate and carry out this important, challenging programme effectively both in the Asia Pacific Region and worldwide.

**Dr Kazem Behbehani
Director
CTD / WHO**

FOREWORD

by

THE PRESIDENT

AUSTRALASIAN COLLEGE OF TROPICAL MEDICINE

This volume records the Proceedings of the combined WHO-ACTM Workshop on the Control of lymphatic Filariasis held on 14 June 1996 and further details the abstracts of papers presented on the subject of filariasis during the 5th Annual Scientific Meeting of the College held on following days from 15 - 17 June 1996. It is immensely satisfying that the organisers have chosen to publish the papers presented during these landmark meetings in the Annals of The Australasian College of Tropical Medicine.

The workshop and subsequent conference sessions provided a unique forum for those working in the area of lymphatic filariasis to present country data and to establish lasting networks. I believe that important professional and institutional linkages were initiated as a result of these meetings and that the strategic plan for the control and ultimate elimination of lymphatic filariasis has been refined.

As you read through the following pages, the "who's who" of lymphatic filariasis present their findings and recommendations concerning the management of what is a major world-wide problem, lymphatic filariasis. The ACTM is proud to have the opportunity to assist with the work of the WHO in finding solutions to these global health concerns.

I wish to thank all those people who made this Proceedings possible and I recommend this volume to you.

**Dr Peter Leggat
PRESIDENT
ACTM**

FORWARD

by

FILARIASIS CONTROL SECTION

FILARIASIS CONTROL - A GOOD NEWS STORY IN PUBLIC HEALTH

Lymphatic filariasis is thought by some to be the forgotten disease of the tropics. This has been due mainly to a lack of recognition of the non-elephantiasis clinical problems associated with filariasis and consequently the low priority given to it by Departments of Health. Recent recognition of the importance of these clinical problems and tools available to more efficiently treat and diagnose filariasis has led to a resurgence in the interest in its control.

The use of multi-drug treatments as an integrated approach to treat a number of diseases is generally being accepted as a far more efficient way of controlling disease as opposed to targeting one specific disease. The use of DEC and ivermectin to control filariasis has the beneficial effect of treating enteric parasites as well as ecto-parasites such as scabies. Forums such as this First International Meeting for the Control of Lymphatic Filariasis, will assist in determining the optimal regime using DEC and ivermectin as an integrated disease control tool.

The Filariasis Control Section was proud to be involved in the organisation of this Workshop and were encouraged by the degree of enthusiasm and interest of those participating. Important outcomes from the Workshop included the establishment of a filariasis network throughout the world which will link those working on, or interested in, the control of lymphatic filariasis. To assist in the development of this network the Filariasis Control Section was requested to publish a newsletter (*Filarial Links*) and to establish an Internet newsgroup (*LymFilariasis*). The Filariasis Control Section looks forward to many years of being involved with groups working on the control of lymphatic filariasis.

The Second International Meeting on the Control of Lymphatic Filariasis will be held in Townsville on 18 - 20 July 1997, at James Cook University.

Dr Paul Turner
CO-ORDINATOR
FILARIASIS CONTROL CENTRE

SECTION A - FORMAL SPEECHES

WHO/ACTM WORKSHOP ON LYMPHATIC FILARIASIS CONTROL BALI, INDONESIA 14 JUNE 1996

OPENING CEREMONY

by

Dr P. F. Turner
Master of Ceremonies and
Coordinator, Filariasis Control Section
Department of Public Health and Tropical Medicine
James Cook University of North Queensland
Townsville, Queensland, Australia

We are very fortunate this morning to have the two Regional Directors from the World Health Organization from Manila and New Delhi, to come and open the meeting.

At the WHO/ACTM Workshop on Filariasis Control in the Asia-Pacific, we have a panel of very important people. I would like to introduce Dr Hadee Abednego who is the Director-General of Communicable Disease for Indonesia; Dr Uton who is the Regional Director for the South East Asian region in New Dehli; Dr Han who is the Regional Director for the Western Pacific Region and Dr Ramachandran, who is the Head of Filariasis for WHO. I would also like to introduce Professor Wronski who is the Head of the Department of Public Health and Tropical Medicine, James Cook University in Townsville, Australia; Professor Rick Speare who is President of the Australasian College of Tropical Medicine, and Dr Professor Sukadika, who is Dean of the Udayana University here in Bali.

I would now like to call on Dr Ramachandran to present the opening address.

**WHO/ACTM WORKSHOP ON LYMPHATIC FILARIASIS CONTROL
BALI, INDONESIA 14 JUNE 1996**

OPENING ADDRESS

by

**Dr C.P. Ramachandran
Chief, Filariasis Control
World Health Organization
Geneva, Switzerland**

Dr Hadee Majanto Abedengo, Director-General Communicable Disease Control and Environmental Health, Ministry of Health, Republic of Indonesia; Hon Dr S.T. Han, Regional Director, Western Pacific Region, WHO; Hon Dr Uton Muchtar Rafei, Regional Director, South East Asian Region, WHO; Dr Robert Kim Farley, WHO representative to Indonesia; Professor Ian Wronski, Director, Department of Public Health and Tropical Medicine, James Cook University; Professor Rick Speare, President, Australasian College of Tropical Medicine; Dr K. Sukardika, Dean, Faculty of Medicine, Udayana University, Bali; Dr Paul Turner, Convenor, WHO/ACTM Meeting, Distinguished Guests, Friends, Colleagues, Ladies and Gentlemen.

Lymphatic filariasis is a mosquito-borne parasitic tropical disease affecting people physically, mentally and psycho-socially, often the poorest of the poor, and has today reached the alarming figure of nearly 120 million people infected globally and nearly 1.1 billion people at risk of infection in 76 endemic countries. Of these, 15 million people have elephantiasis, lymphoedema and filarial fevers with 27 million men having hydrocoele and over 83 million people with lymphatic functional disability. In the Asia-Pacific Region which consists of WHO Regions of SEARO and WPRO, nearly 78 million people are infected. In India alone some 40 million people have the disease.

These are alarming and frightening statistics to all public health workers. However, statistics become reality when one takes a walk through the villages and shanty towns in endemic countries and visualises people, both young and old, men, women and children walking around with enlarged legs, feet, hands and genitals, in addition to other parts of their bodies. Today, the disease still continues to spread unabated in many parts of the world due to continued unplanned urban and semi-urban development, man-made environmental and ecological disasters and habitats which continue to enhance mosquito breeding and consequent transmission of the disease. A solution to all this until recently seemed to be a far cry. However, in the past few years, through the coordination of research and development activities of CTD/TDR/WHO, as well as research institutions and universities globally, we are nearing a stage where some newer intervention measures are becoming available for effective, affordable and sustainable control strategies and we are moving towards elimination of lymphatic filariasis as a major public health problem.

At an Expert Advisory and Consultative Meeting on Lymphatic Filariasis held under the auspices of WHO in Penang, Malaysia in August 1994, which brought together eminent researchers and control experts, many of whom are here today, we reviewed available intervention methods and came out with some clear possible strategies for control of the disease. A report of this important meeting has been published and I believe has been made available to you (Lymphatic Filariasis Infection and Disease: Control Strategies).

Essentially, we have shown through our elaborate operational research that a dose of 6 mg/kg of DEC or diethylcarbamazine given once a year to infected populations will suppress microfilaraemia in patients for well over a year. We have also shown that a single oral dose of 400 $\mu\text{g}/\text{kg}$ ivermectin is equally efficacious in keeping down prevalence of parasitaemia to below 3% of pre-treatment levels, again for well over a year. So we now have two good drugs available to treat communities with a single oral dose once a year, thus increasing possibilities of better compliance. We have also shown that a combination of 400 $\mu\text{g}/\text{kg}$ ivermectin and 6 mg/kg DEC in a single oral dose is far superior as a therapeutic agent in clearing parasitaemia in infected populations for well over 18 months. Studies carried out in India, Sri Lanka, Brazil, Haiti, Papua New Guinea and Tahiti on these combination doses have unequivocally established the superiority of the combination therapy. You will be hearing more about this from people like Dr Jim Kazura and Dr Jean-Paul Moulia-Pelat who are here.

In addition to all this, thanks to the earlier efforts of researchers in Brazil, Tanzania, China, Taiwan and India, we have confirmed that DEC mixed with common cooking salt at a dosage of 0.2 - 0.4 mg per gram of salt is an excellent therapeutic agent if taken by the individual and communities over a period of 6-12 months. In fact, the People's Republic of China and Taiwan were able to eliminate filariasis as a public health problem from those countries using DEC fortified salt as a major weapon. In April 1994, the first successful commercial launching of DEC fortified salt took place in India, by a private Indian pharmaceutical company. The World Health Organization has encouraged pharmaceutical companies to produce DEC-fortified salt and make it available through the private sector for sale and consumption, at a cost affordable by the poor and needy in filariasis endemic areas. The unique thing about DEC salt is that it produces no side effects at the dose consumed; has no odour, no taste, no colour, and can be used in cooking without losing its efficacy. What better way is there than to have a medication which will be efficacious, curative, prophylactic and affordable and which can be made available to communities at large. In fact, in Tamil Nadu in India pioneering trials using DEC-salt for control of filariasis have already been carried out by the Tamil Nadu Government. Using 0.2% of DEC fortified salt showed a reduction of 97% in the rate of microfilaria within a period of two years and this reduction has been sustained to-date. Similar programmes carried out here in the Republic of Indonesia using low dose DEC tablets have also shown it to be successful in reducing parasite rates in communities. I am hopeful that the large-scale production and use of medicated salt would ultimately pave the way for the control of transmission of this dreadful disease in countries like India, Indonesia, Papua New Guinea and in many countries in South East Asia, the Western Pacific,

Africa and Latin America.

The gross clinical symptoms produced by the disease in its chronic stages, namely elephantiasis of the limbs and genital organs, is the phase dreaded most by every individual infected with filariasis. It cripples them, demoralises them, makes them social outcasts in their own communities and societies due to social stigma and alienation. However, here again we have some new hopes on the horizon. Clinical studies meticulously carried out by Dr Gerusa Dreyer from Recife in Brazil, Dr V. Kumaraswami from India, who is here, Professor Olszewski from Poland and other workers, have all confirmed that lymphoedema and progression towards chronic elephantiasis may ultimately be stopped by the use of proper foot care and hygiene and use of antibiotic therapy in patients, especially during the early stages of the clinical disease. It is becoming clearer to us that the main cause of lymphatic pathology resulting in lymphatic obstruction and dysfunction may not be the parasite per se, but secondary bacterial infections which continuously invade the lymphatic system and produce continuous trauma resulting in episodic acute attacks and tissue damage. These unique findings obviously have far reaching implications for the future approach towards the treatment and prevention of filarial lymphoedema in infected populations and for large-scale morbidity control.

There have also been exciting developments that have improved our understanding of the pathology of the disease. A major step forward has been the demonstration of occult pathology in asymptomatic microfilaraemic individuals. Careful clinical examination and use of lymphoscintigraphy by people like Dr Freedman and others, have shown that these individuals have renal abnormalities (microscopic haematuria/proteinuria) and lymphatic abnormalities in the absence of clinical disease. These observations have important epidemiological implications since the number of persons hitherto considered asymptomatic does not hold true anymore, thus dramatically increasing those with disease and thereby enlarging the burden of illness.

We now also have better tools to monitor control programmes. Ultrasound examinations have been used in Brazil and more recently in India, to locate the presence of adult worms in infected individuals and it is now possible to determine the effect of drugs on adult worms and also estimate how long drug therapy should be given for the individual patient. We also now have immunological, antigen assays developed in Australia, and molecular biological tools (DNA probes) to monitor infections in humans as well as in vectors.

In the area of vector control, we also have new hopes. *Bacillus sphaericus*, a bacteriological agent which is target-specific to *Culex* mosquito larvae, the vectors of urban filariasis, has been shown to be highly potent in suppressing the breeding of vector mosquitos in studies carried out in India, Sri Lanka, Brazil, China, Malaysia, Cameroon and other countries. Also the use of expanded polystyrene beads in confined spaces, such as cesspools and pit latrines, totally eliminate the breeding of *Culex* mosquitoes. I believe that a combination of chemotherapy and vector control and a better environmental management policy should ultimately reduce the disease burden and finally eliminate the spread of disease over the next two decades.

All these are exciting new research findings and I believe we have arrived at a crossroads of important new scientific discoveries which will have far reaching implications for the future control of lymphatic filariasis.

Thanks to the dedicated and painstaking research efforts of the past decade or more by all of you present here today, we have reached this important milestone. The question now is, which of these crossroads shall we take to reach our ultimate goal of elimination of the disease as a public health problem from endemic countries. You have, through your clinical and applied research in hospitals, laboratories and in the field, laid down a number of options or strategies that can be taken up and implemented by Ministries of Health and Communicable Diseases Control Departments in endemic countries to reduce infection and thereby bring down morbidity and disease burden. Not all options or strategies chosen may succeed in all countries, as this would very much depend on each country's ecological, environmental, political, cultural, social and economic feasibilities, and hence as public health decision makers, you have a major task to make the right choice which will culminate in the best chances of success. This is particularly so in making the right choices in terms of cost-effectiveness, feasibility and sustainability for control of the disease. This workshop here in Bali, I hope, will at the end of the day, give us all the necessary knowledge, and a better insight and know-how towards making the most appropriate and judicious decisions, for control of this disease.

I am particularly pleased to note that Indonesia and India, major partners in this global venture, have initiated a revised new control strategy to address the various pressing control issues and have set the pace for other countries in the Region to follow. Soon Fiji, Samoa and French Polynesia are to follow. This is a great challenge and an opportunity for the public health workers in SEARO/WPRO Regions. A challenge I am sure we will meet against all odds.

Ladies and Gentlemen, although all of us present here today are convinced that lymphatic filariasis, this grotesque disease affecting over 120 million people in the Americas, the Africas and the Asia-Pacific, creating immeasurable disability, misery, psycho-social and socio-economic problems of unimaginable magnitude, can now be controlled with modern medical technology made available to the communities affected and the disease eliminated as a major public health problem from the world, bringing hope and expectations for a better quality of life, I am afraid, precious little has been done to obtain the necessary financial resources and political commitment to combat the disease globally. Here, I have no doubt, WHO has a crucial and critical role to play as the global coordinator for disease control. Many countries simply do not have the necessary financial or human resources to deliver the much needed medication to endemic communities to prevent and control the spread of the disease. Hence there is an urgent and humanitarian need for non-governmental organisations (NGOs), to render their support and assistance to Governments in endemic countries to control the disease. It is indeed sad to say, that unlike leprosy and many other diseases, there is not a single non-governmental organisation as of today, involved in the control of lymphatic filariasis. This may be because the magnitude of the disease burden and disability caused by filariasis has never really been brought to light by

public health workers globally. However, this situation has changed in the recent past. Lymphatic filariasis has now been classified as the world's number two cause of disability in the World Health Report, 1995, published by WHO. Secondly, there were not adequate tools available to control the infection. However, this has also changed thanks to the pioneering efforts of many of you, as we now have a battery of medications to reduce morbidity and infection.

Governments and Ministries of Health and in particular, NGOs, must recognize the fact that the tools are now available and come forth with financial resources to assist in the control of filariasis in the months and years ahead. As the retiring Chief of Filariasis Control for WHO, it is my profound and earnest appeal to all NGOs involved in health care globally, to come forth and assist Governments in this humanitarian venture towards the control of filariasis, but each one of us should play our role in this initiative on behalf of our brothers and sisters suffering from this horrendous disease.

Finally, I would like to place on record WHO's thanks to the Government of the Republic of Indonesia and to the Australasian College of Tropical Medicine for their approval and support to hold this meeting here in Bali. I also wish to thank my two Regional Directors, Dr Uton and Dr Han, for sparing their time to come here to Bali and to be present at this workshop. Their presence today indicates a solid commitment and support of WHO in SEARO and WPRO and I am sure will continue in the days and years ahead. In concluding my talk, let me reiterate by saying that the global filariasis control initiative of WHO to assist Member States in their efforts to establish national control/elimination programmes, although only just started, has every reason for pride, plenty of reasons for hope and none at all for despair. Thank you very much.

DR TURNER:

I would like to now call on Professor Wronski, Head of the Department of Public Health and Tropical Medicine, James Cook University. Ian Wronski's main interests are in Aboriginal and Torres Strait Islander health, health information systems, and the politics of health.

**WHO/ACTM WORKSHOP ON LYMPHATIC FILARIASIS CONTROL
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OPENING ADDRESS

by

**Professor Ian Wronski
Head**

**Department of Public Health and Tropical Medicine
James Cook University of North Queensland
Townsville, Queensland, Australia**

Thank you Paul. Mr Chairman, Dr Abednego, Dr Uton, Dr Han, Dr Ramachandran, Associate Professor Rick Speare, Professor Sukadika, Distinguished Guests from participating countries, Ladies and Gentlemen.

Thank you very much for inviting me to make this address. Filariasis is a cinderella disease, its importance is underestimated, focus has always been concentrated on its exotic forms, most of the associated morbidity has been hidden from the trained or the training medical and tropical health workforce and largely this has been because of the way we have defined disease outcomes. That has changed a lot in the last 6 - 10 years.

There has been a new refining of public health methodologies and this has resulted in a re-rating of diseases such as filariasis. We have much better tools to access disease burden, looking not only at death outcomes, which has been traditional, but emphasising the economic impact, morbidity and socio-psychological affects of disease. Reliable and valid methods for testing these have been demonstrated in countries across the world. What's more filariasis is actually amenable to control and probably eradication. We know of the interventions and how to implement them. We know they can operate through the primary health care system. We know and believe that these can be sustainably continued for long periods of time and technologically we have ways of monitoring the outcome of these interventions.

I am pleased to say that James Cook University has been deeply involved in this reassessment of filariasis over the last 6 years or so. We have been involved in both the technological aspects of development and the disease control aspects of this reassessment.

Our Department's involvement began in 1989 largely based in Papua New Guinea and since then has expanded to a number of countries including Myanmar, the Solomon Islands, Cambodia and Vietnam. I must say, that on behalf of the University and the Department, we are committed to pursue this issue because we believe that it is something that has been left off the world's health agenda for some time.

Our Department is strategically placed geographically and we are also the largest trainer of the tropical medical and tropical health workforce in Australia. We believe that over the years we have gained substantial expertise in the focussing of health workforce training and development and disease control activities. We would like to offer our support to WHO's global strategy on filariasis and I would like to close off by just welcoming you all once again to the WHO/ACTM Conference and thanking you all for coming.

Thank you.

DR TURNER:

I would like to call now on Associate Professor Rick Speare, President of the Australasian College of Tropical Medicine. Rick Speare is experienced in both veterinary and human medicine, with a special interest in zoonotic diseases, especially those caused by parasites. He has worked in Australia, Africa, Papua New Guinea and the United Kingdom. As well as being the President of the ACTM Rick is active on several ACTM Committees including the Electronic Networking Committee. His current interests are parasitology, zoonoses, urban animal control, and Aboriginal and Torres Strait Islander health.

**WHO/ACTM WORKSHOP ON LYMPHATIC FILARIASIS CONTROL
BALI, INDONESIA 14 JUNE 1996**

OPENING ADDRESS

by

**Associate Professor Rick Speare
President**

**Australasian College of Tropical Medicine
James Cook University of North Queensland
Townsville, Queensland, Australia**

Thank you Paul. Regional Directors of WHO, Dr Han and Dr Uton, Dr Abednego, Distinguished Guests, Ladies and Gentlemen.

The Australasian College of Tropical Medicine is delighted to play a role in co-sponsoring this Workshop with WHO. By following the Workshop with a lymphatic filariasis stream in our Fifth Annual Scientific Meeting, the ACTM has created what is virtually the First International Conference on Lymphatic Filariasis.

One of the major roles of the ACTM has been to facilitate networking. In the past, using tropical medicine as a focus, the ACTM has brought together people from widely separated geographic regions, different disciplines and different cultures.

This First International Conference on Lymphatic Filariasis has a wider global reach, but a much narrower focus than our usual activities, but this is by far the most important networking task that the ACTM has undertaken. By assisting you to come together the ACTM is playing a significant role in the control and possibly ultimate regional elimination of one of human-kind's serious diseases.

On behalf of the Australasian College of Tropical Medicine I welcome you to the Workshop, I welcome you to the First International Conference on the Control of Lymphatic Filariasis, and I thank you for the opportunity to allow us to be a significant player in this landmark event.

Thank you.

DR TURNER:

Thank you Rick. I would like to call on Dr Han. (Background and areas of interest required).

**WHO/ACTM WORKSHOP ON LYMPHATIC FILARIASIS CONTROL
BALI, INDONESIA 14 JUNE 1996**

Address by

**Dr Han
Western Pacific Regional Office
WHO Manilla
Philippines**

Dr Hadee Abednego, Director-General of Communicable Diseases Control, Republic of Indonesia; my fellow Regional Director of South East Asia Region, Dr Uton; Dr Wronski, Department of Public Health and Tropical Medicine, Townsville University; Dr Rick Speare, President of Australasian College of Tropical Medicine, Dr Ramachandran, my friend from Geneva.

I am very happy to be invited here this morning and be with you at this Opening of the Workshop on Lymphatic Filariasis. I would like to express my appreciation to those who have made this Workshop possible. They include the Indonesian Ministry of Health; the WHO Regional Office of South East Asia; the Filariasis Unit of James Cook University; and the Australian Agency for International Development, AusAID. In fact, what I wanted to say this morning was well spoken by Dr Ramachandran and all of the previous speakers in great detail. Being a scientific meeting, I don't know whether to say more from the point of view of an administrator or as a general manager of the WHO Western Pacific Region, but still I would like to say a few words.

Filariasis, in addition to poliomyelitis and leprosy, can now be targeted for eradication or elimination. Rapid progress is being made in poliomyelitis eradication and leprosy elimination, but the thrust for filariasis elimination is only just beginning in some countries.

Several countries in areas are in a good position to begin treatment with diethylcarbamazine also known as DEC. Examples of the Governments in my region of the Western Pacific that have the political will and an experienced health infrastructure to eliminate filariasis are Fiji, French Polynesia, and Samoa. They have been using the single annual dose of DEC for 14 years or more and are becoming known as the pioneers in the successful use of single annual DEC treatment. It is now recognised that one single annual mass drug treatment is only slightly less effective than the traditional 12 day course of DEC treatments which are more difficult to administer. Even though a prevalence rate of less than five percent can be maintained with a low cost of single dose DEC treatment strategy, infection can persist at low level microfilarial densities.

Recent advances in diagnostic techniques show that hidden lymphatic damage can occur in asymptomatic individuals. This highlights the need to treat all persons once a year, not only with DEC, but combined with ivermectin if possible.

Apart from the three Pacific Island governments just mentioned, the People's Republic of China, who are unfortunately not represented here this morning, has also made considerable progress in filariasis control and successfully began using DEC medicated salt in the early 1970s in areas of high density. Although it is not possible to separate the benefits of this specific method from those obtained with other control measures, the overall results were extremely impressive. By 1988, 130 million people had been treated, leaving less than 1 million infected today.

In Papua New Guinea and Vietnam, where malaria is the most important vector-borne disease, resources tend to be devoted to malaria rather than filariasis control. There is a need to implement viable filariasis control programs in the Southern Highlands of Papua New Guinea where prevalence has been as high as 50% and the Northern Provinces of the Red River Delta in Vietnam with 13% prevalence.

I am pleased to know that partner agencies - I hate to use the word donor agencies - partner agencies are beginning to express interest and become active in supporting filariasis control activities in these countries.

Before I leave, I would like to leave two thoughts with you. The first concerns the criteria used to establish that filariasis has been eliminated. For leprosy the criteria for elimination is a prevalence rate of less than one case per 10,000 population. Since filariasis is a vector-borne infection, elimination would probably require maintenance of a lower prevalence, such as say, one case or less for 25,000 population. I would welcome the views and recommendations of the experienced filariasis experts who are assembled here on what should be the criteria for filariasis elimination. Although, as I said, some countries are just beginning the elimination of filariasis, it would be better if we were already thinking about our target.

The second thought concerns the "healthy island" concept which is being applied to the malaria control program in the Solomon Islands which is represented here by the person in charge of this project. It emphasises multisectoral and multidisciplinary action and recognises the limitations of more traditional, politically oriented control approaches. It particularly emphasises what the individual and the community can do to promote and protect their own health. This approach was adopted by health ministers who met on Nadu Island in Fiji in March of 1995. A similar approach with active involvement of the community, for example, women's committees where the multi-drug administration was also implemented in Western Samoa in 1968. This same concept can be used in filariasis control.

I am glad to be associated with these new initiatives in filariasis control. They are exciting and challenging and can lead to a better quality of life for the exposed populations.

Taking advantage of being here, WHO Western Pacific Regional Office is in the process of designating the Department of Public Health and Tropical Medicine of James Cook University as a WHO Collaborating Centre. This University has already discharged its commitment by supporting WHO's goals, policies and programs. The convening of this meeting is one example. I hope in the not too distant future the designation process will be completed whereby the University will become a WHO Collaborating Centre and there will be more activity to help WHO in discharging its mission.

I am sure this workshop will be extremely valuable. I wish all of you a fruitful and pleasant stay in this beautiful island of Bali.

Thank you.

DR TURNER:

Thank you Dr Han. I would now like to introduce our next speaker Dr Uton.

**WHO/ACTM WORKSHOP ON LYMPHATIC FILARIASIS CONTROL
BALI, INDONESIA 14 JUNE 1996**

Address by

**Dr Uton Muchtar Rafei
Regional Director
WHO South East Asia Region**

Distinguished Guests, Dr Hadee Abednego, Dr Han, Dr Turner, Dr Ramanchandran, Professor Wronski, Ladies and Gentlemen.

I am very happy to be here with you today on the occasion of the Filariasis Control Workshop and share my views and thoughts on it and also draw attention to the policies and objectives of the WHO Regional Office for South East Asia in this matter. The subject of deliberations is of great concern to the health of the people in our Region and hence it occupies an important place in the programmes and activities of South East Asia WHO SEARO.

Lymphatic filariasis is widely distributed in the countries of the WHO South East Asia Region: from India in the west to Indonesia in the east. It is estimated that the total number of cases of lymphatic filariasis in our Region is almost 55 million and that over 600 million people live in endemic areas. Chronic diseases associated with filaria fever, lymphoedema, hydrocele and elephantiasis lead to temporary and subsequently, to permanent disability in the most economically active groups of the population. Rapid population growth and poorly planned urbanization result in the disruption of environment and enhancement of transmission of *Wuchereria bancrofti*, the main species leading to expansion of affected areas.

A deep-rooted impression is that there is no public awareness about the socio-economic effects of the disability caused by this disease in age-groups which are supposed to be the most productive. Decision-makers tend to pay more attention to killer diseases rather than to chronic infections which cause disability.

The present control strategy based on vector control and treatment of detected microfilaria carriers has limited effectiveness and, to a large extent, has failed to secure national commitments for control of lymphatic filariasis. As usual, efforts for the health services in management of cases of filarial disease are also inadequate since diseases related to environmental disruption like filariasis affect the poor. We need to have a fresh look at the growing problems of filariasis and its implications to society.

It is gratifying to learn that, of late, there have been significant developments in regard to filariasis control based primarily on mass chemotherapy measures supplemented by case management and vector control. Several pilot studies conducted in different countries with WHO assistance have shown convincingly that mass chemotherapy once or twice a year for 4-5 years with a single dose of diethylcarbamazine and/or ivermectin or diethylcarbamazine-fortified table salt can reduce the prevalence of microfilaraemia by up to 80%. If supplemented by adequate disease case management and vector control, these measures can lead to a substantial reduction of filarial disease in the community within this period.

Taking note of these developments, the WHO Regional Office for South East Asia is planning to assist Member Countries in reinforcing their efforts to control lymphatic filariasis. After taking stock of the existing situation, we plan to conduct a South East Asia Regional meeting on the control of lymphatic filariasis at the beginning of 1997, and also I endorse the suggestion by my colleague Dr Han, about the target, and also linkage with other active participants about the concept of healthy island, cities and others.

The need of the hour is, therefore, to create public awareness about the magnitude of this dreadful disease and its socio-economic implications, leading to promotion of sustainable partnerships between the government, the community including NGOs, the scientists and the donors for the control of lymphatic filariasis. This is the area in which we fail.

I have noted that you will discuss various issues related to control of filariasis, such as epidemiology, diagnostics, socio-economic aspects and management of control programmes. So I also join Dr Han, in recommending work or strategies on how to promote and focus these issues to the highest level, in parliament, and then to the decision maker, the economist and also to the people. This is one of the most difficult and important aspects in the elimination of several diseases, not only filariasis.

Technology is available for effective control of lymphatic filariasis at affordable prices. But experience has shown that there are many administrative, technical and operational problems which hinder control measures. Strong political will would, of course, resolve many administrative bottlenecks, but as well, research studies need to be undertaken to overcome technical and operational problems. I do hope that the distinguished scientists, policy-makers and programme managers present here will identify priority problem-solving research areas leading to the best proposals for support from our partners and donors in the control of filariasis.

I would like to thank the Government of Indonesia and the Australasian College of Tropical Medicine for giving me the opportunity to participate in the deliberations on

the Control of Lymphatic Filariasis. I am confident that the discussions will lead to practical recommendations for effectively improving the situation concerning filariasis control and will help the authorities concerned in their endeavours to reduce the ill-effects of this debilitating disease on the community.

I wish the meeting every success in achieving its objectives. Thank you.

DR TURNER:

Thank you Dr Uton. I would like to call now on Dr Abednego, Director-General of Communicable Disease for Indonesia, representing the Minister of Health for Indonesia to open the meeting. (No bibliography available)

**WHO/ACTM WORKSHOP ON LYMPHATIC FILARIASIS CONTROL
BALI, INDONESIA 14 JUNE 1996**

OPENING ADDRESS

by

**Dr H. M. Abednego
Director-General
Communicable Disease Control and Environmental Health
Ministry of Health
Republic of Indonesia**

Mr Chairman, Distinguished Guests and Participants

The Minister of Health has asked me to express his apologies for not being present here this morning for this Opening Ceremony as at present he is in West Java so he could not attend this meeting. Allow me now to read his message for this Opening Ceremony.

Mr Chairman, WHO Regional Director for SEARO Region, Dr Uton Rafei; WHO Regional Director for Western Pacific Region, Dr Han; The President of the Australasian College of Tropical Medicine, Professor Rick Speare; Professor Wronski; Professor Sukadika from the Faculty of Medicine, Udayana; Dr Kym Farley, WHO Regional Office in Djarkata; Dr Ramachandran, Distinguished Guests, Ladies and Gentlemen.

It is indeed a pleasure for me to extend to you distinguished participants, a warm welcome to Indonesia and in particular to this beautiful island of Bali. As you know lymphatic filariasis persists as a major cause of critical morbidity and a significant impediment to socio-economic development in many Asian, African and Western Pacific countries as well as in certain regions of the Americas. Indeed, the prevalence of these mosquito-borne infections is increasing world-wide, in large part due to the rapid unplanned urbanisation in many endemic areas. It is estimated, from current data, at least 120 million persons are infected with essentially or manifesting either the awful findings of lymphoedema, elephantiasis, hydrocele and the associated infections or the newly recognised sub-clinical abnormalities of lymphatic and renal function.

The disease has not only reduced the quality of labour productivity, but could also become a permanent disability for some of the cases. This disease is mainly caused by poor environmental conditions where mosquito vectors are able to live and

transmit the disease to make filariasis an endemic condition. In Indonesia, our country, a filariasis control program was initiated in 1970 and then a few years later, from 1975 up to now, the National Filariasis Control Program was established by conducting mass treatment with DEC as the main activities of control strategy, besides a surveillance program and improvement of the environment and health education.

In spite of many successes in the control program, filariasis remains a public health problem in many areas of Indonesia. As you know, out of 27 provinces of Indonesia, the disease is still endemic in 22 provinces both in urban and rural areas, and it usually affects the low socio-economic group of the community. The microfilaria prevalences in Indonesia range from 0 - 23.8% with an average of 4.3%. This includes 100 districts in 22 provinces (we have 304 districts in Indonesia). Only five provinces have a 0% microfilaria rate. Bali is one of them. Bali is free from filariasis so you may feel free and safe here.

I believe that in the past decade we have taken up a number of control and research efforts to reduce infections and thereby bring down morbidity and disease burden, but still the disease remains a public health problem in many areas. Looking around here in this hall, I am really happy to witness that we have at this meeting some of the world's best experts in the field of research and control of filariasis. Therefore I have no doubt this Workshop will be a very stimulating and productive one to bring fruitful ideas, concepts and views towards the global effort to control filariasis.

Ladies and Gentlemen, I would like to take this opportunity on behalf of the Indonesian Government to convey my appreciation and gratitude to WHO and the Australasian College of Tropical Medicine in selecting Bali first as a place for this important Workshop. I would also like to congratulate the Australasian College of Tropical Medicine and members of the organising committee for their deliberations in conducting this very important seminar. To our guests from abroad, I wish you a very happy and pleasant stay in Bali. I would like to recommend you to extend your stay two more days here in Bali to visit this beautiful island. Finally, it is my pleasure and honour to declare the Seminar and Workshop on the Control of Lymphatic Filariasis officially open. Thank you, Minister for Health, Professor Dr Sujudi.

Thank you very much for your attention.

LYMPHATIC FILARIASIS: A POTENTIALLY ERADICABLE DISEASE

**Associate Professor Rick Speare
Chairperson**

Welcome to this second session of the WHO/ACTM Workshop on the Control of Lymphatic Filariasis. We are quite fortunate in having four experts on lymphatic filariasis to now go through various aspects of the disease in a bit more detail.

I would like to introduce Dr Ramachandran who is probably known to everybody in this room. CP is Chief of Filariasis Control, Division of Control of Tropical Diseases and Filariasis Research Coordinator, Special Programs for Research and Training in Tropical Diseases, World Health Organization. CP has had extensive experience in filariasis and has been with WHO working on filariasis since 1979 and he retires at the end of this month. The title of his talk today is "Lymphatic Filariasis - a Global Perspective". So please join me in welcoming C.P. Ramachandran. Thank you.

LYMPHATIC FILARIASIS: A GLOBAL PERSPECTIVE

by

Dr C.P. Ramachandran

Chief, Filariasis Control

Division of Control of Tropical Diseases

and Filariasis Research Coordinator

Special Programme for Research and Training in Tropical Diseases

World Health Organization

Geneva, Switzerland

Thank you very much Rick. I appreciate your kind words. I, as Rick said, am going to give a rapid review of this morning's talk. I hope I don't have to eat into the time of other speakers this morning because we have some very eminent speakers and perhaps I can set the stage for others to go into details. What we will try and do is to give you a global overview of the problem and what we are doing - or what we are trying to do. I must state right from the beginning, I am not responsible for any of these facts and figures I am presenting here. You are responsible for them because all that information which I am presenting is what you have done for the last 15 years or so in research and development in many parts of the world through multicentric studies. All I'm doing is putting them together to show that we can do something for this horrendous disease.

Well, just to start with the main parasites that cause lymphatic filariasis. These are *Wuchereria bancrofti*, *Brugia malayi* and *Brugia timori*. Basically these are figures which Dr Bundy has put together for us showing some of the global statistics in terms of prevalence of the disease. Here we are talking about 120 million people infected, of which about 49% come from South East Asian regions. These are WHO regions. Then followed by the African regions which is about 34% and the Western Pacific region about 16% and the other areas of Latin America about 0.3% as well as Eastern Mediterranean particularly Egypt. So we're talking about a fairly large infected population in the world and what I really want to show is, if you take the global distribution of filariasis, there is something like 76 endemic countries in the world. These include, in the African region, mostly equatorial Africa including Madagascar and Egypt; then in South East Asian region you have India, Sri Lanka, Thailand, Myanmar, Nepal, China. These are not based on prevalence so the whole country has been put as endemic, but as you know in China it is very much less than in South East Asia, Malaysia, Indonesia, Papua New Guinea, West Irian, Philippines and so on. In Latin America you have mostly Brazil and parts of Central America including Costa Rica, Guyana, Surinam and so on and then in the Pacific Islands a

fair number of islands such as Tahiti, Samoa, Fiji and so on. In terms of numbers in the various regions of the world we are talking about over 1 billion people at risk of infection with about 120 million people infected with both *W. bancrofti* and *Brugia* and something like 43 million people have some sort of disability or other. So again these are large numbers and as I said this morning the WHO World Health Report of 1995 indicated that filariasis comes out as the number two disease in the world causing disability. This is mainly because of the fact that it has been underestimated, people have not taken notice of it, so from the point of view of political commitment and trying to attract funds in terms for control, I think lymphatic filariasis comes up as a major problem for disability in endemic countries.

In terms of the burden of disease, you have something like 16 million people with lymphoedema and elephantiasis of various sorts and about 27 million men with various genital problems including hydrocoele lymph scrotum, and approximately 76 million people who are supposed to be asymptomatic, but we know now that there is no such thing as really asymptomatic because Dr Freedman and others have shown that these people have lymphatic damage already although they have microfilaremia only. They have lymphatic and renal damage. Therefore today we don't classify them any more as being asymptomatic, but that they need to be treated.

Besides elephantiasis and lymphoedema, the main clinical manifestations are hydrocoele, chyluria, haematuria and tropical pulmonary eosinophilia and I am just going very quickly through some of the clinical features. Using an example of a young girl of 12 years old from Karauli in South India where *Brugia malayi* infections are predominant. She has got early stage one lymphoedema of the foot. At one point we thought we could not do anything for these people, but now we know that we can do a lot for these people especially in the early stages of the infection where, as I mentioned in my talk, a lot of it is caused by secondary bacterial infection. If you put these people on intensive foot hygiene and probably on prophylactic antibiotics, they will recede and go back to normal. In the past the whole life of younger children has been spoiled because there is no way they can get out of it, and for them these are real problems which have to be solved. In the case of an acute episode where the patient is having adenolymphangitis, they are laid off from work for two or three days. In many parts of India and other places where at that time, there was only one thing you could do - give them DEC. Whether it does anything to them or not, we've never been sure but we now know that just giving DEC doesn't do very much good to them, but if you put them on intensive local foot hygiene and help them out with a course of antibiotics, they will have some regression of their elephantiasis but not all. Elephantiasis is a sight which you and I don't see normally, but if you go into the villages in Papua New Guinea or in parts of Ghana or parts of Tanzania or in India, you see that these people are really having a lot of disability.

With *Brugia malayi* in Malaysia, characteristically the lower limbs are affected and not the genitals. Chyluria is another aspect of the disease spectrum which is not common in many parts of the world, but certainly is common in parts of India. TPE, tropical pulmonary eosinophilia, is also seen. This is where you get a mottling granule sort of syndrome which when given DEC, they clear because you know these people have cough and asthma-like infection, but this is a very small proportion of the total disease, and is again found mostly in Bancroftian areas in India.

Now in the recent past through the multicentric studies which have been carried out through TDR, a lot of new information has come about. I'll try to summarise this as we go along. Some of the new technologies in diagnosis and monitoring have come up, particularly two areas, lymphoscintigraphy and ultrasound, which have really opened up a new area for research and understanding of the parasite biology as well as the pathology of the disease. I am sure later on Dr Freedman will talk to you at length about the use of lymphoscintigraphy and what he has found, and he has published these papers already. Studies with ultrasound have allowed us to be able to actually locate the worms in the scrotal lymphatics and the new DNA probes can pick up infection or even infections in vectors which has also helped in the understanding of transmission as well as monitoring. Finally there are some studies ongoing on use of DNA probes in looking at blood to pick up microfilaria.

For lymphoscintigraphy, an injection of dextran or colloidal dextran or albumin into the tissue is given subcutaneously to the patient and the patient is then put under a beta counter or gamma counter and his lymphatics are then seen visualised on a monitor. In the normal lymphatics of the two legs where there is no infection, you will see equal distribution of the lymphatics, but in an asymptomatic patient collaterals have developed, and there are multiple obstructions. I am sure later Dr Freedman will explain to you that with the asymptomatic patients, looking at the lymphoscintigraphy we know that already early lymphatic damage has taken place, and whether these are reversible I don't know, but we know that these people have already got changes so the early dilatation of the lymphatics and development of collaterals are common. Gerusa from Recife in Brazil, was the first to use ultrasound in trying to locate the parasite, particular in the scrotal lymphatics, and she was able to find the moving adult worms in the screen, (she calls it the "dancing worms"), and then not only locating the worms, but under local anaesthetic using simple surgical procedures, she was then able to remove these worms from the scrotal lymphatics. Mind you, this is only a small proportion of the total worm world in a patient, but now we are able to get lots of adult worms from men with Bancroftian infections, so it is a source for research material. In some cases in women, she has been able to locate the worms in the breast tissues. You cannot actually remove all the worms, but at least we know that ultrasound can be used for detection of worms as well as monitoring the effect of chemotherapy in looking at whether the worms die or not as an indicator.

Now one other aspect which has come up particularly from the group in Townsville, Australia, is the use of circulating antigens for detection of infection, and again probably Bruce Copeman and others here will explain that to you in further detail. Using various monoclonal antibodies produced here at James Cook University (JCU) and using the ELISA technique, we are able to get detection of infection at a very high specificity and sensitivity. I think most of you are familiar with this technique of antigen detection which has been developed here in JCU. The interesting part of this antigen assay is that it is simple to perform, it is sensitive, specific and it's available today in a kit form. We are hoping that JCU will reduce the price so that everybody else can buy it and use it. Meanwhile, we know that ICT in Australia has also developed another antigen assay of which we will learn more about later. This also looks equally promising if not even better than this one. But certainly the antigen assays become very important too, particularly when you are implementing control programs because I think it is important that we have a clear picture whether the therapeutic approaches have been successful or not and also the replacement of night blood examination becomes a big advantage over anything else.

Now the problem, coming back to the disease itself, as I said with 120 million people infected it is the second leading cause of permanent and long term disability, impediment of socio-economic development, and it appears that in many parts of the world the prevalence is continuing to increase world-wide. Now in the last 10-15 years or so TDR, through various research projects all over the world, carried out multicentric clinical trials using various drugs. These studies were carried out in a number of parts of the world in Haiti, Recife, Brazil, Kenya, many parts of India, Sri Lanka, Indonesia, Malaysia, China, Papua New Guinea and so on. We looked at the use of DEC, the use of ivermectin and the combination of these two drugs. Now the results I present to you here are in three categories mainly based on infection control, morbidity control and vector control. Of course the drug aspects will be mainly concerned with infection control. Clinical trials were hospital based, and were carried out in India and many parts of the world on individual patients.

Now for a long time we have assumed that multiple doses of DEC are better than a single dose of DEC. What came out in these studies was the fact that when we compared a single dose of DEC with a single dose of ivermectin, we realised that the differences are not that significant. There is very little difference between the single dose of DEC after treatment for 12 months and the usual standard dose of 12 - 14 days treatment. In fact, the single dose does equally the same job as a multiple dose. So this really opened up our thinking. This has been in the literature, but nobody really took notice of it, in Samoa and parts of this part of the world it has been done, but until we started comparing the single dose of ivermectin and single dose of DEC, we were not really sure. So now we know that a single dose of DEC does equally the same job as multiple dose of DEC. A single dose of DEC with both of them is almost equal in terms of pre-treatment levels, and it comes down to below 10% after

a year, but when you combine ivermectin and DEC together which is 400 µg ivermectin with 6 mg DEC jointly, you can see there is a significant difference. These studies have been done in Papua New Guinea, Pondicherry, Madras and Tahiti, and you will hear more about these later. So basically we have three approaches now. You can either give a single dose of ivermectin, single dose of DEC, or better still if you combine the drugs. I'm sure you'll hear more about it from Jim Kazura later and from Moses Bockarie from Papua New Guinea.

Then of course we talk about the salt. Now the salt is an old story. In fact India and Brazil did this many years ago. You will remember Dr Frank Hocking from the National Research Institute in London. He was the one who first put DEC into salt and since then it has been sort of lost, but India did a number of clinical studies and showed that the efficacy of the drug using salt is indeed very substantial. We forgot all about it for years until we have revived it now. At 0.1% of DEC salt you get about 94% reduction in microfilaraemia and at 0.4%, approximately 92% - 100% depending upon the time period used. So, basically we are talking here about a method which can help control the infection in a period of time. We think at least a minimum use of one year would help in the reduction of microfilaraemia in populations. *W. bancrofti*, in Tanzania in a period of three months has been brought down to pretty low levels. In the case of *Brugia*, it takes a bit longer in reducing microfilaraemia. *Brugia* always takes longer for both ivermectin as well as salt, but they do work in the end. In Tanzania where the Danish group did some work, there was a dramatic fall in microfilaraemia count over a period of 24 months. As I said the Tamil Nadu Government is doing that in a big way in India.

Meanwhile, some studies carried out in Sri Lanka have shown that the use of albendazole in combination with DEC or ivermectin also does the same thing. In other words here is a drug, albendazole and DEC combined. Albendazole alone does not do it, but when you combine albendazole with DEC you get a dramatic reduction in microfilaraemia, but even better if you combine albendazole with ivermectin. In parts of Africa where DEC cannot be used because of the pseudo-Mazzotti reaction due to onchocerciasis, we think the answer would be to use albendazole in combination with ivermectin. I am sure Don will talk to you later about it because also combining reduction of intestinal parasites is probably a good approach. So we have another combination which can be used probably in the future.

Now to summarise: for infection control we can use DEC single dose, ivermectin single dose, or a combination of ivermectin and DEC or DEC fortified salt. I'll add to that now ivermectin in combination with albendazole as well.

Now as I said we feel that a lot of the pathology of the disease is due essentially to the parasite products. The earlier paradigm was inflammatory responses were immune mediated and causing lymphatic pathology, but our thinking is slightly

beginning to move away from that. Jim and others will comment on this later, that we are beginning to feel that although the initial pathology may be induced by the parasite antigen or excretory products, later on you have a situation where bacteria plays a major role and that causes the lymphatic dilatation and so on. So this is an area where we need to do considerably more research in understanding the disease spectrum and understanding the pathogenesis and trying to see whether we can stop inflammatory response and people going on to develop elephantiasis. So the chronic bacterial infection seems to be playing a major role. We know that in some of the clinical trials we have done, that people who have been given antibiotics over a period of time have had the frequency of acute episodes reduced to a very low percentage, and there is regression in lymphoedema. There is also a complete recovery from the point of view of the elephantiasis. Gerusa claims that even in chronic elephantiasis, intensive hygiene and use of antibiotics will reverse it to a great extent, but certainly in the case of stage one and stage two lymphoedema there is no doubt that intensive hygiene and a therapeutic approach with antibiotics will help.

Gerusa has formed an elephantiasis club where patients come and their feet are cleaned every day, washed and so on and so forth, and according to her there is a lot of regression in these people who keep their feet clean. They do not come down with acute episodes as frequently as the others who don't. So this is an area for morbidity control which appears, based on use of intensive hygiene and antibiotics, we can do a lot for these people, especially in the early stages of infection.

For vector control I won't go into detail, but polystyrene beads which are used in pit latrines and cesspools, have helped in reducing infection or reducing the breeding of *Culex* mosquitoes. *Culex* is also reduced by *Bacillus sphaericus*. Moses and Jim have shown that after combination drug therapy in a region of Papua New Guinea, the number of L3 in *Anopheles punctulatus* has almost dramatically dropped and it looks as if there is complete interruption of transmission. Of course, again, we will have more information about it from Moses later on, but it appears that at least in the case of PNG, the combination of drugs has helped in reducing transmission to a considerable extent. I did not talk very much about impregnated bednets because it is a very difficult situation to assess whether bednets play a role. I am sure bednets do play a role, but it is very difficult to actually do a controlled study on that. Community participation in vector control, which you will hear of from Dr Panicker later, plays a major role in trying to remove breeding sites for the genera *Mansonia* and *Culex*.

Now, as I mentioned, at the meeting in Penang in 1994 at which many of you were present, we put a global strategy together and this is found in the Report of that Consultative Meeting "Lymphatic Filariasis Infection and Disease: Control Strategies". This book contains some of the conclusions of this meeting and based on that meeting is what we are now trying to put together as the Global Strategy for Control.

Basically infection control, morbidity control and assessment of control activities using various antigen assays.

So, to summarise, treatment options are as follows as we have already mentioned: morbidity control, intensive hygiene, and use of antibiotics to prevent recurring attacks of adenolymphangitis as well as stop infection of the bacteria. Vector control using biocides, polystyrene beads, and environmental measures. Assessment of program effectiveness we hope will be a major contribution for not only diagnosis, but monitoring infection in control programs, and of course finally the DNA probes are very specific, but we need to bring it into a reasonable level of marketability so that it can be used in large scale, and Moses, you have been working on that. So perhaps you can tell us a little more about how DNA probes are able to help in detecting infection in mosquitoes.

Cost implications are important but in many countries there are already existing control programs, and it is a question of re-allocation of resources so that what you have spent for vector control can be brought together and used in another way to redesign the strategy as India is currently trying to do. Hopefully additional resources will be made available to implement a national control program for filariasis.

So, the overall strategy basically is mass distribution of chemotherapy, or community based treatment; vector control when feasible but not as a major activity. Vector control is expensive, and therefore can only be used as an adjunct to chemotherapy; and integration of a filariasis control program into the normal primary health care programs of any country.

Now, from the WHO/CDT point of view, what we are trying to do is establish, (and you will hear more about this from Don and others), more accurate information on the prevalence and distribution of the disease. We need to develop country-specific strategies. We need to secure the necessary financial support. We need to conduct workshops and training exercises under the new strategy, and finally put the program into action including monitoring and assessment of ongoing control programs. So the outlook looks promising, but it depends on a number of factors: political commitment, understanding of the disease problem, and financial support both from national as well as, as I mentioned this morning, from NGOs and other bodies. So finally what we need is, not so much knowledge, but an action to implement the control program. So, with that, I hope I have not exceeded the time. Probably I did. Thank you very much.

A/PROFESSOR SPEARE:

Our next speaker is Dr Don Bundy. Don is a Reader in Parasite Epidemiology at Oxford University, Deputy Director of the Oxford Centre for the Epidemiology of Infectious Diseases and Professorial Fellow of Linacre College. He coordinates the Partnership for Child Development, an international initiative to evaluate the benefits of school-based health programmes for the health and education of children. The Partnership helps coordinate operations research projects with the government health and education sectors in Africa and Asia, and supports research studies in 14 countries.

PREVALENCE AND DISTRIBUTION OF LYMPHATIC FILARIASIS

by

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Good morning to you all. It is a pleasure to be here. If CP can use a quote from Aristotle as an example of an action man, then someone from Oxford can come along and talk about practical issues.

The World Bank has a practice that is common in economics research of asking people who are presenting at a conference to produce a paper, so you may get four people producing a paper, which will then be summarised. All those papers will be summarised by one person. So in a session like this, although there were nominally four speakers, actually only one person would speak summarising all the presentations that would have been made. I am afraid I feel like that now CP. I feel a certain redundancy, but we'll see how it goes.

The issue we address is the issue of practical control. I think that's the purpose of this workshop and many of us in coming to Bali think of Bali as a ideal holiday destination. I certainly think it is, but we should also recognise that Bali is part of Indonesia and one of the striking things about Indonesia that I have learned is the capacity of this country to put in place programs effectively and rapidly. It has been extraordinary for me working here in the area of school health and having the pleasure of working with Dr Hadee's team on the school health issue, to see how quickly they have moved to actual implementation. So, I know this is a country where people learn from experience and knowledge, and translate it very rapidly into action. I hope this Workshop can be part of that process of moving forward rapidly.

Now we stand at a situation where we are fairly clear that there is a control opportunity for filariasis and that we have tools to achieve the control of filariasis. Simple tools, cost effective tools and Dr Ramachandran has described some of those. The question, and still an unresolved question, is whether the burden of disease is large enough to justify that intervention. That is, I think, still a question in discussion with public health experts. What is the perception of filariasis as a disease problem? We have very few real examples of control programs for filariasis and I would suggest

that this is the reason, that the perception still is unclear. So what we've been trying to do over the last several years is to develop some kind of picture of what filariasis is as a disease problem. In trying to estimate the burden of filariasis, one has to rely largely on extrapolation as the availability of data really is quite limited and much of the data that one observes is data that ignores the gender and age structure of the population. So much of the data I have to present to you today, lacks the precision one would like.

Well, let's start with simply looking at the burden of Bancroftian filariasis based on the idea of looking at microfilaraemia, simply looking at prevalence against age at the global level, but essentially focussing really on the qualitative picture. What we see is that it's an infection that increases in prevalence with age. One of the interesting features of this infection is indeed that it appears to be an infection that's more common in older age groups. That of course goes against much of our public health thinking which focuses on the younger age classes. So, we do have a problem in selling this as an issue in public health because of the fact that it really isn't affecting the age groups in which there is the most public health interest. We also note that it's an infection which on a global scale appears to be more prevalent in men than in women which is an interesting figure to emerge at this stage. If we look at the age structure in terms of numbers, we end up with an estimate of something like 72 - 73 million cases.

As CP emphasised these 73 million cases are cases of individuals with infection and a number of studies now using lymphoscintigraphic techniques by Dr Freedman who is here and also by Dr Dreyer, have shown that there are significant abnormalities of the lymphatic system in people who are microfilaria positive. The issue is whether that actually results in any disease. We still refer to those people as being asymptomatic. The question is does that subsequently lead to disease? How important is that change, that abnormality, that non-normal condition? One's tendency is at this stage to say that it probably is very important. That it is stage one in an inevitable progression to disease, but at the moment that is very unclear. That needs to be clarified because it's that 73 million people with infection which bring up the statistics of lymphatic filariasis, to put lymphatic filariasis at the number two position in disability. So this is an important area in the sense that it is largely overlooked at this stage, and we have also overlooked the damage that does occur in people who are infected.

What we are much more comfortable considering is overt disease. Overt disease increases in prevalence with age in both sexes and there appears to be higher prevalence of disease in women. I'm looking over the picture globally and estimates of numbers of cases here suggest something like 5 million cases in men and 7 or 8 million cases in women. There are something like 13 or 14 million cases world-wide of lymphoedema with most of those cases focussed in the oldest age classes. This is

the overt disability of lymphatic filariasis. This is the disability associated with the limb changes and those terrible conditions that are so frequently shown to us in photographs. But of course we also now recognise that lymphoedema is associated with adenolymphangitis and filarial fever. What we have no clear measures of at the moment are the implications of those conditions as real disabilities. There is some data from south India, from the group with which Dr Panicker works. A series of papers by Dr Panni on chronic infection shows that the typical duration of filarial fever attacks is of the order of four days with the frequency increasing with age. In middle age one may find as much as one month of the year being attributable to filarial fever disability, and with some individuals showing up to 200 days of disability in any one 365 day period. What we don't know, and I think this is a crucial issue and perhaps Dr Freedman will apply himself to this, is whether those individuals with microfilaraemia are also suffering episodes of adenolymphangitis that is disabling and making those individuals unable to perform their normal activities. That would very much change our picture of the importance of this disease on a global scale. I would also emphasise that those with microfilaraemia, those who are simply infected rather than those who have overt clinical disease, are also typically younger. Therefore in most of the societies with which we work, these people would be numerically much more important. I say numerically, of course.

The third area in thinking about lymphatic filariasis disease is hydrocoele. Again hydrocoele is very markedly age dependent. It, of course, only occurs in males. Now hydrocoele is, of course, a manifestation of lymphatic abnormality. It's a manifestation that lymphatic drainage is not occurring in the way it ought to. It's a manifestation that occurs in males because the male anatomy allows that to become more obvious. But it is of course interesting to ponder on whether there are also 26 million women suffering significant lymphatic damage, and because it's not associated with an obvious clinical sign, is simply being overlooked. This, I know, is an issue that Gerusa Dreyer is following up on. It is certainly an issue that we perhaps should give more attention to. There may be another 27 million cases of damage that we are simply overlooking.

I have no data on some of the other areas like chyluria. Dr Ramachandran showed you an example of chyluria from south India where the condition is relatively uncommon but as far as I know, quite unquantified. In Vietnam where we've recently developed a program, chyluria appears to be quite a common event and is reported frequently in the Red River Delta area where we are working. So I've no idea how important these other supposedly rare events actually are in areas of intense transmission.

If we move on from those distributions to thinking about regional distributions rather than age distribution, this is simply looking at prevalence. I've deliberately expressed this as prevalence of infection by region simply to make a point that's rarely made,

and that is that the prevalence actually is highest in sub-Saharan Africa, an area which traditionally we have not thought of as being a filariasis endemic area. Of course, that does not mean the infection is most numerically prevalent in that area because of course there are far more cases in India and the Pacific region.

Moving from Bancroftian filariasis to Brugian filariasis we look again at the age distribution with males more commonly infected than females. Something of the order of 6.5 million cases in men and about 4 million cases in women. Again this is microfilaraemia not disease. If we move to disease and perhaps I should say we know nothing about the disease associations in, or the microfilaraemia associations in Brugian filariasis at this stage, unless I am going to learn more today about that. If we look at disease, cases of identifiable clinical disease, lymphoedema for Brugian filariasis is in the order of 3 million cases, all of which are in Asia.

Similarly, if one looks at the distribution by prevalence just to compare the patterns we saw for Bancroftian filariasis. The pattern that we have been able to come up with on the distribution by country of Bancroftian filariasis is really a very inadequate pattern at this time. For example, it's far too homogeneous in China and certainly one of the pleas I will make before you now, is that we do need much better data by region to direct our actions in the future. We know that the distribution of Bancroftian filariasis in Brazil is very restricted, but have no clear picture of what that actually is. We also know that in much of China, Bancroftian filariasis has been effectively controlled. We also know that Bancroftian filariasis has been eradicated from Japan, Taiwan, Western Samoa, the Solomon Islands, Australia and Trinidad, and that Brugian filariasis has been eradicated from Sri Lanka. Also when one uses the term "eradicated" it implies that there was a willing attempt to do so, and of course in some of those countries that wouldn't actually be the case. We can always claim success after the event!

The eradication of schistosomiasis from Monserat is a fine example. There were seven cases in 1960 and when I did a survey in the 1980s the Ministry, rapidly followed by WHO, claimed eradication had been achieved and I am sure it has now been eradicated by the eruption of the volcano!

With the overall global data, when comparing the WHO 1992 estimates with the results of this current analysis there are two differences I would like to highlight. If we look at the Western Pacific Region, there are some differences, and those differences really relate to China, and they relate to the fact that we have very little precision about the situation in China, and even tiny residual prevalences of infection in China will result in very significant increases in the numbers of cases simply because it's such a populous country. The other significant difference of course, is in terms of Africa and the growing realisation through the contributions of African scientists, particularly the work of Johnny Gyapong, to show that filariasis is much more common and much more of a problem in Africa than had been realised. All of

which suggests that there are something of the order of 86 million cases of microfilaraemia and lymphoedema combined. There has been no attempt to include in this data the cases of hydrocoele which are usually concomitant with the other cases, and that brings me to indicate then that Africa is a major problem that we are still not tackling, but it's equally clear that the Asian Pacific region is a major region for lymphatic filariasis, and should be a major target of our continuing control efforts.

Why do we need data of this kind? We need data to make the case. We need data on the burden of disease. Something people call advocacy, which is, I always think, a term which is rather unattractive, always reminds you of sort of bottom feeding lawyers, and they are not something we would want to continue with in the public health area. We need to create a clearer understanding of the scale of the problem. We need a clearer understanding of the economic scale, and WHO has just completed a workshop in Oxford on multicentric trial results looking at the economic cost of filariasis. We need a clearer understanding of the contribution of filariasis to morbidity. Many of us forget because we're all health professionals, that the world is not entirely obsessed with the issue of health and one of the big changes in the UN system, we are here fortunately hosted by WHO, but one of the big changes in the UN system is moving away from health, and that many of the UN agencies now include health under a broader heading of social development. We should be clearly aware of that and not be complacent about the role of health in social development. When people talk about social capital, they may well be talking much more about organisations amongst people than they are the health of the people involved. So we need to make the case. We need to be clear about how important we think filariasis is to societies. We also need to have data in order to be able to direct control. We need some precision in knowing which areas actually need control, actually deserve control. Professor Hadee mentioned that 22 provinces of Indonesia have filariasis. He would be the first to say that doesn't mean that 22 have a major problem with filariasis, but I'm sure some amongst those do, and making the case for targeting that control activity is very important. It would be quite possible for the Ministry of Health here, for example, to think about including DEC in their current program to deliver pyrantel and albendazole to communities. It would be easy for them to do that, but they would need to know in which communities that should be done. So more precise data is the key, and I think that the idea that this meeting should initiate a network is exactly the correct way forward in terms of developing a data base. WHO has sponsored the creation of an Atlas of Filariasis, and a global information system, a geographical information system for filariasis. This meeting could perform the nexus for developing that for South East Asia, Asia and for the Asia Pacific region. So, if I was to suggest what might be a very useful and practical outcome, it would be to reinforce the importance of networking, particularly networking around geographical data to more precisely define the needs and the control effort therefore required to control filariasis in the Western Pacific Region.

What I have talked about is work in progress. We clearly do not know precisely what the burden of filariasis is but the conclusion must be that filariasis is, for many communities, for many developing societies, still a major and substantial cause of ill-health. We now know what to do about that. We now know that new control efforts can change that. I hope that this meeting will be the start of doing that for the Western Pacific Region. Thank you very much.

A/PROFESSOR SPEARE:

Our next speaker is Dr Kumaraswami. He is Deputy-Director of the Tuberculosis Research Centre in Madras, India, a clinician with an interest in the immunology and chemotherapy of filariasis and he is a member of the WHO Task Force. Dr Kumaraswami is going to talk to us about the "Clinical Aspects of Filariasis", so please join me in welcoming Dr Kumaraswami.

CLINICAL ASPECTS OF FILARIASIS

by

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It is a pleasure to be with you this morning to discuss the clinical aspects of lymphatic filariasis. I will try to highlight some of the areas which will be of interest to clinicians and also to health planners in general.

I would like to start my talk with a picture of the smiling lady from Madras. She has a reason to smile. She is probably in her thirties and managed to live without developing microfilaraemia, without developing any swelling of her legs or feet, and hopefully she will be antigen negative when we use one of the antigens tests which are available. But another lady next door has these very decorative arrangements which Indian ladies use to decorate their feet. She also has streaks of redness, which usually indicates that she is already susceptible or has some element of filariasis going on with her. Then there are others who develop regular episodes of adenitis and fever. There are individuals who come to you with little swellings along the line of the lymphatics. This is what we call the "string" sign which is overlooked as an early form of the disease. Then there are more common ones which all of you surely recognise as early oedema with episodes of adenolymphangitis. Gross pictures like this are used in textbooks to illustrate the classic nature of the disease, but you may wonder if you still see such cases. Many of you who work in endemic areas may probably see them. We don't see these cases any more, but if you do work in a large teaching hospital in tertiary care places, you still come across cases from deep in the country who have diseases that manifest like this in India today.

You also see what a physician or a surgeon can do to filariasis. Not just what the disease does to the person, but what the surgeon does to filariasis. In an attempt to sculpture a leg which has been damaged by disease the effort can be even worse than the disease itself. With breast disease, even today we have cases in India where women are operated on for lumps in the breast. Not as gross as elephantiasis of the breast, but more subtle. These lumps are believed to be carcinoma of the breast on suspicion. Lumps are being removed, and breasts are being removed only to find that ultimately the true cause was filariasis. Whether it occurs in the female as Dr Bundy raised is a good question.

Some years ago, Dr Ottesen structured the diagram of the clinical manifestations which occurred in endemic regions. Although these conditions are shown linearly there is no assumption to show that people actually go through these stages

sequentially. But what is very clear is that in most endemic areas many of the people who are living with the parasites all around them may not be infected, while at the other end are those who hyper-respond to the parasite, and which leads to the tropical eosinophilia syndrome. As Dr Ramachandran has shown you earlier, we've had a lot of new work showing that by the ability to visualise parasites, we can now use them to monitor disease and also to monitor control programs.

We also used ultrasound like other groups, and we have found it particularly useful to study responses to drugs because now you have a choice of drugs to use. Previously there was just one drug, DEC. Now you have a choice. You have DEC, or ivermectin and as Dr Ramachandran has shown you, even albendazole entering the picture. It is very clear that by using ultrasound you can see what these drugs do to the adult worms. All along we knew what they did to the microfilaria. There have been questions raised about resistance to these drugs.

Lymphoscintigraphy has shown various abnormalities, which I am sure have become the topic of the day, and these have been shown in different forms of filariasis, but what is of interest is those abnormalities which occurred in the early forms of the disease. Our own experience has shown that these could include dilatation of the lymphatics. Classically we always taught students that lymphatic disease in filariasis was due to obstruction. We always said that the lymphatics were blocked. We now very clearly know that these lymphatics may, in fact, be dilated, they may be tortuous and the most interesting aspect is the development of collateral lymphatics, an obvious attempt by the system to overcome the parasite. We also know that these individuals have renal abnormalities ranging from haematuria to proteinuria, and these could be exacerbated by treatment.

Under the area which has not been touched is the interest amongst immunologists in studying lymphatic filariasis as a disease which has many models for studying the immune system in general. The most characteristic I think which Dr Freedman will touch upon later in his presentations is the so-called immunosuppression that occurs among patients with microfilaremia. These asymptomatic individuals, as they were previously known, were shown to have a variety of immunological abnormalities. We have all seen as the literature goes through the various forms of immunological mechanisms which are studied, so many abnormalities have been described in these individuals. To go back to Dr Bundy's point, what do these abnormalities mean? We know certainly the treatment of some of these abnormalities can be the worst. What they mean in terms of pathogenesis is certainly something that has to be studied. We know from a variety of responses that this so-called immunosuppression can be the worst but again, like the term asymptomatic, it is wrong to label these individuals as immunosuppressed. They are immunosuppressed in the sense that they produce classical responses in a diminished fashion, but they are actually very active when they produce other types of molecules. They are hyperactive when they produce molecules

which dampen the immune system. So again the use of the term immunosuppression should be withdrawn just as we would like to withdraw the term asymptomatic for describing these individuals.

We also learned about what the parasite itself can do to produce pathology. We now know that based on studies on the parasite metabolism and from the major studies that there can be two pathways by which lymphatic pathology can be produced in filariasis. One is the non-inflammatory pathway and the other is the inflammatory pathway. This again is a condition which many of you may think is an exaggeration, but it still does occur in endemic areas. These are the conditions where bacterial infections have a very clear role to play in the exacerbation of the response. As Dr Ramachandran has shown you earlier, a number of studies have clearly shown now that bacterial infections added to the existing lymphatic abnormalities do play an important role in perpetration of this disorder.

As I mentioned earlier our interest in tropical eosinophilia, although it represents a very small percentage of individuals who actually have the problem in endemic areas, arises from the fact that it can be used to study other disease models where eosinophils are involved. In acute tropical eosinophilia, there is a gradient between the peripheral blood and the lung as far as eosinophils are concerned. Using bronchial lavage we have shown that these eosinophils are actually activated and degranulate within the lung.

To emphasise a few important issues that still remain to be studied in lymphatic filariasis I have listed some of them which are of interest to clinicians. Should we abandon the term "filarial fevers"? We have discussed at length the role of bacterial infections. We have said washing the feet and using antibiotics, may be a very important part in the program itself, but at the basic level, are all these episodes caused only by bacteria? As clinicians most of us are aware that many of our patients still come and tell us that the fever started with a lymph node swelling, and it descended downwards, so is there a role for the term filarial fever at all? Does the parasite in any way still contribute to these fevers? Secondly, all of you who work in endemic areas think about the silent onset. We assume that all lymphoedemas, and this applies again to hydrocoele and also to chyluria, that anything that occurs which involves the lower limb swelling, which involves genital swelling, we always attribute to filariasis. So, in many of these people there is a silent onset which is not associated with previous episodes of lymphangitis or adenitis. Clinical quiescence and multiple limb involvement are other issues which we are trying to address. What are the factors that move a person along the path to elephantiasis? Is it just mere recurrent episodes of adenolymphangitis, recurrent episodes of bacterial infections? These are clearly important in implementing programs because from the community's perspective, the people who you treat with the so-called asymptomatic microfilaraemia, have no disease. In fact, most programs have got into trouble

because the so-called apparently normal individuals are sick the morning following your visit to the village to do your control program. What the community would like to see is changes in people who have the disease. If you have to treat them properly we need to understand what these factors mean and how the progression of the disease occurs. External genital disease has already been raised by Dr Bundy. Does it occur as frequently as it occurs in males and as I said, pathology is an important matter.

A/PROFESSOR SPEARE:

Thank you very much Dr Kumaraswami. I will ask Dr Paul Turner to now come up. Paul is a Senior Lecturer and Coordinator of the Filariasis Control Section at the Department of Public Health and Tropical Medicine. Paul has played a major role in filariasis control programs in Papua New Guinea and Myanmar. Current interests include diagnosis and epidemiology of Bancroftian filariasis, reactions to therapy for lymphatic filariasis, responses to hepatitis B vaccines and environmental health issues.

COMMUNITY BASED FILARIASIS CONTROL

by

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I think you would all agree listening to the paper we have had this morning that the research results have been very exciting over the last few years. I think that we have come to a point now where we need to go from a research mode into a control mode. There are enough results in on control at the moment to start performing some control work. There is obviously more need for research to be undertaken on topics which Dr Han has commented on this morning. Knowing when to stop undertaking filariasis control is very important as is knowing when to start mass treatment. One of the biggest issues we have to work out is at what prevalence do you start your mass treatment program, and when do you perform selective therapy? If we start control now with the information we have, then as more research results come in, we can adapt our strategy accordingly. Another comment made this morning was that there needs to be political will that filariasis control is a program in endemic countries. I would hope that by the end of this workshop people will see that lymphatic filariasis is a significant health problem in these countries, and that governments make efforts to look at control strategies.

My talk this morning will address, I hope, some of the practicalities of filariasis control. I thought I would recap with a life cycle for a start which is just re-emphasising that what we're looking at in the strategy for control is the elimination of the microfilaria to reduce transmission. One of the problems of undertaking filarial control is that there is no mortality associated with the disease, and that there are a few people with obvious morbidity. I know in Papua New Guinea you can have areas where the microfilaria rate is very high, but there is no obvious chronic pathology. Local health workers will say there is not a filarial problem in these communities because they don't see any chronic pathology. It is unfortunate that most of our textbooks and most of our public health material emphasise elephantiasis and do not emphasise the other clinical aspects of filariasis. As a result Departments of Health do not consider it an important disease. In these times of economic constraint it appears there is little interest in controlling this type of disease. How can we make a case for filarial elimination? We must get people to see that it is an important disease. This includes not only clinicians and politicians but also the local people.

Any control must also be economically acceptable. It is no good doing a control program which costs \$5 per year per person to implement when you have a very small health budget. So the control must be easy to implement and be economically acceptable. We can devise a very complicated control program which, because of the complications we put in, just won't get started.

We also must see some real benefits to the community. Control for control's sake is not really acceptable. We need to show some ideas that this is actually going to benefit the community. There was an international task force on disease eradication which showed that filariasis is one of the six most potentially eradicable diseases around the world. The WHO has also reclassified filariasis as the second most important cause of disability in communities. Lots of control program results say yes, we have reduced the parasite, but few show how the control has affected the community. It is very important that we need to show there is a community improvement after treatment, not just a reduction in parasites.

So what are the new clinical effects of filariasis which are becoming known? We have the obvious chronic lymphoedema which we've discussed already. There have been some interesting anecdotal reports of cerebral filariasis. One case in Papua New Guinea where a lady had cerebral dysfunction in hospital at Chevron Medical Department, and she was not responding to any treatment. By chance they took a blood sample at night and found she had a very high microfilaria density. They treated her with DEC, her symptoms regressed very quickly, and she was home within one or two days after that. Dr Nay Soe Maung from Myanmar is undertaking some research to assess problems from a cerebral filariasis aspect.

We also see adenolymphangitis, tropical pulmonary eosinophilia, splenomegaly, chronic lethargy and weakness which is very important as far as the economic impact of the disease. The work done by Ok Tedi and Dr Schuurkamp is showed that using DEC without antimalarial therapy, can actually reduce the spleen rates over a period of time. There are a number of other issues which have come up today such as proteinuria and haematuria which show that filariasis is a significant cause of clinical problems.

Just recapping on filariasis in Papua New Guinea, we have isolated populations in the endemic areas. The transport cost to travel around Papua New Guinea is very high. We find lymphatic filariasis endemic in most provinces and in the Sepik area, up to 90% positive. So really, selective therapy is not appropriate in New Guinea. Going over the options for control, there are dedicated filarial control teams, some form of community based control program, and control as part of the public health initiative. We have talked a bit already about the different regimes which are available and I am sure you are all fully aware of those. The one which I would like to emphasise to you today is the standard annual treatment regardless of weight. If we look at DEC

alone, on an annual basis it costs around about two cents per person per treatment for DEC alone. This is based on a 50 kg person. The DEC medicated salt works very effectively, but it is more expensive to use, and somebody has got to absorb the cost between the normal cost of salt and the cost of adding the DEC to it. Then obviously if people are going to purchase the salt the cost is going to be a lot less than if they were going to buy it. The standard treatment regardless of weight is approximately 1.2 cents per year and with ivermectin the equivalent.

With dedicated control teams you often get people located in major centres, and the associated cost with these teams can be prohibitive to adequate control. We also, unfortunately, often put complicated monitoring into the processes to show we are working. If you were going to monitor lots of people to show that your control program is working, then the actual costs of the monitoring becomes a lot more than the cost of the medication.

So this is what we're working on with Misima Mines in Papua New Guinea. We are looking at treatments supplied to community groups for delivery. If I can ask you to imagine if you were going to treat 2,000 people as part of a national control program or as a control program in some remote area of New Guinea, what would you have to do to treat those 2,000 people? Under the present situation, you would need to line the people up and weigh them to work out how much treatment to give at 6 mg/kg. You would then have to work out how many 50 mg tablets of DEC were required for each person, and then give them out. For one person to treat 2,000 people would take a long time. So it would be beneficial if we could find some way of delivering the medication without these complications. With a disease like filariasis where there is a long period of treatment, monitoring every six months or every 12 months is perhaps not warranted. Monitoring every two years looking at filarial antigens or whatever analysis you want to do, would be more appropriate.

If you talk to aid post orderlies or health workers in remote areas, they complain that dedicated teams come in particularly to undertake expanded program of immunisation and maternal child health clinics. These teams do all the work and the health workers are not seen as being the initiator of primary health care within the community. Implementation of disease control through local primary health care workers means they are seen as getting the credit for the work. This obviously increases the community's trust in that person's ability to actually do the work.

Transport costs are kept to a minimum and there are reduced costs of monitoring and associated improved compliance. If you go in and start bleeding people at night on a regular basis to show that the program's working, people will pull out of the program. Even using finger prick detection, people do not want to be involved in this monitoring. So, if you do monitoring on a regular basis, it can reduce compliance.

We have calculated that the average weight of a person in Papua New Guinea is approximately 50 kgs, and so using 6 mg/kg we have produced one tablet of 300 mg, so all the adults get the one tablet. In the same way, we've worked out a child treatment dose of 150 mg for children above five years of age and we've colour-coded these tablets to simplify treatments. Thus you don't need to have any complicated system. Every adult that comes around gets a red tablet and every child will get a blue tablet. This can be easily implemented. In New Guinea the church has a really big role in the community life and it would be very simple, on one day a year as everybody is coming out of a church for the pastor to sit there and give out the treatments to everybody. You could get quite a big coverage using that system. There is also no need for scales or complicated calculations and treatments can be given by anyone.

We can get the DEC for less than one cent. So, for drug costs alone for \$30,000 we can have enough treatments for three million people. Also taking only one tablet, improves compliance. There is nothing worse than giving out eight 50 mg tablets for someone to go off and take when you can give them one tablet to take straight away. The costs that are not included are the transport of tablets, health promotion material, monitoring and coordinating staff but we estimate these costs at between five and six cents.

I think it is very important that filariasis control is not too expensive, or that there is a requirement for extensive monitoring. I think the idea of using it as part of a community development project using the standard treatments, would be very simple. So what are the benefits of this? If a department of health can see that they can treat one person per year for five cents a year, then it becomes a viable option. It can also be used as a training tool for public health workers in development projects. There is substantial improved well-being in the communities and people, once they are treated, feel much better. This leads to improved standing in the community of the health worker.

One of the issues always raised is how are you going to monitor this control program. We need to get some feedback as to how the program is working. People have got to decide how much they are willing to spend. You can do as much monitoring as you want if you are prepared to pay for it, but if there's not much money around to spend, you have got to reduce the actual monitoring.

Monitoring using microfilaria which is classed as a gold standard, is pretty labour intensive. The night-time bleeding can also underestimate the prevalence. If you take 1 ml of blood you might find no microfilaria but if you take 5 mls of blood you might find one or two. Unfortunately most of the detection is done by using finger prick blood collection which misses a lot of the people, so underestimates the prevalence. There is also evidence of possible seasonal periodicity. So you can go around and collect microfilaria at different times of the year, and find different prevalence rates. It also needs trained staff and therefore it becomes expensive.

With antigen testing there are two antigen tests available. There's the More-Copeman test from Townsville and there's the ICT test. They are both very good and easy to use. The antigen tests are useful in prevalence surveys where you can do rapid assessment of various sites in the country. One thing Jethro Usurup from Misima is doing is looking at detecting antigen in children between 0 - 5 years of age to indicate break in transmission. We are doing a trial of rapid assessment in Papua New Guinea and also in Myanmar with Nay Soe Maung. I think DNA probes are very good and they work very well, but I'm not quite sure of the practicalities of using it as part of a national control program in an endemic country, so I don't really want to say too much on that.

I believe we need, in this economic climate, to explore other avenues for funding control programs. One of the avenues we are exploring is multinationals funding these projects. You find that many mining companies and oil companies are located in filarial endemic areas. If you look around the world, the big companies such as Chevron, Placer and other companies are located in very strategic spots as far as filarial endemicity is concerned. They have good logistical support: they have helicopters, boats, cars and vehicles. They have everything you require for doing any program. They also have a commitment to community development. All their sites which are working around the world could start doing public health programs of filarial control in their areas. Certainly some of the data which Jethro and I are getting is that expatriate workers working in these endemic countries could be at risk of subclinical infection.

So, I think lymphatic filariasis eradication or elimination is a viable option if you are using community-based treatments and can be assisted by outside funding. It will be accepted by Departments of Health if we can show them that it will work, the community can get some benefit from it and it can be economical.

A/PROFESSOR SPEARE:

Thank you very much Paul. To wind up this session, I think in one and a half hours we have had a very comprehensive overview of lymphatic filariasis which has not only set the scene for the country discussions this afternoon but also for the succeeding two and a half days of lymphatic filariasis.

SECTION B - ROUND TABLE

COUNTRY REPORTS

Dr C.P Ramachandran
Chairperson

This afternoon we have a fairly important session in trying to bring to light what the current situation is of filariasis control in many of the countries in the Asia-Pacific Region. I believe that Dr Paul Turner has given you a brief on what you need to presume in terms of current status. The main purpose, I believe, of this exercise is for us to update ourselves on the current situation in the Asia-Pacific Region because, as you probably know, there are many countries in the region where we have not got much information on filariasis prevalence and also its importance as a public health problem. Some countries on the other hand have lots of information and also have an ongoing control program, but in the context of the new thinking in control strategies, I think we need to re-look at some of the ongoing control programs for those countries, but yet at the same time, for those countries where there is no program perhaps you should consider how you will implement them in the context of the new knowledge we have acquired over the years. Basically we do not want too much detail, but just the gist of what the filariasis problem is in the country, what you are doing about it, and how, and perhaps a few other additional comments on the future.

We will start with Dr Jo Koroivueta from Fiji. Joe Koroivueta is the Chief Medical Officer of the National Filariasis Control Programme, Medical Officer in Charge of Virus Laboratory and Coordinator of the National Dengue Control Programme for the Department of Health, Fiji.

**Dr Josefa Koroivueta
Chief Medical Officer
National Filariasis Unit
Tamavuna, Suva
Fiji**

Mr Chairman, Ladies and Gentlemen. I just want to present very briefly the situation in Fiji now and basically to give you a bit of background, and then talk about the diagnostic methods and lastly the control program.

Fiji has a population of 760,000 with 110 islands which are inhabited, and this is a third of the total island groups in the country. Filariasis is one of the priority diseases in the public health sector. The control program started initially way back in the 1960s, but stopped in 1975 when, firstly, there were indications that the infection was at a very low level, and secondly, there was a lack of funding to sustain that program. However, later in the studies in the 1980s, it was shown that both infection and clinical cases were again on the rise, and that necessitated a scientific study in 1986 and 1991, and at the moment we have a national control program.

The diagnostic method that has been used all the time has been the finger prick method and this is still used now. The current control program we have now is the single, annual dose regimen of Hetrazan using 6 mg per kg to everyone above the age of two years right across the divisions. There are four main divisions in Fiji and the Central, Eastern and the Northern Division is where most of the filariasis is. The Western Division is the dry area of Fiji, and, if you do come for holidays, that will be the place to be because it is very dry and very lovely.

The prevalence now, with some areas having had treatment, ranges from 0.5% on the Western side to around 10% in the other Divisions. The highest infection rate from current evidence now, is on the Polynesian part of Fiji which is a very isolated island of Rotuma, accessible by a 2½ hour flight, and the rate in those areas ranges from 20% - 30%. It is the area that we have targeted initially. We were there about a month ago when we started drug distribution to the whole population.

For the future for Fiji, ivermectin will be added so it's a combination of Hetrazan plus ivermectin and we would be starting the distribution if everything goes well maybe around August. The ivermectin has been provided through the WHO support with Merck, Sharp and Dohme as the providers of ivermectin and I think the understanding now is to supply it for about five years. So, certainly the control for filariasis in Fiji is a combination of Hetrazan plus ivermectin for a minimum of five years. Thank you very much.

DR RAMACHANDRAN:

Thank you. I think, maybe before we go onto the next one, perhaps there may be some points others want to raise, but before they do I just want to say a couple of things in case people are wondering where the ivermectin is coming from.

I think Dr Eric Ottesen was the chief negotiator in trying to get ivermectin out for lymphatic filariasis, and he has been going down to Merck quite often. More recently, the information, although it is not official yet, is that ivermectin will be registered as an indication for lymphatic filariasis before the end of the year in Paris. I think the French registration which of course, is the same thing that has been done for onchocerciasis, means that it should be available for ministries of health and other consumers in other parts of the world hopefully in the immediate future.

Meanwhile, what Merck has agreed upon is that in view of the fact that it is important to do the combination therapy, they are prepared to provide, free-of-charge, ivermectin to those countries if the request comes from the ministries of health, and this is exactly what I believe Fiji has done as has Samoa and perhaps Egypt. The idea is that Merck will make available ivermectin to these countries for a long period of time until such time as the countries feel that they have got rid of the infection. So that's a pretty long commitment as with onchocerciasis, which I think is a great thing for Merck to do.

The other point I want to make is we have been recommending, as you know from our Penang studies and early multicentric studies, a combination of 400 µg ivermectin with 6 mg DEC. Now obviously I think Jim will tell us later in Papua New Guinea or perhaps Moses, that when you work out in terms of per kilo body weight, this comes to a fair amount of capsules or tablets and you can see that people have to have a large meal of tablets, and it can be quite difficult especially in terms of compliance. So, we believe that 400 µg obviously was the best result we obtained at the time when the multicentric studies were carried out by various people here, Dr Moulia-Pelat, Kumaraswami, Jim and others, but it appears that even at 200 µg per kilo, will have a fairly similar effect. So if that is confirmed from Dr Kumaraswami's studies, then you can actually bring down the dosage to 200 µg plus 6 mg DEC which will certainly help in the consumption of the drug. So, I believe Jo, that in your setup you're going to start at 200 is that right or is it 400? Two hundred, although I was a bit anxious about that; but perhaps Dr Kumaraswami you could comment on that - 400 and 200 because I think it is important that we get it right.

DR KUMARASWAMI:

Very briefly; 200 does the same job as 400.

DR RAMACHANDRAN:

Okay, any questions? So, it looks like your program is well on its way. You said August. This is mass chemotherapy. Is it for the whole of Fiji or just this particular Polynesian area?

DR KOROIVUETA:

All of Fiji.

DR RAMACHANDRAN:

All of Fiji. Okay. Jim?

PROFESSOR JIM KAZURA:

May I ask how you are planning to monitor it or are you planning to monitor it at all? I mean do you go on for 10 years, five years, or what's your approach to determine how long you need to give it especially in this high prevalence area if I can use this as an example?

DR JO KOROIVUETA:

We are planning to do monitoring every two years.

DR RAMACHANDRAN:

Until such time you feel you've interrupted transmission or reduced infection in the population.

DR RAMACHANDRAN:

The question of course most of us will have in our minds is how and when the antigen assays will be made available for large scale use and this is something which probably Paul Turner - I think we have the lady from ICT here. Would you like to comment at this stage?

DR MEARNS (ICT):

At the moment Gary Weill and colleagues are doing some clinical trials to verify specificity. So once we get the results back from them, I think we can go ahead and use the test in the field. So it will probably be in the next three or four months.

DR RAMACHANDRAN:

At an affordable cost I suspect?

DR MEARNS (ICT):

I don't know what the cost will be. I don't work in that section,

DR RAMACHANDRAN:

Okay. Any other burning questions? If not, we go on to the next presentation by Dr Moses Bockarie from Papua New Guinea.

Moses Bockarie graduated in Zoology from the University of Sierra Leone in 1984. As a Research Assistant with the British Medical Research Council Onchocerciasis Unit in Bo, Sierra Leone, he studied the transmission dynamics of *Onchocerca volvulus* and submitted it as an external MSc with the University of Sierra Leone in 1989. In the same year he completed another MSc program in Medical Parasitology and Applied Entomology in the Liverpool School of Tropical Medicine, UK. His PhD, also in the Liverpool School of Tropical Medicine, was based on vector ecology and malaria transmission in Sierra Leone. In 1994, he was awarded the Sir Phillip Toosey Prize for "notable research in any branch of Tropical Medicine by students associated with the Liverpool School". Dr Bockarie joined the Papua New Guinea Institute of Medical Research in 1993 as a Research Fellow in Medical Entomology and initiated a longitudinal study on the transmission dynamics of lymphatic filariasis in Papua New Guinea, which is still going on. He has 20 publications, in the fields of malaria, onchocerciasis and lymphatic filariasis, in peer review publications.

Dr Moses Bockarie
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PO Box 378, Madang
Papua New Guinea

Statistics on filariasis in Papua New Guinea started early in the 50s and early survey maps by Dutch workers indicated that the entire coastline of Papua New Guinea was endemic for the disease and prevalence, even in those days, were quite high, up to about 20% in coastal areas using the techniques they used then. Fairly recently, well designed and organised surveys have been conducted using techniques like blood films, filtration techniques, nucleopore counting chamber and Knotts concentration. These have also shown the four regions in the country have filariasis as a problem and prevalence rates at the village level varies from about 20% up to 98%. Over 90% prevalence rates have been recorded both in the inland areas and also in the highlands region where mosquito numbers are not known to be very high and where malaria is not considered to be a major problem because in Papua New Guinea lymphatic filariasis is transmitted by the same *Anopheles* mosquito that transmits malaria. It is not only the prevalence rates that are very high in Papua New Guinea. The endemic densities are also very high and some people can have up to 60,000 microfilaria/ml blood. The current estimate by the WHO is that over 25% of the four million people living in Papua New Guinea are infected with the parasite and well designed surveys have now shown that as opposed to other places, the prevalence in males and females are very similar but in terms of disease, the situation in Papua New Guinea is a bit like that in Africa with hydrocoele being more common than elephantiasis.

Also, when we look at the mosquito infection rates we've recorded some of the highest rates of mosquito infection in the world. Definitely the highest for *Anopheles* mosquitoes in terms of infection rates. We've recorded up to a thousand L3s in a single mosquito and in terms of the incidence of transmission, the annual transmission potential is an estimate of the number of L3s that a single person is exposed to in a year, and the records in Papua New Guinea for *Anopheles* mosquitoes are the highest in the world. So the individuals in very endemic areas in Papua New Guinea could be exposed to over two thousand L3s per year and over 40,000 mosquito bites per year.

In terms of control in Papua New Guinea, there is no planned national control program although there is evidence that the malaria control program using residual insecticides in the early 60s, actually resulted in elimination of filariasis in most of the coastal areas in the same way that it did in the Solomon Islands although in Papua New Guinea that was not recorded as it was in the Solomon Islands. But we know very clearly, for instance, that Maprik where the IMR malaria laboratory was based

and where the research was actually based, was very endemic for lymphatic filariasis in the 1950s and early 60s. This is the area now where we do malaria vaccine studies, and we do regular blood films of people we have screened at six monthly intervals, approximately 2,000 - 3,000 people and we've not recorded a single microfilaria case in that area that was very endemic in the 50s and 60s. So there are indications that the malaria control also eliminated filariasis in certain areas. In fact if you look at the map of Papua New Guinea, filariasis in the Sepik really starts where the malaria control program stopped. In terms of control now, as I said, the government hasn't got really established control programs but non-governmental organisations, especially the mining companies, have established or created control programs. The Ok Tedi Mines, for instance, with Dr Spicer, Richard Keogh and Dr Schuurkamp, initiated control measures that were very effective, treating people with DEC at six month intervals. Also Dr Steve Flew who appeared with the Lihir Mining Company did start a control program that is ongoing and is very effective. This is not a research based thing, it is the Health Department in collaboration with the hospital. The drugs are given to the community and the community, is involved and Lihir will be monitoring the effectiveness of that, not only in reduction of microfilaraemia, but also transmission, and looking at the entomology. There have been dramatic reductions when people are treated once every six months.

So, the few areas we have concentrated on in Papua New Guinea look to be working very well. In the Sepik there are trials where we are trying DEC in combination with ivermectin and then also DEC alone. We have been doing work in about 16 villages and as Professor Kazura will emphasise later when he makes his presentation, the reduction in microfilaraemia in all the villages where the people were treated with DEC and ivermectin, varied between 70% to about 97%. So we know that the combination works very well in the Sepik in these areas where prevalence was over 90%, and intensity of transmission was very high. However, I think more dramatically, was the fact that with one treatment for one year, transmission was almost interrupted as Dr Ramachandran showed in those slides, in villages where prevalence rates were over 50%. Before the treatment, we would pick up L3s in mosquitoes in over seven to eight months collection. After that it was only one month when we could detect L3s.

The Papua New Guinea situation is a good situation where maybe the idea of eradicating filariasis can be achieved very easily but unfortunately filariasis control at the moment is not in the hands of the government or the government has not seen it as a major public health problem. Probably the next phase in Papua New Guinea is trying to get the government involved, and with that we can easily see lymphatic filariasis taken care of.

DR RAMACHANDRAN:

Thank you Moses. I think Moses has given us a quick overview of the current situation in PNG. I think it is paradoxical in a way that they have the highest rates of infection in the world probably, and yet from the point of view of therapeutic approaches, probably the chance of eliminating is greater than any other place as he pointed out rightly. We had never heard of 85% - 90% prevalence rates in communities and mosquitoes with 50% infectivity at any one time. These are unbelievable figures, but they are true. I think the fact remains that a drug like Ivermectin or DEC can interrupt transmission in this *Anopheles punctulatas* transmitted filariasis. So, I think perhaps although they don't have a national program yet, I believe that the studies which Moses and Jim and others are doing there, as well as Paul Turner and his group, will add to it in terms of the future controls, strategies from your point of view, what can be done there, what will be done, in terms of a national activity. Do you have any comments on who may be involved there?

DR TURNER:

Unfortunately there is no-one here representing the PNG Government. However, I think the resources are there in Papua New Guinea to do a national program. All we need is a political decision to do it.

DR RAMACHANDRAN:

Thank you. Any other points to be raised? Perhaps at this stage we must recognise that the other side of Papua New Guinea is West Irian which is Indonesia and they probably have an identical situation there. But we will hear about that from an Indonesian delegate in a while. Thank you, Moses.

Now we will move on to the Republic of Indonesia and Dr Widarso. (No bibliography available).

Dr Widarso
Sub Directorate of Filarial Control Programme
Directorate of Vector-Borne Diseases Control
Ministry of Health
Jakarta, Indonesia

Thank you, Mr Chairman. There is a filariasis control program in Indonesia. Indonesia consists mainly of five large islands from about 13,760 big and small islands and the five large islands are Sumatra, Java, Kalimantan, Sulawesi and Irian Jaya.

The population in Indonesia was 192 million in 1994, and the population living in the endemic area was 140 million. Only five out of 27 provinces are filaria free. Lymphatic filariasis in Indonesia is caused by three species which are *Wuchereria bancrofti*, *Wuchereria malayi* and *Wuchereria timori*.

In Indonesia the vectors of filariasis includes a wide variety of mosquitoes. The genera of these are *Culex*, *Anopheles*, *Mansonia* and *Aedes aegypti*, and all of them are transmitters for *W. bancrofti*. Both *Mansonia* and *Anopheles* are transmitters of *Brugia malayi*, whereas *Anopheles barbirostris* transmits *Brugia timori*. The clinical picture that we found was microfilaraemia, and I could detect lymphoedema, elephantiasis, scrotolymphoedema, breast filariasis, hydrocoele but no haematuria or tropical pulmonary eosinophilia.

Lymphatic filariasis is still a major public health problem in Indonesia. This is endemic in both urban and rural areas, and it is usually is in the low socio-economic group of the community mostly among the productive age group. Filariasis control was initiated in 1970. In 1975 a national filariasis control program was established by conducting mass treatment with a DEC standard dose of 5 mg per kilogram body weight for *Brugia malayi* for 10 days and 14 days for *Wuchereria bancrofti*. Side effects we found ranged from mild to severe.

Since 1991, mass treatment has been applied using low dose DEC weekly for 40 weeks. DEC 100 mgs for those aged 10 years and older and for children 2 - 9 years using half the adult dose or 50 mgs. The objective of our program is to 1) decrease prevalence of microfilaria to less than 1%, 2) decrease transmission rate to zero, 3) treat the patient as early as possible to prevent chronic disease, and 4) to protect the people in the endemic areas from transmission and morbidity caused by the disease.

The strategy is that the priority areas should be controlled. These are migration areas, tourist resort areas, production socio-economic areas and areas bordering on endemic areas.

So, coverage of the control program - as our Director-General mentioned this morning, involves 22 of the 27 provinces. After mass treatment the reported average microfilaria rate decreased from 21.6% in 1970 to 4.3% in 1992 with a range of zero to 23.8%. The management of the control program was organised as follows. The activities were done by sub-district health centres and also by community participation, but sub-district health centres were responsible for the mass treatment. Sub-district health centres should do the planning for mass treatment, and then for the implementation of mass treatment they have to prepare the people, drug, budget and also be the provider. After that they have to apply the treatment with low dose 40 weekly doses by community approach, and also be the centre responsible for records and reporting. We have to evaluate here, the operational outcome 1-2 years after the treatment with a clinical and blood survey. If the microfilaria are found greater than or equal to 1%, we have to plan for mass treatment, and if microfilaria is less than 1%, selective treatment should be done. The sub-district health centre is also responsible if there is suspected endemic areas. The sub-district health centre should do the preliminary survey when they find clinical cases. Preliminary survey will be done for 1% and then if persons are detected positive for microfilaria, it should be reported to the district health service and then the district health service plan the survey for clinical and finger blood samples. The district health service together with sub-district health centre implement the real survey. So, if the results of the survey find microfilaria more or equal to 1%, it becomes an endemic area and should be done like an endemic area using mass treatment, and if microfilaria are less than 1%, selective treatment should also be done.

The future strategy will be done by administering a single dose annual or semi-annual dose of DEC 6 mg per kilogram body weight, and also DEC fortified salt to 0.2 - 0.5% SWS recommendation. Also the pilot project of both new methods will be done in some areas for each species with different places for any species. Also morbidity control is very important like hygiene, antibiotic and foot care.

Vector control was done by community participation through the health education and environment forum or through training and health education activity, and they have to be done. Lastly the intersectoral approach is very important because without intersectoral approach I think it's very difficult to reach the goal of our control program. Thank you, Mr Chairman, and I hope Professor Oemijati would please help me to answer any questions. Thank you.

DR RAMACHANDRAN:

Thank you very much Dr Widarso for that presentation on what you have been doing in Indonesia in terms of control. I am sure many of us here realise that Indonesia, from the logistic point of view, is a fairly large country to cover with approximately 160,000 islands in mostly five major areas. But nevertheless I think one of the things

they have been doing as Dr Widarso has mentioned was the provision of low dose DEC to the population; that is, for 40 weeks adults get a tablet and the children get 50 mg tablets. What you didn't say, Dr Widarso, is the results of those campaigns. Perhaps we would like to have some information on the efficacy of the low dose treatment you have had in many of the districts earlier, and what microfilaria rates it has come down to, or has it remained at a standstill because the low dose DEC is fairly equal or perhaps similar to the use of DEC fortified salt. Anyway perhaps there are other questions and Professor Oemijati may be able to tell us a little more about the situation in this country and the future program. Questions first? Yes, Dr Orlov.

DR ORLOV (WHO Southeast Asia):

Well, since you have three species, do you intend to use the same strategies, same sort of methodology and same expectations for *W. bancrofti*, *B. malayi*, and *B. timori* particularly because, besides Indonesia, I wonder, Mr Chairman, which are the other endemic countries for *B. timori*. Can they think of eliminating *B. timori* to start with?

Second is: I wonder what would be your comments on Paul Turner's presentation in regard to cost of salt. Cost of salt is about five dollars per capita versus a few cents on DEC or ivermectin mass treatment. Since I know that over here out-of-reach health services are substantial, I wonder whether if salt was given, which way things will develop, but I know for sure that there is much more to it with you people when you were preparing this strategy, so I would like to have details.

First all priority species; second whether you will opt primarily for mass treatment versus salt; and third just a statement - to what extent your foci are different? In fact, very idyllically of clinical epidemiological presentation of filariasis whatever in any given place - perhaps it's just nothing to do much with strategy and there's much more to it - but what sort of picture in the community, how much it varies? Thank you.

Professor Sri Oemijati
Department of Parasitology
University of Indonesia
Jalan Salemba 6
Jakarta

Thank you very much for this question. Filariasis actually is not as easy to control as has been discussed so far. As you know in Indonesia, as far as filariasis is concerned, Indonesia is very rich. We have at least three species with five epidemiologically different types. We have the urban and the rural type of *bancrofti* with different vectors with different environments. With *Brugia malayi* we have the strictly anthropophilic or the periodic type, and we have the same semi-periodic or even non-periodic types with different environments with different vectors. Then we have *Brugia timori* which is a new species and is endemic in rice field areas with *Anopheles barbirostris* as the vector. So with all this, we also have different clinical manifestations. Mostly the brugian filariasis is more acute. With bancroftian filariasis we don't see many cases with acute disease, or acute adenolymphadenitis and abscesses. What we see mostly as indicated, is hydrocoele and later on elephantiasis, and also chyluria was found in Jakarta in the older days, but it's disappearing now. For brugian filariasis the clinical appearance is more acute. In an area endemic with brugian filariasis, you see acute stages from enlarged lymph nodes to abscesses, healing abscesses, scar formation, lymphoedema and elephantiasis. Also, the reaction to DEC administration is different. In the bancroftian filariasis, the reaction to DEC is much milder than in the brugian filariasis. In the brugian filariasis we do not dare to give a 6 mg per kilogram body weight in one single dose because the reactions are very severe.

We have one small village with less than 100 people, where we gave three times 2 mg per kilogram body weight to the whole population. The next day nobody was working. Everybody was lying down, but this is a Catholic area, and they do what the church asks them to do. But, in other areas it is very difficult.

So, the approach is then that it is not easy to have only one measure to be used in the control of filariasis in Indonesia. It should be locally specific. Local means the species, local means the environment, and environment means physical as well as socio-cultural environment. This we have to take into consideration, and what we do now is this low dose treatment. We do not dare to give a standard dose and as Professor Ramachandran has mentioned, the use of ivermectin plus DEC sounds hopeful, and also with the albendazole coming into the picture, maybe albendazole is already available in Indonesia. Maybe we can do clinical trials easily with this, and one other thing is, now in Indonesia, we are not only using community participation, but we would like to have a multisectoral approach because the most important is the

change of environment. Change of environment means change of the physical environment so the breeding places will disappear. This can be done with the development of the area. In one area 60 kilometres west of Jakarta, we have a brugian filariasis endemic area with 22% I am afraid and the health people have done nothing at all. This was a swampy area with *Mansonia indiana* as vector. Ten years later, we revisited the area. The area has changed totally. The swamps have disappeared. They make drainage, they make useful lands, and water plants disappear; *Mansonia indiana* disappears. We performed a blood survey. It has come down to less than 1% without the help of any health people. This approach is now being carried out, not only for filariasis, but also for other diseases as well. Thank you very much.

DR RAMACHANDRAN:

Thank you very much for those real practical comments of the situation here in this country. So, as far as we know that the future strategy is to look at the problem on the basis of the five islands or five states from West Irian to Sumatra and it will be made on the basis of the local conditions and ecology while keeping in view the various strategies that are available. Correct? Okay, any other questions? Thank you very much Professor Oemijati.

We'll go on to the Philippines and ask Dr Belizario to give us an idea of the situation in the Philippines (no bibliography available).

Dr V.Y. Belizario
Associate Professor and Chair
Department of Parasitology
College of Public Health
University of the Philippines
Manilla

From the Philippines I come to share with you the experience we have in filariasis. Briefly, the status of filariasis in the Philippines on paper is under-reported. If you talk to the Ministry of Health people, (and I don't belong to the Ministry of Health now that I belong to the University of Philippines), they will cite very low figures. These low figures are not given much attention by the local administration, and so the result is a virtual cycle of low reporting and low support and low priority, and it never ends that way.

The endemic areas in the Philippines happen to be the remote rural areas. We have, seen large hydrocoele as late as in the 1990s. We have more hydrocoele than elephantiasis and lymphoedema. The rates cited by the Ministry of Health do not consider those with chronic disease, and they are purely reflective of those who have proven to be microfilaraemic.

Just recently there was an article which came out in the leading newspaper showing that there are more farmers suffering from mosquito borne diseases, and this article talks about lymphatic filariasis, not malaria. The figures which they cite are pure microfilaraemic cases. The rates are as low as 1%, and even less than 1%, and they say the rates are going higher, from 1% - 2%, and this does not make the local administrators excited. However, in our own limited studies with the Research Institute for Tropical Medicine and the College of Public Health collaborating, we have found villages with microfilaria rates as high as 10% - 15%. Incidence of acute disease can go as high as 100 per 1,000 population and about 4% or 482,000 have hydrocoele or chronic disease which becomes a little more exciting now.

The population in the Philippines is roughly 65 million. Of the 65 million there is about 20% at risk of developing infection. It is too bad that at the moment there is no accurate mapping which we can use with regard to the actual existence of the disease. This, I feel, would be a priority in trying to direct future control efforts. In fact, the first step now, after hearing everyone talk this morning and this afternoon, is to be able to determine where exactly are the areas to be prioritised.

With respect to our plans in the future, our Ministry of Health seems to be going at a slow pace. As I told you earlier, the present program revolves around the not so active test detection, and the 12 day course of DEC. We hope to be able to work

with them in trying out the newer methods of control, but again the more basic question is where to focus this initial testing of these more recent advances in control.

DR RAMACHANDRAN:

Thank you, Dr Belizario. Any questions?

PROFESSOR WRONSKI:

You said that the authority to run the program was limited to local areas, so you've obviously then had some experience of setting a national program and running it centrally compared to trying to run a national program through lots of regions. Can you comment on difficulties you might encounter in let's say if the profile of filariasis was raised at the national level. How easy would it then be to get that taken up by regions?

DR BELIZARIO:

I think the basic problem with having a centralised program is that those in Manila running the program are not reflecting the true picture of the situation. There seems to be a problem also with regards to coordination of the local and the central office. For example now, a problem which we have is that health has been devolved at the local administrative units, meaning that if you are a municipal health officer or you're the physician for a municipality, your boss is the municipal mayor and no longer the Department of Health Secretary. So a problem which we may encounter is that the Department of Health, the Manila Office, may set filariasis as priority, but in implementation there will be a problem. So I think one basic issue here is trying to put the act of the Central Office and the peripheral units together. Something which will keep them united towards one direction I think would be a basic issue to contend with right now.

UNIDENTIFIED QUESTIONER:

What would be the average population of a municipality?

DR BELIZARIO:

A municipality for example which we studied would have about 50,000 people, and filariasis would be outside the town centre. At the different villages around the town centre the population would probably have a total of about 30 - 35,000 all over the different villages, and so one would need to target the villages outside the town centre probably for mass control purposes.

DR RAMACHANDRAN:

Thank you very much. I believe the question you asked, Ian, is very important because there has been a lot of criticism about vertical programs and trying to integrate into primary health care system of any country, so there have been some discussions on filariasis control, and how one can integrate that into a horizontal or a primary health care program as against many of the vertical programs we know of. This is a very difficult question to answer because many of the primary health care programs looking at a number of issues, not just filariasis but tuberculosis and malaria and so on, you may not get the sort of impact one wants initially especially in a country like, let's say, Papua New Guinea where high prevalence rates are initially found. So this is a question we may need to think about a little bit more because most of the approaches have been to integrate communicable disease control into primary health care programs so the question is how successful one would be. Maybe we could discuss this at a different level. If there are no other questions we will move on. Thank you very much Dr Belizario.

I request Dr Guatamadasa from Sri Lanka. She is in charge of the National Control Program for filariasis in Columbo. Thank you.

Dr C. H. Guatamadasa
Director
Anti Filariasis Campaign
42B Summit Flats
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Colombo, Sri Lanka
Sri Lanka

In Sri Lanka the filariasis program today has been operating since 1947. At that time the problem was due to the brugia type of filariasis. Then, due to control measures, the problem of brugian filariasis has been controlled since 1964 and after 1964 not a single case of brugian filariasis has been reported.

Since 1949 the problem has been due to urban filariasis, and the endemic belt is confined to the south western coastal belt of Sri Lanka and yet out of the nine provinces, three provinces are endemic. These are the most deeply populated provinces in Sri Lanka. In 1950 the population in these three provinces was about 1.5 million, but today due to the increase in population, the population has become at least nine million. The total population of Sri Lanka is 18 million. So I believe about 50% of our people are at risk.

We now have very low rates of microfilaria. It is less than 1%. For the year 1995 the average rate was 0.46%, and the infection rates were less than 1%, but realistically we can't go by these figures because the coverage is very poor. This is because in 1983 we had communal riots, then again in 1988, so we were really banking on the night blood service and these programs came to a standstill. So even in 1989 and even now with various problems in the country, the coverage is very poor. Prior to 1983 we were taking about two million blood films, but last year we took only 0.4 million, including the clinical picture. We have 27 special clinics and that's in an endemic area for the clinical positive cases, but the reporting is not so good. From the central Colombo area the total number of reported cases is roughly about 3,000 new cases and about 17,000 old cases, but again we don't get a lot of the people. They go to either the hospitals or private practitioners and they are sent medication, so we do not see the actual number of cases with a clinical picture. So, this is really an underestimation. I don't think it reflects even 1% of the real prevalence.

Regarding the control methods, we bank mainly on the parasite control program. Our targets were fixed in the 1960s and these have not revised, and with the increase in population I think we have to revise these and we need a very large staff to do this. Being a poor country we can't afford to have so many people who can carry out this program. That is one drawback and since 1989 the campaigns existing like vertical campaigns were dissolved, and they began being kept as horizontal campaigns. So,

unfortunately, I think in our country the progress is not very satisfactory. The thing is, once the programs have evolved to the provinces, we don't have people who are more qualified in this field. Another problem is they have other priorities in the regions. So once they give the money for other priorities, the resources that we get for filariasis control is limited. At the moment even our vehicles have been taken up for other purposes. Because of these things the program has completely buckled over the years, and gradually it is deteriorating because recruitment of staff and associated problems are there. So if you can bank on this new regime of one day treatment, I think it will be a great success in our country.

In addition to the parasite control work, we carry out vector control work. We carry out the larvae cycle program in a very limited area; that is only in high density areas. Then entomological investigations are also carried out side-by-side along with the parasite control program. We carry out a special service within a very limited budget in the areas outside the endemic area just to see where there are any unforeseen infections. Fortunately we have only one vector, *Culex quinquefasciatus*, but the mosquito is prevalent all over the country. Another problem is the migration of people between the most thickly populated parts of Sri Lanka, and there is migration of people to and fro. So, unless the control measures are strengthened, I think one day it is possible the whole island will be endemic. Last time when Dr Kumaraswami came, we discussed the situation of introducing medicated salt, but we are not very happy about it. Regarding the one day treatment, I was asked to carry out the project, and I do hope I will get some assistance from the WHO at least to carry out protecting the localised area before you implement anything for the whole endemic area.

Regarding the clinical picture, we now get the majority of the patients with lymphoedema in the lower legs or upper limbs and very few hydrocoels. We get a fair number with tropical pulmonary eosinophilia and other things. Chyluria is very very rare. With the incidence of asymptomatic carriers we get more in males and their age group is 10 - 40 years. The clinical picture is seen more in females. This may be due to the fact that we really don't get the typical elephantiasis cases. Maybe with the better health education and awareness people are coming to get treatment. The clinical picture is that more females are coming with microfilaria, and there are more asymptomatic males.

Then another big problem in the southern province - I don't know what we can do about it. The southern province is one where the endemicity is fairly high and we have no control of the breeding places for these mosquitoes because you can't do any larvical program because the people are in that water the whole time. Introduction of larvenous fish doesn't work as again they won't survive because the water gets polluted, and you have gone introducing fish so health becomes a big problem in those areas. We are hoping with the improvement of the general sanitation and by

having another integrated program like that, we may be able to do a better vector control program, and generally we think of just getting rid of the vector control program unless it is fairly necessary and to bank on the parasite control program. Thank you.

DR RAMACHANDRAN:

Thank you very much Dr Guatamadasa. I believe Dr Guatamadasa has been very modest in portraying a picture in Sri Lanka of the control because I am quite familiar with the Sri Lanka program which has been going on for some years and they have done quite well so far, but I think you have given us a feeling of frustration and depression, but I think they may be temporary in your situation. One question I have is, have you been continuing with selective treatment so far? You haven't really gone on to mass chemotherapy yet, or is there mass chemotherapy? At the time when I was there some years ago it was continued as selective treatment of positive cases.

DR Guatamadasa:

Selective treatments but in the 1960s in an area where endemicity was very poor - we had very high prevalence rates.

DR RAMACHANDRAN:

Other questions - Dr Panicker.

DR PANICKER:

The disappearance of *Brugia malyai* in Sri Lanka, is it associated with the development of the country?

DR Guatamadasa:

Prior to 1947, earlier surveys hadn't been carried out since 1914, and then they detected brugian filariasis. Then what they did was they moved the water plants from the tanks especially the endemic belt was quite different at that time because in the northern part we have huge irrigation canals and tanks so with the removal of the water plants they used a weedicide. At that time the malaria program was also going on, so maybe due to a combination of various reasons because even now the *Mansonia* mosquitoes are there, and all the water plants are there, but fortunately the parasite is not there. We carried out another survey in 1981 in 21 of these areas where brugian filariasis was endemic, and we prepared about 93,000 blood films, but we didn't get a single positive case. We are just assuming that it is eradicated because to do an all island survey is beyond our budget.

DR RAMACHANDRAN:

Good. I think Dr Biswas also had a question.

DR BISWAS:

Do you spray any insecticides in that endemic area?

DR Guatamadasa:

We are using larvicides only.

DR BISWAS:

Is that *Brugia malayi*?

DR Guatamadasa:

Earlier they had been using insecticide Noxalyn 30 on a weekly cycle. That was in 1947 - '48 - '49. After that no pesticide has been used.

DR RAMACHANDRAN:

If there are no other questions, we have to move on. Dr Orlov, your last point.

DR ORLOV:

Sri Lanka is in fact unique because they spent money, and you know if you have an endemic area of a tropical country with prevalence less than 1%, then well, something has been done. In comparative situations next door, microfilaria there runs in two digit percentage, and they have less than one, so Madam, we all have problems, and you know, the moment a vertical program goes into horizontal, everybody has reservations. Sri Lanka is the only country in the region which has national anti-mosquito day and they take, not only malaria vectors, but all blood-sucking arthropods. I make this comment so you don't get that gloomy impression of Sri Lanka. Sri Lanka is doing quite alright.

You have broken down endemicity of filariasis. Do you observe now the phenomenon of clusterisation in your future approach in drug treatment? What is the smallest unit are you expecting to take for mass treatment? That's my first question.

And second, you said that distribution of microfilaria in the population, is on the right in older age groups. Do you foresee selective treatment of older age groups, or

do you intend if you go for chemotherapy, to take all people above two?

DR Guatamadasa:

Actually we haven't gone for mass treatment yet. So as you said, if we are to select people and it is only the clinical incidence where it is mostly from aged 10 - 40, but we have got cases more than nine months old. The youngest reported case so far that I have seen is nine months, so there are cases in between who we get with clinical manifestations. So, I personally feel it is always better for us to carry out mass treatment in the whole area because with the limited resources we have for staff, mass treatment is feasible as it is given bi-annually or annually only. At present we are continuing with 14 day treatment, so at the moment now with the country budget money that I have got, I have been training some of the field midwives and other people who are involved in the primary health care work and in our country the primary health care set-up is very good. So I think making use of those people, we may be able to carry out this mass treatment campaign.

UNKNOWN QUESTIONER:

What is the population unit for the midwives - what do you budget?

DR Guatamadasa:

I thought I would select midwife areas because a midwife area covers about 3,000 population, and they are the best people who visit the houses, and they know the real population. I think if we can get their help we may be able to do a better coverage.

DR RAMACHANDRAN:

Thank you very much Dr Guatamadasa.

Could we call on Dr Moulia-Pelat from French Polynesia. Dr Moulia-Pelat is working in the Institute Territorial De Recherches Medicales Louis Malarde in Tahiti and has been doing a lot of work on filariasis control there.

Dr Moulia-Pelat
Institut Territorial de Recherches Medicales Louis Malarde
BP30 Papeete, Tahiti
French Polynesia

Thank you, Mr Chairman. French Polynesia covers 2,000 square kilometres in the Western Pacific Region which is a large area. There are 100 islands but there are only 200,000 inhabitants. It is not the same program, but lymphatic filariasis is a big problem in French Polynesia, and it is an old program because you can find carriers since the beginning of the century and my Institute was created 50 years ago by American scientists to perform a control program against lymphatic filariasis. In each small island you can find men with elephantiasis of the arms or legs and everybody knows of lymphatic filariasis. In the local language, there are words for elephantiasis, for filariasis, for each aspect of the disease. We began the program 30 years ago with mass treatment with DEC 6 mg per kilo and they tried many dosages, and they tried a lot of different periodicities, monthly, twice yearly and yearly. They tried many targets. They treated all the people, they treated only the carriers, they tried a lot of things, and after 10 years of treatment they decided that the best solution was DEC 6 twice yearly, and they have a good reduction with an active regime. They go house by house and treat, and it was compulsory for all people, so they treat everybody.

At the beginning, in 1950 there were 30% microfilaria carriers, in 1982 there was less than 1% microfilaria carriers, and in 1982 they stopped the program because people became reluctant to take the drug. The political commitment decreased and the program was a victim of its own success, and we stopped the program in 1982. In 1982 DEC was available, but you had to go to the chemist to get it. However, 10 years after, in 1992, we had a survey for filariasis control, and we found in some islands 30% microfilaria carriers. Ten years after the end of the control program we are back to 40 years ago. We have a bigger problem.

For the control program DEC 6 is a good solution, but only for a control program, and if you begin a control program you don't stop. If you stop you go back to 30 years ago, and if you don't stop, you probably find political will decreases. There is no way you can stop with only DEC for the control program. You don't stop during the 30 or 40 years. During the last 10 years Institute Pasteur has performed a trial on single dose of DEC 6 and a single dose of ivermectin 400, and the combination of both, and after this we thought that the combination of ivermectin 400 and DEC 6 was the solution. It is a good solution, but maybe it is not enough because we have a big increase of prevalence rate, and it is difficult to have less than 1%, and maybe you must try to have an eradication. In French Polynesia we have a lot of tools. We have DEC tablets. We have, if we want, ivermectin tablets. We have DEC salt, and with some problem, we can find albendazole.

To evaluate our survey program we have microfilaraemia. We have no antigenaemia or C4:C3. We have antibody levels, and then we have PCR on mosquitoes, but we must chose a new objective because for the last three years, my Ministry performed a new control program with only DEC 3 twice yearly. I think it is not enough, but they want to perform a new control program and they began with the same mistake, they began a control program with DEC 3, and normally this program for five years stop next year. I hope that next year they will perform a new control program with DEC salt every day and the combination DEC 6 and ivermectin 400 every year.

In 1996 ivermectin is available. Merck Sharp and Dohme want to give ivermectin. For the compliance the number of tablets is important, but Paul Turner shows this morning that you can find DEC tablets with 300 mg, and we can find a good DEC salt. I hope that the next DEC salt in French Polynesia will be better than the first, and I think that the most important problem is a political will. If you have no political will, you cannot perform an eradication program or a large control program. For me, the political will is the most important point. If you have the political will, you can have a monopoly situation for the market of DEC salt. French Polynesia is a special area. It is a very very small country, and all the salt is imported, and you can oblige as a company to import DEC salt. Maybe the second legal program is to sell the DEC salt in the grocery stores, and not in the chemist. If you sell the DEC salt in the chemist, it is not good for your program.

For French Polynesia I think that the control program of DEC 3 twice yearly is old-fashioned and I hope that next year they will give ivermectin. They give DEC salt and with this program DEC salt every day and tablets every year. I think we can have a short program, less than five years for eradication, and I hope that French Polynesia can eradicate lymphatic filariasis before the next five years. Thank you.

DR RAMACHANDRAN:

On that optimistic note about French Polynesia are there any questions?

DR KAZURA:

If I understood you correctly, you said the MF prevalence, the MF carrier rates ran at less than 1% in 1982 when the mass chemotherapy campaigns were discontinued for a variety of reasons, so if those numbers are accurate that means that the MF carrier rate is not a good indicator of transmission - I'm thinking more in terms of eradication - I just want your comments. I mean if it's less than 1% ...

DR MOULIA-PELAT:

One or near 1%.

DR KAZURA:

What do you think it would have taken to eradicate it, or do you believe that the MF carrier rate is not a good indicator that we should follow to determine how long we should continue giving drugs A, B, C or D or whatever we are going to do to?

DR MOULIA-PELAT:

I hope with combination we have less than this result, and with the result of India, of China, of Tanzania - we hope that with DEC salt, we have maybe a very strong eradication in about two or three years.

DR RAMACHANDRAN:

No, I think what Jim is trying to say is that you had your prevalence rates there at about 1%, 10 or 20 years ago, you left it there with no interventions for 10 years and then the rates came back to 20 - 30%.

DR MOULIA-PELAT:

In defence of the Island, it has increased to 20 and 30% in some islands.

In 1982 they performed a survey with blood smear and after we perform a survey with blood samples. Maybe it can explain the difference, but I think with only DEC 6 it is difficult to stop the control program.

DR RAMACHANDRAN:

Well, I think that is an important question because we really don't know at this stage exactly when control programs should be terminated in terms of prevalence in a community, but it depends, I suppose, in different situations. Probably in other parts

where *Culex* transmits, it is a different story as against in an island situation, although I thought it would be easier in an island situation to break the cycle, but I think that Dr Moulia-Pelat brought up a comment, about the DEC fortified salt. I think it was very important that wherever we use medicated salt, the quality control becomes very critical because he had some problems with the salt he was using. It was assumed that the quality control of salt was reasonable, and unfortunately it didn't turn out to be there, so he wasted a lot of time and effort in giving salt which contained below the optimal level of DEC. So the preparation of the salt has to be very carefully monitored so that the DEC content per gram of salt is maintained throughout the year otherwise it doesn't work. Are there other questions?

DR BUNDY:

I just want to make a pertinent comment about Jim's conclusion. I discussed this with John Paul before so I hope I'm simply passing on what he would say. If we take the situation, when at the end point of a control program, what we're actually talking about there is a rather desolate program with a lack of interest, not everyone taking their DEC, and not a very effective monitoring system using blood smears at that point, and taking averages over a number of islands and so forth. So you've got very little precision about that end point of 1%. What it means, we don't know. If people believe it should be less than 1%, then it is reported so. You then have people going back in looking for filariasis. Going back and now looking at larger volumes of blood. Looking for that and certainly finding it in certain of the islands. All I'm saying is that we shouldn't necessarily jump to conclusions when we're looking at less than 1% and then back to 20 - 30% MF. But what we're certainly observing is that DEC on its own probably is not going to lead to eradication in terms of its ability to achieve elimination.

DR RAMACHANDRAN:

Thank you Dr Moulia-Pelat. Our next speaker is Dr Judson Leafasia. Judson graduated in medicine (MBBS) from the University of Papua New Guinea in 1983. He worked as Resident Medical Officer in various hospitals in Papua New Guinea (1984-6) and as Senior Medical Officer in provincial hospitals in Solomon Islands (1986-88). He graduated from the London School of Hygiene and Tropical Medicine (MSc) in 1990, and has worked as Chief Medical Officer Communicable Diseases/Malaria, Ministry of Health and Medical Services, Solomon Islands (1991-94). Since January 1995, he has worked as the Director of the Solomon Islands Medical Training and Research Institute.

Dr Judson Leafasia
Director
Solomon Islands Medical Training and Research Institute
Honiara
Solomon Islands

Thank you, Mr Chairman. I think the situation in Solomon Islands is a unique situation as far as filariasis is concerned in that there has not been an indigenous Solomon Islander interested in filariasis, but we have all been interested in malaria. When you talk about filariasis in the case of Solomon Islands, you need to talk about malaria as well because what has actually happened, and what has been recorded in publications and other interested people have talked about, is that because of the malaria eradication program in Solomon Islands since the 1950s and the 1960s, filariasis has been reduced. There have been huge reductions in prevalence rates recorded in parts of Solomon Islands from 80% before the malaria eradication days to zero in some areas, and I think it's also because filariasis is a focal disease. It is not endemic right throughout the country. So areas that have had filariasis have been looked at by interested scientists and interested people, and the figures that we do have come from only interested scientists who look at it, not because they want to eradicate filariasis from the Solomon Islands, but I think from a purely scientific point of view.

The Solomon Islands, are next to Papua New Guinea, north-east of Australia and somewhere in the Pacific Ocean. Nothing like Bali but a beautiful place where 300,000 live, and malaria is the major problem. I think the situation in Solomon Islands at the moment, as far as filariasis is concerned, is that nobody in Solomon Islands cares about filariasis or even wants to know anything about it. That's the reason why I'm here because I think filariasis is important, despite the fact that people say that it has been reduced dramatically, and there are people who actually believe that it has been eradicated as well. If that is the case then this might be a success story, but I don't think so. If the sun rises again tomorrow, and there is no filariasis in the Solomon Islands, then all my efforts here would have been wasted, but I strongly believe that there is a possible resurgence of filariasis in Solomon Islands because the disease has not been controlled per se by a filariasis control program. The gains that have been made are because of the malaria eradication program, and to say that you have one program addressing one disease eradicating another, is much too much to want to accept. I do not believe that, and I sincerely hope that what I will learn here and the things that will come up in this conference, will help me find out exactly what the real situation is in Solomon Islands so that maybe the next time I come up to talk like this, I will be able to know what the real situation is. Thank you very much indeed.

DR RAMACHANDRAN:

Thank you very much, Dr Judson. In fact, you are right, absolutely right. I mean, when we talk about filariasis, we always say that Solomon Islands have eradicated that and you will find that in the literature. You will also see that in the video which you will see later that among the list of countries listed there which has been successfully eradicated filariasis, Solomon Islands comes up as number one. So, you are allowed to tell us whether that is true or not. Thank you very much.

We come to a major partner in the filariasis area, India. Our next speaker is Dr Biswus. (No bibliography available)

Dr Biswas
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Mr Chairman, Distinguished Delegates. Filariasis is also one of the major public health problems in my country. In endemicity it is next to malaria. Control measures were conducted or initiated in 1955 under the auspices of the National Institute of Communicable Diseases, that is a fifth generation of the National Malaria Eradication Program. Because the control measures which we adopt for the control of filariasis are similar to the control measures undertaken under for our malaria scheme, the control part of National Filaria Control Program which was initiated in 1955 was transferred to the National Malaria Eradication Program in 1978.

Now, the present status of this National Filaria Control Program I'll present in detail. Some parts of our country like Bali, are free from filariasis. For example the north-western part, and then the north-eastern part are free from filariasis and you can hold malaria conferences in this part without any fear of getting infection of these diseases.

Endemicity of filariasis in my country has also been mapped by about 27 filariasis units and the Ganges Plain which is highly endemic for filariasis and also the coastal belt of the whole of the southern peninsula is endemic for filariasis.

The country has a population of about 900 million people. Of this 900 million people, about 420 million people are exposed to filariasis and of these 420 about 111 million people are residing in urban areas and the rest of the population are in rural areas.

Two types of filariasis are present in our country. These are bancroftian filariasis which is a major infection and *Brugia malayi* and there is also another subjective form of bancroftian filariasis in the Nicobar Islands.

Presently there are about 420 million people exposed to this infection, and about 2.5 million people are exposed to *Brugia malayi* infection which is carried by *Mansonia* mosquitoes. Then roughly about 0.01 million people are exposed to bancroftian filariasis.

Filariasis control is affected by three types of organisations or institutions. These are the controlling unit, the sub-unit and clinics. We have 203 controlling units, and they are mainly operating in urban areas, and are distributed in about 25 institutes in the whole of the country and in five Indian territories. Then we also have 27 sub-units.

They are marketing the filaria problem in the whole of the country. Then we have 198 clinics that are distributed mainly in the towns where these controlling units are operating. These three set-ups, also treat the patient when they detect any filaria cases. The sub-units bring some cases there also, for treatment.

The main control methods which are undertaken are anti-malarial measures, acute level with approved larvicides. Then we also undertake environmental measures using environmental management by filling ditches which are not used and also de-silting and cleaning of the drains and other environmental measures, etc. Then we also have biological control methods mainly by larvicides. We have two important larvae species that is *Bacillus sphaericus* and *B. thuringiensis*. Where we have applied these species, there is no breeding of mosquitoes.

Our main task is the anti malaria measures. We undertake these malaria measures through the malaria clinics by direction and treatment of the cases directed by these malaria clinics and also we have facilities in the clinics for the examination of the cases, and when there are malaria cases detected cases also are treated. These malaria clinics are at night to start with, and that is the main drawback for the companies of the population. These night clinics have problems operating because it is difficult to collect bloods in the night. Where that is the only option we are still using it, and we cannot adopt any new tools for the detection of filariasis in my country.

In the rural area two to three years ago we did not have any control measures for lymphatic filariasis, but from 1994 we have started to control filariasis in the rural areas. Also through the public health undertaking, that is through primary health centres, we are distributing the filarial drug, with the main drug being diethylcarbamazine to these primary health centres and they are treating the filarial cases in rural areas by distributing drugs through multi (inaudible) or the health frontiers in the rural areas.

This will give you the actual picture of the parts examined by these malaria clinics, and the microfilaria cases detected, and the diseases detected through these clinics. In 1994 about three million people were examined out of which 47,000 detected positive for microfilaria which is about 1.2%. They also detected about 30,000 disease cases which showed 0.89% of the disease cases. So if you compared this microfilaria disease cases detected in 1990 with 1994, there is a gradual decline of both. One point six percent (1.6%) came down to 1.2%, and though that is a marginal reduction this also shows that filaria is coming down with the control measures undertaken by my country. Disease has also showed decline.

On the basis of the actual examination, that means there were 23 million people with microfilaria and about 20 million people suffering from the filarial disease. This is an

estimate of figures.

Parallel studies like DEC medicated salt, were done in my country and there are similar areas where these new techniques were experimented with, but the result in these areas which is obtained here, could not be interpreted due to financial constraint - government assessing. With this technique we could get 100% coverage as was made in some areas where this method was adopted for about 12 months.

The whole aspect of this National Malaria Program is presented in a booklet, and we also state how we are operating this National Malaria Program, and all the details are given. Why I show this is that we are already selling this booklet, which is being distributed by scientists who have presented their contribution on filariasis. They also mention about mass therapy. We have also planned for this and we have already covered in this booklet how we are going to do this single dose treatment in my country. We have already started doing this and in 1996/97. Over the period of the next few years, that is from 1996 - 2001 we plan to have covered the whole of these endemic states under this single dose treatment.

Recently in January the Commissioner of Health with WHO was here for two days and there are some conditions of these companies that the single dose DEC mass drug therapy at a dose of 6 mg per kilo body weight once a year for two to three years. We have already selected seven target districts which are the highly endemic districts, and we are planning to have these mass drug therapy in those areas, and we are trying to get some funds for this to be educated.

DR RAMANCHANDRAN:

Dr Biswus I think there is no point going into fine details

DR BISWUS:

I tell you this as DEC alone for mass drug therapy using tablets at the rate of two tablets per person, we will have to use about 840 million tablets which cost about 1.8 million US dollars and paracetamol also about 1.3 million. At the moment we are only spending 0.4 million for the drugs required for all this control measures. Then for paracetamol we are also spending only 0.3 million and we require about 1.8 million dollars. This money is very difficult to get. That is why I don't know whether mass drug therapy will be successful with 120 million people exposed to this. With these figures, I want to end my presentation here, and if you want to know anything in detail, please ask me. I am ready to answer.

DR RAMANCHANDRAN:

Okay. Thank you very much for your presentation. Obviously, India has a major challenge there. Well I assume that you are not going to cover the whole country at one day or one stretch, so whatever funds you need will be acquired over a period of time, and not in any one single time because that's a large amount of money but I think the basic thing is India has now, for years and years, as you saw from Dr Biswus' presentation, conducted anti-larval measures and a full course of DEC regimen. The impact of that has not been terribly pronounced because there is plenty of filariasis still in India. I think their National Filariasis Control Program has realised that the measures taken so far hasn't really made any great measures in terms of clinical disease prevalence, or reduction in clinical disease or even in infection control. So, they have agreed now to review their program and come up with a revised control strategy as you heard in terms of single dose mass chemotherapy in heavily endemic areas to start with, and then going to other areas as time goes on, and also to be supplemented with, wherever possible, DEC fortified salt. Unless some such measures are taken, it will be difficult to bring down the total prevalence and infection in that country, but I think the most illuminating part of the Indian strategy now is they've declared 5 August as the National Filariasis Day at which they are trying to persuade the population in heavily endemic areas to come forward and take the drug because they had a very successful program for polio immunisation where they apparently did almost over 90% coverage. If the same approach can be done, then, of course, it will have a great impact on the parasitaemia in communities. Are there any questions?

DR TAYLOR:

Is there any particular reason why you chose the 5 August? I was thinking that if there's only seasonal variability in microfilaraemia perhaps this is an important factor?

DR BISWUS:

That has been recommended by a number of organisations.

DR RAMACHANDRAN:

All right. We'll go on.

Dr John Gyapong. Give us a quick review of the situation in Ghana. (No bibliography available).

Dr John Gyapong
Health Research Unit
Ministry of Health
PO Box 184
Accra, Ghana

Ghana is not in Asia, neither is it in the Pacific. Ghana is in West Africa for those of you who do not know. The population is estimated at about 16 million. Filariasis has been a problem for a long time now as far as we can remember but somehow it got buried in the literature, and nobody was doing anything about it until very recently. When I'm talking about recently, I'm talking about the last five to six years when we started doing some work on it. It was just a coincidental finding in an area we were working in, and we decided to explore the extent of the problem, and it caught up with the press men and they made a lot of noise about it. There's an outbreak of elephantiasis somewhere. When you read that in the press, everybody begins to panic. It ended up in Parliament, there was a debate on it and Parliament were instructed to conduct a national survey, and so the political will and backing has been there from the beginning, at least within the last five years. Information available now is mainly on prevalence of the problem - the extent and distribution of the problem.

The national survey revealed a microfilaria prevalence of about 3% with wide geographical variation between zero and 41%. In the coastal belt of the country you find prevalence rates between 10% and 20%, whereas the middle forest belt is relatively free, and when you go up north, the prevalence is between 20% and 40%. So, filariasis has been shown to be a problem, and is still a problem and we've also taken time with support from TDR to document the social and economic impacts and burden of the disease. We've written a lot about that in recent times, but as of now there is no control strategy. There is no control program in the country, and we are working in collaboration with other people who have the experience to try and develop a control program for the country. There is still a lot of political support and in the early part of last week, Dr Eric Ottesen visited us as our guest to look at the extent of the problem to help us design a control program. So there is now a lot in the pipeline as far as designing a control program is concerned.

I just want to highlight a few things about the extent of the problem and a few interesting things about epidemiological disease in Ghana. We used the thick blood smears in documenting all this so what we've documented could be an underestimate of the real problem. One interesting thing we've found is that women appear to be more significantly infected than men, both in terms of microfilaraemia prevalence and in terms of lymphoedema, but when you add the hydrocoele to their chronic disease presentation, then it's about an equal balance, but when you exclude hydrocoele which women don't have, then women are statistically significantly more infected than the men in terms of both disease and microfilaraemia.

With this national survey, of course, we had to sample 16 million people with very little funding. One interesting thing about governments is that when they give their directives, they don't give the necessary financial backing to do a national survey. They give their directives, and they expect the work to be done. So, in sampling the country in terms of the coverage it was a bit low. If you want to work the statistics, it's representative, but when you look at the distribution of the disease in terms of its focal nature, I think there is a lot more work to be done in documenting the real communities which are affected. We are in the process of doing that by developing rapid assessment procedures with support from TDR in describing the distribution of the disease.

The main thing that I want to mention about control is that in our area DEC cannot be used because of concomitant occurrence of onchocerciasis. Our main hope is ivermectin and possibly in combination with albendazole which is shown to be equally effective as a combination of DEC and ivermectin. We hope to begin with some drug trials before launching into a control program. So things are now in the pipeline and we hope that at the next forum we will be able to present some more interesting things as far as control is concerned. Thank you.

DR RAMACHANDRAN:

Thank you very much Dr Gyapong. I think Dr Gyapong has been involved in a number of studies in Ghana and in fact, as you know, in Africa, particularly in West Africa, we have had much less information on the prevalence and distribution of filariasis than in East Africa, so his pioneering studies in Ghana hopefully will be infectious and spread to Nigeria and Cameroon and other areas of West Africa from which have much less information. It is interesting how the Ghanian Ministry of Health has taken up the problem of filariasis very seriously, and hopefully we will have a more clear picture in terms of what control strategies it will be implementing. Am I correct to assume that you have seen a lot of clinical cases of filariasis in the parts you have been to, particularly in the Upper Volta region of Ghana? Is that right? Any questions? Okay, perhaps at some point Dr Gyapong will tell us more about his involvement in a study of rapid assessment that is, he is trying to see whether without blood examination - without using antigen assays, but probably coupled with that, one can obtain prevalence data by looking at a number of cases of hydrocoele, and trying to estimate from that the approximate prevalence of filariasis in the particular district. Perhaps you will tell us about that at some point during these next few days. Thank you very much.

Now Dr Nay Soe Maung will tell us of the situation in Myanmar. Nay Soe Maung was formerly Head, Public Health Laboratory and Public Health Specialist, Health and Disease Control Unit, Yangon. Leading filariasis elimination program in Myanmar. He is currently Acting Regional Representative of the ACTM in Myanmar.

Dr Nay Soe Maung
Directorate of Medical Services
Ministry of Defence
Yangon
Union of Myanmar

Mr Chairman and other participants, I am going to present about the lymphatic filariasis situation in Myanmar. Myanmar is situated in the South East Asia Region. The area covers about 677,000 square kilometres with a total population of about 44.6 million.

Lymphatic filariasis is found in Myanmar. The species is *Wuchereria bancrofti* and the main vector is *Culex quinquefasciatus*. Usually filariasis is localised in Myanmar. We have 14 states and divisions in my country. My country borders with Bangladesh, India, China, Laos and Thailand. The filariasis problem is usually localised in the central part of Myanmar and the coastal region of the Bay of Bengal and the coastal region of the Andaman Sea. More than 50,000 of the population reside in the filariasis risk area. The estimated prevalence is 1.9% but this is an estimation only, because we have done no proper surveys for a few years. We have chronic pathological cases, but it is quite rare. I think we have a problem in my country although chronic pathological cases are rare, the prevalence is quite high in some areas especially in the central region with a prevalence between 15% - 25%. Dr Paul Turner and I went to Sagai recently where the prevalence is about 22%. Dr Kumeraswami and I went to Magwe, but chronic pathological cases are very rare. Our people are usually good with their hygiene, and Dr Kumeraswami feels that in Myanmar it may take longer to locate chronic pathology cases.

In my country people use salt as a regular basis in the diet. Part of the problem is the salt in different areas come from different sources so that if we include use of fortified salt it would be difficult to produce from the one area. We have seen some hydrocoelees in some areas. In these areas people with hydrocoele are called "Baw Gyi". Baw means scrotum, Gyi means big, so that Baw Gyi means big scrotum (hydrocoelees). For instance, if I have hydrocoele they call me the "Baw Gyi Maung". In our town filariasis is called elephant leg disease - like elephantiasis, so that if they see the elephantiasis they think it is filariasis. Otherwise they don't think they have filariasis. Because of this, in my country, filariasis is a hidden disease. Also a lot of politicians like the minister is a politician, don't think filariasis is an ordinary problem because he has seen the elephantiasis.

We usually perform the microfilaria test by doing night blood surveys with the wet film as well as the dry film. Now we are introducing the rapid time assessment technique. It is funded and supported by WHO.

The population surveys were 2% - 5% percent of the population. Usually they are annually, but not regular and for the future we have got plans. Maybe starting from June 1996 for the recent studies funded by WHO TDR Initiative Research Grant. Tomorrow I will present a little bit more, and that is 104 sites in Myanmar.

The previous filariasis control program is now nearly defunct, and the control program lasted for about 15 years. Now it is nearly defunct because it is not a priority disease in our country. In 1993 filaria is ranking number 38, and we have many other major public health programs such as malaria, TB and other chronic diseases, and at the time our control studies were complicated and expensive to sustain. Also previously in our country we have to look at the purchasing of DEC, but nowadays they stop it because they produce a lot of DEC in the country.

Assessment of filaria endemicity in Myanmar using rapid assessment techniques and pre-mass treatment studies is a collaborative project with WHO, Directorate of Medical Services, Myanmar, James Cook University, Australia; Liverpool School of Tropical Medicine and this will be over the period from mid-1996 to April 1997 and is funded by WHO. Thank you very much to the WHO and James Cook University. Also to Dr CP Ramachandran and Dr Paul Turner.

And now the Ministry of Health and Directorate of Medical Services recognise filariasis as one of the major public health problems, and they are willing to conduct a control program, but first we need a budget to establish political will, and commitment and raise community awareness and participation.

DR RAMACHANDRAN:

Thank you very much Dr Nay Soe Maung for that overview of the situation in Myanmar. It is obvious that you don't have a clear picture of the total prevalence in many parts of the country, and hopefully your antigen assay tests will give you more correct information on microfilaria rates in different communities, but the fact remains that you don't see many clinical cases and this may be significant. Thank you very much. Questions?

DR BOCKARIE:

Is the vector contact there *Culex quinquefasciatus* as high as in other places in Asia?

DR NAY SOE MAUNG:

It is high - very high.

DR RAMACHANDRAN:

You will recollect that some 10-12 years ago I think, WHO had a filariasis research unit in Yangon where a lot of work on *Culex quinquefasciatus* was carried out but the transmission levels were pretty low at that time. Nevertheless, they had a control program in the city of Rangoon, but since then we haven't had much information, but other parts of the country particularly Mandalay in Central Burma, we have much less information.

DR NAY SOE MAUNG:

We have detected infective *Culex* mosquito in the Delta area, Central Myanmar, and low on the coastal region, not in the northern part of Myanmar.

DR RAMACHANDRAN:

Thank you very much. We have a few more presentations which we want to finish.

DR TURNER:

There are four countries which were going to be here, but because of problems with visas etc. they were unable to arrive. As they have taken the effort of going through and presenting information from their country on the questionnaires, we have asked four people to present some basic information from those countries. The first country is Palau.

PALAU PRESENTATION

Ms Jennifer Kinnis

I am speaking on behalf of Dr Anthony Piloy, who is the Director of Public Health in Palau, and I'll summarise the status of filariasis in Palau as he has given in the questionnaire.

The current population of Palau is 17,000. In 1969 when the population was 12,200 people, the prevalence of disease was almost 19%. Following an initial survey of the entire population in 1962, a mass treatment was carried out in 1969 and 1970. This used the standard DEC dose of 5 mg per kg body weight. In 1969 the cost of this control was \$15,000. The treatment was seen as a success. Further surveys were carried out in 1972 and 1975 at which point the disease was considered to be eradicated. No further survey has been conducted.

DR RAMACHANDRAN:

Thank you very much. Next, is the Tanzania presentation.

TANZANIA PRESENTATION

Ms Jennifer Kinns

I am speaking for Tanzania on behalf of Dr Makunde from the Tangier region. I will briefly summarise the information that he has given in the questionnaire which was sent to him.

Tanzania has a current population of 23 million people of which 10 million on the mainland live in filariasis endemic areas. The estimated prevalence is nearly 12%, but this is for the whole country. In endemic areas the prevalence is much higher, and the disease is a major socio-economic burden. Any information on distribution and prevalence is based on surveys carried out only when limited funds have been available. Thirteen sporadic surveys have been undertaken since 1955. Filariasis is only known to exist along coastal areas and around the great lakes. However, little inland survey work has been undertaken. All the published reports and papers from Tanzania come from research conducted in one coastal area. Despite the high prevalence of disease in Tanzania, there is no national control program and there are not sufficient funds to undertake regular survey work.

NIIHAU - POLYNESIA PRESENTATION

Dr Douglas Randell

Mr Speaker, Ladies and Gentlemen. I'm speaking on behalf of the island nation of Niihau in Polynesia. It's a small island nation with a population of 2,500 people. Perhaps an equal number or similar to that live in New Zealand. The prevalence there was recorded at about 16% in 1972. Since then they have undertaken another survey in the early part of this year and the latest prevalence data indicates a prevalence of less than 1%, 0.35% and I'm not sure of the extent of that survey. Regrettably, as is the case with most small island nations, budgetary constraints have made a vector control program an impossibility at this stage. However, there was a go at one in the early 1970s and there is documentation about that from that time.

DR RAMACHANDRAN:

Thank you. The last country is the Peoples Republic of China.

PEOPLES REPUBLIC OF CHINA PRESENTATION

Associate Professor Rick Speare

I'm speaking for the Peoples Republic of China. We have two questionnaires, one from Dr Sun De-Jian and one from Dr Wu-Chun Cao, and there is quite close agreement between both.

China is put forward as an example of a successful control program. In the 1950s, 16 of the 31 provinces had lymphatic filariasis, and it was estimated there was 31 million cases and about 17% of those cases were regarded as clinical. This is out of a population of 1.2 billion. Control started in 1956, and so there was 40 years of control. Control consisted of mass treatment with DEC, strategic treatment with DEC and DEC medicated salt at 0.3% given for about six to nine months. Now it says here that up to 1994, all of the 864 counties, cities, in 15 provinces in the mainland, had successfully achieved effective control of lymphatic filariasis. Their definition of effective control was a microfilarial rate of less than 1%. Over the course of the 40 years of control, they've spent \$US50 million so they estimate one million US dollars per year for the control program. They made comments that lymphatic filariasis control had been successful in China, and it proved that integrated intervention based on chemotherapy is successful and particularly illustrated that DEC by itself was successful. Their reasons for why they considered the control program was successful:

1. was that it was listed as a National priority;
2. that there was an appropriate organisational structure;
3. that there was active community participation;
4. that there was diligent work of scientists, health professionals and antifilarial teams.

The surveys to monitor this were done every 1 - 5 years from 1950 to 1970, and the control program was instituted through Institutes of Parasitic and Communicable Disease Control flowing down to what they refer to as anti-epidemic stations at the province and county levels. So it was obviously a top-down program. There is no indication from the questionnaires, what's currently going on at the moment - whether there's surveys being carried out or whether there is any form of control. Perhaps CP you may be able to fill that in.

DR RAMACHANDRAN:

Thank you very much Rick. Well, I think we have heard all the presentations of the countries here. I think it is interesting because on one extreme you have the situation like China and Solomon Islands where successful control has taken place or even eradication, and on the other extreme where in a country like India and perhaps one or two others, there is a major problem still in hand. Inbetween you have the situation like Sri Lanka and probably Myanmar where control programs are still ongoing but they have not come to a stage where we can say it has eliminated the parasite rates.

However, I think we need to talk about strategies in terms of available resources and what can be done in a particular country's situation. While WHO and certainly Control for Tropical Diseases Program has laid down some general parameters that can be followed by any one country, obviously these have to be country specific in terms of available resources and what's feasible.

As Professor Oemijati earlier mentioned, it also has to be in the context of the local social and cultural aspects. Perhaps we will have many more opportunities for discussion in the next few days in the ACTM meetings on some of these issues, but from the point of view of this Workshop, I think it was most interesting that we covered the situation of filariasis in the various countries of South East Asia and the Western Pacific Region. What seemed to come out is that there is quite a bit of filariasis in the Asia-Pacific Region, and we have often underestimated the problem. I hope by the end of this meeting we'll have a little clearer picture of not only the prevalence and distribution, but also the public health importance of the disease so that the various communicable disease control people in these countries will be able to at least initiate some steps in the right direction. I don't know whether there any other issues Paul which you want to discuss at this moment.

SECTION C - ASTRACTS

The First International Meeting for the Control of Lymphatic Filariasis was followed by three days of the Australasian College of Tropical Medicine Meeting. The following papers were presented by the Workshop Participants attending this meeting.

Saturday 15 June 1996

13.30-15.00

ROOM 1: FILARIASIS 1:

Epidemiology of Lymphatic Filariasis

Chairperson: Dr Don Bundy

FILARIASIS CONTROL IN INDIA

Kumaraswami V

Tuberculosis Research Centre, No 1 Satyamurthi Road, Chetput, Madras 600 031,
Tamil Nadu, India

[No abstract received]

TRANSMISSION INTENSITY AND ITS RELATIONSHIP TO INFECTION AND DISEASE DUE TO *WUCHERERIA BANCROFTI* IN PAPUA NEW GUINEA

Kazura JW, Bockarie M, Alexander N, Perry R, Bockarie F, Dagoro H,
Dimber Z, Hyun P, and Alpers MP

Case Western Reserve University, Cleveland USA,
and Papua New Guinea Institute of Medical Research, PNG

The purpose of this study was to determine quantitatively the interrelationships among transmission intensity, infection, and disease due to *W. bancrofti*, a major public health problem in the Pacific region. We thus examined these relationships in 1892 residents of an endemic area of East Sepik Province, PNG. Age-specific prevalence and intensity of microfilaremia were lowest in 5-9 year olds with progressive increases in older age groups. The frequency of lymphatic disease also increased with age. Leg oedema and hydroceles were observed respectively in <2% of persons younger than 9 years compared with 10 and 33% of adults and men >40 years old. Microfilarial status (Mf- vs MF+) was not predictive of leg oedema or hydroceles, and lymphoedema of the legs was twice as common among women as men. Annual transmission potential (ATP) and annual infective biting rates (AIBR) were monitored in detail in 5 geographically distinct population clusters located within 2-5 km of each other. The logs of ATP and AIBR correlated positively with the location-specific microfilarial carrier rate ($r=0.93$, $P = 0.02$) and prevalence of leg oedema ($r=0.89$, $P=0.04$). ATP and AIBR did not correlate with the location-specific hydrocele rates. These data indicate that transmission intensity is a major determinant of patent infection and disease rates due to *W. bancrofti*. The implications of these findings for chemotherapy-based control strategies will be discussed.

A FILARIASIS PREVALENCE STUDY FOR MYANMAR

Turner P, Nay Soe Maung, and Taylor M

1. Department of Public Health and Tropical Medicine, James Cook University of North Queensland. AUSTRALIA
2. Directorate of Medical Services, Ministry of Defence, Yangon, MYANMAR
3. Liverpool School of Tropical Medicine, Pembroke Place, Liverpool, UNITED KINGDOM

Filariasis has been identified in Myanmar by the Public Health Section of the Directorate of Medical Services as a significant public health problem warranting further investigation and control. The Republic of Myanmar is divided into 14 States/Divisions, lymphatic filariasis is found in varying degrees in all of these areas. Prior to the initiation of the National Program for filariasis control it is proposed to undertake a number of studies that will assess the prevalence of infection and pathology which will assist in the implementation of the program. The prime task of the study will be the assessment of prevalence of filarial disease using recently developed rapid assessment techniques, as recommended at a recent WHO meeting in Penang. The study will also determine optimum timing for the delivery of chemotherapy and investigate a possible association of filariasis with cerebral dysfunction.

THE EPIDEMIOLOGY OF ACUTE ADENOLYMPHANGITIS (ADL) IN GHANA

Gyapong J, Gyapong M and Adjei S

Health Research Unit, Ministry of Health
PO Box 184, Accra, Ghana

Objective: Describe the clinical presentation, incidence, duration and severity of acute adenolymphangitis (ADL) in northern Ghana.

Methods: Entire population was followed up every two weeks for one full calendar year by trained fieldworkers. ADL cases were identified using local terminology by fieldworkers and confirmed by a physician using standard WHO diagnostic criteria. Signs and symptoms associated with each episode and the treatment sort was recorded.

Results: The incidence of ADL was 95.9 per 1000 per annum, lasting an average of 5.1 days. The commonest signs and symptoms were pain and tenderness. The incidence was found to be closely related to rainfall pattern. Most people were unable to perform their normal household chores during the episode. The main source of care was from traditional health practitioners and drug pedlars. Local terminology were found to be highly specific and sensitive in diagnosing ADL (sensitivity = 0.978, specificity = 0.980).

Conclusion: Lymphatic filariasis is a major problem in northern Ghana and require the development of a control programme for the affected communities. The use of local terminology in screening ADL in endemic communities is very useful and if further developed, could be used as a tool in monitoring control programmes.

Saturday 15 June 1996

15.30-16.30

ROOM 1: FILARIASIS 2:

Molecular biology

Chairperson: Prof Jim Kazura

PRO-INFLAMMATORY CYTOKINES IN THE PATHOGENESIS OF LYMPHATIC FILARIASIS IN TANZANIA

Taylor MJ, Makunde W and Bianco AE

Liverpool School of Tropical Medicine, Pembroke Place, Liverpool L3 5QA, UK

We have investigated the role of pro-inflammatory cytokines (IL-1 β , IL-6, IL-8, TNF α) in the pathogenesis of human lymphatic filariasis. A survey of 1018 people (age group >15 years) in Kwanjeka, Tanga, Tanzania was carried out to determine the prevalence of microfilaraemia (12%) and pathology (hydrocoele, 13% of males). A group of 57 males were clinically evaluated and plasma and hydrocoele fluid was collected before and after DEC chemotherapy (6 mg/kg single dose). Adverse reactions to chemotherapy were monitored and categorised into distinct local and systemic reactions. In patients with hydrocoele pathology, high levels of pro-inflammatory cytokines were observed in plasma and hydrocoele fluid. In contrast, asymptomatic patients showed no elevated levels of plasma pro-inflammatory responses. Following chemotherapy there was a rapid decrease in pro-inflammatory responses from patients with pathology which was maintained for up to 2 weeks post-treatment.

UNUSUALLY HIGH LEVELS OF GENETIC DIVERSITY AMONG BRUGIAN NEMATODES

Kinns J and Bianco AE

Department of Genetics, University of Cambridge, England,

A central focus in the past decade in parasite epidemiology has been heterogeneity in the host species. It is increasingly apparent that this is also important in the parasite. Here we present preliminary data to analyse levels of genetic diversity in Brugian filarial nematodes. To understand better the phylogenetic relationships and population structure of these parasites we have established ribosomal and mitochondrial DNA markers. A 1500bp region spanning the NADH-dehydrogenase 4 and Cytochrome Oxidase 1 coding regions of the mitochondrial genome has now been sequenced and analysed in several isolates of *B. malayi* and *B. pahangi*. High levels of divergence, 11 - 15%, have been found in both intra- and inter-specific comparisons, suggesting that *B. malayi*, at least may comprise several sub-species. Successful typing of both microfilaria and adults has been achieved, thereby facilitating planned comparisons of within and between population variation over a broad geographic area. A method has been developed for assigning single microfilaria to species. Using controlled inter-specific crosses in animal models this should open a window on the breeding behaviour of individual filarial nematodes.

CAN INDOMETHACIN REDUCE THE SIDE REACTIONS TO DEC IN THE TREATMENT OF BANCROFTIAN FILARIASIS?

Turner P¹ and Ramsay A²

1. Filariasis Control Section, Department of Public Health and Tropical Medicine, James Cook University of North Queensland, Townsville, Australia.
2. Whitsunday Doctors Service, Harry Muller House, Airlie Beach, Queensland, Australia

Side reactions following treatment of all filarial infections are extremely common and, indeed, have been the reason for failure of many attempted control programs. The drug of choice in the treatment of Bancroftian filariasis is diethylcarbamazine (DEC) which eliminates the microfilariae from the blood and kills or sterilises the adult worms for up to nine months. However, as with all anti-filarial drugs, DEC is associated with adverse clinical reactions in microfilaraemic patients such as headache, severe fatigue, malaise, anorexia, fever, abdominal pain, diarrhoea, vomiting, asthmatic attacks, polyarthralgia, postural hypotension and myalgia. The adverse reaction has been attributed to the production of cytokines and may be controlled using non-steroidal anti-inflammatory drugs such as indomethacin. This study investigated the hypothesis that the reaction to DEC is caused by a cascade of cytokines including TNF, IL-1, IL-6 and IL-8, with IL-6 having a major role and can be controlled by the administration of indomethacin. The study found that indomethacin did reduce the side reaction to DEC but at the expense of the reduction in microfilaria.

Sunday 16 June 1996

09.30-10.00

ROOM 2: FILARIASIS 3:

**WHO Training Materials
on Lymphatic Filariasis**

Chairperson: Dr CP Ramachandran

LYMPHATIC FILARIASIS - AN INTRODUCTION

Ramachandran CP

Chief, Filariasis Control, Division of Control of Tropical Diseases,
World Health Organization, Geneva

CP Ramachandran has produced a new video for WHO on lymphatic filariasis. This will be shown.

WHO INTERACTIVE COMPUTER PROGRAM ON LYMPHATIC FILARIASIS

Ramachandran CP

Chief, Filariasis Control, Division of Control of Tropical Diseases,
World Health Organization, Geneva

WHO has developed an interactive computer program on lymphatic filariasis. This is available for Mackintosh and IBM format on 5 floppy 1.4 Mbyte disks. The program will be demonstrated.

Sunday 16 June 1996

11.00-12.30

ROOM 1: FILARIASIS 4:

Control of Lymphatic Filariasis 1

Chairperson: Dr Paul Turner

CURRENT SITUATION OF FILARIASIS IN INDONESIA AND ITS CONTROL

Oemijati S

Department of Parasitology, Faculty of Medicine,
University of Indonesia, Jakarta, Indonesia

[no abstract received]

IVERMECTIN IN THE TREATMENT OF FILARIASIS DUE TO WUCHERERIA BANCROFTI: A META-ANALYSIS

Wu-Chun Cao, Van Der Ploeg CPB, Plaisier AP and Habbema JDF

CDTDC, Department of Public Health, Erasmus University Medical School, PO Box 1738, 3000 DR Rotterdam, The Netherlands

Objective: To aggregate and synthesize evidence from current literature to clarify the efficacy and safety of ivermectin in the treatment of bancroftian filariasis.

Methods: Publications were identified through computer-assisted literature search and review of reference lists. Clinical trials on the treatment of bancroftian filariasis infection with single dose ivermectin were included for the meta-analysis. Effect size was estimated using sample size weight. Safety was assessed by both frequency and severity of adverse reactions.

Results: 748 microfilaria (mf) positive patients were enrolled in 7 dose-finding and 8 comparative studies. Regardless of dosage (ranging from 20 to 400 ug/kg body weight), ivermectin almost completely eliminated mf from the blood, about 90% patients becoming mf-negative within one week post-treatment. This status maintained for about one month, followed by a return in mf prevalence and density. The higher dose of ivermectin showed a greater clearance effect and maintained a lower mf level for a longer period of time. The adverse reactions were flu-like and transient. The frequency and intensity of adverse reactions were strongly associated with pre-treatment mf counts, but independent of dosage of the drug.

Conclusion: Ivermectin in the treatment of bancroftian filariasis causes a rapid clearance of mf with little evidence of action against adult worms. The drug is safe and well acceptable. A single-dose 400 ug/kg administered annually is suggested for the control of bancroftian filariasis.

DIETHYLCARBAMAZINE IN THE CONTROL OF LYMPHATIC FILARIASIS IN THE OK TEDI AREA OF PAPUA NEW GUINEA: PHASE 2 - ANNUAL SINGLE- DOSE TREATMENT

Schuurkamp GJ, Kereu RK, Bulungol PK, Kawereng L and Spiccr PE

Medical Department, Ok Tedi Mining Limited,
Tabubil, Papua New Guinea.

The Phase 1 semiannual single-dose 6mg/kg diethylcarbamazine (DEC) treatment program demonstrated a significant reduction for *Wuchereria bancrofti* in the Ok Tedi area of Western Province, Papua New Guinea. The rate of detectable microfilaraemia was effectively reduced from 39% to 11% and mean microfilarial (mf) densities from 79 mf/ μ L to 19 mf/20 μ L. The Phase 2 annual single-dose treatment of 6 mg/kg DEC not only maintained the gains made during Phase 1 but reduced the microfilaraemia rate to less than 5% by 1990, with mf densities remaining stable at less than 211 mf/microl, amongst all participating villagers within the 5 original villages. The annual treatment program was expanded to 7 remote villages not subject to any form of active vector control. The microfilaraemia rate in these villages declined from 41% before treatment to 17% after only two annual administrations of 6 mg/kg DEC, and mf blood densities were reduced from 71 mf/ μ L to 20 mf/ μ L. As was observed in the 5 original villages participating in the program, a significant reduction in splenomegaly associated with the DEC treatment was reported for the 7 villages in the expanded program during Phase 2; enlarged spleen rates were reduced from 50% (1986) to 32% (1990) and from 76% (1988) to 48% (1990), respectively. Malaria rates on the other hand increased slightly or remained stable. Malaria infections associated with *W. bancrofti* (mixed parasite infections) stimulated a greater splenic response than either parasite detected on its own.

SALT FORTIFIED WITH DEC FOR CONTROLLING FILARIASIS IN SOUTH KALIMANTAN

Marwoto HA¹, Darwis F², Sulaksone STE¹, Ompusunggu S¹, Warni L³,
Itawati⁴ and Kiswarini⁴

¹Communicable Disease Research Centre, NIH RD

²District Health Office of Banjar Baru

³Sub Directorate of Filariasis and Schistosomiasis,
Dit General of CDC & EH

⁴Pharmacy Research Centre, NIH RD

Salt fortified with DEC is simple, cheap and effective in dramatically reducing or even eliminating lymphatic filariasis. It is generally well tolerated, safely used in pregnancy and can be incorporated into iodized salt (WHO Consultative Meeting of Lymphatic Filariasis - Penang Malaysia 1994).

A study on filariasis control using salt fortified with DEC had been carried out in 1980-82 by Communicable Disease Research Centre (NIH RD) in collaboration with Local Health Office of Banjar Baru District of South Kalimantan where sub-periodic *Brugia malayi* was endemic.

The dosages that had been used are 0.1% and 0.2% of DEC in cooking salt which had been distributed for 4 months and 2 months respectively.

There were no significant differences between standard method and DEC-salt in their cure-rates as well as in general/local side effects. And there were no objections from the people to using this salt fortified with DEC.

Sunday 16 June 1996

14.00-15.30

ROOM 2: FILARIASIS 5:

Control of Lymphatic Filariasis 2

Chairperson: Prof Sri Oemijati

HOW TO INVOLVE A COMMUNITY IN A FILARIASIS CONTROL PROGRAMME - A CASE STUDY

Panicker KN

Vector Control Research Centre, Pondicherry - 605 006, India

Lymphatic filariasis due to *Brugia malayi* is primarily a socio-economic problem in the central coastal Kerala, which is the single largest endemic tract in the Indian sub-continent, where over 3.5 million people are exposed to risk of infection. A Technology Mission Project has been launched by the Vector Control Research Centre of the Indian Council of Medical Research to control filariasis in Cherthala taluk (population: 400,000), a severe focus of infection ($\geq 20\%$) in the endemic belt.

Objective: Interruption in the disease transmission and elimination of focus of infection, through community based interventions.

Methods: Designed a strategy linking the entire disease control operations with the overall developmental programmes of the local government, involving the target community.

Results: A massive people's movement called FILCO (Filariasis Control) Movement, has been created exclusively to fight against filariasis. The entire community was involved in the control operations, through various income generating schemes, under the banner of FILCO Movement.

Weed/vector control was demonstrated by composite fish culture in about 65% of the total 75,000 domestic ponds, which were once the potential breeding grounds for the Mansonioides vector mosquitoes. The adult vector density also drastically reduced (72 - 83.9%). The financial gain accrued to the community on account of fish culture was estimated to be over US \$ 1.67 million per year. In the place of aquatic weeds, a nitrogen rich leguminous plant (Sunnhemp: *Crotalaria juncea*) was introduced as an alternative source of green manure for agriculture purposes. The resultant increase in the agriculture produces (like coconut etc.) yielded an additional profit of US \$ 0.5 million per year to the community.

Seven years after launching of the project, the vector control coupled with mass chemotherapy resulted in the total interruption in transmission. Besides, no new infection has been reported for the last three consecutive years.

Conclusion: Filariasis control has been made a People's programme, where the activities are linked with developmental schemes bringing tangible collateral benefits to the community, and thereby converting the disease vector control into a "by-product".

FILARIASIS CONTROL IN FRENCH POLYNESIA: ERADICATION? THEORY vs PRACTICE, THE DOS AND DON'TS.

Moulia-Pelat JP, Nguyen LN, Plichart R, Nicolas L

Institut Malarde BP30 Papeete, Tahiti, French Polynesia

We have actually different useful tools for a control program of lymphatic filariasis: diethylcarbamazine (DEC) tablets, DEC-salt, ivermectin (IVR) tablets given alone or in combination with DEC. Besides, we have available tools to evaluate our control program, namely: microfilaremia, antibodies levels, antigenemia, PCR on mosquitoes. We have to define an adequate strategy in accordance with our objectives and means: morbidity reduction, infection reduction, elimination of filarial infection as public health problem or eradication. Results of several trials performed in French Polynesia suggested a possible eradication of lymphatic filariasis. With DEC-salt every day and IVR in combination with DEC tablets every year in a 2 to 5 years program, it could be possible to eradicate lymphatic filariasis. Technical problems have now been put into its final form: IVR available, a good compliance with this active and passive strategy, DEC-salt effective and suitable. Political and legal problems are the most important. A monopoly situation for DEC-salt on the market and a strong political commitment are compulsory to eradicate filariasis in French Polynesia. It must take extreme measures to get eradication in a short effective program.

TOWARDS THE ELIMINATION OF LYMPHATIC FILARIASIS: EXPERIENCE FROM SHANDONG, CHINA

Wu-Chun Cao*, Van Der Ploeg CPB, Zheng-Xua Ren
and Habbema JDF

1. Department of Public Health, Erasmus University, Rotterdam, The Netherlands;
2. Shandong Institute of Parasitic Diseases, Jining, P. R. China

Epidemiological investigations conducted in 1950s found that bancroftian filariasis was endemic in 74 of 106 counties and cities in Shandong province, China. The average infection rate was 7.1%. It was estimated that more than 2.5 million people were positive for microfilaria (mf), and an equal number of patients being with various clinical manifestations. The provincial anti-filarial campaign began in 1956, when the national control program was initiated. The integrated intervention, which took elimination of infectious sources as the main objective, was employed for large-scale community control. Generally three chemotherapeutic strategies were adopted including blood examination followed by selective treatment of mf- positive cases with diethylcarbamazine (DEC), DEC mass treatment of whole population and DEC-medicated salt administration to the community. In 1983, the province was the first one in China to reach the official criterion for basic elimination of filariasis (mf rate less than 1% in every village). Since then, systematic epidemiological surveillance has been carried out, suggesting interruption of transmission of filariasis in the province. The success of filariasis control program is attributed to an excellent organisational structure, appropriate control strategies, active community participation and diligent work of scientists, health care personnel and special anti-filarial teams. The main challenges at present are potential imported infectious sources due to floating population, lack of cost-effective surveillance methods and management of patients with clinical manifestations.

FILARIASIS CONTROL IN FIJI - THE PAST, PRESENT AND THE FUTURE

Koroivueta J

Chief Medical Officer, National Filariasis Unit,
Ministry of Health and Social Welfare
Tamavu, Suva, Fiji

Lymphatic filariasis has remained one of the leading public health problems in Fiji with the initial control efforts starting in the 1960s. It is seen particularly in the coastal areas of the main island and in small island communities. Symes reported in 1956 microfilaraemia rates in areas surveyed ranging from (12/186) 6.4% to (127/503) 25.2%. A national programme using DEC 5 mg/kg given for 28 doses within 24 months started in 1968. It was discontinued in 1975 when clinical and parasitological indicators showed the disease and infection to be insignificant from the public health perspective.

Finger prick blood surveys in the 1980s showed significant increases in microfilaria rates, densities and clinical evidence of active disease. A trial of single annual doses of DEC at 6 mg/kg for five rounds was compared with intensive 28 dose schedule of DEC at 5 mg/kg. Results will be discussed.

SAR (single annual dose regime) of DEC at 6 mg/kg is presently endorsed for the national programme planned for 10 years. Combination with Ivermectin given a week apart would be carried out shortly to enhance control/elimination efforts.

IS THERE AN OPTIMUM TIME TO USE DEC FOR COMMUNITY TREATMENT OF LYMPHATIC FILARIASIS?

Turner P¹, Taylor M² and Nay Soe Maung³ (Australia / UK / Myanmar)

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³ Directorate of Medical Services, Ministry of Defence, Yangon, Myanmar

This paper reports the findings of a study in Myanmar that examined if there was a difference in efficacy and side reactions between people treated during the day versus people treated at night in nocturnal periodic filariasis. Two groups of microfilariae positive individuals were treated with DEC at 6 mg/kg either during the day or at 10.00 pm. Microfilaria density was assessed at 10.00 pm before and 48 hours after treatment. Participants were asked to record any reaction to the medication over the 48 hour period post-treatment. There was no difference in the reduction of microfilariae density 48 hours after treatment. Fifty percent of the people treated during the day had a severe reaction to DEC whereas none of the people treated at night had a reaction to the drug. These results are important in the design of control programs for the elimination of lymphatic filariasis.

Sunday 16 June 1996

16.00-17.10

ROOM 1: FILARIASIS 6:

Control of Lymphatic Filariasis 3

Chairperson: Prof Jim Kazura

MODELLING FILARIASIS DYNAMICS

Bundy DAP and Norman R

Centre for Epidemiology of Infectious Diseases, University of Oxford
South Parks Rd, Oxford OX1 3PS
UNITED KINGDOM

Mathematical models can be used to guide research and to assist planning of control by predicting the outcomes of control options.

Lymphatic filariasis is a disease for which transmission of the parasite is fairly well understood. However, very little is known of the dynamics within the human host and the development of the disease.

Several theories exist as the cause of morbidity and these include a role for secondary bacterial infections or for immunopathological effects. EpiFil, a suite of simple deterministic models has been developed to allow us to determine the gaps in our knowledge of relevant parameter estimates and can therefore be used to guide empirical work.

The EpiFil models can also be used to study control of the disease. The models are validated using available data and are then used to predict the likely effects of different chemotherapy regimes. A wide range of possible strategies can be considered, including varying the frequency of treatment, the total number of treatments, the age at which treatment is started and the efficacy of the drug.

**IMPACT OF MASS DRUG TREATMENT ON FILARIASIS TRANSMISSION
BY THE AEDES PUNCTULATUS COMPLEX IN THREE VILLAGES
IN EAST SEPIK PROVINCE PAPUA NEW GUINEA**

Bockarie MJ, Kazura J¹, Alexander N, Hyun P¹, Bockarie F,
Ibam E, Dimber Z, Alpers M

Papua New Guinea Institute of Medical Research, Madang, PNG
and ¹ Case Western Reserve University, Cleveland, Ohio, USA

According to a recent estimate by the World Health Organisation, about a quarter of the estimated 4 million people living in Papua New Guinea are infected with *Wuchereria bancrofti*, the causative agent of lymphatic filariasis (WHO, 1994). Entomological surveys in different parts of the country have established the *An. punctulatus* group of mosquitoes to be the principal vectors of human filariasis. Culicine mosquitoes appear to be of little epidemiological importance. Recent epidemiological studies in 16 villages in the Dreikikir area of the East Sepik Province showed bancroftian filariasis to be highly endemic with village specific mf rates ranging from 50 to 93%. The present study describes pre- and post-treatment annual entomological indices in three villages, Ngahmbule, Nanaha and Peneng where rates were 51.7, 55.5 and 65.6%. Single dose annual treatment with ivermectin in combination with DEC in Nanaha and Peneng, and DEC alone in Ngahmbule resulted in significant reductions in transmission indices such as infection rates, infective rates, Annual Infective Biting Rates (AIBR) and Annual Transmission Potential (ATP). Transmission was almost interrupted in Nanaha and Peneng where infective mosquitoes were observed during 8 months in the year before treatment, but only one month in the year after treatment. In Ngahmbule, infective mosquitoes were observed in three months before treatment and one month after treatment. Pre-treatment ABRs were higher than post-treatment ABR in both Peneng and Nanaha where ivermectin was administered. These findings indicate that the transmission of anopheline-borne lymphatic filariasis in Papua New Guinea can be interrupted through mass treatment alone. The pre- and post-treatment ABRs in Nanaha and Peneng further suggest that the lethal effect of ivermectin on mosquitoes, recorded in experimental studies, is of no epidemiological importance. We conclude that the eradication of lymphatic filariasis in PNG is an achievable goal.

Monday 17 June 1996

09.00-10.30

ROOM 1: FILARIASIS 7:

Pathogenesis of Lymphatic Filariasis

Chairperson: Dr KN Panicker

NEW PARADIGMS IN THE IMMUNOPATHOGENESIS OF LYMPHATIC FILARIASIS

Freedman DO

Director UAB Travelers Health Clinic, Division of Geographic Medicine,
University of Alabama at Birmingham. Birmingham, Alabama USA.

Though current paradigms on disease pathogenesis derive almost exclusively from the extrapolation of studies of circulating PBMC in infected individuals, the actual site of disease provides the most appropriate opportunity to investigate relevant immune mechanisms. Because there is no adequate animal model of bancroftian filariasis, biopsy tissue and peripheral blood from infected humans in Brazil has been studied in parallel. We have demonstrated: 1) inflammatory, anatomic, and functional abnormalities in lymphatic vessels of asymptomatic microfilaremic individuals, persons who had been previously assumed to have infection but not disease; and 2) perivascular CD3+ T-cell infiltrates in limb biopsies of symptomatic as well as asymptomatic individuals which, in light of current understanding of lymphocyte trafficking, indicates the extravasation of antigen specific memory lymphocytes from the vascular circulation into the inflamed filarial tissue; and 3) the importance, at the molecular level, of the VLA-4/VCAM-1 pathway in the trafficking of CD3+ lymphocytes through vascular endothelium. We are presently comparing T-Cell Receptor Vb repertoires in infected tissue and in blood to determine the nature of any specific filarial antigens recognized by infiltrating T-cells. Anecdotal impressions by some clinicians of a role for bacteria in primary filarial inflammation are not supported by our data.

Recent findings in peripheral blood indicate that the presence or absence of active infection (determined by circulating antigen status) and not clinical status (the traditional asymptomatic versus symptomatic paradigm) is most closely associated with cytokine responses in filariasis. Extension of these investigations to cytokine responses in local tissue are ongoing.

POSSIBLE RESURGENCE OF LYMPHATIC FILARIASIS IN SOLOMON ISLANDS

Leafasia J

Director, Solomon Islands Medical Training
and Research Institute, Honiara

In 1944 Byrd and Amont showed that the only filariasis found in Solomon Islands was due to the nematode *Wuchereria bancrofti*, of the nocturnal periodic variety, and transmitted by the same vectors as malaria, *Anopheles farauti*, *Anopheles koliensis* and *Anopheles punctulatus*. The widespread use of DDT (dichloro-diphenyl-trichloroethane) as a residual spray in the Malaria Eradication Programme from 1960-1977, was therefore believed to have led to the marked reduction of lymphatic filariasis in the Solomon Islands. Surveys done between 1965 and 1973 provided evidence to support declining prevalence of filariasis in endemic areas. Prior to that the prevalence of filariasis in the Solomon Islands was 80% in some communities to complete absence in some. With the limited use of DDT for malaria control and lack of other effective mosquito control measures there is reason to believe that there is a resurgence of lymphatic filariasis in Solomon Islands. Efforts are now underway to do another nationwide survey from which a direct filariasis control programme would be initiated.

RECENT PROGRESS IN LYMPHATIC FILARIASIS CONTROL IN CHINA

Sun De-Jian

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Chinese Academy of Preventive Medicine, Shanghai, China

Lymphatic filariasis is one of the major parasitic diseases in China. Based on epidemiological survey, 30,994,000 cases estimated before control program. Lymphatic filariasis control was first included in National program in 1956. Since then, a large scale anti-filariasis campaign has been carried out extensively throughout the endemic areas. From 1956-1994, a cumulative total of 707,421,736 person-time were comprised in nationwide blood examination, and a total of 260,041,645 person-time DEC chemotherapy were conducted (including selective treatment, mass chemotherapy and DEC-fortified salt). Up to 1994, all the 864 endemic counties/cities in 15 provinces/autonomous regions/municipalities had achieved effective control of filariasis successively.

Parasitological, entomological and serological surveillance during the past few years demonstrated that the transmission of both bancroftian and malaysian filariasis have been virtually interrupted in most of the areas reaching the criteria for effective control of filariasis. In 1995, two provinces (Guangxi and Guizhou) had reached the criteria for the certification of filariasis eradication.

Monday 17 June 1996

11.00-12.20

ROOM 1: FILARIASIS 8:

Funding for Filariasis Control

Chairperson: Dr CP Ramachandran

Sunday 16 June 1996

09.00-10.30

ROOM 1: Travel Medicine

Chairperson: Dr Peter Leggat

IS THERE A ROLE FOR MULTINATIONALS IN THE CONTROL OF FILARIASIS?

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2. Filariasis Control Section, Department of Public Health and Tropical Medicine James Cook University of North Queensland, Townsville, Australia.

Multinational companies such as mining operations are in a unique position to assist in large scale public health programs such as filariasis control. They are located in filarial endemic countries, they have a commitment for community development and public health and also recognise the impact of control strategies on the local mine employees. Misima Mines is located in the Milne Bay Province of Papua New Guinea and employs some 500 local people. The mine has a large Community Affairs department and is involved in a number of community development projects. The Medical Section of the mine has a major role in disease surveillance and control in the islands around Misima and are involved with a number of public health and research projects on Misima itself. This paper will discuss the role of Misima mines in filariasis control and other initiatives and discuss this role as a model for other multinationals in filarial endemic countries.

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Dr D Randell	Australia
Dr D Silva	Australia
Dr R Douglas	Australia
Dr A Ramsay	Australia
Dr P Braslin	Australia
Dr S Flew	PNG
Delegate	
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Dr J Koroivueta	Fiji
Dr J P Moulet-Pelat	Tahiti

THIRD ROW

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Ms M Capra-Tennant	Indonesia
Delegate	Indonesia
Dr V Y Belizario	Philippines
Dr M McAuliffe	Australia
Col P Warfe	Australia
Dr J Gyapong	Ghana
Dr J Tanasale	Indonesia
Dr J Leafasia	Solomon Is
Ms J Koehler	Australia
Prof B Copeman	Australia

SECOND ROW

Dr J Ursurup	PNG
Dr K Kelly	Australia
Mr R Kero	PNG
Dr C Guatamadasa	Sri Lanka
Dr H Biswas	India
Dr K N Panicker	India
Dr M Bockarie	PNG
Prof J Kazura	USA
Dr D Freedman	USA

FRONT ROW

Dr V Orlov	WHO
Prof S Oemijati	Indonesia
Ms G Mearns	Australia
Prof D Bundy	UK
Prof R Speare	Australia
Prof I Wronski	Australia
Dr C P Ramachandran	WHO
Dr H Abednego	Indonesia
Dr P Turner	Australia
Dr Nay Soe Maung	Myanmar
Dr P Leggat	Australia
Dr V Kumaraswami	India
Ms L Stewart	Hong Kong