Proceedings of 1st Congress of Federation of Asian Parasitologists

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Proceedings of
the 1st Congress of
Federation of Asian Parasitologists (FAP)
in Chiba, Japan

Nov.3 (Fri.)-Nov.5 (Sun.), 2000

Hotel Chiba Sungarden, Chiba Kenritsu Museum

Asian Organaizers:

Korea: Dr. Jong-Yil Chai,

China: Dr. Wu Guanling,

Indonesia: Dr. Singgih H. Sigit,

Malaysia: Dr. Khairul Anuar bin Abdullah,

Philippines: Dr. Lilian de las Llagas,

Sri Lanka: Dr. Mirani V. Weerasooriya,

Thailand: Dr. Yongyuth Yuthavong,

Vietnam: Dr. Nguyen Duy Toan,

Japan: Dr. Isao

The Convenor of 1st Congress of FAP: Dr. Akihiko Yano

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Dr. Isao Tada,

Dr. Takashi Aoki, Dr. Yoshiki Aoki, Dr. Naoki Arizono, Dr. Kunisuke Himeno,

Dr. Kenji Hirayama, Dr. Eisaku Kimura, Dr. Hiroshi Ohtomo, Dr. Masaaki Shimada,

Dr. Mamoru Suzuki, Dr. Hiroyuki Takaoka, Dr. Tsutomu Takeuchi,

Dr. Akihiko Yano

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1st Congress of Federation of Asian Parasitologists (FAP) in Chiba, Japan

Nov. 3(Fri.) – Nov. 5(Sun.), 2000

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11,3 (Fri.) - 11,5 (Sun.), 2000

Hotel Sungarden Chiba

Chiba Kenritsu Museum

Nov. 3, 2000

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Registration and Organizing Committee

Nov. 4, 2000

8;40- Chiba Kenritsu Museum Auditorium

Registration;

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- **Opening Ceremony**

Chairperson; Dr. Kenji Hirayama

Rapporteurs; Drs. Lilian de las Llagas and Eisaku Kimura

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Rapporteurs; Drs. Nguyen D. Toan and Hiroshi Ohtomo

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2. Sri Lanka; Dr. Mirani V. Weerasooriya (University of Ruhuna)
3. Vietnam; Dr. Nguyen D. Toan (Institute of Malariology Parasitology & Entomology)
4. Malaysia; Dr. Anuar Khairul A. (University of Malaya)

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Chairpersons; Drs. Nguyen D. Toan and Eisaku Kimura

Rapporteurs; Drs. Guanling Wu and Kunisuke Himeno

5. Thailand; Dr. Yongyuth Yuthavong (Thailand Graduate Institute of Science and Technology)
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7. Phillippines; Dr. Lilian de las Llagas (University of Philippines)

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Parasitology and Parasitic Diseases in Asia - Country reports -

Chairpersons; Drs. Singgih H. Sigit and Takashi Aoki

Rapporteurs; Drs. Khairul Anuar bin Abdullah and Hiroyuki Takaoka

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9. Korea; Dr. Jong-Yil Chai (Seoul National University)
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Hashimoto Initiative; Dr.Tsutomu Takeuchi (Keio University)

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Banquet

Nov. 5, 2000

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3 Internet Journal of FAP

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Drs. Masaaki Shimada, Kenji Hirayama and Naoki Arizono

・ **Summary of 1st FAP Congress**

Toward Foundation of Federation of Asian Parasitologists (FAP):

The Convener of 1st Congress of FAP in Chiba, Japan: Akihiko Yano

Japanese Organizing Committee: Isao Tada, Takashi Aoki, Yoshiki Aoki,
Naoki Arizono, Kunisuke Himeno, Kenji Hirayama,
Eisaku Kimura, Hiroshi Ohtomo, Masaaki Shimada,
Mamoru Suzuki, Hiroyuki Takaoka,
Tsutomu Takeuchi, Akihiko Yano

1. Purpose of founding "the Federation of Asian Parasitologists"

There are unique characteristics of parasitology, epidemiology and the mathods to parasitic diseases according to individual geographic and cultural situation. More than 40 % of the world's population lives in Asia. Asian countries share common geographic and social environments and similar species of parasites and parasitic diseases are found throughout Asia. However, there are unique features of parasitic diseases according to the endemic or epidemic regions, because there exists extreme heterogeneity and polymorphism in race, history, culture, religion and other factors. Asia is an important endemic region for parasitic diseases in the world. In order to contribute to accelerated economic growth, improvement of living standards, control of parasitic diseases is essential for Asian people. Cooperation between Asian parasitologists is imperative and can be achieved because of the similarity of parasites.

Furthermore, parasitology is going to play a role as a source and a tool for modern biology. Parasitism formed through the parasite-host interaction is an extremely fascinating area of biology, and it is important to study this field through cooperation of Asian parasitologists.

Although there is enormous heterogeneity in various parts of Asia, it is important to establish scientific policies with characteristics common to Asia to work towards treatment of Asian parasites in the 21st century. To achive this goal, we are going to establishe"the Federation of Asian Parasitologists (FAP)" and to hold " the 1st Congress of FAP in Chiba, Japan" by expanding the co-operation that already exists between Asian parasitologists.

FAP is aims to address the problems of parasitic diseases in Asian countries, and to promote parasitology sciences in Asia, through cooperative scientific strategies. FAP encourages parasitologists to present the most up-to-date tools and knowledge for control of parasitic diseases, and FAP will also offer ways to use already established scientific tools to make them more effective. These major aims of FAP are in keeping with the traditions of Asian parasitology that were established by our seniors.

Five of 6 important infectious diseases in the world as identified by WHO, are parasitic diseases. FAP objectives are to educate medical doctors, paramedical staff and technicians, even in economically established countries, and these work in endemic areas of parasitic diseases. FAP will also reach people working in the field of advanced medicine such as organ transplantation and imported parasitic diseases by establishing an education system of up date parasitology information. FAP is going to establish links to WHO and World Federation of Parasitologists (WFP), and to the European Federation of Parasitlogists (EFP) and the Federation of Latin American Parasitologists (FLAP) which are also organized geographically. FAP will contribute to global understanding of parasitology through links with these societies and WHO.

2. Toward 1st FAP congress

The idea of founding FAP has been discussed and refined by parasitologists attending the Japan-Korea Parasitology Seminar (Forum Cheju) since 1995, as both Japan and Korea belong to OECD. Dr. Bebehani (Director WHO/CTD), Dr. Mamoru Suzuki (President of WFP) and more than 100 parasitologists from Korea, Malaysia, Thailand, Philippines, Nepal and Japan attended the 4th Japan-Korea Parasitology Seminar (Forum Cheju-4) in 1998 supported by the Japan Science Promotion Society, Chiba University and Ministry of Education, Science, Sports and Culture, Japan. The foundation of FAP was discussed by the organizing committee of Forum Cheju-4, and this topic was continuously discussed at Forum Cheju-5 held in Seoul on 1999.

Prof. Isao Tada (Kyushu University) endeavored to proceed with the founding of FAP. He organized an international workshop of the “Working group for foundation of FAP” inviting scientists from Asian countries (Korea, Thailand, China, Philippines, Sri Lanka, and Japan), Dr. Mamoru Suzuki (President of WFP) and some Japanese parasitologists in January 2000 to Fukuoka, Japan. The topic of parasitic diseases in Asian countries and countermeasures against them were discussed.

3. The conclusions of " Working group for foundation of FAP"

The conclusions of “Working group for foundation of FAP” organized by Prof. Tada are as follows;

1) The society was decided to call “Federation of Asian Parasitologists (FAP)”. Participants agreed importance and establishment of an international society of parasitologists.
2) The society will consist scientists who are interested and working in the fields of parasitology, parasitic diseases, and intermediate hosts or vectors of parasites.

- The main purpose of FAP is to control and eradicate those parasitic diseases that are a heavy burden to Asian countries. FAP will encourage co-operation among Asian parasitrologists, FAP will help to educate.

- FAP will organize a scientific conference every one to two years.
- Based on the conclusions of the meeting, the “First Congress of FAP in Chiba”, is going to be held from November 3rd to 5th, 2000. It will be organized by the Japanese Conference Organizing Committee under the auspices of the World Federation of Parasitologists and Chiba University with support from Ministry of Education, Science, Sports and Culture, Japan.

Welcome Address to FAP Participants From the Convener

Akihiko Yano

Department of Paasitology, School of Medicine, Chiba University, Japan

The members of the Organizing Committee of Federation of Asian Parasitologists, Distinguished guests and participants, Ladies and gentlemen,

I declare the 1st Congress of Federation of Asian Parasitologists is now open.

As the convener of the 1st Congress of Federation of Asian Parasitologists, I sincerely welcome all participants to the 1st Congress of FAP in Chiba, Japan.

The idea of founding Federation of Asian Parasitologists (abbreviated as FAP) has been discussed and refined by parasitologists attending the Japan-Korea Parasitology Seminar (Forum Cheju) since 1995. More than 100 parasitologists from Korea, Malaysia, Thailand, Philippines, Nepal, Japan, and the representatives of WHO and World Federation of Parasitlogists attended the 4th Japan-Korea Parasitology Seminar (Forum Cheju-4) in 1998 at Makuhari, Chiba, Japan. The foundation of FAP was discussed by the organizing committee of Forum Cheju-4, and this topic was continuously discussed at Forum Cheju-5 held in Seoul on 1999.

Prof. Isao Tada, the representative of The Japanese Organizing Committee for Federation of Asian Parasitologists (FAP) endeavored to proceed with the founding of FAP. He organized an international workshop of the " Working group for foundation of FAP" on 1999 at Fukuoka. The topic of parasitic diseases in Asian countries and countermeasures against them were discussed.

Asia is an important endemic region for parasitic diseases in the world. In order to contribute accelerated economic growth, improvement of living standards for Asian people, control of parasitic diseases is essential, and cooperation between Asian parasitologists is expected through shared geographic characteristics of parasites endemic fields.

Although there is enormous heterogeneity in various parts of Asia, it is important to establish scientific policies with characteristics common to Asia to work towards treatment of Asian parasites in the 21st century.

To realize this idea, we have decided to found “the Federation of Asian Parasitologists (FAP)”. And here we are holding “the 1st Congress of FAP in Chiba, Japan” by expanding the co-operation that already exists between Asian parasitologists under the auspices of the World Federation of Parasitologists, Chiba University and Chiba Convention Beuro.

FAP is aiming to address the problems of parasitic diseases in Asian countries, and to promote parasitology sciences in Asia, through cooperative scientific strategies.

FAP will contribute our effort to patients with parasitic diseases in Asia.

FAP is going to contribute for Asian Countries and people, and the contribution through FAP will be done by the cooperation of Asian Parasitologists.

Furthermore, FAP is going to establish links to WHO and World Federation of Parasitologists (WFP), and to the European Federation of Parasitlogists (EFP) and the Federation of Latin American Parasitologists (FLAP) which are also organized geographically. FAP will contribute to global understanding of parasitology through links with these societies and WHO. I sincerely hope we will get fruitful and excellent results through this Congress.

Before closing my talk, I heartly appreciate Dr. Kaichi Isono, President of Chiba University who has continuously supported our activity. And I thank the staff of the Asian and Japanese Organizing Committee members of FAP, and also thank the staff of my Department and many volunteers for their effort and contribution for this Congress and Foundation of FAP.

Thank you for your attention!

Welcome Address to FAP participants

Dr. Kaichi Isono

The President of Chiba University, Japan

The members of the Foundation Committee of Federation of Asian Parasitologists, Distinguished guests, Ladies and gentlemen,

On behalf of Chiba University, I sincerely welcome all participants to the 1st Congress of FAP in Chiba, Japan. It is great pleasure to welcome the representative parasitologists from 11 Asian countries and the presidents of the 9th and the 10th International Congress of Parasitology, the representative of WHO, and the president of the World Federation of Parasitologists.

The importance of control of parasitic diseases in Asia and World should be recognized by not only parasitologists but also scientists of other areas. The number of victim of malaria patients is more than 1.7 million per year. It is also well known that the frequency of parasitic diseases correlates with the economic situation of endemic area. I strongly hope that FAP will play an important role to control parasitic diseases in Asia, and that FAP may contribute to Asian countries through parasitology.

It was memorial story that the collaboration between Korean parasitologists and Japanese parasitologists to control filariasis in Cheju Island, and that Forum Cheju initiates this opportunity of foundation of FAP. It was a great honor to have given a welcome address at Forum Cheju 4 in Makuhari on 1998, and to have an opportunity to give a welcome address at the opening ceremony of this congress.

Chiba holds Narita New Tokyo International Airport and Chiba International Bay, and Chiba is playing an important role as the international forefront of Japan to the world. Chiba University has a long history of " International Student Center". I, as the president of Chiba University, recognize the importance of Asian countries, and we are accepting foreign students. More than 600 foreign students are studying at Chiba University every year, and 88% of the foreign students are from Asian countries. Chiba University is willing to support the international collaboration and contribution to Asian countries through sciences.

I should like to end these words of welcome with an earnest prayer for the great success of this congress.

Thank you for your attention.

Federation of Asian Parasitologists (FAP)
Asia is One? Why Regionalize?

Isao Tada

Kyushu University, Japan

In the January seminar on the possible formation of Federation of Asian Parasitologists (FAP) in Fukuoka in 2000, participants from various Asian countries agreed the necessity of this type of federation and to convene the first congress in the near future. The followings are the summary of the January seminar.

(1) The name of organization:

The name of the intended organization will be Federation of Asian Parasitologists. The parasitologists in this case will include a wide range of researchers interested in parasites, their vector/intermediate host and parasitic infections.

(2) Concept and purposes of FAP:

Elimination of parasitic diseases in Asia will be an ultimate purpose. This can be achieved by new strategies based on modern technology and knowledge, and by greater involvement of people. Parasitology is expected to be re-discovered or re-emerged in the light of recent scientific and technological developments and, at the same time, through sincere appreciation of old achievements in parasitology in Asia. Much of the parasitology data in Asia have not been shared by regional researchers. The data have to be presented, recorded and distributed to all Asian parasitologists.

(3) Organization:

It should be an authorized umbrella organization which has authority and influence in international meetings of parasitologists. However, in case of attendance or participation, authority from home country may not be essential. In some cases, it is difficult to obtain such authorization. It should have a clear academic direction and educational support especially for young and upcoming parasitologists.

(4) Activities:

Preparation of a book which can be a useful database, and which also include highlights of research activities in Asia. Utilization of internet to provide and exchange information among Asian parasitologists. A net journal may be a possibility. International meetings may be held annually or biennially in an Asian city, closer to every participant. To promote co-operation among Asian countries. It is necessary to clarify difference from SEAMEO in this respect.

(5) Future plan:

Prof. A. Yano, Chiba University, will function as the secretary. He will try to organize next meeting.

Due to this concensus, today we gathered altogether in order to start FAP aiming at the formation of a federation among parasitologists. The rational of FAP will be summarized in the next table.

RATIONAL OF FAP (FEDERATION OF ASIAN PARASITOLOGISTS)

WHY REGIONALIZE?

---

1. Proximity to the problem and efficacy in responding to local issues.
2. Sharing same parasites and infections.
3. Ability to implement a regional strategy
4. Ease of sharing experiences and technical resources.
5. Similar civilizations and common concensus.
6. Association for individual parasitologists apart from the established frames.
7. Asian identity among others (FLAP, ESP, WFP etc)

WHO is now intensively promoting the control/elimination program for parasitic infections for instance in terms of RBM (roll back malaria) and others. This idea is quite important from the view of a combat against poverty. On this context, it will be quite timely to start FAP among other categories like FLAP (Latin American Federation of America) and others in Europe.

Opening Address at The 1st Congress of FAP

Moriyasu Tsuji

Kyorin University, Japan

Good morning, Distinguish Guest, Dear Colleagues, Ladies and Gentlemen,

In the first, I congratulate the start of the Federation of Asian Parasitologists, and I would like to express my sincere thanks to Professor Isono, Professor Tada, Professor Yano and all of the members of organizing committee, for the excellent arrangement of this Congress.

It is my great pleasure and honor, on behalf of the Organizing Committee of ICOPA Ⅸ, to deliver congratulatory address for this Congress.

And I would like to express again my sincere thanks to all participants for ICOPA Ⅸ have been successfully contributed in the year of 1998.

As every body knows, the global issues of parasitic diseases have their medical and socio-economic importance. The study of parasitology also encompasses scientific and humanistic aspects, and the research on parasitology is necessary to insure the health of all mankind.

In this sense, the issue of parasitic diseases should be handled from the global point of view, for early containment, and our former Prime minister, Mr. Ryutaro Hashimoto, proposed setting up an international collaboration network to control parsitic diseases in G8 Summit.

It is necessary to lay a foundation not only for domestic control efforts but also for the advancement as an international undertaking to support the research and medical service capabilities for parasitic diseases.

However, the majority of the developed countries are doing bi-lateral cooperative projects in this moment, but from now, it is necessary to do the multi-lateral cooperations with hands in hands of every countries.

Then, we need the cooperation of excellent Asian Parasitologists for the future works.

In this Congress, we expect to discuss many valuable and fruitful results of basic and operational research in the fields of Parasitology occurring in participating Asian countries.

I hope and believe to continue our more friendful cooperation every to make the global parasite control for the 21st century a success.

Thank you for your attentions

Zoonoses and New Parasites in Canada

R. A. Khan

Department of Biology Memorial University of Newfoundland St. John's, Newfoundland A1B 3X9

ABSTRACT

Canada faces new challenges during this millennium in detecting and controlling parasites of man in its northern region and in new migrants arriving from tropical countries. Endemic food and water-borne diseases such as giardiosis, sarcosporidiosis, hydatidosis and trichinellosis exist in the north. Latent malaria and enteric parasites causing disease such as hookworm and amoebiosis, represent the major pathogens in migrants from tropical regions. Malnutrition and environmental contaminants in food such as pesticides and atmospheric lead, can enhance the impact of parasitic infections. Consequently, advanced techniques are required to detect the parasites in order to control them and possibly avoid establishment.

Canada faces new challenges in this millennium in its quest to detect and control endemic zoonoses in the Arctic-subarctic region and also parasites in immigrants arriving from Africa, Asia and Latin America where some of these disease agents cause considerable morbidity and mortality (see Rausch 1952; Margolis et a1.1979). Detection by health care institutions is therefore imperative in order to avoid dissemination and possible establishment. The majority of immigrants entering this country lie within the age group of 20 to 40 and arrive with children that are not only more susceptible to parasites in their country of origin because of inadequate nutrition but also might harbour latent infections, sometimes not readily detected by routine diagnostic methods. Consequently, highly trained personnel, using the advanced technology, are required to diagnose these infections. This conference is important since it will not only provide invaluable information on the epidemiology, detection and control of important parasites of man in Asia but also information that will be useful in other regions of the world.

Zoonoses in northern Canada are widespread but little is known of their prevalence (Table I). Most are acquired orally through uncooked meat or fecal contamination (Rausch 1952,1978; Khan and Butler 1992; Khan 1995; Khan and Fong 1992). The close association between huskie dog, used in racing teams, and man is responsible for infections with *Cryptosporidium parvum*, *Echinococcus granulosus, Trichinella spiralis* and visceral larval migrans caused by *Toxocara leonina*. Diarrhea of non-bacterial origin has been reported in children in areas of Labrador where the prevalence of *C. parvum* is 100% in both wolves (*Canis lupus*) and huskie dogs (Khan, unpub1.data). Entrails of wolves, shot or trapped by native groups, are left near to houses during winter and available for scavenging by dogs and other animals such as foxes (*Vulpus vulpis*). Similarly, consumption of uncooked meat from caribou (*Rangifer tarandus*), a major source of meat in Labrador and in which the prevalence of *Sarcocystis* spp. is nearly 100%, might also be responsible for gastroenteritis reported by hospitals (Evans 1998). Little is known of *Toxoplasma gondii* but its occurrence in lynx (*Lynx canadensis*), a feline of the boreal forest, and unpublished records of antibodies in people in Labrador, is suggestive of its presence there. Several outbreaks of *Giardia lamblia* have been recorded in Newfoundland (Khan 1995). While some might be attributed to animal origin such as the beaver (*Castor canadensis*), hunters, trappers and loggers might have been the source of infection. The northern biotype of *E. granulosus* cycles in the wolf and caribou (Rausch 1952). Lung is the main site of infection in the latter host and prevalence about 40% (unpubl. data, Province of Quebec). Consumption of uncooked lung by both man and dog as well as offal by wolf, are responsible for the infections in canids, which is about 80% (Evans 1998). It is likely that hepatic tumours surgically removed from Labradorians could conceivably have been hydatid cysts. There are records of outbreaks of *T. spiralis* in communities in Labrador following consumption of polar bear (*Thalarctos maritimus*) that were shot illegally and attributed to black bear (*Ursus americanus*) in which the prevalence of infection is extremely low (Butler and Khan 1992). Morbidity has also been attributed to larvae of *Anisakis simplex* following consumption of raw fish such as Atlantic cod (*Gadus morhua*) and herring (*Clupea harengus*) at St. Anthony, a small community in northern Newfoundland (Chandra and Khan 1988). Visceral larval migrans, most likely of *Toxocara leonina*, have been recorded from in two children from Labrador but few details are available. Eggs in the feces of a11 wolves and huskie dogs examined and adult nematodes in one wolf from Labrador indicates that this species was involved.

Immigrants arriving from Africa, Asia and Latin America could potentially harbour a variety of parasites without exhibiting symptoms of disease especially some in an emaciated condition which might be associated with improper nutrition, (Tables 2-4). Relapsing species of malaria, primarily *Plasmodium vivax* or *P. malariae*, have been detected in Ruandan refugees and other groups arriving from other areas of Africa but rarely have they been examined for enteric parasites such as hookworm (*Ancylostoma duodenale*), pinworm (*Enterobius vermicularis*) or *Entamoeba histolytica* which are widespread in west Africa (Dipeolu 1983). The importance of some infections in a chronic state such as *E. histolytica* and *Trichuris trichura* cannot be overlooked since outbreaks from a foreign source have been recorded in the United States. Intestinal infections, caused by food and water-borne parasites, which deplete nutrients, have been detected in people arriving from the orient and Latin America (Ko 1984; Kaminsky 1991). Intestinal nematodes appear to be the most common parasites in migrants from Hong Kong (Ko 1984). Chronic Chagas disease, caused by *Trypanosoma cruzi*, relapsing malaria and *E. histolytica* have been

observed in migrants from Latin America. As HIV continues to spread, water-bone cryptosporidiosis which might attain epidemic
proportions, can be expected because of its lack of host specificity and its resistance to chlorination and other chemicals.

It is evident that parasites will continue to persist and cause morbidity and mortality in man in developing countries and their impact further enhanced by poor nutrition. There is also little doubt that global climatic changes are occurring and predictions have been made on the spread of malaria and other tropical diseases in a future warmer world (Rogers and Randolph 2000). The global population and malnutrition are both increasing and in an attempt to increase food production, the use of pesticides, which are known to impair human health through disruption of the endocrine and immune systems, have increased considerably (Crew et al. 2000). Other contaminants, lead for example, released by emission into the atmosphere, are known to cause birth defects, lower birth rate, decrease intelligence, retard growth and cause kidney damage (Lyengar and Nair 2000). Less is known of the influence of genetically manipulated foods on human health but there is increasing concern of their effects on man and the environment. It is clear, then, that parasitic disease could have a greater impact on human health already impaired in some countries by malnutrition and chemical contaminants. Health care in many countries is incapable of achieving its full potential because of overwhelming debt, little control over natural resources owned by multi conglomerates and migration of trained personne1 (‘brain drain’). It is anticipated that this conference will address some of these issues, taking cognisance of the epidemiology, prevention, detection and control of parasites to alleviate man’s burden and improve the quality of life in Asia.

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Table 1. Zoonoses in the Canadian Arctic (Newfoundland/Labrador)

Parasite taxa	Animal hosts	Location
Giardia lamblia	Castor canadensis	NF
Cryptosporidium parvum	Rattus norvegica	NF
	Lynx canadensis	
	Vulpus vulpis	
	Canis lupus	
	Corvus brachyrhynchos	
	Larus argentatus	
Toxoplasma gondii	Lynx canadensis	NF
Sarcocystis spp.	Rangifer tarandus	NF,L
Echinococcus granulosur	Rangifer tarandus	L
Trichinella spiralis	Ursus americanus	L
	Thalarctles maritimus	
Anisakis simplex	Clupea harengus	L
	Gadus morhua	
Toxocara leonina	Canis lupus+	L

+visceral 1arval migrans

Table2. Prevalence of commonly-occurring parasites in man from Nigeria (after Dipeoln, 1983)

Parasite	Prevalence
Plasmodium falciparum	-
vivax	-
malariae	-
Trypanosoma gambiense	-
Entamoeba histolytica	3.4*
Toxoplasma gondii	12.0
Taenia solium	0.6 - 0.9*
Schistosoma hematobium	15.0*
Ascaris lumbricoides	41.4*
Ancylostoma duodenale	24. 1*
Trichuris trichura	27.6*
Onchocerca volvulus	10.0 - 70.0*

*age-related (21 -40 age group)

Table 3. Prevalence of commonly-occurring parasites in man from Hong Kong (after Ko, 1984)

Parasite	Prevalence
Plasmodium spp.	-
Entamoeba histolytica	13-32
Giardia lamblia	4
Opistorchis sinensis	13
Fasciolopsis buski	19
Schistosoma japonicum	-
Ancylostoma duodenale	5
Ascaris lumbricoides	5
Enterobius vermicularis	4
Necator americanus	4
Strongyloides stercoralis	4
Trichuris Trichura	4
Wucheraria bancrofti	-
Trichinella spiralis	1.6-6.4

Table 4. Prevalence of commonly-occurring parasites in man in Honduras (after Kaminsky, 1991)

Parasite	Prevalence
Plasmodium vivax	-
Falciparum	-
Leishmania brasiliensis	-
mexicana	-
Trypanosoma cruzi	-
Giardia lamblia	5.8
Entamoeba histolytica	13.9
Cryptosporidium parvum	7.4
Taenia solium *	9.6
Ascaris lumbricoides	15.9
Trichris trichura	4.7
Strongyloides stercoralis	1.7

*% of cysticercosis unknown but common I

The Needs For Basic Studies in Epideniology and Control of Parasitic Diseases in Asia

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SUMMARY

Very many parasitic diseases were endemic in Japan until recently, such as those due to ascaris, hookworms and other nematode infections in the intestines, schistosomes and other trematodes, intestinal cestodes, malaria and other parasitic protozoans, and very many species of blood sucking insects and mites. However, most of them are now very well controled or eradicated from this country mainly due to the basic studies in epidemiology and control of these diseases by parasitologists and public health workers. Among these diseases, I have been mainly involved in the studies on the mosquito borne diseases such as malaria and filariasis, and those transmitted by parasitic mites, especially tsutsugamushi disease (scrub typhus) infected by trombiculid mites. However, many of these diseases are still endemic in Asian countries, especially in those situated in the tropical and subtropical regions, and the people are still awaiting their contro1 or eradication. In this occasion, I shall make summary of my experiences in the control of the three diseases, filariasis, malaria and scrub typhus.

STUDIES ON EPIDEMIOLOGY AND CONTROL OF FILARIASIS IN JAPAN

Two kinds of human filariasis were found to be endemic in Japan, the Malayan filariasis transmitted by *Aedes togoi* breeding in the rock holes on the sea cost, and bancroftian filariasi transmitted mainly by *Culex pipiens pa11ens* breeding in sewage waters. The former was discovered by us in Hachijo Koshima Island south of Tokyo and reported in 1951 as a new type of human disease. The latter was endemic very widely in the mainland of Japan with the exception of the northern island of Hokkaido, and millions of people were infected, causing elephantiasis and bloody urines, and causing serious diseases especially in the southern islands of Amami and Okinawa. A drug called diethylcarbamazine (DEC), produced in Japan mainly for the purpose of the treatment of ascariasis in Japan, was found to be highly effective against both types of filariasis, and after comprehensive studies to compare the effectiveness of various doses and intervals of its administration mainly in villages on Amami Island, a standard method of oral administration of 0.6 gr. per. 1 kg of body weight, one a day for-12 continuous days, was effective for the clearance of the parasite. The drug was found to be causing fever reactions in many of the parasite carriers, and this was the main cause of the refusal of the intake of the drug, but by comparative studies of the carriers with the quantitative examination of 30 mg of blood samples per- person, this reaction was shown to be not caused by the drug itself, but due to the descruction of the parasite in the body and discharge of fever causing substances from the dead parasite and not at all dangerous but is a sign of cure from the disease, and thus no refusal of the carriers occurred in Japan after this new evidence was discovered.

The National Filariasis Control Programme was started in 1962 by applying this new standard method covering all the known endemic areas in Japan. In the first year in Kagoshima Prefecture, for example, the blood samples of a total of 135,557 persons were examined, and 8,968 or 6.62% among them were found to be microfilaria positive, and received the administration of DEC. In 1963 in the second year, 167,604 persons were examined and 6,597 or 3.94% were positive. The positive rate descreased gradua11y by the years as the treatment of positive cases by the drug, and reached to only 9l cases in 11,645 persons in 1971. Such gradual decreases in the positive rates occurred also in other 8 prefectures in Japan covered by this national programme, and all became to almost 0 in 1971 in all the prefectures concerned, in about 10 years after start of this programme, and is now this disease is completely eradicated from Japan. However, this disease is still endemic in many of the tropical countries in the wor1d, mainly due to lack of information on the effectiveness and the safety of the drug treatment, and the lack of appropriate budget for the control programme.

A summary of the results of these studies were published by Sasa (1976) in a monograph of "Human Filariasis" published by University of Tokyo Press, 819 pp.

STUDIES ON EPIDEMIOLOGY AND CONTROL OF MALARIA IN JAPAN

Two species of malaria parasites were endemic in Japan, *Plasmodium falciparum* causing malignant malaria in the southern islands of Japan, and *P. vivax* widely endemic throuout Japan including the northern island of Hokkaido. The number of malaria patients of the Yaeyama Islands were reported in 1945 to be 16,884, or 53.3% among the total population of 31,671, and as many as 3,647, or 11.5% were reported to be killed by the disease this year. I visited these islands in 1952, when malaria was still highly prevalent in these islands, and proposed to the American Occupying Government for the start of its control programme by the coverage of all the houses with DDT residual spraying and by extensive administration of antimalarial drugs by the local doctors. The disease was found to be rapidly decreasing from the next year, became only 4 cases in 1960 and 5 in 1961, and to zero after 1962.

The total number of malaria patients reported by from Japan to the Ministry of Health of the Japanese

Government were 28,210 in 1946, 11,825 in 1947, 4,953 in 1948, and 3,716 in 1949, but gradually deereased untill it became only 16 in 1959 and also in 1960, and became 0 excepting those infected abroad in the tropical countries. Such reductions to the complete eradication of the disease endemic in Japan is considered to be mainly due to the effective treatments of local doctors of the malaria patients, and the reductions of the vector densities mainly due to the reduction of the breeding places such as waste swamps, and better care of rice paddies such as by removal of waste grasses and debris fop better productions.

A summary of the above studies were published by Sasa (1997) in "Clinical Parasitology" Vo1. 8, pp. 19-29.

STUDIES ON EPIDEMIOLOGY AND CONTROL OF TSUTSUGAMUSHI DISEASE IN JAPAN

This disease was first reported by Tanaka (1899) as a febrile and often fatal disease caused by the bite of "akamushi" in the riverside area of Akita Prefecture, and later studied by a number of bacteriology and epidemiology workers in Japan to be endemic during the summer season in the glassland of the three main rivers in Niigata, Akita and Yamagata, an infectious disease caused by a Rickettia, and transmitted by the bite of a larval mite of *Trombicula akamushi*. Five species of this group of the mites had been recorded only from the endemic areas of this disease in northern Honshu, by Nagayo and others (1919-1921), before we started this work.

In 1948, soon after the War, cases of tsutsugamushi disease were reported to be found among the Americal soldiers staying in the foot of Mount Fuji in the southern region of Honshu, and several species of trombiculid mites were collected to be parasitic on field rats captured in this endemic area. Among them, we found *Leptotpombidius scute11are* was the new vector of this disease.

Our studies on the trombiculid species all over Japan from Hokkaido to the southern islands of Okinawa began after this, and a total of more than 60 species, including many new species, were recorded in the monograph of “Tsutsugamushi and tsutsugamushi diease” published in 1956. New endemic areas of the disease were discovered later from almost all over Japan, and a total of several thousands of patients were recorded from Japan there after. For example, the occurrence of several hundreds of cases among some 1,000 inhabitants was reported by us on the island of Hachijo south of Tokyo. The effective measures against the reduction of cases of this disease have not yet been discovered, but the patients thus formerly misdiagnosed as other diseases became effectively cured by the use of antibiotics effective against rickettial infections. It has also been discovered that not only *Leptotrombidium akamushi*, but several other species of this group were found to be acting as vectors of this disease, and the seasons of the occurrence of the disease were found to be not only in the summer, but in late autumns in those of the type transmitted by *L. scute11are*, or in autumn and spring in those transmitted by *L. pa11idum*. In the studies on this disease, the information on the taxonomy of the mites were also found to be very important.

A summary of the above studies were published by Sasa (1956) in “Tsutsugamushi and tsutsugamushi disease” published by Igaku Shoin, Tokyo.

The burden of helminth infections in Asia: perspectives for their control

Dr. Carlo Urbani

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Mister Chairman, distinguished participants, Ladies and Gentlemen,

On behalf of the Regional Director of the WHO Region for the Western Pacific, Dr. Shigeru Omi, I have great pleasure to greet all of you and to congratulate the organizers of this congress. I am pleased and honored to be attending this 1st Congress of the Federation of Asian Parasitologists, and to have the opportunity to express in my presentation the concern of the World Health Organization about the burden of selected helminth infection in Asia, and to discuss the perspectives for their control.

People who live in affluent modern society fail to appreciate the importance of parasites because they are so rarely encountered in their everyday life. Probably, even if more or less known exotic diseases are considered as a danger for the health of the international travelers, there is lower knowledge about the impact that several parasites have in the human health, in the life of million of people in developing countries. Where the well known mix of low hygiene, low education, low availability of latrines, lacking health services and low access to essential medicines characterizes the background, parasitic infections dramatically affect essential aspects of the individual life, as nutrition, susceptibility to infections, micronutrients deficiency, and also determine severe diseases, as for schistosomiasis, lymphatic filariasis or foodborne trematode infections. The World Health Organization categorizes parasites among the six most harmful infective diseases of man and globally parasitic infections outrank cancer as the number one killer in the world. The 1993's World Development Report ranked intestinal helminths among the main causes of disease in children.

More recently WHO considered the control of schistosomiasis and soil-transmitted helminths among the five health priorities within the global Massive Effort Against Poverty.

Infections by *Ascaris lumbricoides, Trichuris trichiura* and hookworms, which together constitute the group of soil-transmitted helminths (STH), are reported as common infections, in particular in children, in almost all the countries in this region. It is estimated that worldwide 3.5 billion people are infected with intestinal parasites of which 450 million are ill and the numbers of people infected is increasing in all

WHO regions. Reliable representative data have been provided by national or regional surveys in almost all the countries in this region, in particular among the most disadvantaged segment of the population. Children and pregnant women are particularly vulnerable to these infections that influence many nutritional indices and, consequently, cause growth retardation, protein-energy malnutrition, iron-deficiency anemia, vitamin-A deficiency, or goiter. General and social consequences of hookworm infections include decreased work capacity, increased maternal and fatal morbidity and mortality, increased susceptibility to infections, and reduced rate of cognitive process.

Aquaculture is currently one of the fastest growing food production systems in the world with production increasing at an average rate of 9.6% per year over the past decade. Approximately 90% of global aquaculture production is based in Asia, where it provides an important source of dietary animal protein of the region and income for millions of small-scale farmers. Foodborne parasitic infections have been identified as hazards of aquaculture products. It has estimated that over 40 million people worldwide, mainly in eastern and southern Asia, are affected by fish-borne trematode infections and that more than 10% of the world population is at risk of infection. Clonorchiasis is endemic in China, the Republic of Korea, Japan, Hong Kong, Vietnam and the Russian Federation. About 7 million persons are estimated to be infected and more than half are in China. Opistorchiasis is endemic in Thailand, Laos and Vietnam. More than 10 million persons are estimated to be infected, at least 7 million are in Thailand. Paragonimiasis affects 22 million persons in at least 20 countries, and the major foci are in Asia (India, Indonesia, Myanmar, Nepal, China, Korea, Vietnam, Laos, Philippines and Thailand).

Schistosomiasis is still endemic in China, Cambodia, Laos and the Philippines, where the infection represents a priority public health problem. A dramatic disease is related to the *Schistosoma japonicum* and *Schistosoma mekongi* infections and in endemic areas the infection is a leading cause of disease and death.

Lymphatic filariasis constitutes also a public health problem in many Asian countries, but aspect related to the infection will be matter of another presentation.

The public health importance of parasitic zoonoses is of growing global concern. Although zoonoses do not appear to represent an important issue when looking at the major causes of death worldwide, these diseases represent an important health hazard in most countries, where they cause considerable expenses and losses in the health and agricultural sector. The developing countries suffer much more severe losses than do the industrialized countries, partly because of the less well-developed health system and veterinary services, and partly because of their climatic and environmental conditions. Both alveolar echinococcosis, the most dangerous parasitic infection, and cystic echinococcosis are a problem of worldwide importance. The highest prevalence in the world of alveolar echinococcosis are in China, where in the province of Gansu prevalence is up to 15% in particular villages, with a mean prevalence in the area of 5%.

Million of persons are affected by taeniasis/cysticercosis in Latin America, Asia and Africa, where the disease is a factor in the extremely high prevalence rate of epilepsy. According to the Commission on Tropical diseases of the International League against Epilepsy the age-adjusted prevalence of active epilepsy in tropical countries range from 10 to 15 per 100,000 inhabitants, almost twice the level in Europe. Neurocysticercosis has been estimated by WHO to cause at least 50,000 deaths per year.

This is the figure, but fortunately we have today available effective, sustainable, and feasible tools and strategies to control the disease related to helminth infections.

In recent years evidence on efficacy and cost-effectiveness of control have been showed in many countries. A recent breakthrough has been the development of highly efficacious single dose drugs. New strategies for mass-treatment of human population has been tested, new diagnostic tools and treatment procedures make now the management of infected individuals more efficient. For parasitic zoonoses vaccines are now also available to prevent infection in animals. It is necessary to implement national plans aimed at controlling helminthic diseases. Major components of these plans include periodical mass drug administration of a single dose drug, improvement of hygiene and reduction of risk habits through health education campaigns, environmental control to reduce the transmission risk of schistosomiasis, and also improvement of rural employment and food availability, as well as promotion of animal health and reduction of environmental pollution related to animals.

Successful experiences, even if conducted in pilot scale, showed the feasibility of a morbidity control. This has been reported in Cambodia, Laos, Philippines, Indonesia, Sri Lanka, Vietnam, and other countries. In Cambodia, in the difficult context of the northern Mekong provinces, only five years of schistosomiasis control based on annual universal treatment with a single dose of praziquantel reduced schistosomiasis prevalence from an average of 72% to less than 10% in four sentinel villages, and the dramatic finding of children with 'big belly' is now exceptionally rare. Sonography surveys showed as this simple intervention achieved an excellent morbidity control. More advanced programmes achieved also the subsequent steps of infection and transmission control, as for schistosomiasis in Japan, STH in Japan and Korea, lymphatic filariasis in China.

WHO advocates the integrated control of schistosomiasis and soil-transmitted helminths, as well with lymphatic filariasis control. Control strategies for both diseases have indeed common grounds. Highly effective, safe single-dose drugs can be dispensed through health services, school health programmes and community interventions directed at vulnerable groups. As these infections are endemic in poor communities, more permanent control will only be feasible where chemotherapy is supplemented by improved water supplies and sanitation, strengthened by sanitation education. In the long term, this type of permanent transmission control will only be possible with improved living conditions due to economic development.

In November 1999, this strategy was endorsed by the Cabinet of WHO, which is now taking steps to largely advocate this strategy and obtain a formal commitment from Member States for the implementation of the following implementation package

The target WHO proposes now is to regularly treat at least 75% of all school-age children at risk of morbidity (in and out of school) by 2010. Besides regularly treating children at risk of morbidity through the IMCI strategy. And treating pregnant women at risk of iron-deficiency anemia due to hookworm infection, through women's health programmes is also recommended.

If food-borne diseases are recognized as a major concern in industrialized countries, how much more of a problem is it in countries where the urban growth is faster than the public health infrastructure can support? Further collaboration is essential between all professions involved in food technology development, food production and food control and the promotion of new production technique to ensure protection of food from animal origin. In Thailand the liver fluke control programme includes detection and treatment as well as health education for avoiding raw fish and hygienic disposal of excreta. However in spite of the efforts in most areas prevalence has increased in recent years, except in the north-east, where the control programme has had the most complete coverage and decline from 35 % in 1981 to 15 % in 1996.

For parasitic zoonoses control the intersectorial collaboration, as well as the need of research and international cooperation, was indicated as essential issue toward a sustainable effective echinococcosis control during the last National Symposium on Strategy of Hydatid Disease Control, held in Urumqi in 1999. Specific guidelines have been proposed by WHO and FAO. In Asia both China and Japan have been developing control programmes for alveolar echinococcosis at national level. Several Chinese teams have the largest experience in the world with new interventional technique as PAIR and Percutaneous Puncture with Drainage and Curettage specifically developed in China, with new field serological tests, praziquantel subcutaneous implant in dog, vaccination of sheep.

For cysticercosis control two approaches are possible: comprehensive programmes of long-term interventions or short-term target interventions. The former involves appropriate legislation, health education, modernization of swine husbandry practices, more efficient and all-inclusive coverage of meat inspection, adequate sanitary facilities and measures to detect and treat human carriers. Both this approaches have been reported effective in large experience in South-America countries.

In conclusion, there is the evidence that the development of efficient public health systems create a favorable action on the control of many communicable diseases, including helminth infections. A good example on how the economical development sustains the control of parasitic diseases is constituted by Japan and South Korea. At the same time parasitic infections impoverish affected populations. Recently Professor Feng Zengh, Director of the Shanghai Institute of Parasitic Diseases, pointed out that these 'small worms' hamper economic development and civilization.

A strong political commitment is a necessary step toward the control. Governments should pay attention to this group of infection, mobilizing resources, seeking adequate strategies and setting up realistic and sustainable control programmes, as well as the scientific community should identify in the research and development of new drugs, tools and strategies for controlling helminth infection a priority as an essential contribution to the global development. There are still unclear aspect, related to the complexity of immunological and physiological relationship of helminths with the host, of their epidemiology, pathology and biology, which require a big effort in research.

I am sure, I hope, this entire subject has already the necessary room in your scientific agenda.

Status of Parasitology and Parasitic Diseases in Sri Lanka

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Sri Lanka is a tropical country situated in the Indian Ocean with a maximum length of 435 km and a maximum width of 240 km . It has a total area of 65000 sqkm, which includes 8 provinces and 24 districts. The total population is about 18.4 million. The health care facilities are provided free of charge and a well developed health care system is available for the whole country.

Parasitic diseases are common in the country due to overcrowding and poor sanitary conditions. The two most important parasitic diseases in Sri Lanka are malaria and lymphatic filariasis. Helminthic infections are the most prevalent chronic infections of Sri Lankan population. Of these, enterobiasis is the commonest and three soil transmitted helminthiases namely ascariasis, trichuriasis and hook worm infection due to *Necator americanus* are also commonly encountered. It has been increasingly recognized that chronic intestinal helminth infections cause considerable morbidity, affecting the nutritional status and growth of children in this country. The intestinal protozoans, *Entamoeba histolytica* and *Giardia intestinalis* and the genital flagellate *Tricomonas vaginalis* are also common. Scabies and Pediculosis are two very common ectoparasitic infestations found in this country.

The more rarely reported parasitic diseases are toxoplasmosis, cutaneous leishmaniasis, and balantidiasis. Cestode infections like *Taenia saginata, Taenia solium, Echinoccocus granulosus, Hymenolepis diminuta, Bertiella studeri* and *Dipylidium caninum* have also been reported as less common infections. In addition, dirofilariasis due to *Dirofilaria repens* is becoming more prevalent in recent years.

At present, there are two nationl programs namely, Anti Malaria Campaign and Anti Filariasis Campaign established under the Ministry of Health to control the two main parasitic diseases. The functions of these campaigns are case detection and treatment, vector control activities, and conduct of health education programs.

Two protozoan parasites responsible for malaria in Sri Lanka; *Plasmodium vivax* and *Plasmodium falciparum* causing respectively benign tertian and malignant tertian fevers. *P.vivax* is the predominant species and percentage of cases for year 1998 is 79.97 and for *P.falciparum* are 19.67. The Annual Parasite Index for the years 1996, 1997 and 1998 are 10.1, 11.1 and 11.38/1000 population respectively.

At present *Wuchereria bancrofti* is the only causative parasite of lymphatic filariasis. Malayan filariasis due to *Brugia malayi* was reported to have been completely eradicated. The endemic area for bancroftian filariasis is the coastal belt of Western and Southern Provinces with some inland pockets. The mf rate for the overall country as reported by the national campaign remains, less than 1% and for the years 1996, 1997 and 1998 it was 0.37, 0.38 and 0.23 respectively. A mass treatment programme using a single dose of 6mg/DEC was recently started covering the whole endemic area.

Universities and Parasitologists of Sri Lanka

There are thirteen state owned universities in Sri Lanka and only in six universities, Faculties of Medicine have been established. Three of them, Colombo, Jayewardenepura and Kelaniya are situated within Colombo City limits and outstation faculties are in Peradeniya, Galle and Jaffna.

Parasitologists being a rare specialty in this country a total of nine qualified parasitologists are available in these faculties. The junior Parasitologists are engaged in their postgraduate studies while assisting in the teaching programmes.

The University of Colombo has a well-established Malaria Research Unit initiated by Professor Kamini Mendis and their main research interests are on many aspects of malaria, in addition to leishmaniasis and hydatidoses. Prof. M.M.Ismail former Professor of Parasitology in the Colombo Faculty was mainly involved in research on filariasis and soil transmitted helminthiases. At University of Peradeniya the parasitologists, Professor Manel K. de S. Wijesundera and Professor J.S Edirisinghe have been involved in research on Toxocariasis, free living amoebae, soil-transmitted helminthiases and global climatic changes on vectors.

The University of Ruhuna being situated in the filariasis endemic-belt the main activities are focussed on filariasis. A well-organized field program on epidemiology and control of filariasis, is being carried out at present, by the Department of Parasitology.

There are two parasitologists in University of Kelaniya and their main research areas are intestinal parasitic disease, malaria, filariasis and leishmaniasis. Faculty of Medicine, University of Sri Jayawardenapura has two parasitologists at present and their research areas are filariasis and malaria.

A special mention has to be made at this point about Prof. A..S.Dissanaike, former Professor of Parasitology , Faculty of Medicine, Colombo who has contributed both as a researcher and a teacher in Medical Parasitology. His work was on animal malarias, human and other filariases, *Sarcocystis* and several other parasites of animals, which are of zoonotic importance. He now lives in retirement still contributing to the field of Parasitology in Sri Lanka.

In addition to Departments of Parasitology in the Medical Faculties, other departments like Zoology and Animal science etc. In other faculties are too engaged in Parasitology related research in Sri Lanka. Notable among them is the group headed by Dr.F.P.Amarasinghe, Professor of Applied Zoology, Faculty of Science, University of Peradeniya.

<u>Other Parasitology related Institutions in Sri Lanka</u>

1. Medical Research Institute in Colombo, which is the main Research Institute under the state, too has a division of Entomology and Parasitology. At present, there is one Parasitologist who is engaged in research on toxoplasmosis.

2. Anti Malaria Campaign – This was established in 1931 after several malaria outbreaks, which resulted large number of deaths in Sri Lanka. This functions under the Ministry of Health and has many stations in the endemic areas. Their main functions are active and passive case detection and treatment, entomological studies, vector control and health education.

3. Anti Filariasis Campaign - This was established under the Ministry of Health in 1947 and the main office is in Colombo having one sub unit in Matara. Their functions are case detection and treatment entomological studies and vector control and health education. Recently the campaign commenced a mass treatment program with single dose of 6mg/kg DEC covering the whole endemic area.

4. National Science Foundation – This is another state owned institution that promotes research by

universities and other science and technological institutions by providing research grants. Their other activities are organizing of conferences, seminars, and workshops, providing funds for research and for overseas visits by local scientists.

Expectations from the Asian Fedaration of Parasitologists

As a parasitologist of a developing country with four-year experience in doctoral research in Japan, followed by eight- year collaborative research experience with a team of Japanese Parasitologists, I wish to make the following suggestions to the Asian Federation of Parasitologists.

Expectations from the Asian Federation of Parasitologists by the member countries would be different due to the degree of availability of parasitic disease, research capabilities, availability of experties and priorities of the research needs etc.

Assistance by such a Federation could be listed out as follows:

- Technical support and Technology transfer.
- Establishment of collaborative research projects with third world country members.
- Exchange of experts within members with a view to transfer of experties.
- Opportunities for electives for medical students.
- Training for junior academics in the form of short term and long term exposure in special centers.
- Provision of scholarships and fellowships for research degrees.
- Joint Scientific Sessions for exchange of knowledge.(yearly)
- Award programs to encourage young scientists.
- Travelling awards for member scientists.

I wish to make a comment at this point about my own research experience with Japanese Parasitologists. I initiated a Bancroftian Filariasis Research program in 1992 in Matara.

We started from epidemiological surveys to collect baseline parasitological, clinical and entomological data in selected areas to select a definite area for an experimental site for future activities.

The following studies have been carried in the experimental area of Walgama, funded by WHO/TDR.

- Epidemiology of bancroftian filariasis in Walgama.

- Village scale trial on the efficacy of lambdacyhalothrin impregnated houses curtain on vector biting rate and filariasis transmission.

- Evaluations of single dose 6 mg/kg DEC over the year.

Presently a drug trial to evaluate the long-term efficacy of a single dose albendazole alone or combined with DEC or ivermectin funded by the WHO is in progress.

In 1994, we invited Prof. E.Kimura of Aichi Medical university to visit our project. Since this first visit, he with few other Japanese scientists has made annual visits to the project to carry out collaborative immmunological research. He is funded by a Mombusho grant.

Dr.Kimura's team collects the research material in the field and process it in Japan.

The following are their main studies.

- Antigenaemia of *Wuchereria bancrofti* by Og4C3 ELISA.
- Use of whole blood absorbed in filter paper to detect *Wuchereria bancrofti* circulating antigen.
- Use of urine samples to detect antibodies for *Wuchereria bancrofti*.

More recently rapid assessment procedures (RAP) using questionnaires circulated among key informants have been conducted to identify filariasis endemic areas in Matara district for mass treatment. Using GIS technology Dr.Kimura's team will prepare maps of these areas.
Our collaboration continues in these studies.

Present Situation of The Main Helminthiasis and Helminthiasis **Control In Vietnam**

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Abstract

According to the survey of the Vietnam National Institute of Malariology, Parasitology and Entomology (NIMPE) the main present helminthiases in Vietnam are: *Ascariasis* (50-95%), *Trichuriasis* (30-95% in the North, 15-80% in the Center and meanwhile very low in the South (0-1.4%), *hookworm* infection (30-68%), lymphatic filariasis (the infection is predominant in the Red River Delta in the North with the mean prevalence rate of 2.47%, in the South the distribution of infection is not widespread although it exists in some places with high prevalence of 13.3%). Clonorchiasis and opisthorchiasis are present in defined regions following the eating habits of habitants, the prevalence is in the range of 0.2-30.3%. Paragonimiasis is present in some mountainous provinces in the North with the prevalence 6.4-15.7% and cysticercosis.

In the recent years, the pilot studies on the control of soil-transmitted helminthiasis and Lymphatic filariasis have been conducted in several communities and districts by mass treatment. It was found that the prevalence and intensity of the infections have reduced and it has improved the public health of community in the study areas.

I. PRESENT SITUATION OF THE MAIN HELMINTHIASIS IN VIETNAM

Vietnam is a tropical country. The climate conditions as temperature and humidity are conducive for development of the infection of helminthiasis. The widespread helminth transmission is facilitated by economic conditions, cultivation practices and living habits of the people.

Many surveys of helminth infections have been carried out in the Northern Vietnam from 1957 and in the Southern Vietnam from 1979 up to now. Above 500,000 stool samples and 120,000 blood specimens were examined in many randomly selected areas: mountainous, midland, plain, urban, rural, coastal areas... According to the data of surveys collected by Vietnam National Institute of Malariology, Parasitology and Entomology, the parasitic infections in Vietnam are mainly soil-transmitted helminthiasis, lymphatic fi1ariasis, clonorchiasis/opisthorchiasis, paragonimiasis and taeniasis/ cysticercosis. These infections are an important public health in Vietnam.

1.1 Soil-transmitted helminthiasis.

Soil-transmitted helminthiasis is very common diseases in Vietnam, particularly in children. In northern and central provinces the infection rates are very high (up to 100% in some places). The intensity of soil-transmitted helminthiasis is also severe. Soil-transmitted helminthiasis may cause malnutrition, anemia, affecting the physical and mental development of Vietnamese children.

Ascariasis :

The prevalence rates are as follow:

In the North:	In plain:	90-95 %
	In midlands:	80-93 %
	In mountainous areas :	50-70 %
	In coastal areas :	70 %
In the Center:	In plain :	40-99 %
	In Tay Nguyen plateau :	31-41 %
	In mountainous areas :	7-66%
	In coastal areas :	7-66 %
In the South :	In plain	45 -60%

Some epidemiological characteristics of ascariasis in Vietnam :

- The prevalence rate of ascariasis is very high, especially in the children at the age of 3-15 years old.
- The prevalence in the North is higher than that in the South.
- The prevalence in the rural areas is higher than that in the urban areas.
- In the recent years, the prevalence rate of ascariasis has tendency increaes in mountainous areas and Southern provinces by the changes of people's habits and the migration of population. In the previous times in the mountainous areas and in the Southern provinces people had no habit of using night-soil as fertilizer and nowadays the population density in these areas has increased by the migration for setting up new economic zones.
- The intensity of infection is low in most places surveyed (the average number of eggs is under 10,000 eggs per gram)

Trichuriasis :

There is a significant difference between the North and the South in the prevalence rate of Trichuriasis. The prevalence has tendency to decrease gradually from the northern to the southern provinces and from the plain to the mountainous regions.

The prevalence rates:

In the North :	In plain :	58-89%
	In midland :	38-55%
	In mountainous areas	29-52%
	In coastal areas	28–75%
In the Center:	In plain :	19-80%
	In Tay Nguyen plateau :	17-36%
	In mountainous areas	3-48%
	In coastal areas	1-75%
In the South :	In plain :	very low 0-1.4%

In general:

- The prevalence rate in children is higher than that in adults.
- There is no significant difference between urban and rural areas.
- The infection intensity is low (the average number of eggs is under 1,000 eggs per gram)

Hookworm infection:

The prevalence rates are as follow :

In the North:	In plain :	3-60%
	In midland :	58-64%
	In mountainous areas :	61%
	In coastal areas :	67%
In the Center:	In plain :	11-75%
	In Tay Nguyen plateau	24-43%
	In mountainous areas ;	21-46%
	In coastal areas :	10-68%
In the South:	In plain :	52 %
	In coastal :	68 %

In generally, the prevalence rate of hookworm infection have characteristics :

- The prevalence rate gradually increases with the increasing of the age.
- The prevalence rate in rural areas is significant higher than that in urban areas in recent years.

It is shown that the prevalence of hookworms in schoolchildren at Hanoi suburb is very low according to the recent surveys (1-2%).

- *Necator americanus* is predominant hookworm species in Vietnam (95% positive cases are *N. americanus* and only 5 % are *Ancylostome dueodenale*).
- The average intensity of infection was under 1,000 eggs per gram in almost survey areas.

1.2 Lymphatic filariasis :

Over the past years, surveys of *lymphatic filariasis* have been carried out in various places selected randomly in Vietnam by blood examination. The 60 µl blood samples were taken at night-time between 20:00 and 22:00h and stained with giemsa. In some surveys the number of microfilariae in positive samples was counted and the species of the filaria was identified by morphology of microfilariae.

Three series of surveys for *lymphatic filariasis* have been conducted in northern Vietnam during the period 1960-1990. From 1960 to 1975, surveys were carried out in 15 provinces and 90,545 individuals were examined. The overall prevalence rate was 6.01 % and the highest prevalence of microfilaraemia were seen in provinces at Red River Delta : Ha Nam Ninh (13.37%), Hai Hung (9.94%) Ha Noi (5.4%) Thai Binh (4.9%). In the period 1976-1983, a total of 39,298 individuals in 5 provinces of northern Vietnam were examined. The overall prevalence rate was 2.01% (0.9-5.5%), lower than the one from the first survey. During the period 1985 -1990, a total of 5,998 individuals in three communities of Hai Hung and Quang Binh province were surveyed. The mf prevalence was highest in Hai Hung province (4.3%) and lowest in Quang Binh province (23 %).

In the South, from 1976 to 1997 total 12,611 individuals in 28 villages of 13 provinces were examined for microfilaraemia. The results showed that positive cases were found in only 3 villages in the mountainous area in Khanh Hoa province with the prevalence rates 0.39-13.3%,

In general, epidemiological characteristics of *lymphatic filariasis* in Vietnam are.

- The infection is clearly localized, the microfilaraemia prevalence may be significantly different in nearby areas, sometimes, even from hamlet to hamlet of the same commune.
- The highest overall prevalence is seen in the Red River Delta located in the plain area of the North.
- In northern Vietnam, the prevalence decreases gradually from the plain to the mountainous regions, none or only few cases of microfilaraemia were found in mountainous areas. In the coastal region the infection is very low. In the North, *Brugia malayi* is predominant filarial species (90-95% positive cases are *B. malayi*).
- In southern Vietnam, the infection is not widespread although there are some places with high prevalence in mountainous areas. All mf positive cases were identified as *W. bancrofti*.
- In the recent years the infection have declining trend although no intervention was carried out.

The reasons may be due to various environmental changes. Many of ponds had been filled, houses with mud floors and thatched roofs were replaced by houses with concrete floors and tile roofs.

- Mf periodicity was examined in some infected cases and all cases of the *B. malayi* and *W. bancrofti* mf showed to be of nocturnal type.
- The main vectors for *B. malayi* are *Mansonia annulifera* and *Mansonia indiana* whereas the main vector for *W bancrofti* is *Culex quinquefascitus*.

1.3. Parasitic food-borne infections:

Food-borne infections are due to the habits of people to eat raw or undercooked meat, fish, crayfish or crab. In Vietnam, food-bone infections are present in defined regions related to the eating habits of the inhabitants.

Liver fluke :

Surveys were carried out by direct smear stool examination. Clonorchiasis and opisthorchiasis have been determined in 11 provinces in the North (Nam Dinh, Ninh Binh, Ha Nam, Ha Tay, Thanh Hoa, Thai

Binh, Hai Phong, Bac Giang, Ha Giang, Hoa Binh, Nghe An) and in 2 provinces in the Center (Phu Yen, Dak Lak) with various infection rate in range of 0.2-30.3%, and the mean one is 21.2%. The highest prevalence rate is in Nan Dinh, Ninh Binh and Phu Yen with above 30%. Species of liver fluke in the North provinces is *Clonorchis sinensis* and in the Phu Yen province is *Opisthorchis viverrini*.

In generally, the endemic areas are related to the behavior of eating raw fish (*goi ca*), especially came (*Hypophthalmichthys molitrix*). In high prevalence areas the rate of larvae infected fish is also high to 56.47 %. Some animals also can be reservoirs of *Clonorchis* such as: cats (*Felis domesticus*) the infection rate was 64.2 %, and dogs (*Canis familaris*): the infection rate was 28.6%.

Paragonimiasis :

The results of surveys based on stool or sputum examination in some years ago showed that paragonimiasis was distributed in the northern mountainous provinces such as in Lai Chau (6.4-7.4%), Son La (0.2-15%), Hoa Binh (3.3-11.3%), Lao Cai (3-4.5%), Nghe An, Ha Giang (2.1%), Lang Son, the mean infection rate is 3.1-6.9%. The disease is especially focused in Sin Ho district (Lai Chau province) with the infection rate of 6.4-7.4% and positive cases detected in 11 communes. The majority of infections are schoolchildren. KAP surveys showed that 11.3–72.5% inhabitants in mountainous areas have habits of eating roasted crab. The symptoms of disease are similar of tuberculosis and patients are ofen treated as tuberculosis patients.

The parasite species is *Paragonimus helerotrelmus* and the intermediate host is crab *Ranguna kimboiensis*. In this crab, the metacercariae infection rate was 63.5% (52.5-98.1%).

Taeniasis/cysticercosis :

The surveys based on direct smear stool examination in several small places collected randomly show that taeniasis is widely distributed from plain to the mountainous areas with the infection rate of 0.5-6%. Teania solium accounts for 20% among teaniasis patients identified by stool examination.

The local people in some provinces as Bac Ninh, Bac Giang have habit of eating raw pork , thus they can easy acquire teaniasis or cysticercosis.

In the recent years the rate of teaniasis and cysticercosis have increased by the uncontro11ed slaughter.

II. HELMINTHIASIS CONTROL IN VIETNAM IN THE RECENT YEARS

In the recent years, although budget for the control was limited and the number of specialized–staff in helminthology was lack, the National Institute of Malariology, Parasitology and Entomology (NIMPE) have tried to carry out studies in the treatment and control of soil-transmitted helminthiasis, lymphatic filariasis. Besides, NIMPE also initiated the studies in the control of parasitic food borne infection in some areas with high infection rate.

2.1. Soil - transmitted helminthiasis control: .

The objective of periodic mass-treatment is not the complete elimination of the worms, but rather, the decrease of the prevalence rate as well as the intensity of infection, especially in children. The periodic deworming campaign is considered as one of the main measures to control soil-transmitted helminthiasis. The choice of treatment schedules and frequency of deworming depend on the prevalence rates as well as health manpower and resource of anthelmintics.

In the recent years, the Institute piloted some regimens of controlling the disease. The results was as follows:

- Periodic half-year deworming by Mebendazole: After 1 year the prevalence rates of ascariasis, trichuriasis and hookworm infection decreased by 21.9% (from 80.9% to 63.2%), 58.6% (from 36.3% to 15%) and 69.7% (from 17.2% to 5.2%), respectively.

- Periodic bi-monthly treatment by Mebendazole: Both *Ascaris* infection rate and intensity were decreased. After 3 treatments, the prevalence rate of ascariasis decreased by 73.3% (from 73.1% to 19.5%). The intensity decreased by 96.1% (MEPG decreased from 23986 to 937).

For trichuriasis prevalence, the results were limited. After the third treatment, the prevalence decreased only by 20.2 % (from 86.2% to 68.8%). The intensity decreased markedly by 81.8% (MEPG decreased from 2,343 to 407).

- Periodic 4-monthly treatment by Combantrine: For ascariasis, 1, 2 or 3 years after treatment the prevalence rate decreased only by 24.4%, 15-9%, 15.6% (from 83.6% to 63.2%, 70.3% and 70.5%). However the infection intensity decreased by 83.3%, 57.1%, 87.4% (MPEG decreased from 8199.9 to 1366.5, 3515.8, 103l.6).

For Trichuriasis the prevalence rate and infection intensity decreased slowly and unclearly. The prevalence rate decreased by 10.2%, 10.6%, 18.7% (from 77.3% to 69.4%, 69.1%, 62.8%) and the intensity decreased by 25.6%,-12.2%, 38.2% (MEPG changed from 246.3 to 183.3, 276.4 and 152.1) in the period of 1, 2, 3 years after treatment.

For hookworm infection: the results were significant. The prevalence rate decreased by 95% (from 12.1% to 0.6%) and the intensity decreased by 99.4% (MEPG decreased from 16.4 to 0.1) after the third year.

The above results showed that the decrease of helminth infection depended on the frequency of treatment and the anthelmintic used. The treatment interval was shorter, the prevalence rate decrease was higher. Mebendazole is a cheap, safe, broad-spectrum anthelmintic and effective against ascariasis, trichuriasis and hookworm infection, it can be used for mass treatment in controlling soil-transmitted helminthiasis , meanwhile pyrantel pamoate (combantrine) is effective mainly against hookworm infections.

2.2. Filariasis control:

In the recent years, the Institute have carried out some pilot studies of the lymphatic filariasis control with different treatment regimes. The results was as follows:

- In the period 1981-1985, the pilot study has carried out in My-Van district (Hal Hung province) by selected DEC treatment given to *B. malayi* microfilaraemic individuals. All micrifilaraemic individuals aged 6 years and above were offered an annual treatment with a daily dose of DEC (6mg/ kg body weight) for 3 consecutive days. The 2 treatment rounds were given in 2 years 198l - 1982. The pre-treatment survey was carried out in 1981 and post-treatment survey was carried out in 1985. The overall prevalence of microfilaraemia in community was reduced by 68.8% (from 1.6% to 0.5%).
- In the period 1986 -1989, a pilot study on annual mass DEC treatment was carried out in Tan Viet commune (Hai Hung province). One group were offered treatment with a single dose of DEC (6mg/kg body weight) and another group with a dose of DEC (6mg/ kg body weight) given once daily for 3 consecutive days. Both treatment were given once a year for 2 years and the compliance of treatment was 60-70%, respectively. After 2 years , the microfilarae prevalence in community receiving treatment with single dose were reduced by above 3 times (from 3.9% to 1.1%) and another with treatment for 3 consecutive days were reduced by above 8 times (from 4.9% to 0.6%), respectively.

In 5 communities located in the same area and in which the habitants were not given any treatment during the study period no significant difference in mf prevalence between the pre-treatment and post-treatment survey was observed.

2.3. Parasitic food- borne infections :

Liver fluke:

Praziquantel with dose 25mg/kg/day for 3 consecutive days have good effective and 9l.3% positive cases could not find *Clonorchis* eggs in the stool examination. In control studies, the annual treatment in positive cases with above dose for 2 or-3 years have reduced the prevalence rate in study places (after 2 years treatment the prevalence have reduced from 27.4-29.6% to 11.8-10.3%).

Paragonimiasis:

Treatment of paragonimiasis by Praziquantel with dose 25mg/kg/day for 3 consecutive days the cure rate was 68.8 %, with dose 50mg/kg/day for 3 consecutive days the cure rate was 75%. The drug is safe although has some side effects.

In general the epidemiology of parasitic food-borne infectious is not very well known ill Vietnam and the control activities is in the beginning phase.

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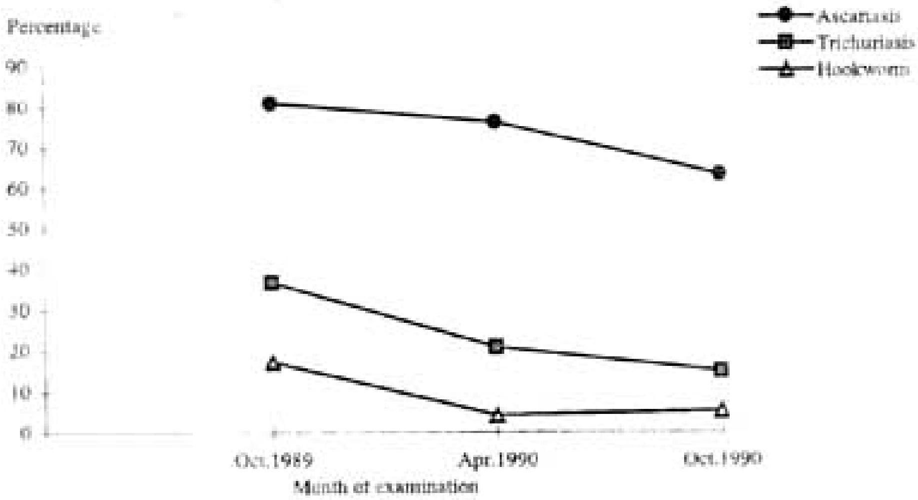
Tab.1: **Effect of periodic half-year treatment by Mebendazole: The pre-treatment and post- treatment prevalence of soil-transmitted helminthiases in children (Thua Thien - Hue province).**

	No. examined	Prevalence rate (%)		
		Ascaris	Trichuris	Hookworm
Pre-treatment (October,1989)	6090	4932 (80.9)	2213 (36.3)	1049 (17.2)
6-month after treatment (April, 1990)	880	670 (76.1)	183 (20.8)	36 (4.1)
12-month after treatment (October,1990)	903	571 (63.2)	135 (15.0)	47 (5.2)

Fig.1 **Prevalence rate of soil-transmitted helminthiases in children before and after periodic half-year treatment (Thua Thien Hue province)**



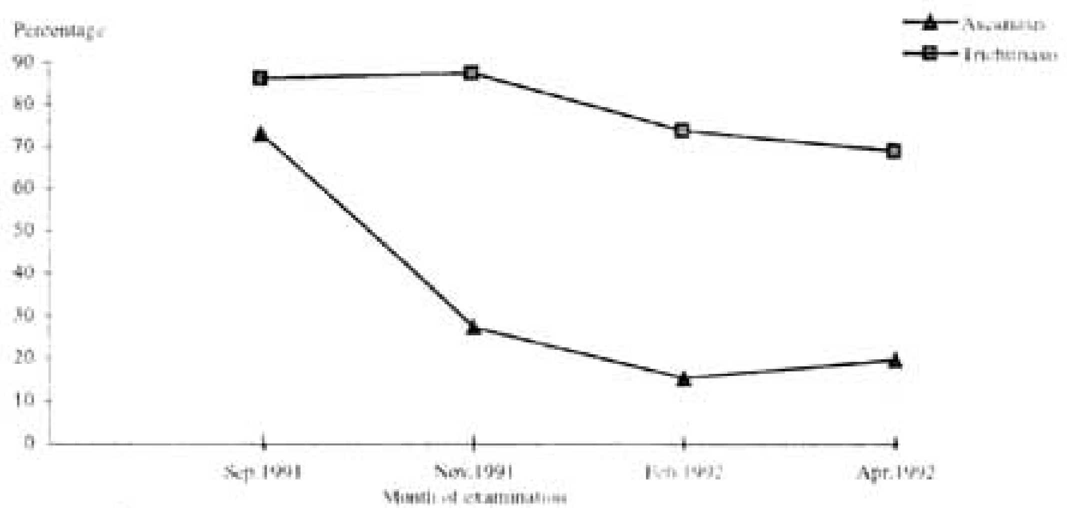
	October 1989	April 1990	October 1990
Ascaris	80.9 %	76.1 %	63.2 %
Trichuris	36.6 %	20.8 %	15 %
Hookworm	17.2 %	4.1 %	5.2 %

Tab.2: **Effect of periodic bi-monthly treatment by Mebendazole : Pre-treatment and post- treatment prevalence of soil-transmitted helminthiases in children (Hanoi outskirts)**

	No. examined	Prevalence rate (%)		Infection intensity (MEPG)	
		Ascaris	Trichuris	Ascaris	Trichuris
Pre- treatment (September,1991)	494	361 (73.1)	426 (86.2)	23986	2243
2-month after treatment (November, 1991)	477	130 (27.2)	373 (87.4)	2314	423
5-month after treatment (February,1992)	429	75 (15.2)	364 (73.8)	704	794
7-month after treatment (April,1992)	414	84 (19.5)	285 (68.8)	937	407

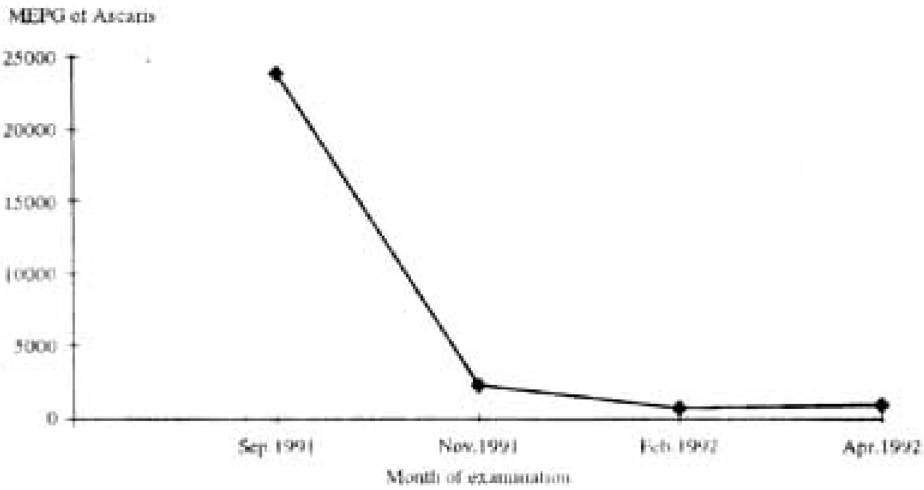
(MEPG : Mean number of eggs per gram)

Fig.2 **Prevalence rate of Ascariasis and Trichuriasis in children before and after periodic bi- monthly treatment (outskirts of Hanoi)**

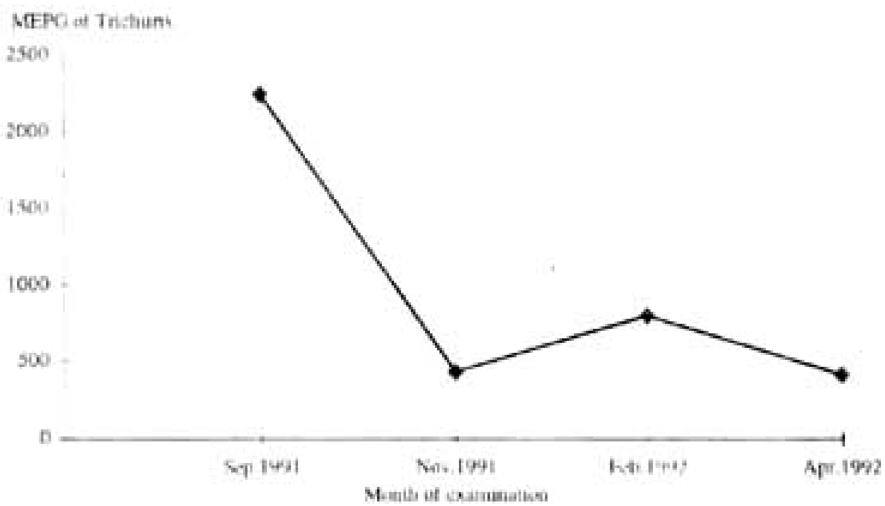


	Sep. 1991	Nov. 1991	Feb. 1992	Apr. 1992
Ascaris	73.1 %	27.2 %	15.2 %	19.5 %
Trichuris	86.2 %	87.4 %	73.8 %	68.8 %

Fig.3 : **Infection intensity of Ascariasis and Trichuriasis in children before and after periodic bi-monthly treatment (outskirts of Hanoi)**



	Sep 1991	Nov 1991	Feb 1992	Apr 1992
Ascaris	23986	2314	704	937



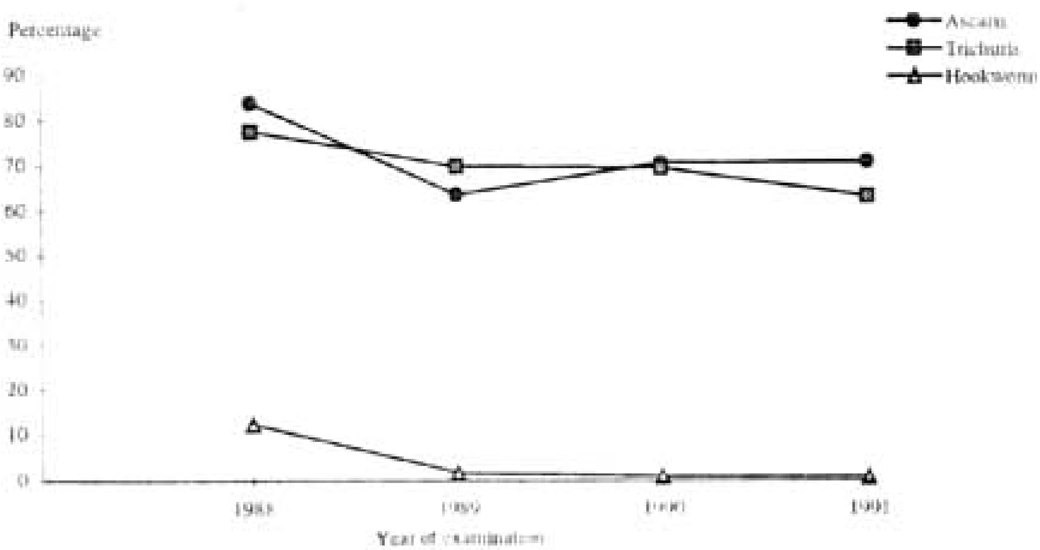
	Sep 1991	Nov 1991	Feb 1992	Apr 1992
Trichuris	2243	423	794	407

Tab.3: **Effect of periodic 4-monthly treatment by Combantrine :**

Pre-treatment and post-treatment prevalence of soil-transmitted helminthiases in children (Ha Tay province).

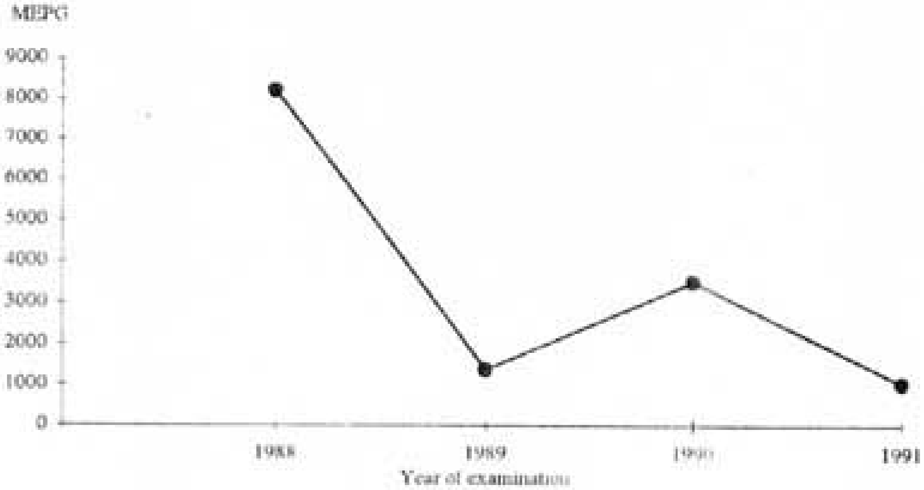
	No. examined	Prevalence rate (%)			Infection intensity (MEPG)		
		Ascaris	Trichuris	Hook-worm	Ascaris	Trichuris	Hook-worm
Pre- treatment (1988)	225	188 (83.6)	173 (77.3)	27 (12.1)	8199.9	264.3	16.4
1-year after treatment (1989)	193	122 (63.2)	134 (69.6)	3 (1.5)	1366.5	183.3	0.5
2-year after treatment (1990)	149	105 (70.3)	103 (69.1)	1 (0.7)	3515.8	276.4	2.5
3-year after treatment (1991)	156	110 (70.5)	98 (62.8)	1 (0.6)	1031.6	152.1	0.1

Fig.4: **Prevalence of soil-transmitted helminthiases in children before and after periodic 4- monthly treatment with Combantrine (Ha Tay province)**



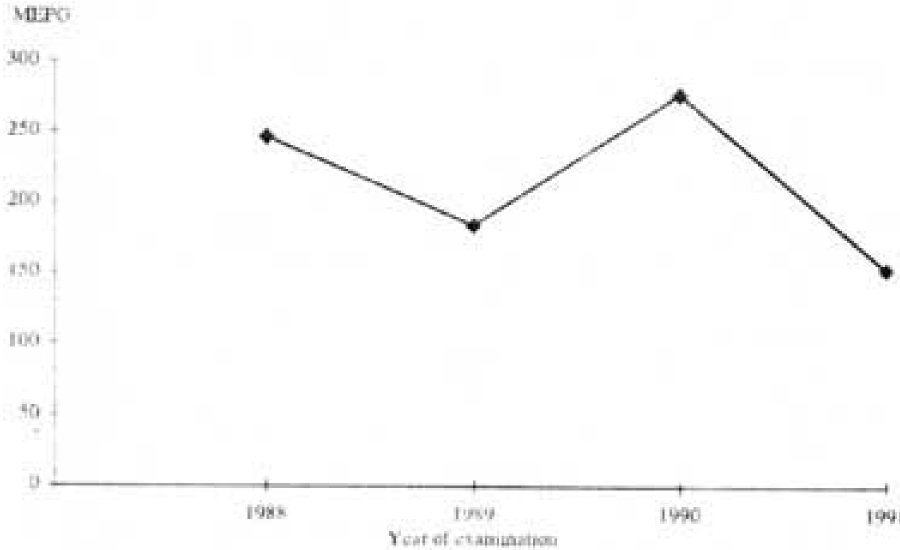
	1988	1989	1990	1991
Ascaris	83.6 %	63.2 %	70.3 %	70.5 %
Trichuris	77.3 %	69.6 %	69.1 %	62.8 %
Hookworm	12.1 %	1.5 %	0.7 %	0.6 %

Fig.5: **Intensity of Ascariasis in children before and after periodic 4-monthly treatment with Combantrine (Ha Tay province).**



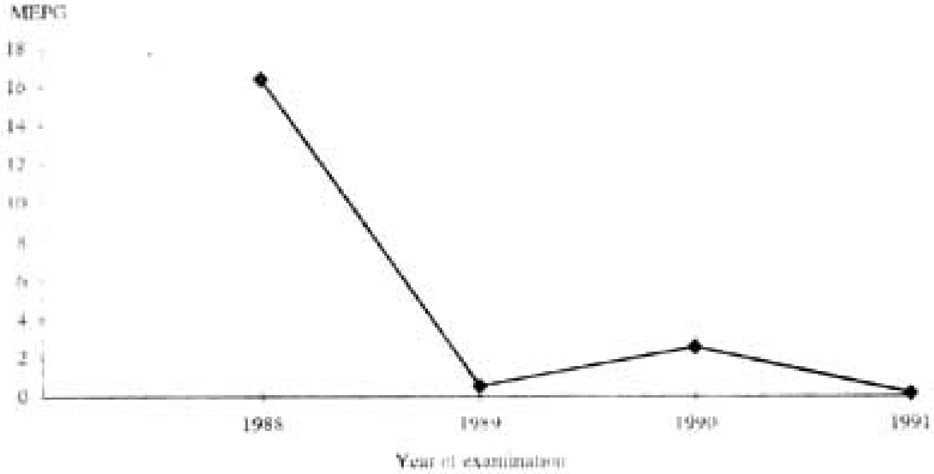
	1988	1989	1990	1991
Ascaris	8199.9	1366.5	3515.8	1031.6

Fig.6 : **Intensity of Trichuriasis in children before and after periodic 4-monthly treatment with Combantrine (Ha Tay province)**



	1988	1989	1990	1991
Trichuris	264.3	183.3	276.4	152.1

Fig.7 **Intensity of Hookworm in children before and after periodic 4-monthly treatment with Combantrine (Ha Tay province).**



	1988	1989	1990	1991
Hookworm	16.4	0.5	2.5	0.1

Table 4: **Infection rate of lymphatic filariasis in the North of Vietnam (1960 - 1975)**

Ords.	Provinces	No. of persons exmined	No. of mf carries	Percentage
1	Ha Nam Ninh	10,400	1,525	13.57
2	Hai Hung	20,996	2,087	9.94
3	Binh Tri Thien	2,807	328	11.7
4	Ha Noi	10,104	546	5.4
5	Thai Binh	10,296	513	4.98
6	Quang Ninh	1,675	41	2.5
7	Ha Bac	4,522	108	2.3
8	Ha Son Binh	10,963	221	2.01
9	Bac Thai	192	3	1.5
10	Nghe Tinh	4,107	47	1.1
11	Hai Phong	715	0	0
12	Vinh Phu	8,023	24	0.3
13	Son La	2,757	0	0
14	Ha Tuyen	856	1	0.13
15	Cao Bang	1,149	0	0
Total		**90,545**	**5,444**	**6.01**

Table 5: **Infection rate of lymphatic filariasis in the Red River Delta (1976 - 1983)**

Ords.	Provinces	No. of persons examined	No. of mf carries	Percentage
1	Ha Nam Ninh	2,588	142	5.49
2	Hai Hung	27,417	464	1.69
3	Ha Noi	2,891	26	0.89
4	Thai Binh	894	19	1.12
5	Ha Son Binh	5,508	141	2.56
Total		**39,298**	**792**	**2.01**

Table 6: **Filaria species in some study sites**

Study sites	Percentage (%) of filaria species among the mf positives		
	B. malayi	W. bancrofti	Mixed
P.T	86.4	8.1	5.4
T.B	90.2	5.3	4.4
M.V	93.19	5.44	1.37

Table 7. **Infection rate of lymphatic filariasis in the South of Vietnam (1977 - 1997)**

Ords.	Year	Study sites	No. of persons examined	No. of mf carries	%
1	1977	Phước Lâm, Bình Phước, Nghĩa Bình	700	0	0
2	1978	Gò Vấp - Hồ Chí Minh city	500	0	0
3		Mỹ Long, Cầu Ngang - Cửu Long	440	0	0
4		N/trường cao su Hàng Gòn, Long Khánh - Đ/Nai	505	0	0
5	1980	Thành phố Huế	218	0	0
6		Ea Kuang- KrongPach - Đắc Lắc	502	0	0
7	1985	Thới Sơn - Châu Thành - Tiền Giang	594	0	0
8	1986	Mỹ Thới - Thốt Nốt - Hậu Giang	512	0	0
9	1992	TT B'Lao - Bảo Lộc - Lâm Đồng	681	0	0
10		Tam Bố - Di Linh - Lâm Đồng	772	0	0
11		Phú Hội - Đức Trọng - Lâm Đồng	679	0	0
12		Đồng Xoài - Đồng Phú - Sông Bé	406	0	0
13		Long Hà - Phước Long - Sông Bé	387	0	0
14		Bình Giải - Phước Long - Sông Bé	65	0	0
15	1994	Xuân Hưng - Xuân Lộc - Đồng Nai	446	0	0
16		Tân Lập - Tân Phú - Đồng Nai	501	0	0
17	1995	Suối Đá - Minh Châu - Tây Ninh	354	0	0
18		Tân Định - Minh Châu - Tây Ninh	242	0	0
19		Thái Bình Đông - thị xã Tây Ninh	101	0	0
20		Thạch Đông - Hoà Thanh - Tây Ninh	227	0	0
21		Ninh Thuận - Hoà Thanh - Tây Ninh	119	0	0
22	1996	Khánh Nam - Khánh Vĩnh - Khánh Hoà	404	54	13.3
23		Khánh Trung - Khánh Vĩnh - Khánh Hoà	506	47	9.29
24		Cầu Bà - Khánh Vĩnh - Khánh Hoà	519	2	0.39
25	1997	Ba Cụm Bắc - Khánh Sơn - Khánh Hoà	475	0	0
26		Sơn Trung - Khánh Sơn - Khánh Hoà	560	0	0
27		Hoà Hải - Ngũ Hành Sơn - Đà Nẵng	598	0	0
28		Hoà Quý - Ngũ hành Sơn - Đà Nẵng	598	0	0
		Total	12,611	103	0.82

Table 8: **Effect of DEC treatment (at 6mg/kg for 3 consecutive days)**
among the treated mf positives

Species	No. of persons treated	No. of amicrofilaraemia cases	No. of mf reduced cases
B. malayi	54	36 (66.7%)	18 (33.3%)
W. bancrofti	6	6 (100%)	

Table 9: **The side effects produced by DEC treatment**
among the treated mf positives

Reactions	No.of persons reacted	Percentage (%)
Fever	55/60	91.7%
Headache	17/60	28.3%
Vomiting	8/60	13.3%
None	5/60	8.3%

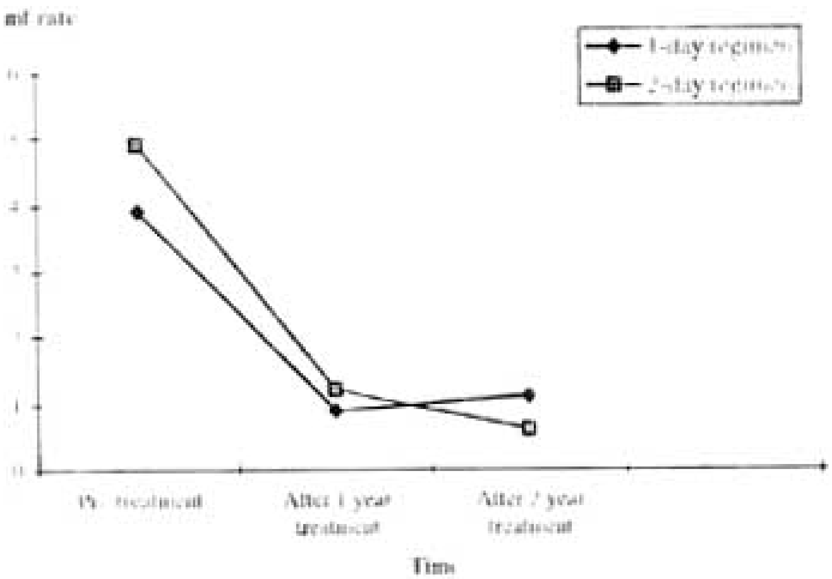
Table 10: **Results of filariasis control by annual selected DEC treatment**
in pilot communes

Period	Treated 15 communes				Untreated 5 communes			
	No exam.	No. positive	(%)	Density of mf	No. exam.	No. positive	(%)	Density of mf
Before treatment (1980)	10,708	169	1.57	7.14	3,524	159	4.51	8.5
After tretment (1985)	7,531	38	0.50	4.94	2,359	102	3.32	11.7

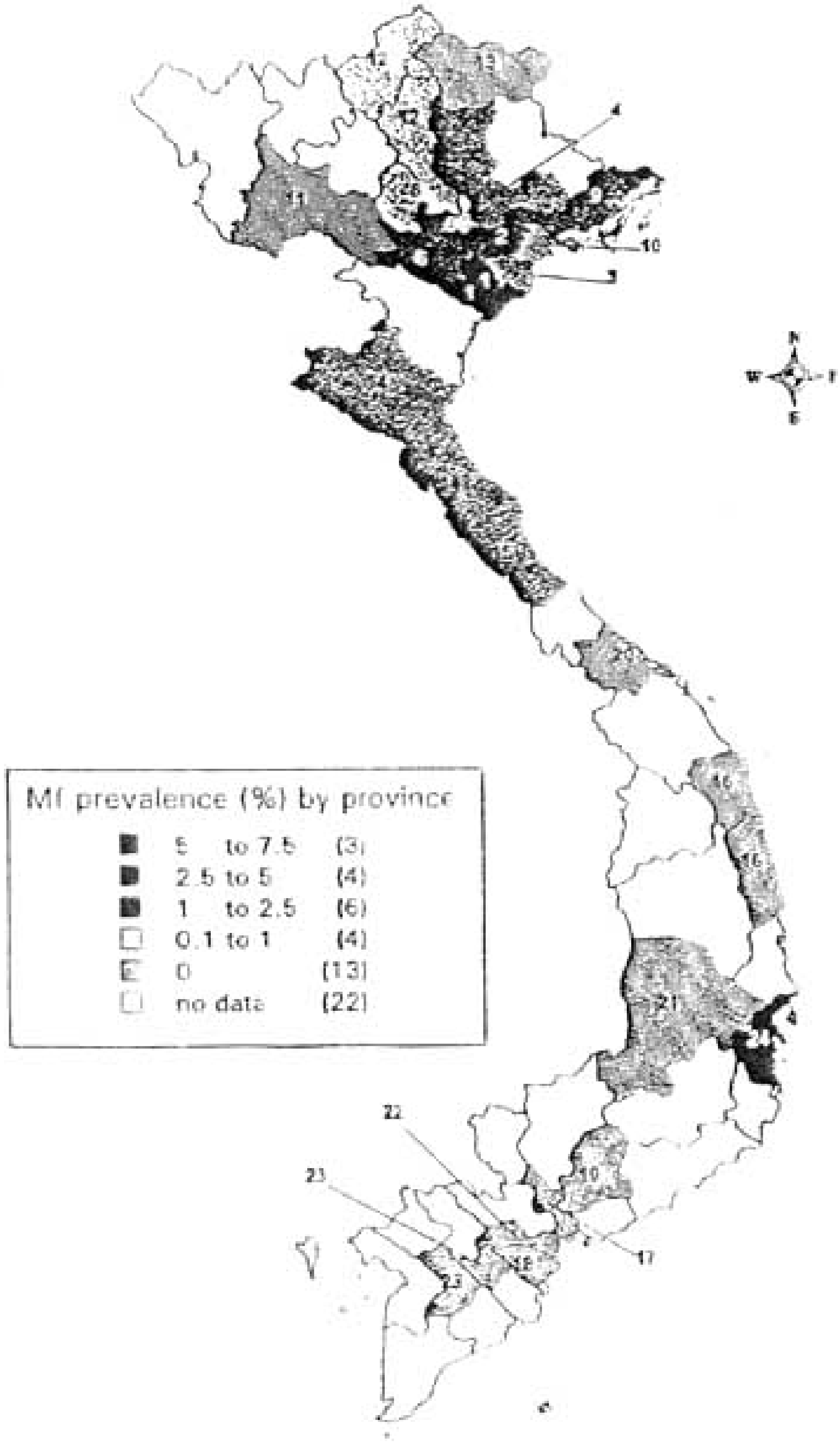
Table 11 **Results of filariasis control by annual mass DEC treatment in pilot Tan Viet commune**

Type of treated regimen	Infection rate			Density of mf per 60mm³ of blood		
	Pre-treatment (1987)	After 1 year (1988)	After 2 year (1989)	Pre-treatment (1987)	After 1 year (1988)	After 2 year (1989)
Single dose (1 day)	3.91	0.87	1.09	7.72	11.1	16.75
For 3 concecutive days	4.92	1.18	0.59	11.6	9.2	35

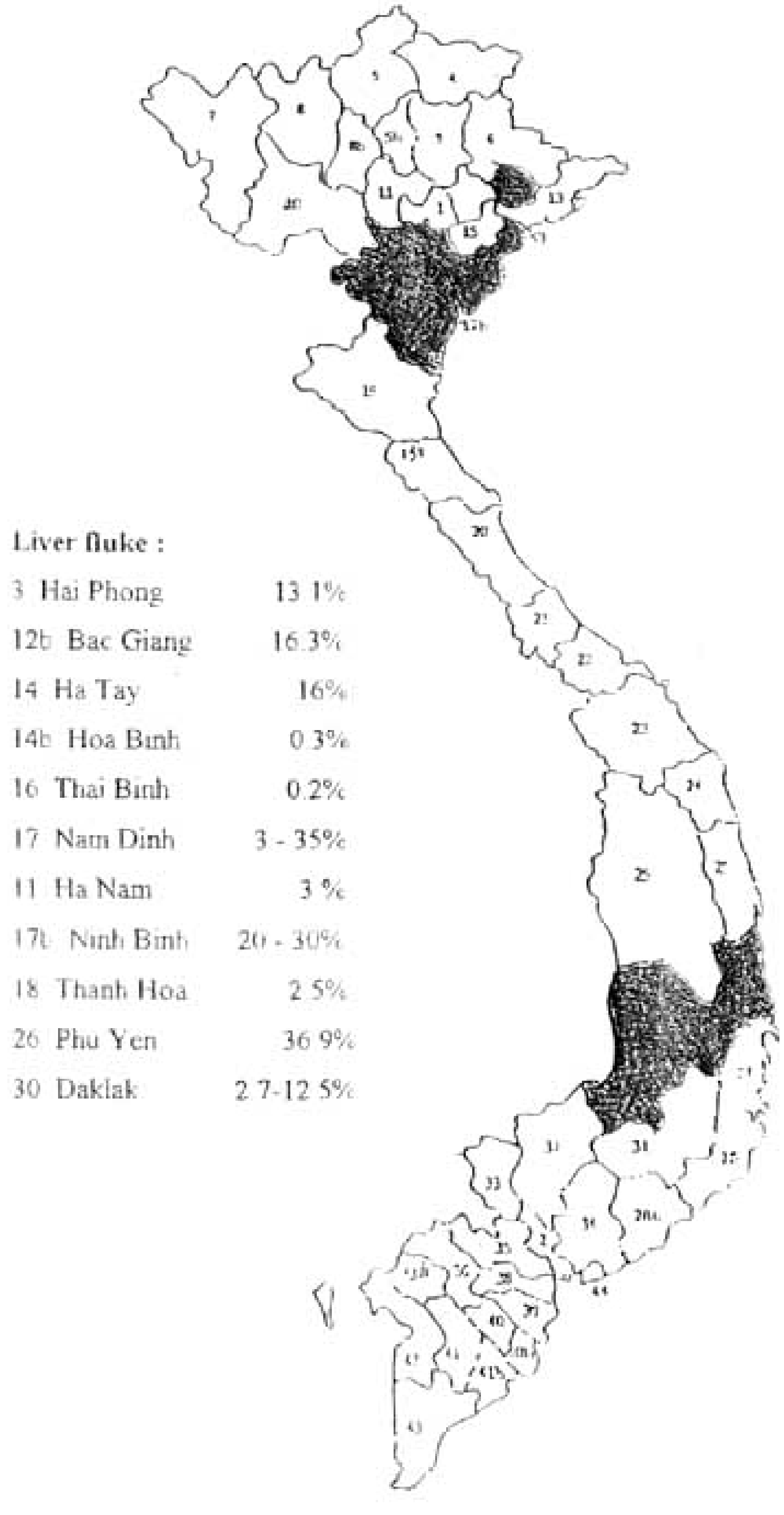
Fig 8 **The mf rate following annual mass DEC treatment**



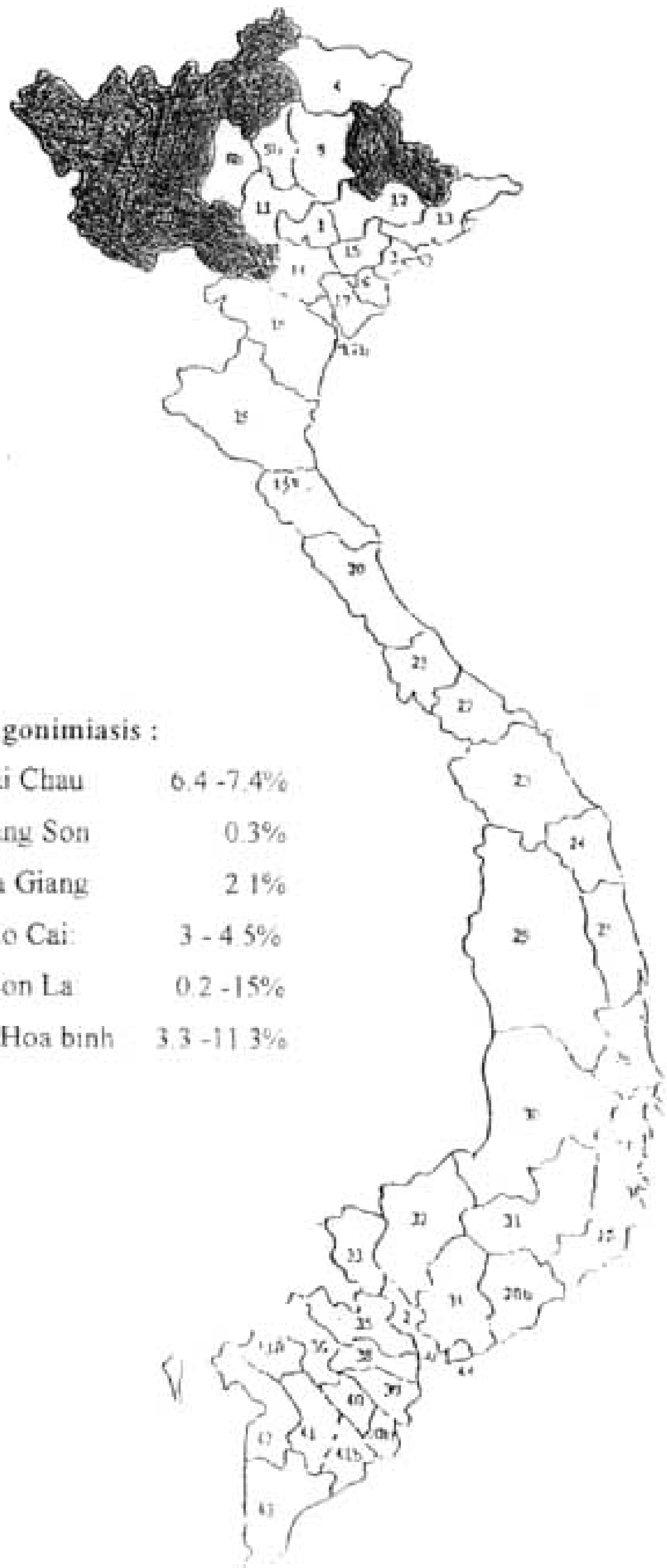
EPIDEMIOLGICAL MAP OF LYMPHATIC FILARIASIS



EPIDEMIOLOGICAL MAP OF LIVER FLUKE



EPIDEMIOLOGICAL MAP OF PARAGONIMIASIS



Paragonimiasis :

2 Lai Chau	6.4 -7.4%
4 Lang Son	0.3%
5. Ha Giang	2.1%
6. Lao Cai:	3 - 4.5%
10. Son La	0.2 -15%
14b. Hoa binh	3.3 -11.3%

Parasitic Infections in Malaysia - Review of the Last Millennium

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Introduction

As Malaysia marches into the new millenium with aspirations to be a fully developed nation, the health and well being of its people remains a top priority in the agenda. Among others, control or eradication of infectious diseases that affects large segments of the population has been given much attention. Significant manpower and finance have been channeled into these efforts.

Diseases caused by parasitic infections have always been a major concern among health providers and managers in Malaysia. Historically, when the Institute for Medical Research (IMR) was established in Kuala Lumpur in 1899, the institute’s top priorities were to conduct research into parasitology, diagnosis, treatment and control of malaria. Since then, many other parasites and related diseases have been investigated. In fact, some of the pioneer researches such as on filariasis, malaria, helminthiasis and scrub typhus have been conducted in Malaysia and their contribution in the control of these diseases have been immense.

This paper presents a review on the epidemiology and status of the major parasitic infections in the country. It is hoped that the data and views presented in this review will be useful as a guide for the future planning of measures in the combating of parasitic infections in Malaysia.

Malaria

Malaria, in many countries is rapidly regaining its status as one of the major diseases, affecting the indigenous population and travellers to endemic areas of malaria. The World Health Organization estimates that 2.1 billion people live in areas of the world affected by malaria. Despite an extensive vector control programme, there are 100 million new cases of malaria each year, causing up to two million deaths (Hoffman, 1992). Malaria has been known in Malaysia since the early occupation of Penang by the British in 1786 and by 1 829 one-third of all deaths in Penang were attributed to malaria (Sandosham and Thomas, 1982). Malcolm Watson, one of the pioneer antimalaria workers in this country introduced a new scheme of drainage system which immediately resulted in the reduction of malaria incidence. This was probably the earliest measure applied any where in the world after gaining knowledge of the transmission of the disease (Sandosham and Thomas, 1982). In 1899, the IMR began its important role in elucidating all aspects of malaria. Though 100 years has lapsed since the establishment of the Institute but malaria still continues to be a major public health problem in Malaysia (Chuah, 1985; Thomas, 1986; Moore, 1995; RKPBV, 1997).

The total number of malaria cases in Malaysia is taking a downward trend being from 50500, 26649 and 13491 in 1990, 1997 and 1998, respectively (RKPBV, 1998). The majority of these cases were from the state of Sabah. Most malarial cases were reported in rural areas. In the Peninsular Malaysia, 5141 cases reported for the year 1997. The Malaysian aborigine (Orang Asli) had the highest prevalence, followed by those working in Land Development Schemes and those recently returning from the jungle (RKPBV, 1997). Malaria cases were rarely reported in the urban areas. Kuala Lumpur, being a city center, had 55 cases in 1990 and no cases in 1998 (RKPBV, 1998). Recently, a new source of malaria has been introduced into the country. These were from the immigrant workers (legal and illegal) and the large number of tourists coming into the country (Jamaiah *et al*., 1999). These have resulted in the detection of malaria in urban areas such as Klang Valley. The total number of malaria cases among immigrants was 910 in 1990, and this increased to 8658 in 1995, with 5439 (63%) Indonesians and 3040 (35%) Filipinos. Cases were also reported among immigrants from Thailand, Myanmar, India, Bangladesh and Papua New Guinea (RKPBV, 1998).

Four species of *Plasmodia* are known to infect humans, namely, *Plasmodium falciparum, P. ovale, P. malariae* and *P. vivax*. However, *P. falciparum* has been recognised to cause higher morbidity and mortality rates compared to the other three species of *Plasmodium* (WHO, 1985). In Malaysia, *P. falciparum* is the predominant species with 50.4%, *P. vivax* (44.6%) and mixed infection 2.9%, meanwhile *P. malariae* had a prevalence of 2.1%. The reason for such variations is not well understood except to provide reasons such as better control measures for *P. vivax* and drug resistance in *P. falciparum* (WHO, 1985; RKPBV, 1998).

In 1997, there were 25 deaths due to malaria. Higher incidence of malaria was recorded in the 5-9 year age group (Fig. 1). There were more males infected with malaria compared to female (Fig. 2). Both Chloroquine and Fansidar resistant *P. falciparum* has been reported only in Peninsular Malaysia and Sabah (Ho, 1985).

The important vectors involved in the transmission of malaria in Peninsular Malaysia are *Anopheles maculatus, An. campestris, An. Sundaicus* and *An. balabacensis*. In Sabah, *An. sandaicus* and *An. balabacensis* are the major vectors of malaria while *An. sandaicus, An. balabacensis, An. leucophyrus* and *An. donaldi* have been identified as the important vectors in Sarawak (RKPBV, 1998).

Currently the Ministry of Health Malaysia has taken up new strategies in its control programme against malaria. The emphasis is on reducing morbidity and mortality due to malaria by active case finding and institute treatment; as well as surveilance of vectors and other control measures such as distribution of impregnated bed nets in areas where malaria is endemic. It is now expected that the above measures would cause further decline in the incidence of malaria.

Filariasis

Filariasis with an estimated 200-250 million infected persons in the world, constitute an important public health problem in many parts of the tropics (Ramachandran, 1981). It has been estimated that approximately 90.2 million persons with lymphatic filariasis in the world, and 61.4 million of these cases occur in Southeast Asia (Mak, 1986).

Lymphatic filariasis is caused by three species of parasites, these being *Wuchereria bancrofti*, *Brugia malayi* and *Brugia timori. W. bancrofti* infection predominates with 81.6 million infections while *Brugia* infections account for 8.6 million. All *Brugia* and 64.7% of *W. bancrofti* infections are found in Southeast Asia.

Although the ethiology of filariasis was only began to be elucidated in the late 1800s, research on filariasis was started in the IMR around the early part of last century. The first reference to filariasis in Malaysia was by Daniels (1908) who found 3 microfilarial carriers among 100 patients at the Kuala Lumpur Hospital. Filariasis was then thought to be rare in Malaysia and Fraser (1912) reported another 11 admission to the Kuala Lumpur Hospital to be positive for microfilaria. There was no further mention of filariasis in Malaysia until 1934. In the meantime, Brug (1927) described on the basis of microfilariae in blood films from the Malay Archipelago, a new species of filaria worm. This he named *Filaria malayi (Brugia malayi*). Untill then, it was presumed that the disease in this part of the world was only due to *W bancrofti*. The first filariasis survey in Malaysia was undertaken by Strahan and Norris (1934) in Province Wellesley. On the basis of the presence of elephantiasis and blood surveys, they proved this area to be a focus of filariasis infection due to *B. malayi*. Hodgkin (1939), carried out vector studies and *Mansonia annulata, M. annulifera, M. longipalpis* and *M. uniformis* were shown to be efficient vectors.

Humaun lymphatic filariasis in Malaysia is due to *B. malayi* and *W. bancrofti*. Although *B. timori*, the other human lymphatic parasite, has only been reported from the islands of Timor, Rote, Alor and Flores in Indonesia (Oemijati & Lim, 1966; Kurihara & Oemijati, 1975). Its introduction into Malaysia through Indonesian immigrants is a possibility. However, there has no such reported case that has been recorded. Filariasis is mainly seen in rural areas and of the estimated 2.5 million people who live in endemic areas have microfilaria. Microfilarial prevalence rates increased steadily from birth to reach a peak at the age group 15-19 years; then decline, rising to another peak at the age group 45 - 49 years (Mak, 1986).

In Peninsular Malaysia, filariasis caused by both nocturna11y periodic and sub-periodic *B. malayi* has

been known to be endemic. Extensive surveys on the prevalence of the infection have been carried out and the public health importance of the disease has been ascertained. Periodic *B. malayi* occurs mainly in the coastal rice fSon, Hoang Thi Hao, Nguyen Duy Toan, Le Dinh Cong and Motohito Sano. Epidemiology of clonorchiasis in Ninh Binh province, Vietnam. Southeast Asian J.Trop. Med. Public Health, Vol.29, No. 6/1998, p.250-2*54 23*

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Parasitic Infections in Mal*aysia - Review of the* Last Millennium

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I*ntroduction*

As Malaysia marches into the new millenium with aspirations to be a fully d*eveloped nat*ion, the health and well being of its people remains a top priority in the agenda. Among others, control or eradication of infectious diseases that *affects large* segme*nts of the populati*on *has been given much attention. Significan*t man*power and financ*e *have been ch*anneled into these efforts.

Diseand no animal reservoir has been detected (Mak, 1981).

In Malaysia the formal control programme against filariasia was introduced in the early 60’s. This programme was then incorporated under the Programme of Control of Vector Borne Diseases in the year 1983. The incidence of filaria in Malaysia is estimated at 2.64 for every 100,000 people for the year 1992–1997 (Table 1). For the year 1997, one hundred and eighty cases were found in males compared to 95 cases in the females. The highest incidence of filariasis was reported among the Orang Asli, ie. 103 cases, followed by Malay (52 cases), Kadazan (47 cases), Melanau (36 cases), Iban (19 cases) and others (8 cases). B. malayi (sub periodic) was found in 173 cases followed by 71 cases of *B. malayi* (periodic), and *W. bancrofti* in 31 cases. The total number of cases detected in 1998 shows a dovmward trend compared to 1997. There is a need for a more detailed survey to be carried out to determine the actual number of filarial cases, especially in the interior of the rural areas. The finding of *B. malayi* and *W bancrofti* in the migrant workers pose a new dimension to the problem which already exists. In some communities of illegal immigrant workers up to 30-40% microfilaria carriers were detected. The recent influx of foreign workers (approximately 3 million people) from neighbouring countries which are endemic for lymphatic filariasis (Indonesia, Myanmar, Thailand and Bangladesh) are causing some concern about the possibility of a rise in filariasis in the near future.

Toxoplasmosis

Toxoplasma gondii is an ubiquitous obligate intracellular protozoan parasite (Karen, 1992). It is estimated that up to 60% of the American adult population have been infected; while as many as 90% of adults in European countries are seropositive for *T. gondii* (Chamberland, 1991). Epidemiological surveys in Malaysia indicated that *Toxoplasma* antibody is common among all ethnic groups of all ages, with the highest prevalence rate found in Malays (18%), followed by Indians (29%) and Chinese (18%) (Khairul Anuar *et a1*., 1991). The age group of 15 to 26 years old was found to have the highest rate of antibody production, thus sero-negative pregnant women in Malaysia may be at risk of contracting *T. gondii* infection. Foetuses infected with *T. gondii* often develop serious sequel such as hydrocephalus, microcephalus, deafness, blindness or foetal death (Van de Ven es *et al*., 1994). Three groups of people are at risk of acquiring clinical diseases namely, the foetus of seronegative pregnant women, young children and immunocompromised patients (Hanifah *et al*., 1991). Cerebral toxoplasmosis is the most common cause of focal brain lesions in patients with acquired immunodeficiency syndrome (AIDS), occurring in 30-40% of such patients (Snider *et al*., 1983).

The definitive diagnosis of cerebral toxoplasmosis in patients continues to be a major problem. The established diagnostic requirements are: (1) a compatible clinical presentation, (2) serological evidence of exposure to *Toxoplasma gonii* (positive antitoxoplasma IgG or IgM or both), and (3) computed cranial imaging findings of discrete cerebral lesions, often with mass effect, oedema and contrast enhancement of CT scan. When these three criteria are met, a therapeutic trial of specific antitoxoplasma therapy can be administered. Positive clinical and radiological response following one to two weeks of therapy nail confirm the diagnosis of cerebral toxoplasmosis (Holliman *et a*., 199l).

Even though the current therapy for toxoplasmosis is effective, there are many side effects. Therefore there have been active research into newer drugs with fewer or no side effects such as azithromycin and roxithromycin (Tee *et al*., 1998).

Currently there is no routine diagnostic facilities offered to antenatal patients in Malaysia. However, one could test for toxoplasmosis if the need arises. In view of the increasing cases of clinical toxoplasmosis being reported in Malaysia it would be advisable for the Ministry of Health Malaysia to consider including toxoplasma as a routine examination for antenatal patients.

Enteric parasitic infections

Approximately 1 billion people of the world population are infected with intestinal helminths (Chan *et al*., 1994). These are mainly *Ascaris lumbricoides, Trichuris trichiura* and hookworms (*Ancylostoma duodenale, Necator americanus*). Human infection by *A. lumbricoides* and *T. trichiura* is through ingestion of the worms' eggs, where as infection by hookworms is through penetration of the larvae into the skin of the foot. Heavy *A. lmbricoides* infection may lead to intestinal and billiary obstruction. In cases of severe *T. trichiura* infection, rectal prolapse and dysentery are seen. Iron deficiency anaemia is the main manifestation of hookworm infection. Estimated global annual death due to (Soil Transmitted Helminths) STH is 130,000 (WHO, 1987).

Malaysia, with its warm and humid clime, is suitable for sustaining transmission of STH all year round. The commonly found STH *are A. lumbricoides, T. trichiura* and *N. americanus*. Extensive surveys carried out in the country revealed overall prevalence of STH infection of about 40% (Kan, 1982). *T. trichiura* has been found to be the predominat helminth, followed by *A. lumbricoides* and *N. americanus* (Kan, 1982).

Epidemiological pattern of STH prevalence was generally similar to that found elsewhere in the world. Majority of those infected fell in the younger age group (3-14 years), mainly due to high risk of exposure to the sources of infection, as children of this age group were most active but least careful about personal hygiene. Furthermore, their resistance to STH infection might be lower than that of older age group and adults. Prevalence of STH was high in rural areas and urban slums, where living conditions and environmental sanitation were poor.

Infection rates have been observed to be higher among the Indians and Malays than among the Chinese, who are mainly urban and sub-urban dwellers (Lie, 1964; Bisseru and Aziz, 1970; Khan and Anuar, 1977; Sulaiman *et a1*., 1977; Chia *et al*., 1978; Kan, 1982; Kan, 1985; Sinniah, 1984; George and Ow-Yang, 1982; Kan and Poon, 1987). Eating habits and food preparation practices were also contributing factors in the higher prevalence among the groups. Studies on Orang Asli communities of Malaysia showed higher prevalence of infection in the resettled villagers than in the nomadic groups (Karim *et al*., 1995; Norhayati *et al*., 1997). This was possibly because the nomadic groups would not stay long enough in a place to contaminate the soil sufficiently to bring about high transmission of infection (Zulkifli *et al*., 1999a).

Double infections with two species of helminths were more frequently encountered than single species infections. Double infection involving *T. trichiura* and *A. lumbricoides* were predominant (> 85%) (Ran and Poon, 1987; Raj *et al*., 1996), and this was not only among children, but also among adults as well. Triple infections were less common, and were notably seen in rubber and oil palm estates (Kan, 1982).

Campaigns to control STH were initiated in 1968. In these campaigns, measures such as deworming by antihelminthic administration among school children, health education and improvement of water supply and excreta disposal were implemented. However, after 1984, routine deworming of schoolchildren was terminated, and only indicated children were given antihelminthics (Zulkifli *et al*., 1999b).

The main protozoan species of medical importance in Malaysia are Entamoeba hystolytica and Giardia lamblia. The former, which causes amoebiasis, inhabits the large intestine of human, particularly the caecum. The parasite exists as lumen or tissue invasive form. A munber of surveys were carried out in the period 1970-1987 to determine the prevalence of amoebiasis in the country. These studies encompassed population samples of different sex and age of the main ethnic groups from different parts of the country (reviewed by Kan, 1988). The overall prevalence of amoebiasis from these surveys ranged from 1.0 to 14.4%. In an extensive study by Lai (1992), covering 7995 individuals between the period 1982-1992, overall rates of *E. histolytica* infection was 8.4%. It was also noted that in Peninsular Malaysia, the Malays showed the highest prevalence (11.1%), followed by the Orang Asli (8.6%). In East Malaysia, the various Sarawak tribes had overall prevalence of 6.0%. No difference was seen between the males and females. Higher prevalence rates were noted among the adults. For giardiasis, Kan (1988) calculated overall prevalence of 2.6-25.0%. Lai (1992), reported overall prevalence at 11.1%, and the rates were equally high among the Orang Asli, Malays and the Sarawakian tribes (9.7-13.8%). Unlike amoebiasis which showed higher prevalence among adults, giardiasis was highest among primary school children. However, there was no difference between the prevalence among the males and females.

Generally, both amoebiasis and giardiasis are found among all ethnic groups in Malaysia. However, it should be pointed out that prevalence of these infections is not affected by ethnicity. In fact, the prevalence depends on the living conditions. In areas where basic amenities of safe or clean water supply and proper sanitation are provided, the prevalence wrill be much lower than areas without these amenities.

Toxocariasis

Toxacariasis or visceral larval migran (VLM) caused by *Toxocara* sp. is one of the most common human zoonosis in Malaysia. Infections of this parasite in dogs and cats in Malaysia have been studies since early 60’s (Rohde, 1962). Because of the occult nature of VLM, toxocariasis cases in patients have been detected by serology using *in vitro* released excretory/secretory antigens of *Toxocara canis* against patients' sera. From the diagnostic data, positive cases were 27% in 1993 and 16% in 1997 out of 88 specimens from suspected toxocariasis patients respectively (Ann. Rep. IMR. 1993 & 1997).

The studies of seroprevalence of toxocariasis among Orang Asli admitted to Gombak Hospital, Selangor was 31.9% and the highest rate being among the children (45.2%) of age between 0-9 years old (Ann. Rep. IMR, 1991). Lokman Hakim *et al*. (1997) reported that prevalence of T. canis antibodies among children with bronchial asthma in Klang Hospital was higher (57.8%) than among non-asthmatic children (15.4%). This study showed that the proportion of asthmatic children having significant anti-toxocaral antibodies in Malaysia was much hidler compared to Hawaian children (10%) (Desowitz *et al*., 1981) and Natherlands children (19.2%) (Buijs *et al*., 1994). Recent study among pediatric patients at University Hospital, Kuala Lumpur by Chan *et al*. (2000) showed that children with bronchial asthma were observed to have higher *Toxocara* seropositivity than that of the non-asthmatic control (21.2%). The observed relationship between exposure to *Toxocara* infection and bronchial asthma in Malaysian children warrent further evaluation as it provides potential avenue for prevention.

Emerging parasitic infections

Very little emphasis is given to emerging parasites in Malaysia. For instance, *Cryptosporidium* have been frequently detected in the early 80's in the diarrhoeal stool specimens which were sent by several Hospitals to IMR, Malaysia for confirmation of pathogenic agents. Since then, *Pneumocystis carinii Isospora belli*, *Microsporidium* sp. *Acanthamoeba* sp. have been detected in specimens ttom symptomatic patients in both immunocompetant and immunocompromised individual (Table 2). *Blastocystis hominis* which was believed to be a harmless organism was first detected in 1988 in a stool sample from a Medical Officer complaining of recurrent diarrhoea and abdominal discomfort. Since then, the detection of this parasite was carried out until 1997 and found that 142 patients were *B. hominis* positive and found to be free from other parasites and bacterial pathogens as determined by basic laboratory tests. As only *B. hominis* were seen in the stool, it is extremely tempting to incriminate this as the cause of diarrhoea, abdominal discomfort and joint pains in the patients. The studies of local strains differences using PCR and the pathogenicity detection using monoclonal antibodies of this parasite have also been carried out successfully (Init, 1999).

A study carried out in IMR (1988) showed that 4.4% of 158 children with diarrhoea admitted to Klang Hospital were positive for Cryptosporiditm (Ann. Rep. IMR, 1988). Mat Ludin *et al*. (1991) have also reported a similar prevalence of 4.3% (36) of 836 stool samples from Pediatric ward with cases of diarrhoea and acute gastroenteritis, were positive for *Cryptosporidium*. Currently, research emphasis on cryptosporidiasis and other human diseases that are responsible for waterborne infection is being actively elucidated. Human diseases cause by emerging parasites is gaining recognition throughout the world and it is expected to be an important area of research in the years ahead.

Other parasitic infections

There are also reports on human schistosomiasis, trypanosomiasis and sarcocystosis which are relatively rare or as incidental finding. New species, *Schistosoma malayensis* (Greer *et al*., 1988) and *Trypanosoma cyclops* (Weinman, 1972) were found in previously unreported Malaysian snails (*Robertsiella kaporensis, R gismanni* and *Robertsiella* sp.) and monkeys (*Macaca nemestrina* and *M. fascicularis*) respectively, and they are relatively hamless. Leishmaniasis which has not been reported in Malaysia was found in 8 cases of Bangladeshi immigrant workers between 1996 to 1998 (Table 2).

Concluding remarks

The prevalence of parasitic infection in the next millennium depends upon the efficiency at which the control and prevention programmes are implemented. Barrier or measure to stop the spread of parasitic infection has to be established through application of biological and epidemiological knowledge. These measures require large amount of funds, which some countries may not afford it, especially the developing countries. An integrated approach involving the improvement of environmental sanitation, standards of living, nutritional status, health education and periodic chemotherapy would have better and more long-term effects.

Malaysia with positive economic growth would continue to have an impact on parasitic diseases. It will continue to import cheaper labour from its neighbours and along with it would also import parasitic infections. Only through efforts from all parties concerned, political, non-governmental organization, public health authorities, scientists and communities could we reduce the haunt of parasitic infection in the next millennium.

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Malaria

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Table1

Rate of incidence of filarial infection in Malaysia 1992-1997

Year	Population of Malaysia	Cases	Rate of incident
1992	18,625,841	876	4.87
1993	19,058,270	781	4.23
1994	19,500,984	651	3.34
1995	19,748,202	770	3.90
1996	21,169,000	1108	5.23
1997	21,665,500	572	2.64

Table2

Data of samples from symptomatic patients positive for parasites recorded at the Annual Report,

Institute for Medical Research from 1988 to 1998

Parasites/year	88	89	90	91	92	93	94	95	96	97	98
Cryptosporidium sp.	70	50	50	50	50	60	nr	36	28	32	23
Pneumocystis carinii	2	0	5	5	0	0	nr	0	2	2	3
Isospora belli	nr*	nr	nr	nr	nr	nr	nr	10	8	13	21
Microsporidium sp.	nr	nr	nr	nr	nr	nr	nr	0	0	1	2
Acanthamoeba sp.	nr	nr	nr	nr	nr	nr	nr	4	5	2	6
Leishmania sp.	nr	nr	nr	nr	nr	nr	nr	nr	3	2	3

*nr=not reported

Figure1

Rate of specific incidents according to age for year

1996 and 1997

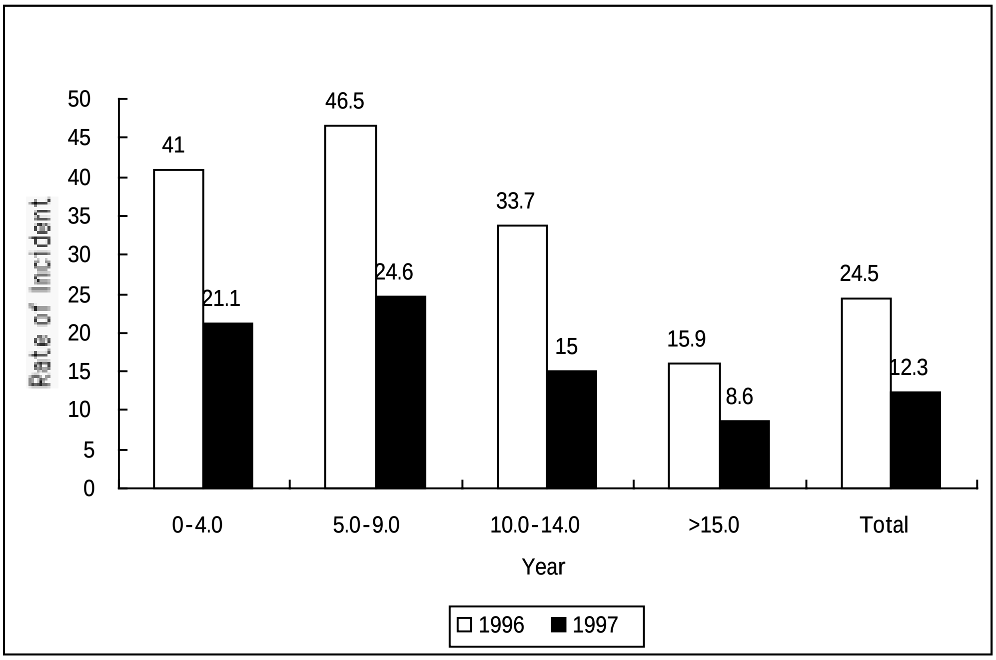
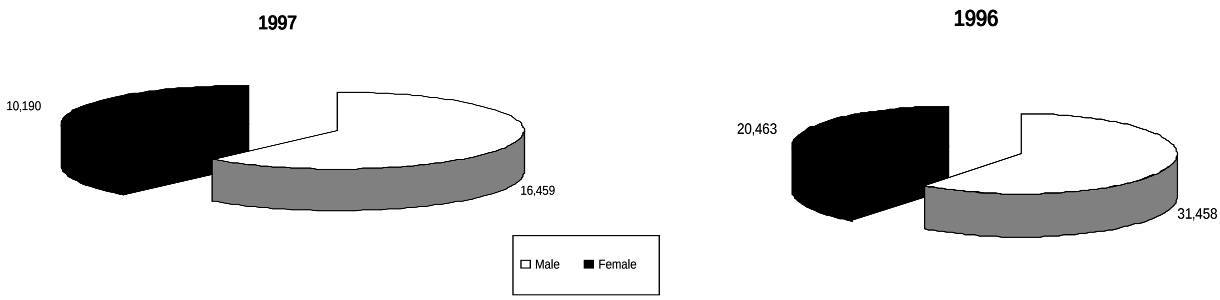


Figure2



Comparison cases according to sex for year 1996 and 1997

Parasitology and Parasitic Diseases in Indonesia (A Country Report)

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Abstract

Parasitic infections in Indonesia, although have declined over the past three decades, are still highly prevalent especially among low socioeconomic communities living in slums and underprivileged rural areas.

Parasitic diseases of high public health importance are: malaria, filariasis, soi1-transmitted helminths, tapeworm infections, amoebic dysentery, toxoplasmosis, and scabies. At present malaria, which is mainly caused by *Plasmodium falciparum* and *P. vivax*, is given top priority in the communicable Disease Control Program of the Indonesian Department of Health.

Community education and proper information on parasites and parasitic diseases to the public have been continuously given by the authorities. Much information on parasites arc still to be gained in order to define proper strategies in the control programs.

INTRODUCTION.

Indonesia is an archipelago consisting of more than 13600 islands, stretching from 95° to 140° longitude (about 5150 km) and from 5° North to 10° South latitude (about 1930 km). About 200 millions people now inhabit more than 6000 islands, about sixty percent of which live on the island of Java, which is only seven percent of Indonesia's total areas.

Agriculture is Indonesia's major economic activity, with about 71% of the people living in the rural areas. The remaining 29% live in urbanized environment. The average population density is about 95 persons per square kilometer, and in Java the figure is around 850. Rice is the main food, which is served with a variety of vegetables and some meat, fish or eggs. The meat usually is water buffalo, beef or chicken. Being largely Moslem country, pork consumption is low. In some areas, maize is a major food.

Indonesia has a hot, humid climate, with an average yearly temperature of about 27℃ in the lowlands, somewhat lower in the highlands. The average local temperatures vary little throughout the year, and so the seasons in Indonesia are based on differences in rainfall, not on temperature changes. The period from November to April is normally the wet season, while that from June to October is the dry season. The driest regions receive from 90 to 100 centimeters of rain a year ; lowlands in other regions generally have from 180-320 cm, but certain parts of the country have annual rainfall of 300 to 370 cm. Rainfall increases in the highlands, some mountainous areas receiving more than 600 cm a year. As a result rain forests flourish in the islands of Kalimantan, Sumatra and Irian.

Under such physical conditions, coupled with the poor economy and low knowledge of most of the people, it should be easily understood that parasites and parasitic diseases stand as a serious problem in Indonesia.

SITUATIONS OF PARASITIC INFECTION.

Parasitic infections in Indonesia, although have declined over the past three decades, are still highly prevalent especially among people living in slums of big cities and in underprivileged rural areas. A review of the situation made by Sri Oemijati (1989) stated that at least 23 species of protozoans and 40 species of helminths have been reported infecting man in Indonesia. It did not cover hundreds of ectoparasites such as mosquitoes, biting midges, mites and lice, some of which are important disease vector as well.

Several parasites of high public health significance are presented here.

Malaria Parasites.

Malaria is still a major public health problem in Indonesia. There are four species known to occur, namely, *Plasmodium falciparum, P. vivax, P. malariae* and *P. ovale*. The first two are most common, while *P. malariae* is now rare in Java but is still found in other islands. *P. ovale* is very limited in its distribution, being found only in certain parts of eastern islands (Gandahusada, 1989).

At present malaria is a problem in rural areas, with high endemicities in certain parts of eastern Indonesia, such as Irian. In 1997 the average parasite rate for all islands except Java and Bali was 4.78%, but in Irian the figure was 21.21%, in Maluku 7.38% and 5.45% in North Sulawesi. In 1999 the annual malaria incidence (AMI), or the number of clinical cases out of 1000 people per year was 110.8 in Irian, 52.7 in North Sulawesi, and 165 in East Nusa Tenggara. In Java the annual parasites incidence (API) or the number of positive malaria cases out of 1000 people per year was 42.33 in the province of Yogyakarta and 4.07 in Central Java. The other parts of Java showed API of less than 0.5, most of which are thought as not being indigenous. Mortalities caused by malaria (mainly by *P. falcifarum*) in 1999 were reported as high as 53% in Irian and 12% in Yogyakarta. (Dept. of Health, 2000).

At present malaria is reported from 23 provinces of Indonesia, including 161 districts, with a total of more than 79 million people living in endemic areas. As such, malaria is one of the highest priorities in the Communicable Disease Control Program of the Indonesian Department of Health. Under the project named "Intensification of Communicable Disease Control" (ICDC), financed by the Asian Development Bank (ADB), malaria control is being enhanced, including the establishment of six regional vector research laboratories. Up to now 21 species of *Anopheles* mosquitoes are being incriminated as malaria vectors, as listed on Table 1. (Abednego and Suroso, 1998).

The routine activities in malaria control program include: active case detection (ACD) carried out by specially trained malaria surveyors at village level, passive case detection (PCD) at the centers for Public Health Services, anti malarial drug treatments to clinical cases patients, vector control through indoor residual spraying, use of

impregnated bed net, 1arviciding, and use of larvivorous fish. It has been realized that malaria control program should involve the participation of all people in the community, as well as of other sectors such as agriculture and public works, and also of private enterprises.

Soil-transmitted Helminths.

Soil-transmitted helminths are widely distributed and pose a serious problem among low-income communities. City slums and underprivileged rural areas are locations with the highest prevalence. The most commonly found species are *Ascarias lubricoides, Trichuris trichiura Necator americanus* and *Ancylostoma duodenale* (Sri Oemijati, 1989). In certain areas A. *lumbricoides* may be found in almost 100% of the inhbitants, *T. trichiura* up to 92% and hookworm infections 82%. In a rather dry province, *East Nusa Tenggara low incidences occur i.e. 10% for A. lumbricoides, 35% T trichiura* and only 1% infested by hookworms.

Although clinical symptoms due to these worms are not severe, loss in terms of working hours is considered to be high. Weakness, abdominal pain, diarrhea and fever are often very disturbing to the patients. Among the government's efforts to cope writh this problem are: improvement and rehabilitation of slum areas in big cities, and community education through local group meetings. The Indonesian Parasite Control Association, in cooperation with the National Planned Parenthood Agency, at times takes part in providing the needed information to the people.

Filarial Parasites

Filariasis constitutes a serious problem in certain parts of Eastern Indonesia. An Mf-rate of 70% and a disease rate of 47% were found among native people in one island of the province of Maluku (Sri Oemijati, 1989). Although it may be found in urban areas, filariasis is mostly a problem in rural areas, affecting people of the low socioeconomic community. The disease occurs mostly in the lowlands and only occasionally found in hilly localities. Up to now three species of at least five epidemiologically different types have been identified in Indonesia (Sri Oemijati, 1989) *Wuchereria bancrofti* is prevalent both in urban and rural areas. The urban type is endemic in Jakarta and some other cities, with the urban mosquito *Culex quinquefasciatus* serving as vector. The rural type of *W. bancrofti* has a wide distribution and is highly endemic in Irian. Many species of mosquitoes have been incriminated as vectors, i.e. *Anopheles farauti, An subpictus, An. punctulatus, Aedes kochi* and *Culex bitaeniorrhynchus*.

Brugia malayi is strictly rural, and may be found in swampy and rice-growing areas. The zoophilic type (formerly described as the subperiodic type) which also affect animals, is mostly found in swampy areas and has as vectors several species of *Mansonia mosquitoes*. On the other hand, the anthropophilic type (formerly described as the periodic type) is more restricted in rice-growing areas with *An. barbirostris* serving as vector.

The third species, *Brugia timori*, is a new species (Partono *et al*., 1977) which was discovered in certain islands of East Nusa Tenggara iud Maluku. The mosquito *An. barbirostris* has been confirmed as the vector.

At present a continuous blood survey is being done by health officials to find new endemic areas. Low dosage of DEC for 40 weeks is given in mass to the people within an endemic locality. In addition, community education is given whenever considered necessary.

Cestodes.

Cestodes are found endemic in certain areas of Indonesia, i.e. North Sumatra, Bali, East Nusa Tenggara, and Irian Jaya. The most common cestodes found are Taenia saginata and T. solium. The infection in man relates closely to the habits of the people and sanitary conditions of the living environment. The patient usually get the infection by consuming half-cooked meat In 1999 a total of 1984 cases were reported, all from the province of Irian Jaya. Brain cysticercosis is also prevalent in that area; many patients fell into fire at night because of epileptic seizures caused by cysticercosis (Subianto *et al.*, 1978 in Sri Oemijati,1989). Another highly endemic area is the island of Samosir at the Lake Toba, North Sumatra where the inhabitants never eat beef, only goat and pork. The tapeworm has been identified as resembling the Taiwan Taenia.

Higher prevalence of taeniasis are found among the less-educated adult male groups, probably because they consume more meat than children or women. In Irian it is customary to let the man have the pork brains while the women get the intestines. In the endemic villages with low educational and socioeconomic level, people usually defecate outdoor because they do not have latrines. In the meantime pigs and cattle are being kept freely around the yard, so they have chances to pick up tapeworm’s eggs out of the fecal material.

Trematodes

Trematode infection is considered to be a nonpublic health in Indonesia, with the exception of two species namely, *Schistosoma japonicum* and Fasciolopsis buski (Hadidjaja, 1989).

S japonicum infection has been known to be endemic among the inhabitants of a village near the lake Lindu and Napu Valley in Central Sulawesi. The prevalence varied from 8 to 55% over a period of more than half a century (since 1937, when the worm was first found). The intermediate host is the snail *Oncomelania hupensis lindoensis*. Clinical symptoms include: dermatitis, diarrhea, abdominal pain nausea and vomiting loss of appetite, weakness, distention of the abdomen, hepatomegaly and splenomegaly. Mass treatments using praziquantel within a period of 5-6 years were reported to give good results.

F. buski infection was first reported in 1982 from South Kalimantan. A subsequent survey in 1986 revealed a prevalence of up to 68.3%. The complaints of the patients were: diarrhea, poor appetite, mild abdominal colic or burning sensation, vomiting andfevers. Physical examination, anemia, distended abdomen, ascites, and jaundice. So far the intermediate host has not been found.

Other pathogcnic Protozoa.

Although more than 20 species have been reported infecting man in Indonesia (Sri Oemijati, 1989), only two species, i.e. *Entamoeba histolytica* and *Toxoplasma gondii* which are important.

E. histolytica is endemic throughout the country. The prevalence rates reach up to 18% among the poor communities. Extra intestinal infection mostly occurs in the liver abcess is freauently found (Gandahusada, 1989). In severe cases, perforations into the pleural and the abdominal cavities have also been observed. Ameboma of the cecum, amebic skin lesions, appendivitis and brain abcess have also been reported (Sri Oemijati, 1989).

Toxoplasma gondii is widely spread. The prevalence of Toxoplasma antubodies in man varies from 2 to 63%, while among the domestic animals cats show 35-73% positive, pigs 11-36%, goats 11-6l%, dogs 75% and cattle less than 10% (Gandahusada, 1989).The Prevalence of *Toxoplasma* antibodies among women of child-bearing age in Jakarta is 62.3%, in pregnant women in Cipto Mangun Kusumo Hospital 14.3%, among hydrocephalic children 10.6%, among chorioretinitis patients 60% and among patients with other eye lesions is 17%. Some confirmed cases of congenital toxoplasmosis are reported in Jakarta and Irian Jaya.

Ectoparasites

Hundreds of arthropod species act as ectoparasites, but aside of being disease vectors only a few of which pose public health problem.

Most important is *Sarcoptes scabiei* the itch mite causing scabies. Scabies occurs in connection with unsanitary conditions normally found among the low socioeconomic status, usually the disease is disappearing eventually.

Another ectoparasite associated with crowded and poor sanitary habitation is the head louse, *Pediculus capitis*. Same as scabies, the parasite is disappearing with the betterment of living conditions.

Bedbugs, *Cimex hemipterus* and C: lectularirus, which formerly were very common especially in urban communities, are nowadays rather difficult to find, owing to the wide usage of synthetic materials within the household in place of cotton, wood and rattan.

Chiggers, the larvae of Trombiculid mites, are found widely in the field. Hadi (1989) described 128 species in Indonesia, including *Leptotrombidum deliense*, a vector of scrubtyphus.

Ticks (**Ixodida**), while importatnt in veterinary health, uncommonly bite man in Indonesia. About 50 species have been reported infesting a wide range of vertebrates.

Biting midges (*Culicoides* spp.) can be very annoying to people having outdoor activities, such as camping, hunting, or fishing. About 100 species have been collected from Java and the eastern islands, many of which act as vectors of veterinary importance.

The black flies, (Simuliidae) in Indonesia have been studied by Takaoka since 1990 and are still being continued up to now. So far about 100 species have been described, including at least 20 new species. Up to now the black flies in Indonesia is only important as vectors of some diseases of animals.

And finally, 457 species of mosquitoes (Culicidae), have been recorded in Indonesia, belonging to 18 genera (O’connor and Sopa, 1981). The genus Aedes has the highest number of, species (125), followed by *Culex* (82), *Anopheles* (80) *Tripteroides* (42), and *Uranotaenia* (30). *Culex quinquefasciatus* and Aedes aegypti are the two most annoying species to people living in urban areas, while *Anopheles* spp. are rural mosquitoes.

In addition to being malaria and filariasis vectors, other species incriminated as vectors of dengue hemorrhagic fever (DHF) and Japanese encephalitis (JE) are listed on Table 1.

CONCLUDING REMARKS

Parasitic diseases are still a serious problem in Indonesia. Poor economy and low knowledge of the people have resulted in ignorance to sanitary practice to their living environments. Efforts have been made by the government to cope with the problem, but the people themselves should have realized that parasite problem could not be controlled effectively without their active participation.

Moreover, the hot and humid tropical climate in Indonesia is very conductive for the perpetuation of the parasites. Much work is yet needed to discover the many aspects of the parasite's life, in order to define proper control strategies. In this context, epidemiological and applied field researches should be given priorities, while sophisticated basic research hopefully could be carried out through international cooperation.

Table 1. Mosquito species as disease vectors in Indonesia

Malaria	DHF	Filariasis	JE
1. *An. aconitus*	1. *Ae. aegypti*	1. *An. aconitus*	1. *Cx. tritaeniorhynchus*
2. *An. balabacencis*	2. *Ae. albopictus*	2. *An. bancrofti*	2. *Cx. gelidus*
3. *An. bancrofti*		3. *An. barbirostris*	3. *Cx. vishnui*
4. *An. barbirostris*		4. *An. farauti*	4. *Cx. fuscocephala*
5. *An. farauti*		5. *An. letifer*	5. *Cx. bitaeniorhynchus*
6. *An. flavirostris*		6. *An. koliensis*	6. Cx. annulus
7. *An. karwari*		7. *An. nigerrimus*	7. *Cx. quinquefasciatus*
8. *An. kochi*		8. *An. peditaeniatus*	8. *An. annularis*
9. *An. letifer*		9. *An. punctulatus*	9. *An. kochi.*
10. *An. leucophyrus*		10. *An. subpictus*	10. *An vagus*
11. *An. maculatus*		11. *An. vagus*	11. *An. Subalbatus*
12. *An. minimus*		12. *Ae. kochi*	
13. *An. nigerrimus*		13. *Ar. Subalbatus*	
14. *An. Parangensis*		14. *Cx. annulirostris*	
15. *An. punctulatus*		15. *Cx. bitaeniorhynchus*	
16. *An. sinensis*		16. *Cx. quinquefasciatus*	
17. *An. subpictus*		17. *Cq. Orchracea*	
18. *An. sundaicus*		18. *Ma. Annulata*	
19. *An. tesselatus*		19. *Ma. Annulifera*	
20. *An. umbrosus*		20. *Ma. Bonneae*	
21. *An. koliensis*		21. *Ma. Dives*	
		22. *Ma. Indiana*	
		23. *Ma. Uniformis*	

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Parasitology and Philippine Human Parasitoses

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Introduction

Conventional Parasitology in the Philippines, in the last 20^{th} century has provided the country's foundation to prevent and control parasitic disease problems. The prominent works of classical parasitologists have provided the avenue for the modern parasitologists, to pursue their great interest, and desire to appreciate parasitologic problems, that are still prevalent today.

Parasitology has become a sophisticated discipline. Its sophistication, has, however, not been fully applied, as parasitic problems still contribute to the country's major health problems. For example, malaria still ranks as one of the major leading causes of morbidity and still contributes to the nation's record of mortality.

Indeed, studies both basic and applied, have gone into the development of control programmes but parasitic diseases are still around, emerging and possible re-emerging.

Parasites infecting humans and parasites of animals transmissible to humans as of 1999 has amounted to 136 species. These include 68 species of nematodes, 34 species of cestodes, 19 species of trematodes and 16 species of protozoans (Table 1 provide the various species of the parasite).

The major parasitic problems include:

1. Geohelminths; Ascaris, Trichuris, hookworms
2. Capillariasis, heterophyiasis, paragonimiasis
3. Malaria
4. Filariasis
5. Schistosomiasis
6. Amoebiasis

Brief description of the status of the parasitic diseases / infections

Geohelminths:

- Ascaris: prevalence 80%, highest among children up to 14 years of age
- Trichuris: 80-84%, highest among children between 5 - 9 years of age

- Hookworms: 40-45% prevalence

Capillariasis:

- 1963, first reported in Luzon
- 1998, outbreak in Southern Philippines; 22% (16/72 diarrhea cases)

Heterophyiasis:

- 1998 outbreak, Southern Philippines; 15.7%, N (153)

Paragonimiasis:

- 1998 outbreak in Southern Philippines; 6.5%
- prevalence; 4.6- 12.5%

Malaria:

- health problem since 1926
- remains among the top 10 causes of morbidity
- mortality: 1.3/100,000 in 1993

Filariasis:

- health problem since 1907
- 45 endemic provinces, out of 76 provinces
- emergence of microfilaremics in previously non-endemic provinces
- continued transmission in endemic areas
- m.f. rate, range: 0.6 to 3.4% (*Wuchereria bancrofti*); in endemic areas

Schistosomiasis:

- highly endemic in 3 provinces; 18.91% Southern part of the Philippines

Year	Estimated prevalence (%)
1987	6.6
1989	7.5
1993	3.3
1994	5.4
1997	4.5

Amoebiasis

- Entamoeba histolytica: 0.1 - 5%, Hospitals
- Other species of amoeba: E. coli 21%

  E. nana 9%

  I. butschlii 1%

Control strategies laid down by the Department of Health: Disease Control Programmes:

Considerable success has been achieved in the control of parasitic infections. The control is implemented according to the principles of adopting integrated measures, with an ultimate aim of;

1.Reducing mortality and morbidity by treating 80% of 2-14 years of age for 3 years by, mass treatment, advocacy and environmental sanitation practices for geohelminths. Utilization of school-based control strategy targeting the pupils.

2. Integration of filariasis, schistosomiasis and geohelminths, due to similarities in diagnostic and treatment technologies by advocacy, mass treatment, DEC and albendazole (towards elimination of filariasis). Capillariasis, paragonimiasis and heterophyiasis by case detection and treatment, advocacy.

3. Malaria - towards malaria transmission elimination, application/prioritization on macro (province) and micro (village) stratification. - preventive, promotive and curative: anti-mosquito measures, early case detection and prompt treatment; self-protection measures.

4. Amoebiasis thru environmental sanitation and advocacy

Problems/factors affecting Control Strategies

Ⅰ. Geohelminths

- Morbidity and prevalence figures are not adequate or unavailable to effect successful mass treatment of the affected population
- The current strategy being utilized by the school-based control program, thru deworming, has no significant impact on improving the quality of life of school-age children. The ideal focus for parasite control should be defined, in order to maximize available resources. Research data showed those 9 to 10 y.o. pupils - represents the cross section of the infected children

5. Logistics to operationalize the target indicators

Ⅱ. Capillariasis, Paragonimiasis and Heterophyiasis

1. Absence of intervention to effectively deliver the prevention and control strategies; to prevent a repeated outbreak of these diseases; which include:
   - absence of accurate clinical diagnosis by the physicians, PTB vs. pulmonary paragonimiasis; and laboratory diagnosis by the laboratory diagnosticians.
   - patients compliance with treatment, absence of follow-up and visits to the clinics
   - wrong notions and misconception about the disease
   - continued ingestion of uncooked intermediate hosts (feeling of security as the disease could be treated)
   - continuing problem of environmental pollution (stream), defecation practices

III. Malaria

1. Existence of widespread but low level chloroquine resistance
   - No monitoring of drug resistance, in vivo and in vitro
   - Inconsistent method of sampling from one area to another, no longitudinal study(ies) have been done in one site
   - Quinine not available in highly endemic areas
   - In-vivo-in-vitro resistance showed varying patterns in different areas
   - Problem in one geographical area is different from another
   - Low level of awareness among practitioners on the drug resistance
   - Asymptomatic, parasitemics
   - Vector species complex - indoor vs. outdoor transmission
   - Misidentification (morphotaxonomy)
   - Operational/logistics problems

IV. Amoebiasis

- Misdiagnosis; under diagnosis; over diagnosis using the classical microscopy; under estimate: over estimate
- Inadequate studies on free-living protozoans; clinical epidemiology; prevalence - lack of awareness on their public health importance

6. Prevalence and distribution not well characterized
2. Accurate diagnostic tools for effective clinical and public health management

V. Filariasis

8. A low priority disease; synonymous with microfilaremia
2. Reliance still on traditional methods given amicrofilaremic individuals
7 Mosquito infection, reliance on dissection
11. Brugia malayi epidemiology
   - Prevalence aside from microfilaria rates
   - Clinical epidemiology of the disease
   - Disease rates
   - Need to look for other predisposing factors
   - Understanding the association of parasitemia with the clinical manifestation of acute and chronic filarial diseases

VI. Schistosomiasis

- Detection of eggs not sensitive in determining light infections (25% being missed)

- Animal reservoir hosts
- Untreated patients
- Undiagnosed unproductive infections
- Vaccine is not available: “cocktail” antigen is needed to have broad spectrum effects need to have a defined schistosome molecule for vaccine production
- Risk of infection is not drastically reduced by fundamental improvement of the environment, socio-economic conditions and human behavioral change is a long term process

Ⅶ. Other parasitoses

- No data on prevalence of other trematode infections
- Life-cycle not yet fully established. Capillaria, only laboratory-based: absence of field-based data
- Intermediate hosts and other reservoir hosts not fully defined for trematode infections
- Prevalence in the natural hosts
- Little research on cestodes - neurocysticercosis

Conventional Parasitology

Mollusks (Morphotaxonomy)

- snails serving as paratenic or intermediate hosts

l Class

2 Subclasses

3 Orders

6 Families

12 Species

Vectors

- 8 species of mosquitoes

Modern Parasitology Developments

1. Amoebiasis:

- Drug development; study on immunotoxins, an in-vitro test
- Parasite differentiation:
  - E. histolytica and E. dispar
  - Acanthamoeba sp., pathogenic vs. non-pathogenic

2. Schistosomiasis:

- Antigen detection; vaccine candidate: circulating anodic and cathodic antigens (CAA & CCA)

- Testing of diagnostic kit: immune test over Kato-Katz; ELISA
- Immunogens identification for development of monoclonal antibodies
- Proteases; cathepsins
- Anti-embryonation vaccine

3. Malaria:

- Characterization of human immunological response to *P. falciparum*
- Plasmodium falciparum: antigen polymorphism
- Vector identification

Perspective

The modern tools of parasitology should be made available to fill up the gaps of knowledge needed to effectively respond to the technical problems of parasite detection and identification due to parasite diversity, host parasite and vector relationships, vector identification and biology. Classical parasitology should be able to define the epidemiology of these parasitic diseases as basis for effective clinical and public health management of these problems in the light of emerging changes in human behaviour, environmental conditions and developing technologies.

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Table 1. Lists of Parasite Species: Human Parasitoses / Parasitic Zoonoses

Nematodes	Cestodes	Trematodes	Protozoans
Ascaris lumbricoides	Taenia solium	Heterophyidae (4)	Blastocystis hominis
Trichuris trichiura	Taenia saginata	Carneophallus sp.	Entamoba histolytica
Necator americanus	Spirometra sp.	Echinostoma	Entamoeba dispar
Ancylostoma duodenale	Dipylidium (4)	Artyfechnimostomum	Entamoeba coli
Ancylostoma braziliense	Raillietina sp. (19)	Fasciola sp. (2)	Balantidium coli
Toxocara sp.	Hymenolopis diminuta	Schistosoma japonicum	Giardia lamblia
Strongyloides Stercoralis	Vampirolepsis nana	Paragonium westermanni	Trichomonas vaginalis
Capillaria philippinensis	Bertiella sp. (4)	Philopthalmus	Endolimax nana
Angiostrongylus Cantonensis	Echinococcus granulosus	Eurytrema sp. (4)	Cryptosporidium parvum
Wuchereria bancnofti	Echinococcus multilocularis	Clinostomidae	Cyclospora sp.
Brugia malayi		Fasciolopsis buski	Toxoplasma gondii
Gnathostoma sp. (3)			Naegleria fowleri
Mammonogamus Laryngeus			Acanthamoeba sp.
Trichostrongylus sp. (7)			Malaria (3)
Ancylostoma caninum			lsospora belli
Anisakis sp. (44)			
Acanthocephala sp.			

What is the Present State and What Should We Do for Parasitic Diseases in This New Century in China

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Before 1949, China was ruined by national war and economically backward. Parasitic diseases were severely epidemic in whole country, especially in southern of China. Since 1949, Chinese government launched the crowd movements for elimination of parasitic diseases, great achievements have been gotten. For example, as showed in Table 1,

Three major parasitic diseases, have been largely controlled in national wide.

	1950	**1998**
Malaria	**30,000,000**	**31,000**
Schistosomiasis	**11,000,000**	**860,000**
Filariasis	**860,000**	**140,000**

Although Chinese people and Chinese government made their best for controlling parasitic diseases, the morbidity of parasitic diseases remains a big public health problem. According to the survey of 1988 to 1992, the morbidity of parasitic diseases was 62. 6% and there were 64 species parasites in whole China. In the southern China, for example, Hainan, Guangxi, Guizhou, Sichuan, Fujian and Zhejiang province, the infection rate of parasitic diseases reached 80%. Besides malaria, schistosomiasis, and filariasis, food borne parasitic diseases, clonorchiasis, echinococcosis, and earth transmitted parasitic diseases, ascariasis, ancylostomiasis, are also prevalent in some area.

Chinese government recognized that social civilization of a country should have low morbidity of parasitic diseases. They have made a determination that in the fifth 5-year plan (1996-2000) of China that they want to decrease the infection rate of parasitic diseases to 20~30%, including 1) to eliminate the intestinal parasitic diseases; 2) to establish the [National Network of Survey]; to control food borne parasitic diseases, especially clonorchiasis; 3) to look for new diagnostic tool; 4) to narrow the difference of infection rate in different areas. This is a very hard work to get this goal. The fifth 5-year plan has already finished and the data of control of parasitic disease needs to be summarized. Accompanying to economic reform and quickly growth, Chinese will improve their living environment, living habits and give more education about the knowledge and prevention methods for parasitic diseases to young generation.

Recent Trends of Parasitic Infections in Korea

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Abstract: The recent trends of parasitic infections in Korea are briefly reviewed. Soil-transmitted helminthiases such as ascariasis, trichuriasis, hookworm infections, and trichostrongyliasis decreased remarkably. Enterobiasis, clonorchiasis, and tapeworm infections (taeniases, cysticercosis, hymenolepiasis, diphyllobothriasis, and sparganosis) do not show so much reduction in the prevalence. Paragonimiasis decreased noticeably. Intestinal trematodiases (metagonimiasis, heterophyiasis, echinostomiasis) are steadily prevalent, or even increasingly reported. A new intestinal fluke, *Gymnophalloides seoi*, transmitted by oysters, has been found prevalent in southwestern coastal areas. Increasing numbers of anisakiasis cases were reported recently, and other zoonotic parasitoses such as fascioliasis, hepatic and intestinal capillariasis were also reported. Amebiasis, giardiasis and trichomoniasis apparently show decreasing tendency. Meanwhile, malaria has become a re-emerging disease since 1993. Imported diseases (malaria, babesiosis, leishmaniasis, schistosomiasis, heterophyiasis, hydatidosis, angiostrongyliasis, gnathostomiasis, and pentastomiasis) became another emerging problem. In terms of prevalence and distribution, clonorchiasis and enterobiasis are the two major helminthiases of public health importance nowadays in Korea.

INTRODUCTION

Parasitic infections in Korea have been remarkably changing not only in the endemicity (prevalence and intensity) but also in relative public health importance. One of the most important examples of such change is seen in the results of fecal examinations on the Korean people. In contrast to 84.3% of all intestinal helminth positive rate in 1971 among randomly sampled people, the rate in 1976 became 63.2%, that in 1981 became 41.1%, that in 1986 became 12.9%, and the rates in 1992 and 1997 appeared to be only 3.8% and 2.4%, respectively (Table 1). Important recent trends of parasitic infections in Korea can be summarized as follows;

(1) Remarkable decrease of soil-transmitted helminthiases

(2) Almost eradication of filariasis

(3) Decrease of intestinal protozoan infections (excluding cryptosporidiosis)

(4) Persistence of pinworm, liver fluke and tapeworm infections

(5) Persistence, or increased detection, of intestinal trematodiases

(6) Increased detection of zoonotic/tissue parasitic infections

(7) Increase of opportunistic parasitoses

(8) Increase of imported tropical diseases

(9) Re-emergence of malaria

SOIL-TRANSMITTED HELMINTHIASES

Ascariasis: The national egg positive rate of *Ascaris lumbricoides* among Korean people was over 80% until the end of 1950s, but decreased steadily to show 55% in 1971, 41% in 1976, 13% in 1981, 2% in 1986, 0.3% in 1992, and 0.06% in 1997 (Table 1). This dramatic decrease of ascariasis is considered owing to national control activities by repeated mass chemotherapy, together with environmental sanitation and health education. The decrease is considered also greatly indebted to the remarkably improved socioeconomic status of the Korean people.

Trichuriasis, hookworm infections, and trichostrongyliasis: The prevalence has been decreasing in a very similar pattern to ascariasis (Table 1).

VECTOR-BORNE PARASITOSES

Malaria: Tertian malaria by *Plasmodium vivax* had been highly prevalent by 1970s, then eradicated or disappeared, but since 1993 it re-emerged from the northern part of Kyonggi-do (Chai, 1999). By the end of 1999 more than 9,761 patients have been reported (National Institute of Health, Korea, 2000). The initial source of this resurgence of malaria is considered to be infected mosquitoes flown from the northern part of the DMZ (North Korea).

Lymphatic Filariasis: In the 1960s, southern coastal parts of Korea including Cheju Island revealed high blood Mf rate of 17.6% for *Brugia malayi*. (Seo, 1978). However, this disease is now considered nearly eradicated, except in a southwestern remote island, the Heugsan-do (Chai et al., 2000).

PROTOZOAN INFECTIONS

Amebiasis, giardiasis: Data from various sources are showing that *Entamoeba histolytica* and *Giardia lamblia* cyst positive rates are both lower than 1%.

Trichomoniasis: Although published data are very few on *Trichomonas vaginalis* infection, it is generally agreed that this infection has decreased remarkably among the gynecologic patients of large hospitals or clinics.

PINWORM AND TAPEWORM INFECTIONS

Enterobiasis: The egg positive rate of *Enterobius vermicularis* by scotch-tape anal swab method in a paper of 1957 was 20% among 1,529 local children and that in another paper of 1963 was 32% among 2,689 local people examined. The infection is considered not so much reduced thereafter. Even in the 1980s-1990s, the egg positive rate remained ranging 10-40% by local areas.

Taeniases, hymenolepiasis: The egg positive rate of *Taenia solium* and *T. saginata* (including *T. asiatica*; Eom and Rim, 1993) by fecal examination was 1.9% in 1971 among the nationwidely sampled people, but decreased to 0.7% in 1976, 1.1% in 1981, 0.27% in 1986, 0.06% in 1992, and 0.02% in 1997 (Table 1). Hymenolepiasis, due to *Hymenolepis nana*, shows a decreasing tendency similar to taeniases (Table 1).

Diphyllobothriasis: About 40 worm-proven *Diphyllobothrium latum* cases have been reported in the literature, since the first case report of 1971 (Cho et al., 1971; Lee et al., 1989). One case of infection with a related species, *D. yonagoense* was reported (Lee et al., 1988a).

SNAIL-TRANSMITTED HELMINTHIASES

Clonorchiasis: This infection, due to *Clonorchis sinensis*, is currently the most prevalent human-parasitic helminth among those diagnosed by fecal examination. The egg positive rate in nationwide inhabitants was 4.6% in 1971, 1.8% in 1976, 2.6% in 1981, 2.7% in 1986, 2.2% in 1992, and 1.4% in 1997 (Table 1).

Paragonimiasis: Due to difficulties in the diagnosis of the infection by *Paragonimus westermani*, no much data have been available on the nationwide prevalence, although it is believed decreasing significantly. Using ELISA, for example, only a total of 105 patients were detected in a large University Hospital during the period of recent 10 years.

Metagonimiasis: The nationwide egg positive rate of *Metagonimus yokogawai* was 1.2% in 1981, 1.0% in 1986, and 0.3% in 1992 and 1997 (Table 1), showing decreasing tendency. In some endemic areas, however, 30-40% prevalence was reported among the residents until the 1990s (Chai and Lee, 1990). Numerous new endemic foci have been discovered, where the sweetfish, or cyprinoid fish, are eaten raw by the people (Chai et al., 2000).

Heterophyiasis: This infection, due to *Heterophyes nocens*, is not easily differentiated from metagonimiasis by fecal examination only (Chai and Lee, 1990). It is prevalent on coastal areas where the mullet or goby is consumed raw. A southwestern coastal island of Shinan-gun, for example, was found to be a highly endemic focus of heterophyiasis, where 43% of the villagers were infected (Chai et al., 1994). Another coastal village was found to have 70% prevalence of villagers (Chai et al., 1997).

Echinostomiasis: *Echinostoma hortense*, *E. cinetorchis*, *Echinochasmus japonicus*, and *Acanthoparyphium tyosenense* were found to infect humans, the first being the most frequent species. A total of 79 egg or worm-proven cases of *E. hortense* were reported in the literature. An inland area of Cheongsong-gun was found to be an endemic focus of *E. hortense*, with 22.4% egg positive rate of the villagers (Lee et al., 1988).

Gymnophalloidiasis: The infection by *Gymnophalloides seoi*, a new human intestinal fluke (Lee et al., 1993), has been found prevalent in southwestern coastal areas. Oysters were proved to carry the metacercariae, and to play the role of the source of infection. A small coastal village was found to have about 50% infection rate of the inhabitants (Lee et al., 1994).

Other Trematode Infections: A few to considerable numbers of cases infected with intestinal trematodes such as *Neodiplostomum seoulense*, *Pygidiopsis summa*, *Heterophyopsis continua*, *Stellantchasmus falcatus*, *Centrocestus armatus* and *Stictodora fuscata* have been reported by identification of adult worms (Seo, 1990; Chai and Lee, 1990) (Table 2).

ZOONOTIC/TISSUE PARASITOSES

Anisakiasis: About 200 cases, mostly due to *Anisakis simple* larvae, have been reported in the literature (Chai, 1995). Cases are increasingly reported nowadays.

Fascioliasis: About 10 cases infected with *Fasciola hepatica* were reported.

Trichinosis: Three persons infected with *Trichinella spiralis* were recently found (Sohn et al., 2000).

Toxocariasis: Five ocular patients were diagnosed serologically and clinically as toxocariasis (Park et al., 2000).

Hepatic Capillariasis: A case of accidental infection with *Capillaria hepatica* in a child was diagnosed by biosy specimens from the liver (Choe et al., 1992).

Intestinal Capillariasis: Three native cases of intestinal infection with *Capillaria philippinensis* were found by intestinal biopsy and fecal examination (Lee et al., 1993; Hong et al., 1994).

Cysticercosis: More than several thousands of clinical cases have been reported and there are much more cases unreported. Using combined diagnostic procedures of ELISA and brain CT (or MRI), 82 neurocysticercosis cases were, for example, detected in a University Hospital during the period of 3-4 years.

Sparganosis: Hundreds of clinical cases have been reported, but there seem be much more cases unreported. ELISA and advanced radiological techniques (CT, MRI) became very useful diagnostic tools for cases including cerebral sparganosis.

OPPORTUNISTIC PARASITOSES

Pneumocystosis: A report from National Medical Center in 1983 showed that 18.2% of premature infants and 7.5% of full-term babies suffered from pneumonia due to *Pneumocystis carinii*, with some cases based on recovery of organisms. It is speculated that this infection is apparently increasing, due to wider use of immunosuppressive drugs.

Toxoplasmosis: Local serological surveys on *Toxoplasma gondii* infection have shown that the antibody positive rates of patients in general hospitals ranged from 1.9% to 7.2% during the past 20-30 years (Kook et al., 1999).

Cryptosporidiosis: Many diarrheal patients have been diagnosed based on recovery of oocysts or EM identification of organisms. A small village in a southern part was found to be a highly endemic area showing 10-40% oocyst rate (Chai et al., 1996).

Strongyloidiasis: Activation of *Strongyloides stercoralis* infection by anticancer chemotherapy has been verified in many cases (Lee et al., 1994).

IMPORTED PARASITIC DISEASES

Malaria: A total of 80 imported malaria cases of *Plasmodium vivax, P. falciparum* or *P. malariae* were reported during the period from 1970 to 1985 (Soh et al., 1985). It is likely that increasing number of cases are detected from the visitors to foreign countries.

Babesiosis: A total of 5 imported babesiosis cases have been found (Kweon et al., 1998).

Leishmaniasis: One case of *Leishmania donovani* infection (Chi et al., 1983) and 15 cases of *L. tropica* infection (Kim et al., 1984) were reported.

Schistosomiasis: Five cases of *Schistosoma haematobium* infection were reported (Min et al., 1982).

Heterophyiasis: Seven cases infected with *Heterophyes heterophyes* and/or *H. dispar* were imported from the Middle East and Sudan (Chai et al., 1986).

Hydatidosis: At least 15 imported cases, exclusively by *Echinococcus granulosus*, have been reported (Chai et al., 1995).

Angiostrongyliasis: Eosinophilic meningoencephalitis due to *Angiostrongylus cantonensis* was reported from 15 cases who had eaten *Achatina* snails in Samoa (Lee et al., 1981).

Gnathostomiasis: A Thai woman suffering from meningoencephalitis revealed a male worm of *Gnathostoma spinigerum* after craniosurgery (Lee et al., 1988b).

Pentastomiasis: A case of pulmonary pentastomiasis was reported after a open lung biopsy (Park et al., 1985).

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Table 1. National prevalence of intestinal helminths in Korea (1971-1997)

Helminths/Year	1971	1976	1981	1986	1992	1997
Helminth egg posit. rate(%)	84.3	63.2	41.2	12.9	3.8	2.4
Ascaris lumbricoides	54.9	41.0	13.0	2.1	0.3	0.06
Trichuris trichiura	65.4	42.0	23.4	4.8	0.2	0.04
Hookworms	10.7	2.2	0.5	0.1	0.01	0.007
Trichostrongylus orientalis	7.7	1.0	0.2	0.02	0.004	0.000
Clonorchis sinensis	4.6	1.8	2.6	2.7	2.2	1.4
Metagonimus yokogawai	n.e.	n.e.	1.2	1.0	0.3	0.3
Taenia spp.	1.9	0.7	1.1	0.3	0.06	0.02
Hymenolepis nana	n.e.	n.e.	0.4	0.2	0.01	0.02

n.e.: not examined

Table 2. Human intestinal flukes reported in Korea

Family/Species	Second intermediate host
Neodiplostomidae	
Neodiplodtomum seoulense	frog, snake
Heterophyidae	
Metagonimus yokogawai	fresh water fish (sweetfish)
Metagonimus miyatai	fresh water fish (minnow)
Metagonimus takahashii	fresh water fish (carp)
Heterophyes nocens	brackish water fish (mullet, goby)
Heterophyopsis continua	brackish water fish (perch, goby)
Pygidiopsis summa	brackish water fish (mullet, goby)
Stellantchasmus falcatus	brackish water fish (mullet)
Centrocestus armatus	fresh water fish (carp)
Stictodora fuscata	brackish water fish (mullet)
Echinostomatidae	
Echinostoma hortense	fresh water fish (loach, carp)
Echinostoma cinetorchis	fresh water fish(loach) or large snail
Echinochasmus japonicus	fresh water fish (carp)
Acanthoparyphium tyosenense	brackish water bivalves (clams)
Gymnophallidae	
Gymnophalloides seoi	oysters

Table 3. Brief summary of imported parasitic diseases in Korea

Parasitic diseases	No. of cases	Reporter	Areas of acquisition
Visceral leishmaniasis	1	Chi *et al.* (1983)	Saudi Arabia
Cutaneous leishmaniasis	15	Kim *et al.* (1984)	Saudi Arabia & Jordan
Malaria	80	Soh *et al.* (1985)	Africa, South East Asia, Middle East, Australia, Latin America
Babesiosis	5	Kweon *et al.* (1998)	Ivory Coast
Angiostrongyliasis	15	Lee *et al.* (1981)	Samoa
Gnathostomiasis	1	Lee *et al.* (1988b)	Thailand
Heterophyiases	7	Chai *et al.* (1986)	Saudi Arabia
Urinary Schistosomiasis	5	Min *et al.* (1982)	N. Yemen
Hydatid Disease	15	Chai *et al.* (1995)	Middle East
Pentastomaisis	1	Park *et al.* (1985)	Saudi Arabia/Indonesia

Parasitology and Parasitic Diseases in Japan

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Only 50 years ago, parasitic diseases and exoparasites were prevalent in Japan. I remember that DDT was sprayed on my head on my first day of elementary school. Schistosomiasis and lymphatic filariasis were then endemic in Japan, vivax malaria was found in the main land of Japan and falciparum malaria was found in Okinawa islands. However, these parasitic diseases have now been eradicated, and the incidence of soil-transmitted intestinal parasites has decreased to almost zero. People have almost forgotten parasites. However, just as in many other industrialized countries, Japan is not a parasite-free environment. In this paper, the current status of parasitology and parasitic diseases in Japan is briefly overviewed.

Parasitic diseases in the present day Japan.

To clarify the incidence of parasitic diseases in Japan, case reports of parasitic diseases were searched for in the database, Igaku-Chuo-Zasshi (Japana Centra Revuo Medicina). Unexpectedly, more than 1000 case reports were found between 1995 and 1999 in this database (Table 1).

In protozoan diseases, Entamoeba, Pneumocystis, Toxoplasma and malaria are the most frequently reported parasites. Of these, practically all patients with malaria were infected during travel in tropical or subtropical countries. At least some amebiasis cases were also imported, but it was also pointed out that the current prevalence of amebiasis is related to the increase of homosexuals among Japanese. Opportunistic infections are also important as seen in the number of pneumocystosis cases. As a new public health problem, we had at least two water-borne outbreaks of cryptosporidiosis during the last several years.

Regarding trematoda parasites, many case reports of schistosomiasis are still found in Japan, but most of these cases are old inactive infections along with a few imported cases. Paragonimiasis is still endemic in Kyushu island and sporadically found all over Japan. Among tapeworm diseases, diphyllobothriasis is the most common. Taenia solium is also reported, but most of these are found as cysticercosis in immigrants. The most serious public health problem among tapeworm diseases is echinococcosis. Echinococcus multilocularis is now endemic in Hokkaido and its infection rate in wild animals is steadily increasing. Among nematode parasites, anisakiasis is ranked at the top of the list, apparently reflecting the

Japanese taste for raw marine fish, sushi and sashimi. There are many case reports of Ascaris, which migrated into the bile duct or pancreatic duct, suggesting that this classic parasite continues to exist at a low level in local communities in Japan. Strongyloidiasis still shows a high prevalence in Okinawa. Interestingly, it has been reported that in Okinawa the human T cell leukemia virus- 1 infection rate was higher among Strongyloides carrier, than among those without Strongyloides infection. Although sporadic, there are also many cases of lava migrans caused by a variety of nematode species. These larva migrans, which are usually not easy to diagnose, raise issues concerning the development of rapid and specific diagnostic measures.

In summary, parasitic diseases in Japan are characterized as follows:

(1) Gradual increase of parasitic disease infection during travel abroad or found in foreign laborers: malaria, leishmaniasis, cysticercosis and other diseases.

(2) Gradual increase of opportunistic infections: pneumocystosis, amebic encephalitis, toxoplasma encephalitis etc.

(3) Emerging diseases: echinococcosis, cryptosporidiosis, amebic keratitis etc.

(4) Persistent occurrence of some of food-borne parasitic diseases related to Japanese dietary habits: anisakiasis, diphyllobothriasis, paragonimiasis and other diseases.

(5) Persistence of certain soil-transmitted parasites: strongyloidiasis

(6) Persistent occurrence or emergence of classic or new types of parasite larva migrans: dirofilariasis, toxocariasis, gnathostomiasis, Spirurin type X-larva infection, Ascaris suum-lava infection and other diseases.

Parasitology Research in Japan

The Japanese Society of Parasitology (JSP) is the primary academic society for Japanese parasitologists (Table 2). In addition, there are the Japan Society of Medical Entomology and Zoology and the Japanese Society of Tropical Medicine.

The largest numbers of JSP members are associated with medical schools, followed by veterinary schools, and other research institutes, such as the National Institute of Infectious Diseases, National Institute of Public Health, National Institute of Animal Health, International Medical Center, and Japan Association of Parasite Control (Table 3). In some medical schools, however, departments of parasitology or medical zoology have disappeared during the last 20 years because of the steep decline in parasitic disease prevalence in Japan. The numbers of staff in each parasitology department have also been continually decreasing.

In this trend, many Japanese parasitologists have gradually shifted their research interest from domestic issues to more world-wide interests, such as malaria, leishmaniasis, and schistosomiasis, as well as to more broadly disciplined interests such as immunology and molecular biology. To analyze the recent research trend in Japan, papers presented at the JSP annual meeting in 1999 and 2000 were classified according to the parasite species and the categories of study, such as epidemiology, immunology (Figs. 1-4). Large numbers of papers on malaria were presented at the JSP meeting, and the majority of them consisted of basic immunological and molecular biological studies. This is also the case for papers on Leishmania, Trypanosoma, Toxoplasma and Entamoeba. For trematodes and nematodes, relatively large numbers of papers also focused on immunological issues for Schistosoma, Strongyloides and Nippostrongylus. For Cestoidea, contrary to papers on protozoas, nematodes or trematodes, the epidemiology of Echinococcus was at the top of the list, reflecting that the epidemics of Echinococcus multilocularis in Hokkaido are currently a serious concern.

The majority of academies in the parasitology field in Japan receive research funds as grants from the Ministry of Education, Science, Sports and Culture, Japan and some from the Ministry of Health and Welfare, Japan. Total amount of money dispensed to parasitology research from the Ministry of Education, Science, Sports and Culture in the last 3 years was 3-4 million dollars annually, which was approximately 0.5% of the total budget for science research funds from the Ministry (Table 4). Among research grants in the parasitology category, approximately half of the budget was allotted to a special project aimed at developing new molecular strategies for malaria control. However, this malaria project was finished this year, and the start of a new special project in the parasitology field is awaited. From the Ministry of Health and Welfare, a total of 1.5 million dollar grants has been offered to parasitology fields, and this is allotted to special projects as shown in Table 5.

Parasitic diseases and parasitology research in Japan was briefly reviewed. Japan still has and will continue to have public health problems on at least several parasitoses, some due to traditional dietary habits among Japanese, some to rapid expansion of international commerce and demographic movement, and some in accordance with the emergence and reemergence of various infectious diseases world-wide. However, it is also a reality that the importance of parasitic diseases in public health has declined in the last 50 years simply because of the elimination of most of the classic parasitoses in this country.

Therefore, it is natural that Japanese parasitologists have gradually shifted their interest into tropical parasitoses and/or more basic immunological or molecular biological topics. In the 21st century, solving the mystery of the host-parasite relationship using new technology might be one of the most challenging areas of research. However, it is also our duty, or rather our most basic role, to respond to the needs of the presentday problems in society, and I must admit that current Japanese parasitologists have not necessarily been active enough on this point. We are asked to contribute, directly or indirectly, to the control of parasitic diseases. We need more collaboration with our colleagues throughout Asia.

Table 1. Numbers of parasitic diseases case reports in Japan Found in Japana Centra Revuo Medicina Database (1995-1999)

Protozoa		**Trematoda**		**Cestoidea**		**Nematoda**	
Entamoeba	167	*Schistosoma*	90	*Diphyllobothrium*	62	*Anisakis*	99
Pneumocystis	154	*Paragonimus*	49	*Sparganum*	31	*Dirofilaria*	54
Toxoplasma	102	*Clonorchis*	16	*Taenia Solium*	27	*Ascaris*	52
Plasmodium	94	*Fasciola*	13	*Echinococcus*	21	*Strongyloides*	48
Acanthamoeba	35			*Taenia saginata*	6	*Toxocara*	27
Giardia	14			*Diplogonoporus*	5	*Gnathostoma*	23
Leishmania	13					*Spirurin*	19
Amebic encephalitis	10					*Ascaris suum*	16
Isospora	6						
Trichomonas	6					*Hookworms*	11
Cryptosporidium	5					*Enterobius*	10
						Angiostrongylus	8
						Trichuris	8
						Trichinella	5
Total	606		155		152		393

Table 2

	The Japanese Society of Parasitology	**The Japan Society of Medical entomology and Zoology**	**The Japanese Society of Tropical Medicine**
Founded in	1929	1948	1959
Members	900	600	600
President	Prof. Mamoru SUZUKI	Prof. Yasuo CHINZEI	Prof. Akira IGARASHI
Annual Meeting	Every year in April	Every year in April	Every year in Autumn
Publication	*Parasitology International*	*Medical Entomology and Zoology*	*Japanese Journal of Tropical Medicine and Hygiene*

Table 3. Medical and Veterinary Schools in Japan

	Medical Schools		**Veterinary Schools**	
	National and Provincial	Private	National	Private
Total number	51	29	11	5
Parasitology or Tropical Medicine Department	35	14	3	5

Table 4.

Research grants from the Ministry of Education, Science, Sports and Culture in parasitology research category

Year	Special Project	International Project	General Project	Total
1999	† 197(1)*	0(0)	267(100)	464(101)
1998	185(1)*	65(12)	126(78)	376(91)
1997	203(1)*	44(9)	136(69)	383(79)

† Million Yen (number of projects)   *Malaria project

Table 5. Research Grants from the Ministry of Health and Welfarein parasitology research category

Year	Million Yen	Projects in 2000
2000	164(8)	malaria (3) cryptosporidiosis (1)
1999	168(8)	amebiasis (1) trypanosomiasis (1)
1998	118(7)	echinococcosis (1) schistosomiasis (1)

(number of projects)

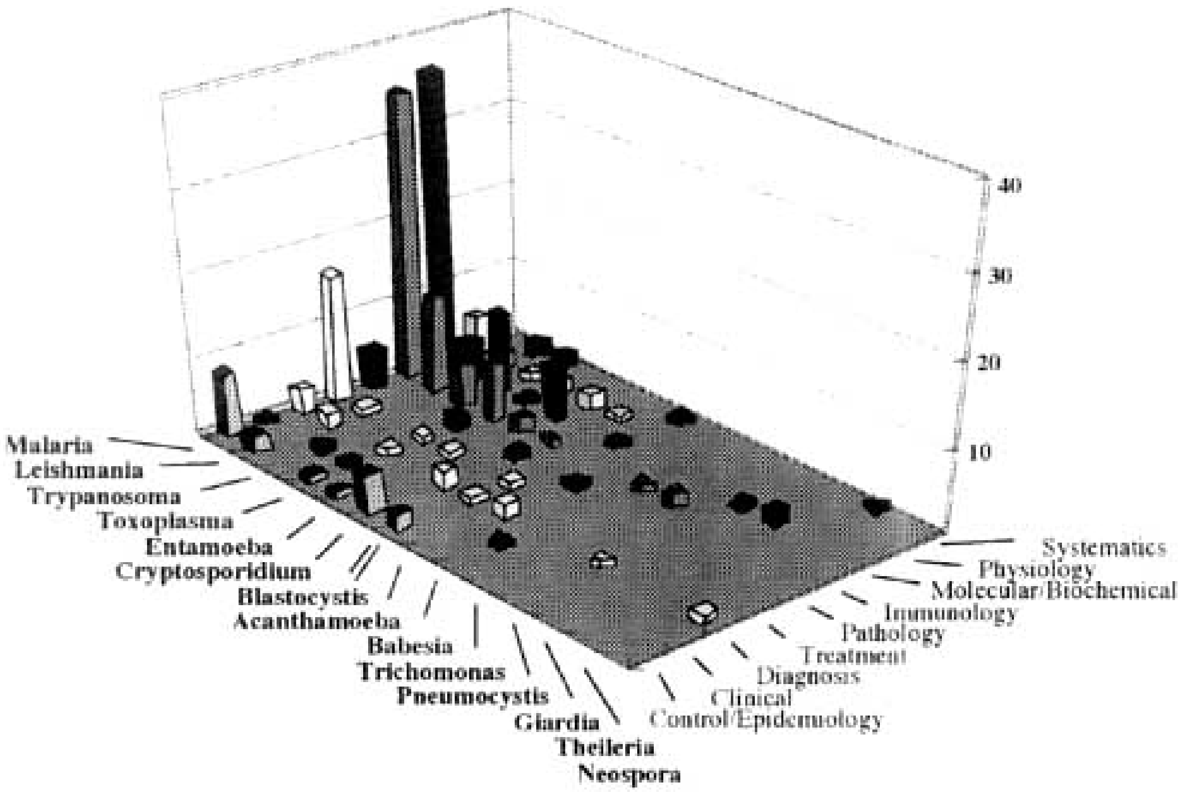

Fig. 1 Papers presented at JSP annual meetings, 1999 and 2000 (Protozoa)

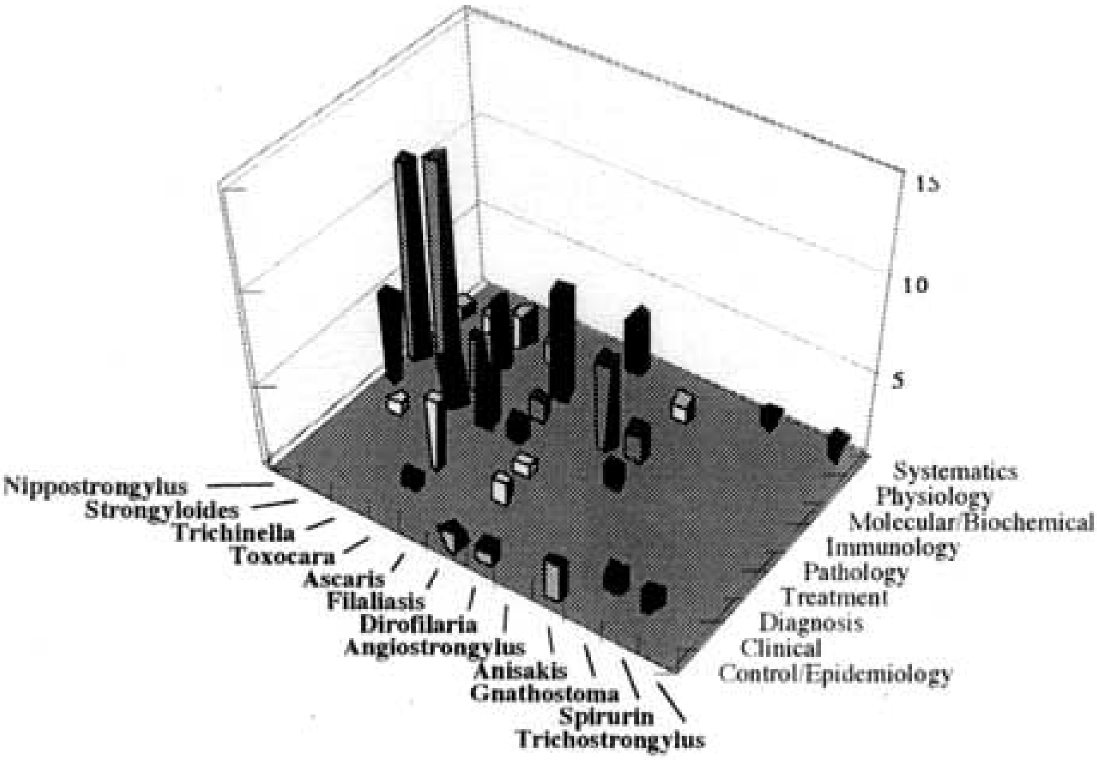

Fig. 2 Papers presented at JSP annual meetings, 1999 and 2000 (Nematoda)

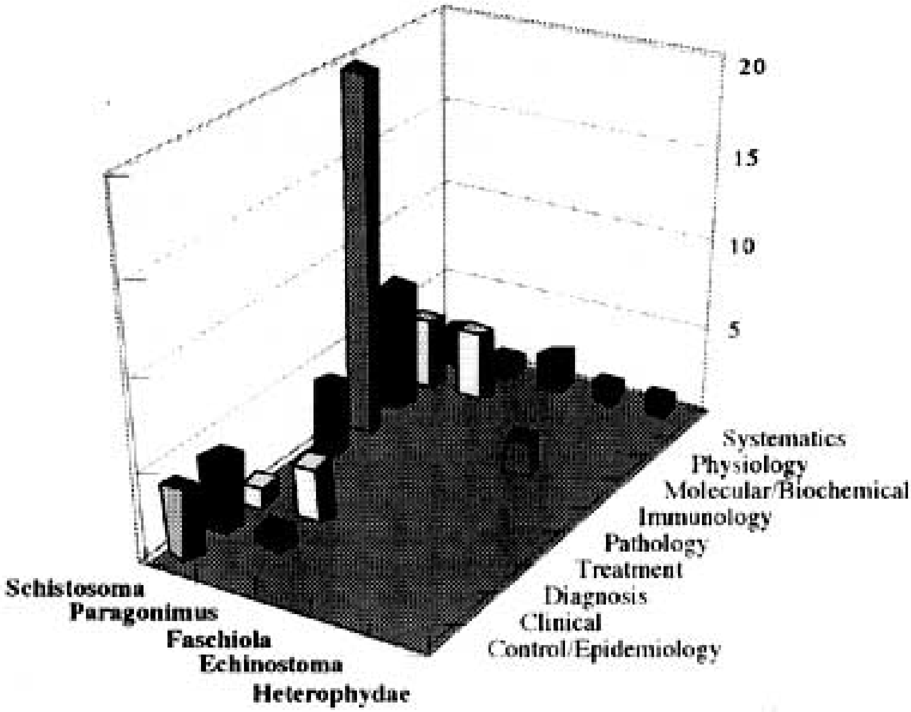

Fig. 3 Papers presented at JSP annual meetings, 1999 and 2000 (Trematoda)

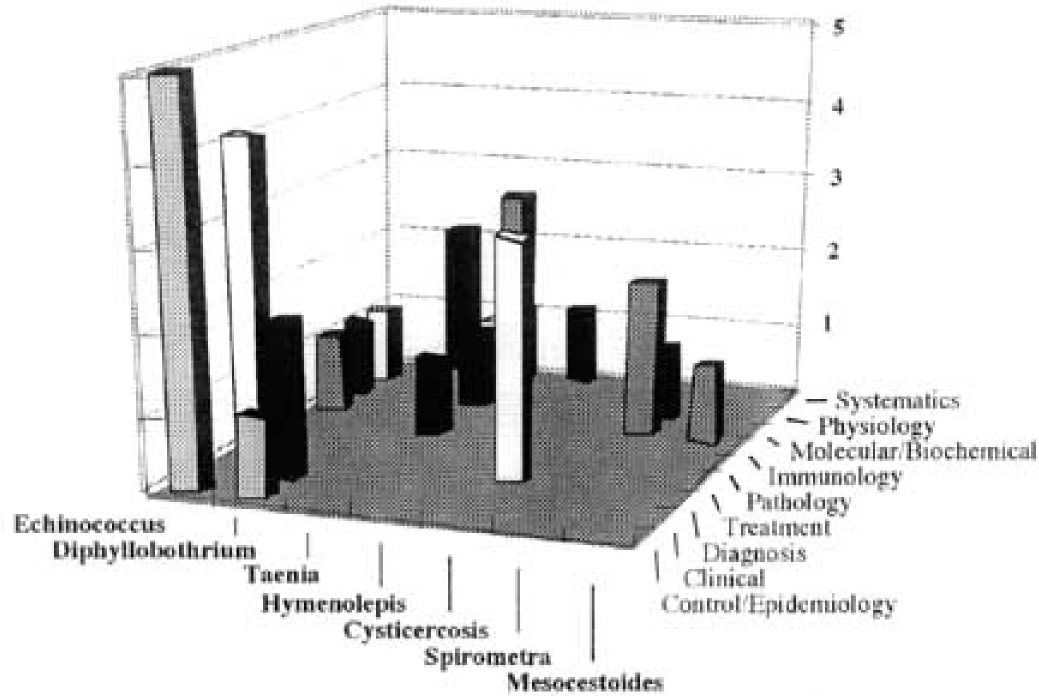

Fig. 4 Papers presented at JSP annual meetings, 1999 and 2000 (Cestoidea)

The Asian Parasite Control Organization (APCO) and an Achievements of Parasitologists' Group

Takaaki Hara, Shigeo Hayashi, Junko Kajima

Japan Association of Parasite Control (JAPC)

Introduction

In February 1974, the late Mr. Chojiro KUNII, Executive Director, JAPC advocated establishing the APCO and the first preparatory meeting to be held in Tokyo participated by the representatives of Korea, Taiwan and Japan.

In fact the first Conference of APCO was held in August 1974 in Tokyo with newly participating countries of Indonesia, Thailand and Philippines.

The objective of APCO was to transfer the Japanese experiences of soil-transmitted helminthiases (STH) control to other Asian countries. Japan has succeeded STH control and also has a rich experience and technical know-how of program management.

At the same time, another objective was hidden behind the APCO, that to promote family planing (FP) activities in developing countries through STH control.

The advocator, the late Mr. Kunii, he is also take a position as the Executive Director of Japanese Organization for International Cooperation in Family Planning (JOICFP), had much concern about actual situation of FP.

In those days, FP was often promoted as population control in developing countries, with little concern about the people's health and welfare. Community people, therefore, did not show their interest in FP nor hardly participated.

At the first conference of APCO, he proposed unique idea of utilizing parasite control, especially STH, as a partner of the Integrated Project of FP, Nutrition and Parasite Control (IP). He strongly suggested that Japanese experience of the STH control could serve as the best partner to help other community activities including FP develop in every part of the world.

APCO Parasitogists' Group

Since then, General Conference of the APCO had been held every year until 1989 as an APCO/FP Integrated Conference.

At the beginning, though STH diseases were spreading almost all countries in Asia and South East Asia, they weren’t recognized as major problems among researchers.

In order to promote the IP, it is required that to conduct basic and/or operational research to provided the results/outcome at the annual APCO/FP Conference. In 1979 the first APCO Parasitologists’ Meeting was held in Tokyo, Since then, the meeting mostly held in Tokyo with only few exceptional occasions.

The research were finalized by respective principal investigators and adopted in the series of the “Collected Papers on the Control of Soil-transmitted Helminthiases” to be published once in every 3 to 4 years as shown below.

Year and place of APCO Parasitologists’ Meeting

Times	Year	Place	Publication of Collected Papers
1	1979	Tokyo	
2	1980	Tokyo	Vol. I
3	1981	Tokyo	
4	1982	Tokyo	
5	1983	Tokyo	Vol. II
6	1984	Kathmandu	
7	1985	Tokyo	
8	1986	Tokyo	Vol. III
9	1987	Tokyo	
10	1988	Beijing	
11	1989	Jakarta	Vol. IV
12	1990	Tokyo	
13	1991	Tokyo	
14	1992	Tokyo	
15	1993	Tokyo	Vol. V
16	1994	Tokyo	
17	1995	Tokyo	
18	1996	Tokyo	
19	1997	Tokyo	
20	1998	Tokyo	Vol. VI
21	1999	Tokyo	
22	2000	Tokyo	

Gradually the number of countries, which participated in the APCO Parasitologists' Group increased from six original countries up to thirteen at the latest as shown below:

1977: Malaysia, Sri Lanka

1978: Nepal

1979: Bangladesh

1984: China

1988: Vietnam

1997: Laos

The subjects of research were classified into several areas as:

1）Examination method and/or technique

2）Epidemiology

3）Treatment

4）Control

5）Health hazard

6）Socioeconomic hazard

7）Nutrition

8）Training of the project personnel

9）Implementation of the control activity

10）Biology and physiology of the worms

11）Information exchange of various imporant issues concerned

Among these subjects, examination method and technique for detection of parasite eggs were considered as most important and taken up for study at the beginning.

It is because mass population is required in stool check-ups for the data's comparison among countries and areas.

For this purpose, the technique should be:

1）Efficiency in mass parasite examination

2）Accuracy

3）Simple procedure

4）Inexpensive

In this regards Japanese experts recommended to utilize Cellophane Thick Smear Technique (Kato method) and Quantitative Cellophane Thick Smear Technique (Kato-Katz method). The efficiency and usefulness was tested and confirmed by each researcher of member countries.

As a result these examination technique were uniformly adopted in the countries as the standard, and

WHO also started to recommend these methods as useful and applicable technique for mass stool examination of STH.

The epidemiological subject also essential for implementation of STH control. Many researchers started their investigation in this field and especially in detail about:

1）Seasonal fluctuation of STH infection

2）Infection sources

3）Infection route

4）The relation between STH infection and environmental status

5）People's life style

6）Educational status

7）Social status

8）Utilization of existing community group

9）Attitude of the community, especially community leaders and so on

The information gained was so useful for not only effective control but also for gaining people's better understanding and interest in STH control.

The issue of treatment and control was attractive them for researches. Many anthelmintics such as piperazine, levamisole, pyrantel pamoate, mebendazole including the latest albendazole were tested with respective population concerned to assess efficacy, appropriate dosage, necessary frequencies and duration required for the periodical deworming plan in mass treatment.

It was indicated that for the control of *Ascaris* and hookworms almost all trials could give satisfactory results in reducing both infection rates and infection intensities among the target population.

Some researchers are tried to minimize the standard dosage of chemicals and others tried to treat at a single dosage instead of repeated administration.

The local herbs also tried in Thailand, Nepal and Sri Lanka, especially, Ma-klua *(Diospyros mollis)* one of the flutes of the indigenous plants was found effective against *Ascaris* and hookworm in Thailand and widely used, however, few cases of optical impairment occurred then it had been stopped.

For deworming of *Trichuris*. One of them is the seed of a kind of tree named "*Embeliia ribes*" grown in India, Nepal and Sri Lanka were tried by researchers of Nepal and Sri Lanka. In Nepal satisfactory result were gained, while in Sri Lanka it was not considered so efficient.

In Nepal there are several indigenous drugs which have been in common use for the treatment of parasitic infections. One of them, "*Butea monosperma*" was studied, a seed of this plant was prepared in fine powder and encapsulated in 500mg capsule, and effective for *Ascaaris,* hookworm and *Trichuris* infection. Most of the cases taken this drug passed the worm, but egg reduction rate and cure rate have not been demonstrated yet.

Furthermore, a lot of important contributions was found on biology, physiology of the worm, Many encouraging results of successful control program against *Ascaris* infection came in Korea and Taiwan and other countries.

Clinical manifestations and socioeconomic loss due to STH infections were researched too.

It was obvious that all the efforts made by the researchers of the APCO Group have been of great use in providing the scientific basis in initiating and conducting the control program in each respective country.

Conclusion

The contribution of the APCO Parasitologists' Research Group should be highly evaluated especially in the following points:

1）To make a determined scientific basis in STH control program

2）To stimulate and promote new field of researches on STH

As a results, a number of experts in STH research were generated to play key roles as excellent resources when the STH control projects were expanded to other countries in the world.

It is very unfortunate that the APCO Parasitologists' Meeting will be suspended from the year of 2001, due to the financial constraint. The networks and relations among the APCO Parasitologists' Group are firmly maintained.

We sincerely with the APCO will be resumed in near future.

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A Brief Overview of Medical Parasitology in China

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The earliest investigations of parasitic diseases in China emerged in the 70s of last century, Which began with the work done by some foreign doctors working on customs of China, e.g. the Manson's discovery in Xiamen inChina in 1878, reporting for the first time that mosquito was the intermediate host of *Wuchereria bancrofti* and its vector. Then since 1887, more foreign doctors from missionary hospitals setting up mainly in trading ports of China had migrated to the study of pathogenic parasitic diseases in China, among whom, the outsrtanding representative was Maxwell, who published a book giving a full account of the state of parasitic diseases at that time in China. After 1920, Faust and other foreign parasitologists came to China and did further investigations of parasitic diseases in China on the basis of the work previously performed by foreign doctors in custom and missionary hospitals, involving filariasis. schistosomiasis, clonorichiasis, fascioliasis and some protozon infections. Around 1930, a small number of Chinese scholars began to do our own work focusing on epidemiology of parasitic diseases in China, who made very important contributions to the early development of parasitology in China. It was obvious that after 1930, Chinese investigators had gradually replaced foreign doctors and scholars to become the main body of being engaged in Parasitology research in our own nation. Unfortunately further development in this field was retarded until the mid of this century owing to the absence of funding and manpower, resulting from neglect or the ruler in old China and chaos caused by war. Before 1949, the development of parasitology in China was very small by today's standards but nonetheless enough to specialization.

After foundation of People’s Republic of China, in view of the fact that parasitic diseases were one of leading causes of morbidity and mortality in China, the government has attached importance to parasitic disease control. Since early 1950s, parasitic disease problems with emphasis on malaria, schistosomiasis, filariasis and leishmaniasis etc have bccome one of highlights in national disease control efforts and after many years or control efforts, outstanding Progresses have been made with remarkably decline in morbidity And mortality of these diseases. Perhaps the biggest story of our many proud accomplishments is the significant success in the control of leishmaniasis, filariasis, malaria, as well as schistosomiasis. It is emphasized that the outstanding accomplishments we have had in parasitic diseases control, to a great extent, benefit from the development of education and research of medical parasitology, which has yielded critical control strategies as well as improved tools for control, and builded up our own professionals.

Parasitic diseases remain one of major health problems in China today

In despite of great success in the control of those parasitic diseases mentioned above, it may not be surprised that even now, 708 (7.04-7.12) million individuals in China are currently infected with a variety of parasitic diseases in view of resource shortage for control program in developing country. A nationwide survey of distribution of parasites in China performed during 1988 - 1992 under the auspices of the Ministry of Public Health, with stratified masses randomly sampling, all data being pub1ished in a book "*Distribution and Pathogenic Impact of Human Parasites in China*", Showed that the overall infectio1, rate of parasites was 62.632% with 60 species of human parasites detected,. From analysis of data obtained, two major trends in epidemiology were noticed. For one trend, the infection rate of *E.histolytica, Fasciolopsis buski* and soil-transmitted helminthasis declined markedly, and the second trend was that the prevalence of food-transmitted ones (trichinellosis, clonorchiasis, paragonimiasis, cysticercosis and hydatiosis) seems increasing. Subsequent to the nationwide survey, we should say that parasitic diseases remain one of major health problems in China and contributing to their severity and spread is the economic restrain at the current level of social and economic development in China and the inadequate attention paid by modern medical science. At present, a national coordinated effort to bring the resources of modern science to bear on the control of parasitic diseases has been further enhanced, and at least three Experts' Advisory Committee in the Ministry of Public Health, composed of distinguished scientists from the country are involved in the affairs of parasitic diseases control (malaria, schistosomiasis and other parasitic diseases). Looking to the future, We must continue our effort in consolidating and developing the accomplishments we have had in the control of malaria, schistosomiasis , filariasis, leishmaniasis etc, and identify other control priorities of target diseases. To this end, better ways must be found to apply existing control methods, improved tools must be developed, and solutions must be identified to circumvent and combat emerging problems. Of course, funding resources will be critical. In addition, The further development of parasitology in China needs to be staffed by new generation scientists, including parasitologists.

Education of parasitology in China

Parasitology education in China probably began in 1920s with the practice in medical schools when the departmental organization was usually microbiology (bacteriology) or pathology, which means it did not fully establish itself as a separate and distinct discipline at that time, e.g. Hong Shi-lu (1894 - 1955), the founder of medical parasitology in China, was appointed as a professor of both patho1ogy and parasitology in National Beijing Medical University, Jin Da-xiong, a professor of pathology first, then parasitology in Guiyang Medical College and Chen Xin-tao, a professor of both bacteriology and parasitology in Ling-nan University. In 1935, the National Committee of Medical Education promulgated curriculum list of medicine, in which parasitology was specified for the first time as a separate course.

In carly 1950s in view of the fact that the development of education and research of parasitology could yield real impact on the scientific and technical advances of disease control, the Ministry of Public Health conducted a few of training courses for persons qualified to teach medical parasitology in Nanjing, directed by professors Wu Zheng-jian and Mao Shou-bai and then about 40 trainees from this training course went to medical schools all over the China top set up teaching units specialized for medical parasitology. Nowadays, in 177 medical schools and universities in China, parasitology is one of required courses for medical undergraduates, which is offered by department of parasitology available in each school, providing medical undergraduates with appropriate learning opportunities of parasitology through a series of lectures. The biological properties of parasite, the specific mechanisms of pathogenesis and epidemiologic characteristics, the host response, means of laboratory diagnosis, considerations of public health, control measures, and prevention are primary foci for study. Recently parasitology departments in some medical school and universities have been integrated into department of bio-pathogen biology but parasitology is still a course in the new departmental organization. In addition, for teaching needs, up to now there has been 4 editions of recommended textbooks of human parasitology published.

Since 1 940s, there has existed postgraduate education of parasitology in medical schools and institutes but very small in scale till 1960s. The real development of postgraduate education in parasitology started with the establishment of degree system in China in 198l. Now, in China there are about 40 parasitology postgraduate programs for master degree. And more than 10 medical schools and institutes have been approved to grant doctor degree in parasitology. The development of postgraduate education has changed the structure of formal Schooling record and academic degree of professionals working, on parasitology, and has promoted the proccess of integrating parasitology with the most advanced disciplines in modern biomedicine : imunology, molecular biology and cell biology etc, and meanwhile, in this field many young scientists with probing mind and well grounded in modern parasitology involving multiple disciplinary knowledge have been growing up, who will bring much strength and vision to further recruiting effort in parasitology.

The research of Parasitology in China

As mentioned above, the parasitology research in the nation started with some foreign doctors and scholars' work in the 70s hat century and then Chinese Scholar began to do our own investigations in this field. The first research institute in China for tropical diseases with emphasis on parasitic diseases was set up in 1928 in Hangzhou, named "Hangzhou Institute of Tropical diseases" and then "Central Program for hygienics" was set up in 1932-1933, consisting of 9 departments. Among them one was parasitology department dealing with survey and control of parasitic diseases. Afterwards, a couple of local research institutes were established one after another.

The past years have been outstanding for parasitology research in China. Since 1950s, many research programs have been highly productive and have led to numerous publication in jounals. According to incomplete statistics, there were more than 20,000 articles and reports of parasitology published in a variety of journa1 during 1949-1986, which reflected that the parasitology research in China was so active. Those articles and reports could be read in some international journals and domestic journals including some our own parasitology journals published in Chinese with English abstract, e.g. *"Chinese Journal of Parasitology and Parasitic Diseases", "Chinese Journal of Zoonoses", "Acta Parasitologica et Medical Entomologica Sinica", "Chinese Journal of Schistosomiasis Control"* and *"Chinise Journal of Parasitic Disease Control"* etc. Besides the biggest one, Institute of Parasitic Diseases, "Chinese Academy of Preventive Medicine" in Shanghai there are about 17 of institutes specialized for parasitic disease research, located in provinces. which are offered specific budget by provincial goverments to pursue a variety of work linking to control program, and also pursue research projects mainly at the applied level in laboratory and fields. It should be emphasized that the involvement of medieal schools and universities in parasitology research has led to striking developments in many fields, in which the research projects are usually at both basic and applied levels by use of modern research techniques. The application of advanced techniques make parasitology as a discipline not only undergo a revolutionary change in the past few decades and yield a strong appeal to young generation of parasitologists. Current major research highlights in medical schools include the development of diagnostic tools, mcchanisms of pathogenesis, the modulation of the host's immune response with special attention to vaccine development. These departments are now expected to expand more and more modern research techniques.

With regard to the funding for parasitology research, the grant supports have been offered by different sources inside or outside China. In recent years, research projects have been granted by some important sources at national 1evel, e. g. National Natural Science Foundation, National 5 years' plan for tackling key problems in Science and Technolngy, the 863 high-tech foundation from the State Scientific

Committee of China, and starting from 1995, an input of 6 million Yuan for five years have been provided by the Premier Reserve Funds of the State Council for the development of vaccine against S.japonicum infection. However, current support from government and other origins is far from enough and so more input of funds into the research of parasitology is urgently required.

Regular academic exchange between parasitologists is facilitated by society meeting. In China the following societies are involved in the field of parasitology: the Society of Tropical Medicine and Parasitology under the Chinese Medical Association, the Society of Medical Parasitology under the Chinese Association of Preventive Medicine and Society of Parasilology under the Chinese Society of Zoology.

Oversea collaborations

Today, there are many opportunities for Chinese investigators in the field of parasitology to pursue international collaborations through official or people to people channels, which enable us to improve research facilities, to train our young scientists and to share experience with foreign collaborators. The examples include “China-Japan joint Seminar on Parasitic Diseases”, “China-Korea Pilot study program for helminthes Control”, the training and study visit program sponsored by Sasakawa Foundation, “Regional Networking Group for Strengthening Surveillance & Control of Asian Schistosomiasis” and other projects supported by NIH in U.S, EC, WHO/TOR, private foundations and grants from foreign collaborators etc. The establishment of FAP will, no doubt, promote between Asian parasitologists goodwill and friendship which, I trust, will lead to further interflow of mutual visits and academic exchanges.

Measures against *Echinococcus multi1ocuralis* Targeting the Source of Human Infection

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During the mid-twentieth century, there was an expression of "This Wormy World (Stoll, 1947: J. Parasitol.)" to describe the abundance of parasitic worms in our society. However, with the widespread use of antihelmintics, roundworms and the related helminths had been almost eradicated in Japan. Nevertheless, with the increase of garbage from kitchens and from agricultural and fisheries waste materials as food for wildlife such as the red fox, the epidemiology of certain parasites had changed greatly.

In August 1999, Echinococcus multilocularis metacestodes were found in pigs in Aomori prefecture, on the mainland of Japan. Thus, the endemic area for this cestode, which had been hitherto confined to Hokkaido has been extended to the mainland of Japan. When this parasite infects the human body, it causes clinical signs similar to that of hepatic tumor for more than a decade. Since there is no effective antihelmintic for this alveolar hydatid disease, therapy is difficult when the patient starts to show clinical signs. In Hokkaido, ca. 400 people had been confirmed as having the lesions caused by this parasite and most cases of the disease had been reported fatal.

Echinoccocus multilocularis has skillfully adapted its life cycle to the predator-prey (foxes-voles) relationship. Humans are infected by ingestion of the parasite ova excreted from the predator. Human to human, or pig to human transmission of the parasite does not occur.

In April 1999, with the enactment of the "New Infectious Disease Ordinance", human echinococcosis, as diagnosed by detection of the parasite or the antibody against it, must be reported to the authorities within 7 days. Although such regulation had been highly regarded, much more needs to be done. The most important measure is to eradicate the source of infection of this disease. There is a need to identify and control the animal hosts that disperse the parasite eggs and also to set up a systematic program for controlling and containing the spread of the parasite.

Until the 1970's it was thought that echinococcosis in Hokkaido could be controlled by cutting one third of all foxes on the island, but such a measure proved to be fruitless. Studies on fox behavior had shown that they inhabit a defined territory or domain and that if a certain fox had been killed in a certain area, other foxes from the surrounding territory would move into the culled fox domain. Thus, the culling of foxes is thought to be counterproductive and has resulted in the migration of infected foxes and an increased infection rate among the animals, leading to further spread of the disease.

Presently, the prevalence of echinococcosis in Hokkaido foxes is about 60% and the parasite has also been detected in pet dogs and cats. If no actions are taken to control the source of infection of this parasite, then its spread to Honshu on the main land of Japan, will become a matter of time.

Several years ago, our research group at Hokkaido University developed a diagnostic method for fox detecting antigen in the feces of the infected fox, whereby it is not necessary to kill the animal in order to diagnose the infection.

In 1998, a deworming program to eradicate echinococcosis in wild foxes, involving more than 10,000 hours per year was carried out by our research group, in a pilot area facing the Sea of Okhotsk in northern-eastern Hokkaido, covering 200 Km2. The wild foxes were fed meat and fish sausage containing the antihelmintic, Praziquantel. Using

the coproantigen detecting method and fecal examination, it was observed that the number of foxes excreting the Echinococcus eggs had been reduced to almost zero despite the fact that some foxes were still positive for the coproantigen test which indicates there are still infected intermediate voles in the area. Thus, it is thought that if the deworming program were carried out more extensively, there is a possibility of eradicating the source of infection of the parasite from all foxes.

In an echinococcosis control pilot program that was carried out in southern Germany about 10 years ago, wild foxes were fed antihelmintic and then killed to evaluate the effectiveness of the deworming program. In the peripheral pilot area, the effectiveness of the deworming program was quite low due to the movement of other infected foxes into the test area following the culling of foxes there. However, the prevalence of echinococcosis among foxes in the center of the pilot area had been completely eradicated. Thus, both Japanese and German researchers had shown that it is possible to clean up our environment contaminated by infected foxes.

In 1994, the Parasitology Department of the Faculty of Veterinary Medicine, Hokkaido University, was designated as a reference center for echinococcosis by OIE. Since then, the aforementioned department has been collaborating with researchers from other endemic areas such as Uruguay, France and China, as well as with officials from international organizations such as FAO and WHO, in attempts to control the source of infection of the echinococcosis. Collaborative networks were also forged with researchers in EU countries in the form of exchange of scientific information as well as diagnostic reagents and antihelmintics used in sylvatic control programs.

A measure to control echinococcosis had not been taken by the Japanese government authority. In this context, I wou1d like to propose 3 points, which will not only help solve the echinococcosis problem domestically but also contribute to international cooperation.

The first is to add to the “New Infectious Disease Ordinance" the duty to authorities the authority the prevalence of Echinococcus infected animals which serve as the source of infection to humans, as well as the establishment of the diagnosis and quarantine of these animals.

The second is to establish a specialize research organization with facilities and human resources to handle infected animals and the ability to response to the needs of each individual local situation. For example, using the local agricultural and fisheries waste products to develop antihelmintic-laced baits for the deworming program of the infected foxes, development of a parasite vaccine for the foxes and training of experts and technicians to educate the public on prevention of the disease.

The third is to establish a network among international researchers where information exchange and scientific collaboration can transcend the borders of their countries in order to establish and perfecting the disease control program. This includes the free flow of information on the sources of infection, on techniques regarding the prevention of infection, and on the extension of technical cooperation to the endemic areas. These proposals are in line with the policy on the International Control of Parasitic Diseases (the so-called ”Hashimoto Initiative” as proposed by Japan in the 1998 summit meeting in Birmingham , England.

Constitution of the "World Federation of Parasitologists"

Mamoru Suzuki

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I - Name

The World Federation of Parasitologists-founded in Warsaw, Poland, 1960, hereinafter designated "The Federation", is a non-profit making association in the sense of Art. 60 of the Swiss Civil Code.

II - Aims

the aims of the Federation are:

a) To promote and co-ordinatc exchange of knowledge, research and other activities related to parasitism

b) To assure the continuity of holding International Congresses of Parasitology

III - Full membership

The full members of "The Federation" consist of scientific organisations concerned with parasitism. All full members are elected by the Council of the Federation.

IV - Admission, withdrawal and dismissal

The admission, withdrawal and dismissal of membera are detailed in the Bylaws.

V - The Council

The Council of the Federation consists of:

a) One voting representative officially appointed by each member Society.

b) Not more than two Additional individual members appointed by the Executive Board.

VI - Council Meetings

Council Meetings are to be held during and at the site of every international congress of parasitology.

Council Meetings are normally called by the Executive Board in accordance with the By-laws or by a quorum of the Council at any time. Business to be conducted will be in accordance with the By-laws and when necessary to amend the articles of the Constitution or to act on a motion for the dissolution of the

Federation.

The President of the Board or in his/her absence the ranking Vice-President shall conduct the Council meeting. Resolutions are carried by majority of the votes cast by the members present. Dissolution of the Federation or amendments of the articles of the Constitution must be agreed upon by two thirds of the members of the Council.

VII - The Executive Board

There shall be an Executive Board as described in the By-laws.

VIII - Functions of Executive Board.

The functions of the Executive Board are as described in the By-laws.

IX - Meeting of the Executive Board

Meetings of the Executive Board will be as described in the By-laws.

X - Mail Ballots And Extraordinary General Meetings

Decisions, normally taken at meetings of the Council (excluding amendments of the Constitution and dissolution of the Federation), may be resolved according to the By-laws.

XI - Minutes

Minutes of all meetings shall be kept according to the By-laws.

XII - Liabilities

a) Financial liabilities are limited to the funds of the Federation. Personal liability of the members is excluded.

b) The Federation shall not be responsible for the utterances or acts of its members.

XIII - Accounting

The accounting year ends on June 30.

XIV - Financial Statement

The Board submits to the Council at each meeting a financial Statement for auditing. The Financial statement must contain an exact accounting of the financial status of the Federation.

XV - Dues

The annual dues of members shall be recommended by the Executive Board for approval by Council.

XVI - Amendments

Proposed amendments to the Constitution should be sent to the Secretary al least 18 months before a scheduled Council meeting. Such amendments may be proposed by any member-association of the Federation.

The Secretary shall submit the properly proposed amendments to all members of the Council and members of the Executive Board at least one year prior to the scheduled meeting of the Council.

Changes to the By-laws can bc made at any Council Meeting provided that 24 hours notice be given, in writing, of such proposed changes.

The Council shall formally consider and act upon the proposed amendments at its regularly scheduled meeting. A favorable vote of two-thirds majority of the Council members present is required to adopt the proposed amendment.

XVII - Dissolution

The Federation has to be dissolved if its objectives cannot be fulfilled. Funds available after dissolution must be used in compliance with the objectives of the Federation.

BY LAWS OF “ THE WORLD FEDERATION OF PARASITOLOGISTS”

I - Name

The name will be that as stated in the Constitution

II - Aims

In addition to the aims as stated in the Constitution, an International Congress of Parasitology shall normally be held every four years.

III - Full membership

In addition to Full Membership status as described in the Constitution, the Federation, through its Executive Board. may invite other duly constituted governmental or non-governmental organisations which have interest in parasitology to have an observer, at the meetings of the Council.

To retain active membership in the Federation, Societies must pay the annual dues established by the

Council.

Affiliated Societies

Specialist and/or international associations without full membership status may join the Council meetings without the right of vote.

IV – Admission, withdrawal and dismissal

Members are admitted to the Federation by a majority vote of the Council upon submission of a written application to the Executive Board which must list current officers and state current membership. Members Can withdraw from the Federation at the end of a calendar year after submitting an official written notice to the Executive Board.

The Executive Board, by written notice, can propose the dismissal of Societies which do not comply with the Constitution or decision of the Federation. Such dismissal action can be appealed by writing to the Council within 6 months after receiving notification of removal Council decisions on appeals arc final.

V - The Council

The Council of the Federation is as described in the Constitution.

VI - Council Meetings

Council meetings are called by the Executive Board by written notice indicating the agenda four months in advance of Such meetings. The names of voting representatives from each Member Society shall be posted 24 hours Prior to each Council Meetings. The Council Meetings have the following powers:

a) To approve the business reports of the Executive Board.
b) To act motions presented by the Executive Board and by members of the council.
c) To elect the Executive Board by secret vote.
d) To elect financial auditors.
e) To determine the date and place of the next International Congress" of Parasitology

The Executive Board may ask individual persons as consultant or expert to join the Council meeting, supporting one or more items of the agenda. The observers of governmental and non-governmental organizations shall have no vote or responsibilities in the affairs of the Federation.

VII - The Executive Board

The Executivc Board will consist of the following : President, 1st, second, and third Vice-Presidents, Past President, 7 members at large, Secretary and Treasurer. The members of the Executive Board shall be elected by Council during its meeting at the International Congress. In case a Board member was previously a Council member, a replacement Shall be provided by the Society involved. They shall serve for a period between two successive International Congresses. Officers will be eligible for election to other offices. Only the Secretary and the Treasurer can be re-elected to their office. Normally, one of the Vice-Presidents shall become President upon election by the Council.

The order of seniority of the Executive Board members is the following: President, 1st, 2nd, 3rd Vice-presidents, members at large in descending order according to the number of votes obtained when elected. When the President is unable to serve, the first Vice-President shall act as President until the next ordinary general meetings. When the Secretary or the Treasurer is unable to serve, they shall replace each other. When another member of the Board is unable to serve, the vacancy on the Board shall be filled according to the vote obtained during the previous election.

Duties of Officers

The President shall be the chief executive officer of the Federation. The lst Vice-President shall be responsible for the appointment of a Resolutions Committee and shall report to the Board these resolutions to be considered by the International Congress at the Final Plenary Session. The Past-President shall be responsible for appointing a Nominating Committee which will present a list of nominations for positions on the Executive Board. Other nominations may be made by members of the Council but must be submitted in writing. at least 24 hours before the Council Meeting at which the elections will be held. Election will take place by secret vote during the Council Meeting.

The Secretary is responsible for mail, archives and convocations for meetings, the duty of noting down minutes, and care of the registers provided by law.

The treasurer is responsible for all financial concerns of the Federation including receipts, payments, maintenance of records for the different transactions and accounts for stewardship during the Council Meeting. The Treasurer is answerable for the Federations properties and must provide quarantees for that. Members of the Executive Board cannot serve as members of the Council and have no vote.

VIII - Functions of the Executive Board

The Board, through its Executive Officers, represents the Federation in matters involving other parties, decides on signature rights and appoints Committees needed to carry out the aims of the Federation.

IX - Meeting of the Executive Board

The President, or in his absence, the most senior member of the Board, calls the Executive Board meetings. Not less than four Executive Board members may request a special Executive Board Meeting.

Resolutions are to be decided by majority of the members of the Executive Board present, in a quorum of not less than 7 members. In case of tie votes the President shall cast the deciding vote. Resolutions of the Executive Board may be decided by mail ballot.

X - Mail Ballots and Extraordinary General Meetings.

Certain decisions, normally taken at Council Meetings, may be made either by mail ballot or at an Extraordinary General Meeting.

a) Mail Ballot: Circulation of a ballot to all Council members. The secretary sha11 send to all members of the Council an analysis of the questions together with a ballot for voting members. A reasonable time limit, norma11y three to five months, should be designated by the Executive Board for the retum of ballots. A majority of the ballots returned within the specified time decides the issue.

b) Extraordinary general meetings: These have to be called by the Executive Board at least 6 months before such meeting. Written notice of such meetings indicating the agenda should be sent to all members of the Council. At least one fifth of the members of the Council should have requested the meeting. Such extraordinary meeting would be held in thc international seat of the Federation (Switzerland).

XI - Minutes

The minutes of each meeting of the Executive Board and the Council of the Federation must be recorded and signed by the President and by the Secretary and distributed to the Board and Council Members.

XII - Liabilities

These are detailed in the Constitution.

XIII - Accounting

The accounting year is as described in the Constitution.

XIV - FinancialStatement

The Financial Statement is as described in the Constitution.

XV - Dues

Dues should be reasonable and should cover the legitimate expenses of the Federation.

XVI - Amendments

The mechanism for amending either the Constitution or the By-laws is described in the Constitution.

XVII - Dissolution

Dissolution of the Federation is as described in the Constitution.

Report and Sammary of 1st FAP Congress in Chiba, Japan

Rapporteurs: Dr. Lilian A. de las Llagas, Yoshiki Aoki, Kharirul Anuar bin Abdullah and Mamoru Suzuki

Opening Ceremony:

Dr. A. Yano: As Convenor

Dr. Yano said, that the idea of founding FAP has been discussed and refined by parasitologists attending the Japan-Korea Parasitology Seminar in 1995, and in 1998. The foundation of FAP was discussed by the organizing committee of Forum Cheju – 4 in Seoul in 1999.

The FAP thru the efforts of Prof. Isao Tada was organized and established in January 2000 and the topic of parasitic diseases in Asian countries and countermeasures were discussed.

The FAP aims to:
Contribute to the acceleration of economic growth thru control of Parasitic Diseases. It would serve as an official link to WHO, European and Federal Latin American Parasitologists.
Enhances global understanding
Seeks truth and arrive at excellent results

Dr. K. Isono: President, Chiba University

Dr. Isono emphasized the importance of controlling parasitic infections in Asia. Concerns like, malaria death of more than 1 million, and the incidence of parasitic disease affects the economy. He stated that the FAP should contribute to the control of these parasitic infections.

Chiba University has a centre for international students, and supporting international cooperation in sciences among Asians students.

Dr. I. Tada:

Dr. Tada narrated the background and philosophy behind the creation of FAP, since 1998, saying that it was the idea of Dr. Yano. He said that the FAP is a wider and flexible structure

Regionalization is a must because of the following:

Proximity of the problem

Sharing some parasites and infections

Case in sharing experiences

Civilization similar

Asian identity

The purposes include:

Formation of alliances – finance, resources, technology, meeting

Development of parasitology

Regional initiative

4. *Dr. Jong-Yil Chai:* KSP

Parasitology is a broad spectrum of sciences. This includes biology, entomology, medicine and public health. There's a huge number of parasitologists to discuss researches and share opinions. There should therefore be a meeting to discuss together.

Asian federation is not available; the trip to Columbia congress of a young number of Columbian parasitologists, felt that there should be a group of parasitologists in Asia to study their common parasites.

He wished for a successful and fruitful activities of FAP.

5. *Dr. Suzuki:* WFP President

Dr. Suzuki gave some background on the development of parasitology;

19^{th} century; parasite identification and environmental studies end of 1960’s; *T. gondii* life cycle was elucidated

overview of Health Parasitology

malaria always referred to, but still prevalent

guinea worm; an outstanding accomplishment

Japan; Hokkaido

Echinococcus re-emergenes thru Northern part of Japan

a dynamic change in parasite prevalence in Japan

Globally;

Agricultural development like irrigation causes change in parasite-vector relationships

Countermeasures?

Unknown occurrence ?

in 1993 in Korea, for ex. People were diagnosed to have malaria due to P. vivax, but have never been abroad, presumably the malaria parasite originated from a temperate area.

In Japan; Cryptosporidiosis is considered of emerging trends

In 1997, Dr. Hashimoto established a network to control parasite diseases that in 1998, a proposal was born the HASHIMOTO INITIATIVES

Other global developments include:

polio and guinea worm eradication

control of onchocerciasis

Dr. Suzuki, raised the question, on who should help in the control of parasites?

The answer was, the knowledgeable parasitologists

with what? The FAP – organization where ICOPA IX was held.

How? Molecular biology, in the 21st century with gene to cell study; faunal ecosystem, modern interdisciplinary sciences, and a need to form a group of parasitologists.

FAP is an organization of one union with global alliances.

6. Dr. M. Tsuji: *Pres. IX ICOPA*

Gave his congratulatory address, and stated the successful inputs of ICOPA IX, on the global and economic effects, and ensuring health of mankind.

He recommended:

Adoption of a global point of view to solve parasitic diseases not only domestic
Cooperation of Asian parasitologists to discuss operational research
Global parasite control in the 21st century thru FAP.

7. Dr. Khan, Pres. Xth ICOPA

He extended his greetings from Canadian Soc. Parasit congratulated the host, the conference should end, in collab. studies.

In Canada, where there are immigrants there is a risk of transmission. A highly trained personnel is needed for diagnosis. This conference is needed as information source. He enumerated endemic parasites in Canada. Zoonoses (6), and 5 migrant parasites. The most common include *E. histolytica*, *Trichuris* & *Enterobius*.

Intestinal nematodes / *E. histolytica* and *Plasmodium* are imported cases.

If parasites will continue, might lead to a morbidity problem.

He enumerated (the) factors affecting impact of parasites.
malnutrition – micronutrients (Vit) / minerals
contaminants in food – pesticides ; leads
genetically manipulated foods

Health Care is insufficient in Asia

End of Opening Ceremony; Round table

Round Table Session

Strategy for Asian-Co-Operation in Parasitology

APCO: Dr. Akira Hara

Dr. Hara talked about APCO, generally. That APCO is Asian activities and achievements in family planning thru STH control. He described Japanese experiences in the control of parasitic infections thru School Health and Community Health activities.

In 1977, Researches in Asian countries include examination technique, epidemiology, treatment and control measures. The first report of APCO was published in 1980 (Vol. I) and Vol. VI was published in 1998. Vol. VIII would be published in 2001.

The Hashimoto initiative has a similar aim with APCO

The recommendations of APCO:

Efficiency in mass examination
Accuracy
Simple procedure
Inexpensive

The examination methods should be standardized to have comparable results. He cited KATO, and KATO-KATZ should be used.

Epidemiology

The seasonal fluctuation infection, age, sex, regions and involvement of the community should be considered

Effective anthelmenthics

Efficacy, appropriate dosage, frequency and duration

Reduction in infection rates and intensity among target population

Tried single dose mebendazole

Herbal

Trichuriasis control was difficult

Conclusion:

APCO has contributed results for evaluation. New researches should be done by other group.

Questions/Comments:

Dr. M. Suzuki

The young generation does not participate very much in laborious work

Classical microscopy is no longer attractive to younger people

In the future *Ascaris* egg could no longer be identified

JAPAN-CHINA Joint Seminar – Dr. Yoshiki Aoki

The first semester in 1981, was the first joint seminar in Shanghai between Japan and China. This was followed in 1982 in Tokyo. Dr. Aoki said that 20 years ago there was little information about parasitic disease in China. Japanese professors were invited and they visited *Schistosoma japonicum* endemic area. The topics were *Schistosoma* (1982; 1983); malaria, filaria and schistosoma (1985), and malaria; vaccine (1988). In 1999, there was a recommendation that young parasitologists should take part in research.

Questions/Comments:

Is JAPAN-CHINA bilateral project, a closed association?

How about the financial aspect?

Japan – Korea

As a background:

Korea was endemic for filariasis. There was a research program on Brugian filariasis. This covers patients clinical signs and symptoms examination. The Japan-Korea bilateral program is a scientific program and a forum for exchanges of information. The Forum – Cheju (1995 – 2000) was run successfully. It seeked line of cooperation with Hashimoto initiative on operational researches and training. Its contributions to Hashimoto include, expertise of Korean scientists, training of young researcher, cooperative research program between Korea and Japan and cheap effective drug from Korea.

Korea – China

Organizations involved: thru exchange of experts

KOICAS (Korea International Cooperation Agency)
KAH (Korea Association of Health)
Korea-China collaborative project for the contribution of Parasitic Infections in China the amount of $311,000.00. The project was implemented by KAH under the NGO project of KOICA. The target was 4 provinces in China.

Results of Survey

Total stool examined: 6,137 using KK; FECT, HKW culture and anal swab
Each province has different prevalence

Questions:

Reasons for selection of pilot areas. (Dr. Tada)
KAP (knowledge, attitude, perception) done? (Dr. Anwar)

Southeast Asia: Dr. K. Anwar

There is no research collaboration in Southeast Asia. SEAMEO is not a research organization
Asian countries have common culture and values more than 50% are in Asia
There's movement from place to place due to labor force; source is immigrants. There should be screening.

Rationale

Most researches were done in the WEST
Discard/lessen dependency on the WEST

Asian should unite, there should be a voice of Asian Parasitologists; a platform; or a forum to unite; there should be a federation; an Asian Journal of Parasitology; Institute of ASEAN Parasitology; annual seminar; and a newsletter.

There should be a collaboration on:

research
exchange personnel
education
travel
sharing of experiences
bilateral share

The paper I have distributed summarizes my proposal

K. Hirayama

Proposals

FAP newsletter as an information source for FAP members; necessity of accessibility. Contents include: Basic Science, Applied Science Regional Report including finished and on-going study;

Grant/Scholarship information; Scientific meeting schedule, Registration and job search

Problems:

Reliability of information

Copyright

Editorial

Structure

Advisory

<u>Dr. Suzuki</u>

Dr. Suzuki talked about the characteristics of FAP, according to him:

European federation has veterinary science, emphasis on zoonoses

American Society has more zoologist e.g. fish parasitology, fish parasite; the medical parasitology has been transferred to the Society of Tropical Medicine

Asian make the major trends

He concluded by asking, "*Can I say that this is diagnostic feature?*"

<u>Dr. Shimada</u>

Dr. Shimada asked if it is an academic journal. He asked what is the characteristic of the journal?

<u>Dr. Tada</u>

Dr. Tada said, it should be a scientific publication, an INTERNET JOURNAL with 3 sections:

original paper

consultation; diagnostics and questions, and

announcement

A question was raised on who would be responsible for the maintenance. Dr. Shimada's name was mentioned as the responsible person on the technical aspect, the mechanics is an instantaneous approach, on per article basis.

THE FOLLOWING COMMENTS WERE GIVEN ON THE JOURNAL BEING PROPOSED:

As on on-line journal, it would be distributed in an electric form through computer network.

It can be read and printed as long as there is a set of computer system connected to global network. Ex. E-mail

What is good, is, it should be less expensive than hard copy and has no limited distribution.

What is not good, include the following reasons

Accessible with a set of computer
No change in editing work
An application software maybe necessary

A question of which type was raised - a mailing list (e-mail the most primitive), HTML (explorer/netscape) and PDF (acrobat reader)

Dr. Khairul Anward, commented that, every type has its own purpose. He also disagreed on the 2 negative remarks regarding on-line journal (refer to item No.4, above)

Dr. Arizono commented, "Scientific papers" should be included, regional editor is to be responsible to review the papers.

Dr. Yano said the problem was to collect responses from the members (tiredness of Dr. Yano). Someone commented that this is the responsibility of the secretariat. The homework of the secretariat are;

internet journal
FAP organization

Constitution

He emphasized that continuous effort is necessary from every member. It was a unanimous decision that the Newsletter would start.

To continue the activities of the FAP, Dr. Yano and many committee members of FAP (Dr. Arizono?) said that the organization of the FAP should be discussed.

Chiba University is the centre of contact - the sit of the secretariat, federation of officers and council members.

These personnel/composition should accelerate the activities of FAP thus making the society firm

There should be an establishment of an on-line journal

The copy of the proposed FAP organization, developed by Dr. K. Anwar has been given to every member, and all comments on the proposal, should be sent to Dr. Yano.

The flow of communication should be:

Individual information sent to Dr. Yano

↓

Dr. Yano selects important news

↓

Dr. Shimada

↓

Nagasaki University

Dr. Yano as the secretariat/as the coordinating body of FAP

DECISIONS MADE:

CHIBA University as the secretariat

Dr. Shimada in-charge of the internet journal

Proposal of Dr. Khairul (Malaysia) to be studied by everyone

(deadline for all comments to be sent on 30 Nov. 2000,to Dr. Yano)

Diagnostic characteristics of the FAP: Parasitology/and Parasitic diseases.

Other ideas presented by the participants;

Prof. Kamiya

FAP as an interdisciplinary basis
Vet. Med. Included
Get opinions from other parasitologists for FAP membership

CONCLUSION

There was a discussion of parasitologic concerns by Asian parasitologists
Dr. Urbani: PARASITOLOGY as key not only as a sciences – WHO will facilitate; e.g. technical results and regional needs

Dr. Yano thanked all the convenors and the participants. The participants express their hope for the success of FAP and each one gratefully thanked the organizers specially Dr. Yano, for having been invited to participate in the formalization and establishment of FAP.

It was a touching moment when Dr. Suzuki gratefully thanked Dr. Yano for doing an excellent job.

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