

**RECENT ADVANCES
IN RESEARCHES
ON FILARIASIS
AND SCHISTOSOMIASIS
IN JAPAN**

edited by MANABU SASA

RECENT ADVANCES IN RESEARCHES ON FILARIASIS AND SCHISTOSOMIASIS IN JAPAN

Edited by

Manabu SASA



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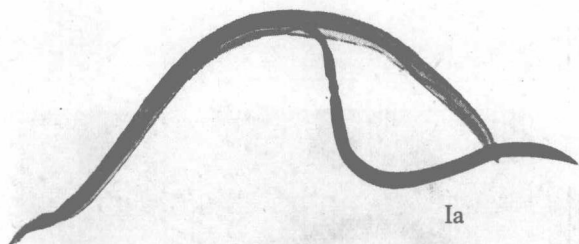
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Ia



Ib



Ic

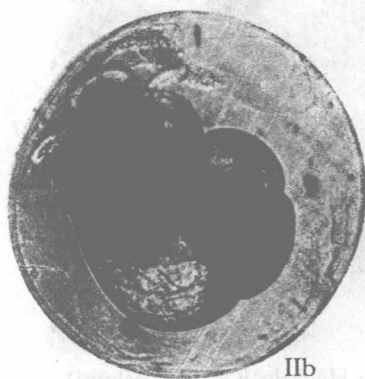
Ia. *Schistosoma japonicum*, male (above) and female (below)

Ib. *Schistosoma japonicum*, cercaria

Ic. *Schistosoma japonicum*, egg



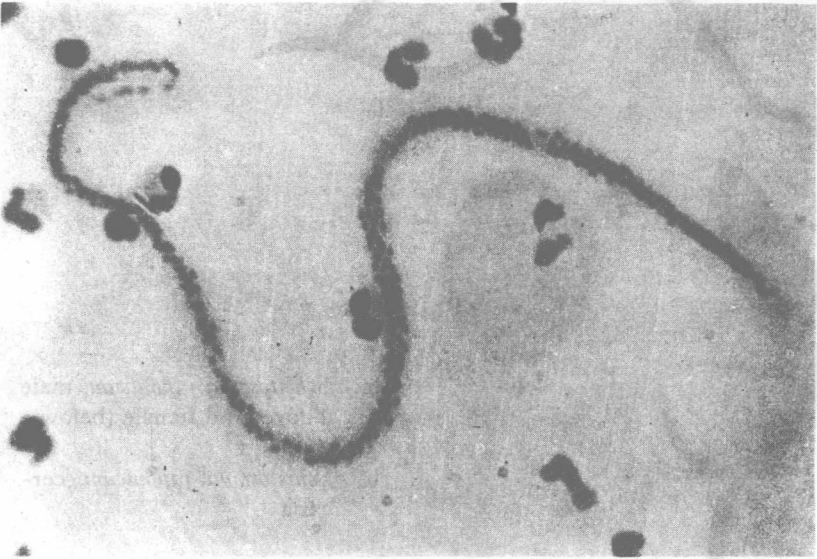
IIa



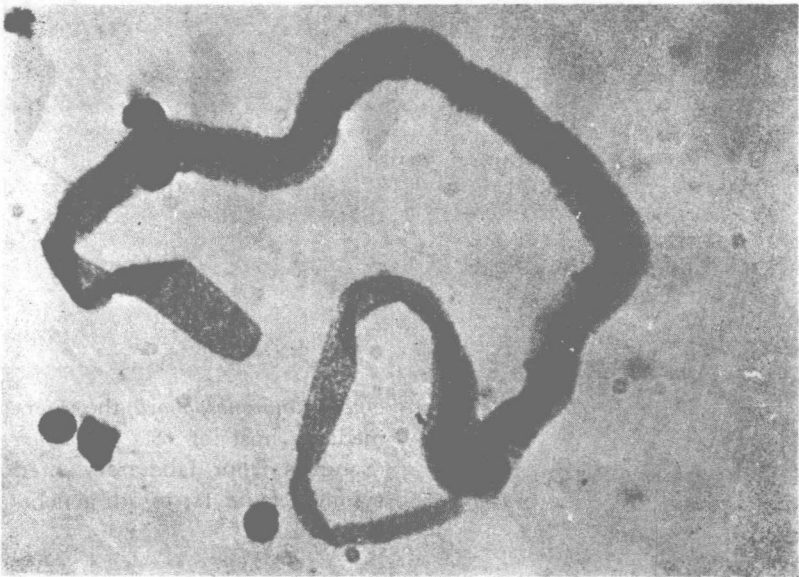
IIb

IIa. *Oncomelania nosophora*, the intermediate host of *S. japonicum* (Samples from laboratory bred colonies, from 1st to 5th generation)

IIb. Mature egg of *O. nosophora*



IIIa. Microfilaria of *Wuchereria bancrofti* (from Amami Island)



IIIb. Microfilaria of *Brugia malayi* (from Hachijo-Koshima Island)

PREFACE

At the First Joint Meeting of the Japan-United States Cooperative Medical Science Program held in Tokyo in 1965, a suggestion was made concerning the organizing of a research group on parasitic diseases (filariasis and schistosomiasis) as one of the five panels dealing with researches on important diseases in Asia. Dr. Y. Komiya was appointed Chairman of the Japanese Panel on Parasitic Diseases, and he in turn appointed four members to constitute the Panel and some 20 members to make up the working group. Nearly five years have passed since research activity on filariasis, schistosomiasis, and their vectors commenced under the Program. The Panel was reorganized in May 1968, and Dr. M. Sasa was elected Chairman; the working group had been expanded gradually to include 31 principal investigators affiliated with 19 research units at various universities and research laboratories in Japan as of December 1969. The Program was successful and fruitful in stimulating and encouraging research activities in Japan on filariasis and schistosomiasis, and remarkable advances have been achieved in the basic sciences concerned with parasites, vectors, and their related diseases, as will be summarized later.

The Japanese workers involved in the study of these two important parasitic diseases have had the privilege of being situated in or near the endemic areas of these diseases, and thus have been able to carry out extensive studies on the epidemiology and control of the diseases in human communities. Experimental studies have been also carried out on the parasites and the vectors in the laboratories, using modern equipments, chemicals and techniques. The successful mass breeding of *Oncomelania* snails for infection of animals with *Schistosoma japonicum*, and of cotton rats for animal experiments in filariasis has brought about promising prospects for future advances in experimental studies on the chemotherapy and immunology of the two diseases.

Both filariasis and schistosomiasis are still widely endemic in developing or tropical countries throughout the World causing sickness and disabling effects on several hundred millions of people. No satisfactory methods of control and treatment of the two diseases that can be easily applied in the developing countries have been developed yet. In this connection, it is considered that the basic and applied studies in these

fields are among the first research priorities in the medical and biological sciences.

This Symposium was compiled with the purpose of presenting scientific achievements made by the Japanese Working Group on Parasitic Diseases during the past four years after its organization. Due to the shortage of time allowed each worker for preparation of the drafts, some of the important work now in progress as well as the reports of some workers unable to meet the deadline have been omitted. It is intended that these works will be included in the next volume of this Symposium.

Our grateful thanks are due to Professor Toshio Kurokawa, Chairman of the Japanese Committee of the Japan-United States Cooperative Medical Science Program, who gave both support and encouragement to the activities of our Working Group, and to Dr. Goto and his associates in the Preventive Medicine Section, Ministry of Health and Welfare, for assistance in organizing the Panel and in the publication of this Symposium. We are also indebted to Dr. Leon Jacobs (Chairman) and other United States members of the Panel on Parasitic Diseases for their close collaboration in our research activities.

This book has been edited by the Panel members, M. Sasa, K. Okabe, T. Ishizaki, D. Katamine, and M. Yokogawa, with the cooperation of the working group members. The massive secretarial work such as the collecting of papers and the distributing of proofs was handled by Dr. Hiroshi Tanaka and Dr. K. Yasuraoka. We are greatly indebted to staff members of the University of Tokyo Press for their assistance in the publication of this book.

Tokyo, Japan
March 1970

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States Cooperative Medical Science Program

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Japan Environmental Sanitation Center, Kawasaki; Takeshi SUZUKI (Chief, Second Department); Insecticide resistance in mosquito vectors.

Department of Parasitology, Faculty of Medicine, Kyushu University, Fukuoka; Kenjiro KAWASHIMA (Lecturer); Biological control of *Oncomelania* snails.

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Recent Advances in Researches on
Filariasis and Schistosomiasis in Japan



The Filariasis Control Programs in Japan and Their Evaluation by Means of Epidemiological Analysis of the Microfilaria Survey Data*

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I. INTRODUCTION

Filariasis has long been one of the most important endemic diseases in Japan, causing suffering and disabling effects on large numbers of people living in the southern regions. In a catalogue of references on human filariasis in Japan compiled by Sasa, Hayashi, and Sato (1958), there were already over 500 papers published in medical literature. Comprehensive studies on the geographic distribution of the disease in Japan were made by Morishita (1951), Sasa and Hayashi (1952), and Sasa (1962, 1966).

Two species of human filariae have been known to be endemic in Japan; *Wuchereria bancrofti* (Cobbold, 1877) and *Brugia malayi* (Brug, 1937). The latter was discovered on a small island of Hachijo-Koshima, located south of Tokyo, by members of this Department in 1951 (Hayashi *et al.*, 1951, Sasa *et al.*, 1952). *Brugia malayi* having periodically nocturnal microfilarial activity and epidemiological characteristics associated with its occurrence in the principal mosquito vector *Aedes togoi* (Theobald, 1907), that breeds mainly in beach rock pools and in artificial containers in villages. The malaysian filariasis of this type was never found in other areas in Japan during extensive blood surveys carried out later in connection with a country wide filariasis control program, but occurrence of the same type of the disease was later confirmed on Sejudo Island, Korea and on coastal districts of continental China.

* This study was supported by a WHO Research Grant and a Japan-United States Cooperative Medical Science Program grant from the Ministry of Health and Welfare, the Government of Japan.

In blood surveys of army recruits from all over Japan in 1912 as reported by Army Medical Surgeon (Rikugunsho Imukyoku, 1913), microfilaria positive cases were detected in 55 of 74 regimental districts (Rentaiku), and the overall positive rate was 1.86% or 2,090 positive cases out of 112,353 recruits tested. The microfilaria positive rate was highest in Okinawa (17.6%), followed by districts in southern Kyushu (Omura 13.6%, Takase 11.5%, Kagoshima 8.5%, Yatsushiro 8.4%, and Miyakonojo 8.0%). The distribution of filariasis (presumably the bancroftian type) at that time as revealed by the country wide blood survey appeared to be very extensive, covering three of the four main islands of Japan; Honshu, Shikoku, and Kyushu. Later surveys made by various workers, such as the critical reviews by Sasa (1962, 1966), showed that clinical cases of bancroftian filariasis as well as the microfilarial carriers were distributed in large numbers in areas of Honshu, Shikoku and Kyushu. In general, the disease on the Honshu mainland was restricted to certain rural areas geographically isolated from each other and having usually very low prevalence in microfilarial rate and clinical filariasis rate (lower than 1 percent); the infection rates as well as the parasite burden of the people in these endemic areas are estimated to be decreasing year by year. On the other hand, it has been shown through the surveys carried out in recent years that the disease is still highly prevalent in some areas of Shikoku, Kyushu, and the adjacent islands, especially in the prefectures of Kagoshima, Nagasaki, Kumamoto, Ehime, and Kochi. Particularly noteworthy is the high prevalence of the disease in the islands of Amami and Okinawa, where the microfilarial rates and clinical filariasis rates have often been shown to be over 20 percent in the populations (Fig. 1, 2).

A systematic study on epidemiology and control of filariasis in Japan was initiated in 1952, when the Filariasis Research Committee supported by the Ministry of Education was organized with workers from the universities of Tokyo, Nagasaki, and Kagoshima participating. The Committee was reorganized in 1958 to undertake pilot experiments in the areal control of filariasis. Basic studies were carried out on the methods of microfilarial surveys and analysis of the data, comparative effects of various drug treatment regimens, and on bionomics and control of the mosquito vectors, as were reported in detail by Sasa *et al.* (1959, 1960, 1963, 1964, 1966, 1967). Based on results accumulated in these studies, the National Filariasis Control Program sponsored by the Japanese government was inaugurated starting in the fiscal year 1962, and the Filariasis Eradication Program of the Ryukyu Islands

Fig. 1

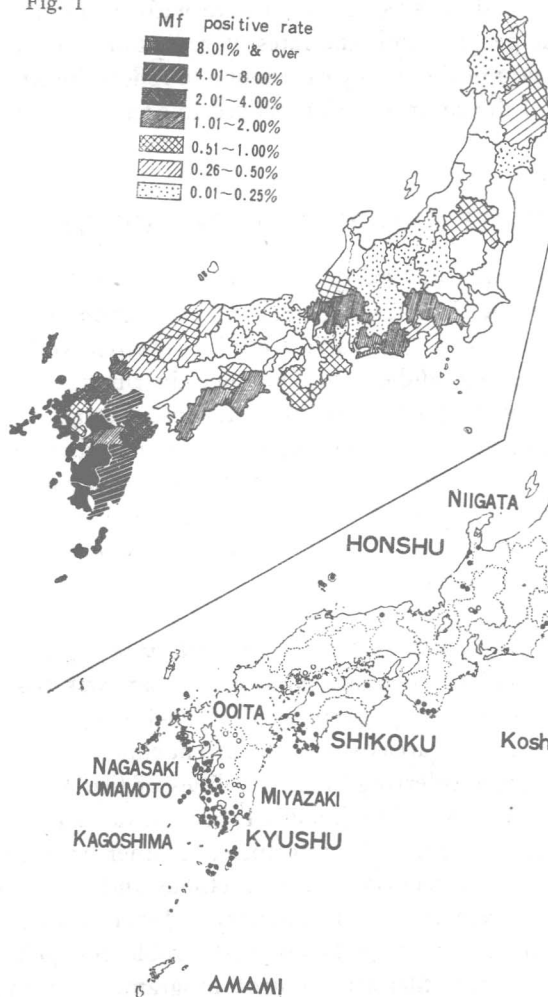


Fig. 2



was started in 1965 under the joint sponsorship of the Ryukyu, Japanese, and United States governments.

The present paper intends to describe the scientific backgrounds and methods of epidemiological surveys employed in the control programmes and to make statistical analysis of data accumulated in the course of microfilarial surveys before and after the application of the