STUDIES ON FILARIASIS IN THE PACIFIC: 5. *BRUGIA MALAYI* FILARIASIS IN TREATED AND UNTREATED POPULATIONS OF SOUTH BORNEO

H. SAJIDIMAN, R.S. DESOWITZ* and F. DARWIS**

Directorate of Communicable Disease Control, Jakarta, Indonesia. *Department of Tropical Medicine and Medical Microbiology, School of Medicine, University of Hawaii, Honolulu. U.S.A., and **Regency Health Office, Matapura, South Borneo, Indonesia.

INTRODUCTION

Previous studies in this series have been concerned with the epidemiology, as assessed by membrane filter concentration (MFC) diagnosis, of periodic and non-periodic Bancroftian filariasis in treated and untreated populations (Desowitz and Southgate, 1973; Desowitz *et al.*, 1973; Desowitz and Hitchcock, 1974; Oemijati *et al.*, 1975). This present report describes the results of a similar investigation on Malayan filariasis and is the first instance of a *Brugia malayi* microfilaraemia rate obtained by the MFC technique.

MATERIALS AND METHODS

This survey was carried out in the Banjar Regency (Kabupaten) of South Borneo (Kalimantan Selatan), an area of endemic *B. malayi* filariasis. A total of 287 one ml venous blood samples were obtained from individuals, ranging from 5 to over 50 years of age, living in two villages, Tanah Intan and Pengiuran Baru, that had not been previously subject to a mass diethylcarbamazine (DEC) administration campaign. A further 93 venous blood samples were obtained from individuals living in Air Puteh, a village whose population had completed a course of DEC treatment approximately $1\frac{1}{2}$ years previously.

In view of the periodic nature of the *B. malayi* in this area, all blood samples were obtained between 1900 and 2300 hours, Membrane filter concentration was carried in the manner described by Desowitz and Southgate (1973), the only modification being that Septisol^{R} (Vestal Laboratories, St. Louis, Missouri, U.S.A.) diluted 1:20 in water, was used instead of Teepol^{T} (Shell Chemicals) as haemolyzing agent.

RESULTS

Untreated population : The results of the survey of Tanah Intan are summarized in Table 1, for that of Pengiuran Baru in Table 2, and as consolidated data in Table 3. Reference to these tables reveals that in both communities MFC revealed approximately twice as many microfilaraemias for all age groups, as did examination of the 20 c.mm thick blood films. Microfilaraemia rates and densities were only slightly higher in the older age groups than for younger ages. For all age groups the mf rate and density were generally greater in males than females. There was considerable individual variation in microfilarial density ranging from 1 to 3,402 mf/ml. The average mf density of each age group was relatively low, approximately between 175 to 300 mf/ml (3.5 to 6 mf/20 c.mm).

Treated population (Air Puteh village): Prior to mass DEC administration a blood survey (20 c.mm thick films) carried out by Indonesian Ministry of Health personnel revealed a 12.5% mf rate in the population

Table 1

The number and percentage of microfilaria positives as detected by 1 ml membrane filter concentration and 20 c.mm finger prick blood in various age groups of Tanah Intan, S. Kalimantan.

Age group (yrs)	Total exam.	No. & (%) millipore + ve	No. & (%) 20 c.mm blood film + ve	Millipore/ blood film factor
5-9				
M	14	0	0	
F	19	7 (36.8%)	3 (15.8%)	
T	33	7 (21.2%)	3 (9.1%)	X 2.3
10-14				
M	15	2 (13.3%)	1 (6.7%)	
F	7	0	0	
T	22	2 (9.1%)	1 (4.5%)	X 2.0
15-20				
M	14	5 (35.7%)	3 (21.4%)	
F	5	0	0	
T	19	5 (26.3%)	3 (15.6%)	X 1.6
21-50				
M	46	19 (41.3%)	10 (21.7%)	
F	43	9 (20.9%)	2 (4.6%)	
T	89	28 (31.5%)	12 (13.5%)	X 2.3
>50				
M	6	3 (50%)	2 (33%)	
F	2	2 (50%)	0	
T	8	4 (50%)	2 (25%)	X 2.0
Total	171	46 (26.9%)	21 (12.3%)	X 2.2

of Air Puteh. The schedule of drug administration was 12 weekly doses of 5 mg DEC/kg and was completed in March 1972. A follow-up survey carried out in December 1973 gave a 2.4% mf rate. The present investigation was carried out in September, 1973, some $1\frac{1}{2}$ years after completion of the MDA campaign. The results of this survey are summarized in Table 4. MFC revealed a mf rate of 15%. The majority of these infections were of an extremely low grade nature, averaging 2.2 mf/ml. "Higher" density infection were also of a relatively low grade nature, about 1 to 2 mf/20 c.mm. However, it should be noted that the mf rate, as estimated by 20 c.mm thick films, appears to have increased from 2.4% to 4.3 % in the 9 months since the last survey.

DISCUSSION

The present study represents the first investigation in which the MFC technique has been applied to the epidemiology of Malayan filariasis, and as such the observations made and inferences drawn from them

Table 2

The number and percentage of microfilaria positives as detected by 1 ml membrane filter concentration and 20 c.mm finger prick blood in various age groups of Pengiuran Baru, S. Kalimantan.

Age group (yrs)	Total exam.	No. & (%) millipore + ve	No. & (%) 20 c.mm blood film + ve	Millipore/ blood film factor
5-9				
M	7	3 (42.8%)	2 (28.5%)	
F	3	0	0	
T	10	3 (30%)	2 (20%)	X 1.5
10-14				
M	13	7 (53.8%)	3 (23.0%)	
F	12	5 (41.6%)	1 (0.8%)	
T	25	12 (52.0%)	4 (16.0%)	X 3.0
15-20				
M	9	4 (44.4%)	2 (22.2%)	
F	10	1 (10%)	0	
T	19	5 (26.3%)	2 (10.5%)	X 2.5
21-50				
M	34	19 (55.8%)	11 (32.3%)	
F	22	9 (40.9%)	4 (18.8%)	
T	56	28 (50.0%)	15 (26.8%)	X 1.9
>50				
M	5	3 (60%)	2 (40%)	
F	3	0	0	
T	8	3 (37.5%)	2 (25%)	X 1.5
Total	118	51 (43.2%)	25 (21.2%)	X 2.0

are of a preliminary nature. The pattern of *B. malayi* infection observed in the untreated populations of S. Borneo appears somewhat different from that in Tonga, a situation of endemic non-periodic *Wuchereria bancrofti* filariasis (Desowitz and Hitchcock, 1974). In Tonga the mf rate, as diagnosed by MFC was essentially the same for all age groups whereas in Borneo it was somewhat higher in the older segment of the population. In Tonga the majority of the microfilaraemias in the 5-14 year old group was of low density; MFC revealing approximately 8 times as many infections as did the thick blood films in the 5-9 years old and 5 times as many in the 10-14 year old groups. About one half of the microfilaraemias in older Tongans were of low density, diagnosed only by MFC. In contrast, the mf density patterns of the S. Borneo population seems to be established by 5-9 years of age and is constant thereafter. If this observation is confirmed by other studies the elucidation of the reasons for these differences will be of interest as will be the comparison of the clinical manifestations in the two populations studied.

Table 3

Consolidated parasitological data for Tanah Intan and Pengiunan Baru.

Age group (yrs)	Total exam.	No. & (%) millipore + ve	No. & (%) 20 c.mm blood film + ve	Millipore/ blood film factor
5-9				
M	21	3 (14.3%)	2 (9.5%)	X 1.5
F	22	7 (31.8%)	3 (13.6%)	X 2.3
T	43	10 (23.2%)	5 (11.6%)	X 2.0
10-14				
M	26	9 (34.6%)	4 (15.3%)	X 2.2
F	19	5 (26.3%)	1 (5.2%)	X 5.0
T	45	14 (31.1%)	5 (11.1%)	X 2.8
15-20				
M	23	9 (39.1%)	5 (21.7%)	X 1.8
F	15	1 (6.6%)	0	
T	38	10 (26.3%)	5 (13.1%)	X 2.0
21-50				
M	80	38 (42.5%)	21 (26.2%)	X 1.8
F	65	18 (27.6%)	6 (9.2%)	X 3.0
T	145	56 (38.6%)	27 (18.6%)	X 2.1
>50				
M	11	6 (54.5%)	4 (36.3%)	1.5
F	5	1 (20%)	0	
T	16	7 (43.7%)	4 (25%)	X 1.8
Total	287	97 (33.8%)	46 (16.0%)	X 2.1

Table 4

The microfilaraemia detected by 1 ml membrane filter concentration in a treated population (Air Puteh, S. Kalimantan).

Age group (yrs)	No. exam.	Microfilaraemia					Estimated MFC/ 20 c.mm blood film factor
		No. & (%) + ve	Low density (<50 mf/ml) microfilaraemia		High density (>50 mf/ml) microfilaraemia		
			No. & (%)	Average density (mf/ml)	No. & (%)	Average density (mf/ml)	
5-14	25	3(12.0%)	2 (8.0%)	1	1(4.0%)	57	X 2.0
15-50	68	11(16.2%)	9(13.2%)	2.4	3(4.4%)	104.6	X 3.0
All ages	93	14(15.0%)	11(11.8%)	2.2	4(4.3%)	97.2	X 2.8

A number of filariasis workers have expressed the opinion that *B. malayi* is more susceptible than *W. bancrofti* to DEC treatment. Our study of the treated population of Air Puteh would suggest that this may not be true. MFC diagnosis revealed a mf rate of 15%, 1½ years after completion of the MDA campaign. It is not known whether these positives represent persisting post-therapeutic microfilaraemias or whether they are new infections acquired after the programme terminated. It should be noted that the mf rate and low density infections resemble the situation in the S. Pacific populations that had been subject to MDA (Desowitz and Southgate, 1973). In view of these uncertainties, it is recommended that it is important to carry out periodic resurveys by MFC following an anti-*B. malayi* filariasis campaign.

SUMMARY

A blood survey employing membrane filter concentration (MFC) and examination of stained 20 c.mm thick blood films as diagnostic methods was carried out in Banjar Regency of South Borneo, an area of endemic *B. malayi* filariasis. In untreated populations the mf rate, as revealed by MFC, ranged from 23.2% for the 5-9 year old group to 43.7% for the > 50 year old group. For all age groups approximately one half of the microfilaraemias were of a low grade nature, diagnosed by MFC only. In a population that had been subjected to mass DEC administration 1½ years prior to this survey, the MFC-diagnosed rate was 15%. Approximately two thirds of these infections were of very low density, the average density being 2.2 mf/ml.

ACKNOWLEDGEMENTS

This study was carried out during the tenure by one of the authors (R.S.D.) of a consultancy under the World Health Organization Programme of Investigations of Filariasis. The authors are grateful to Dr. Julie Soelianti Saroso, Director-General of the Directorate of Communicable Disease Control, for her interest and assistance in making this study possible.

REFERENCES

DESOWITZ, R.S. and HITCHCOCK, J.C., (1974). Hyperendemic Bancroftian filariasis in the Kingdom of Tonga: The application of the membrane-filter concentration technique to an age-stratified blood survey. *Amer. J. Trop. Med. Hyg.*, *23* : 877.

DESOWITZ, R.S. and SOUTHGATE, B.A., (1973). Studies on filariasis in the Pacific: 2. The persistence of microfilaraemia in diethylcarbamazine treated populations of Fiji and Western Samoa: Diagnostic application of the membrane-filatration technique. *Southeast Asian J. Trop. Med. Pub. Hlth.*, *4* : 179.

DESOWITZ, R.S., SOUTHGATE, B.A. and MATAIKA, J.U., (1973). Studies on filariasis in the Pacific: 3. Comparative efficacy of the stained blood-film, counting-chamber and membrane-filtration techniques for the diagnosis of *Wuchereria bancrofti* microfilaraemia in untreated patients in areas of low endemicity. *Southeast Asian J. Trop. Med. Pub. Hlth.*, *4* : 329.

OEMIJATI, S., DESOWITZ, R.S., PATONO, F., PANT, C.P., MECHFUDIN, H. and SAJIDIMAN, H., (1975). Studies on filariasis in the Pacific: 4. The application of the membrane filter concentration technique to survey of *Wuchereria bancrofti* filariasis in Kepu District, Jakarta, Indonesia. *Southeast Asian J. Trop. Med. Pub. Hlth.*, *6* : 186.