OBSERVATIONS ON THE SIX YEAR RESULTS OF THE PILOT PROJECT FOR THE CONTROL OF MALAYAN FILARIASIS IN THAILAND†

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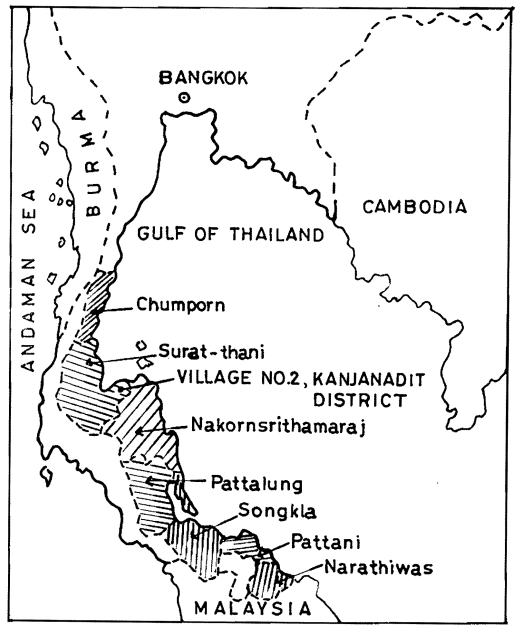
In a previous communication (Harinasuta *et al*, 1964), we reported the results of the pilot trial of control of periodic malayan filariasis in Village No. 2, Kanjanadit district of Surat-thani province, South Thailand (Map 1). The project was successful in that after one month and one year of the mass treatment the microfilaria rate dropped from 21.1 per cent to 2.2 and 2.2 per cent, the filariasis infection rate from 26.1 per cent to 8.6 and 8.5 per cent and the mean microfilarial density of blood films from 4.8 to 0.48 and 0.12 per 20 c.mm. blood respectively. Larvae of *Brugia malayi* were not found in any mosquitoes dissected.

Since then, blood examinations for microfilariae in the people of the village, mosquito catchings by the human bait method and dissections for larvae of *B.malayi* and examinations of animal hosts in the area have been repeated at two, three, five and six years (1965-1969) following the treatment with diethylcarbamazine.

The present report describes the results of the pilot project.

METHODS AND PROCEDURES

During 1965-1969 a temporary field station (occupied for a period of 2-3 months once each year) was established in Village No. 2, Kanjanadit district. Blood surveys in man and animals, mosquito catchings and dissections and observations on elephantiasis cases were made, by the procedures described by Harinasuta *et al*, (1964). It was observed that in this period some people had moved into or out of the village, and there was a slight decrease of the total population of the area. Also, during the period of study, all houses in the village were sprayed once or twice a year with DDT water-dispersible powder, 5 per cent suspension, at a dosage of 2 gm. per. sq.m., according to the pro-



Map 1—Showing village No.2, Kanjanadit district where the investigation was carried out.

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Individuals who were found to have microfilariae of *B.malayi* in their blood were subsequently given a full course of diethylcarbamazine.

RESULTS AND DISCUSSION

A summary of the results in the six years (1963-1969) is included in Table 1. The findings for 1963-1964 (one month and one year after the mass therapy) are also included.

The results in detail are as follows:—

Table 1

Showing the six year results (1963-1969) of blood examinations for microfilariae of *B. malayi* in village No. 2 of Surat-thani province after mass treatment with diethylcarbamazine.

Time	Total population	No. examined	Mf.-positive		Microfilarial density/ 20 c.mm.	Filariasis infection rate per cent
			No.	Per cent		
1963 prior to treatment	1,023	977*	209	21.1	4.8	26.1
1963 one month after treatment	1,014	814	18	2.2	0.48	8.6
1964 one year after treatment	1,020	820	18	2.2	0.12	8.5
1965 two years after treatment	944	753	3	0.4	0.002	7.0
1966 three years after treatment	992	783	3	0.4	0.03	6.8
1968 five years after treatment	992	755	7	0.9	0.04	7.3
1969 six years after treatment	990	807	4	0.5	0.02	6.4

* There were 52 cases of elephantiasis.

1963: ONE MONTH AFTER MASS TREATMENT

Eighteen persons were still found harbouring microfilariae (2.2%). The results are shown in Table 2.

Table 2

Showing the details of the eighteen positive cases, one month after mass treatment.

Number of cases	Before treatment	Diethyl-carbamazine	One month after treatment
8	Mf.-positive	Took full course	Marked decrease in mf., very few seen
2	,,	Took 2-3 doses	Mf.-positive
7	,,	Refused to take drug	Mf.-positive
1	Mf.-negative	Refused to take drug	One mf. per 40 c.mm. blood

Of these eighteen positive cases, two were subsequently given a full course of diethyl-carbamazine (5 mg/Kg. body weight for a total of six doses); five accepted only 1-5 doses, and the other eleven did not take any.

The filariasis infection rate was 8.6 per cent and the mean microfilarial density of all films was 0.48 per 20 c.mm. blood.

1964: ONE YEAR AFTER MASS TREATMENT

1. Eighteen villagers were found harbouring microfilariae (2.2%). The results of analysis of the cases are shown in Table 3.

Table 3

Showing the details of the eighteen positive cases, one year after mass treatment.

Number of cases	Before treatment	Diethylcarbamazine	One year after treatment
2	Blood not examined	Did not take drug	Mf.-positive
11	Mf.-positive	,,	,,
5	,,	Took one dose only	,,

Of these eighteen cases, fifteen were subsequently given the full course of diethyl-carbamazine and three refused treatment.

2. There were still 52 cases of elephantiasis; thus the filariasis infection rate was calculated as 8.5 per cent.

3. The mean microfilarial density of all films was calculated as 0.12 per 20 c.mm. blood.

1965: TWO YEARS AFTER MASS TREATMENT

1. Three persons were positive for *B. malayi* microfilariae (0.4%).

Case No. 1-2: Two new-comers, 32 and 71 years old; number of microfilariae: 1 per 40 c.mm. blood in each individual.

Case No. 3: An old positive case given a full course of diethylcarbamazine in 1963; number of microfilariae: 1 per 40 c.mm. blood.

These three cases were subsequently given a full course of diethylcarbamazine, 5 mg/Kg. body weight for six doses.

2. There were 50 cases of elephantiasis (two cases moved to other villages); thus the filariasis infection rate was calculated as 7.0 per cent.

3. The mean microfilarial density of all films was calculated as 0.002 per 20 c.mm. blood.

1966: THREE YEARS AFTER MASS TREATMENT

1. Three persons were positive for *B. malayi* microfilariae (0.38%).

Case No. 1: An old positive case who had not received diethylcarbamazine; number of microfilariae: 45 per 40 c.mm. blood.

Case No. 2: An eight-year-old girl who previously received an incomplete course of diethylcarbamazine; number of microfilariae: 2 per 40 c.mm. blood.

Case No. 3: A twenty-year-old woman, a new-comer; number of microfilariae: 2 per 40 c.mm. blood.

Each of the positive cases was subsequently given a course of six doses of diethylcarbamazine.

2. There were 50 cases of elephantiasis; thus the filariasis infection rate was calculated as 6.8 per cent.

3. The mean microfilarial density of all films was calculated as 0.03 per 20 c.mm. blood.

1968: FIVE YEARS AFTER MASS TREATMENT

1. Seven persons were positive for *B. malayi* microfilariae (0.9%).

Case No. 1-5: Five new-comers; number of microfilariae: 7-10 per 40 c.mm. blood.

Case No. 6-7: Two males who were previously negative for microfilariae; number of microfilariae: 6 and 8 per 40 c.mm. blood respectively.

These seven cases were subsequently given a full course of diethylcarbamazine.

2. There were no new cases of elephantiasis, but the number of old cases was reduced to 48 (one died and the other emigrated); thus the filariasis infection rate was calculated as 7.3 per cent.

3. The mean microfilarial density of all films was calculated as 0.04 per 20 c.mm. blood.

1969: SIX YEARS AFTER MASS TREATMENT

1. Four persons were positive for *B. malayi* microfilariae (0.5%).

Case No. 1: A new-comer, 24-year-old male; number of microfilariae: 11 per 40 c.mm. blood.

Case No. 2: A male, 40 years old, who was previously negative for microfilariae; number of microfilariae: 13 per 40 c.mm. blood.

Case No. 3-4: The two females who were previously positive for microfilariae and refused to take diethylcarbamazine; number of microfilariae: 2 and 6 per 40 c.mm. blood respectively.

These cases were subsequently given a full course of diethylcarbamazine.

2. The filariasis infection rate in this year was calculated as 6.4 per cent.

3. The mean microfilarial density of all films was calculated as 0.02 per 20 c.mm. blood.

This situation depended largely on two factors:—

1. *Migration.*

It was observed that during the period of study a few new-comers with microfilaraemia moved into the village causing an increase in the number of microfilaria-carriers. On the other hand, some elephantiasis cases moved out of the village causing a decrease in the filariasis infection rate. However, the number of movements were small each year.

It was noted that there was no occurrence of new cases of elephantiasis during the six year period of study.

2. *Refusal to take the drug.*

As it is well known, diethylcarbamazine when given to microfilaria-carriers causes unpleasant side effects such as fever, headache and body pains. Some villagers in the first year of the investigation consequently refused to take the drug. This probably explains the persistence of the 2.2 per cent microfilaria-positive rate in 1963-1964. (Table 1). In the second year (1965) when the people had observed the disappearance of the symptoms of repeated inflammation of inguinal lymph glands and fever in those who had been treated, all cases which were found to harbour microfilariae then accepted the full course of the drug. The microfilaria rate thus fell to a very low level of 0.4, 0.4, 0.9 and 0.5 per cent in the second, third, fifth and sixth year respectively.

Animal hosts

The blood of many cats and dogs and some monkeys in the village was examined every year during 1963-1969, but no microfilariae of *B. malayi* were found.

The mosquito vectors

In Village No. 2 mosquitoes were caught outdoors by the human bait method, and were then identified and dissected for larvae of *B. malayi*. The period of catching for each year varied between 15 and 44 successive nights and the numbers caught ranged from 1,207 to 2,925 during 1964-1969 (Table 4). Only stage II larvae of *B. malayi* were found in two *M. uniformis* caught in the second year after the mass treatment (in 1965). No other larvae were found.

Since *Mansonia uniformis*, the vector mosquito of *B.malayi* in this area, was found to have some endophilic characters (we found that 10 - 20% of *M.uniformis* in Surat-thani province bite man inside houses), spraying of all houses in the village with D.D.T. once or twice a year (according to the Malaria Eradication Programme) resulted in a significant decrease in the numbers of this mosquito caught (Table 4). Transmission of the disease in this area was thus reduced by spraying.

SUMMARY AND CONCLUSION[1]

1. A pilot project for the control of filariasis in Thailand was started in 1963

[1] Including the previous results (Harinasuta *et al.* 1964).

Table 4

Showing the number and species of mosquitoes caught in the area of village No. 2, and dissected for *B. malayi* larvae. (each period of catchings lasted from 15 to 44 nights).

Species	Before mass treatment (Preliminary Survey) (1963)	After mass treatment					
		One month (1963)	One year (1964)	Two years (1965)	Three years (1966)	Five years (1968)	Six years (1969)
Aedes							
aegypti	6	-	-				45
albopictus	12	-	20	21	52	78	108
alboscutellatus	18	-	5	1	2	1	-
butleri-dux	1,144	400	1,822	320	26	483	942
flavipennis	-	-	-	1	-	-	-
laniger	5	-	-	2	3	-	1
lineatopennis	56	-	-	-	8	-	5
mediolineatus	-	-	9	5	-	2	8
pallidostriatus	-	-	-				
sigmoides	-	-			346		
vexans	40	-	-	16	12	120	346
Anopheles							
aconitus	18	3	3	1	-	-	-
annularis	1	-	-	-	-	-	-
argyropus	123	6	11	1	-	-	-
barbirostris	10	12	24	2	2	-	1
campestris	-	-	4	1	-	1	-
hyrcanus group	54	-	-	4	2	1	1
kochi	8	-	7	-	-	-	-
lesteri paraliae	36	3	12	1	-	-	1
nigerrimus	115	39	63	10	8	2	6
peditaeniatus	112	19	26	2	2	-	-
philippinensis	291	30	130	35	42	30	55
sinensis	17	22	59	8	18	12	7
subpictus malayensis	80	44	86	75	62	180	203
subpictus subpictus	413	7	16	320	152	137	114
tessellatus	12	-	-	1	1	-	1
vagus	81	24	20	12	10	8	42
Armigeres							
subalbatus	26	-	142	145	117	13	10
Culex							
bitaeniorhynchus	-	-	8	1	-	4	1
fuscocephalus	-	-	-	12	1	17	25
gelidus	3	-	10	22	17	1	15
quinquefasciatus	-	-	18	2	15	8	5
sinensis	-	-	12	10	8	35	68
sitiens	-	-	5	1	-	1	-
tritaeniorhynchus	1,002	-	89	186	165	98	195
Mansonia							
annulata	-	-	-	1	-	1	3
annulifera	11	4	7	8	-	5	7
dives-bonneae	104	16	27	42	16	14	13
indiana	-	-	15	10	5	5	2
uniformis	338	98	275	3	115	90	22
Total	4,136	727	2,925	1,282	1,207	1,347	2,252

and evaluation of the results was made during 1963-1969.

A field station was established by the Faculty of Tropical Medicine in Village No. 2 in Kanjanadit district of Surat-thani province, South Thailand. In 1963, blood films were examined from 977 villagers (95.5 per cent of the total population of 1,023). Two thick films, each of 20 c.mm., were prepared from each person and stained with Giemsa. It was found that 21.1 per cent of the people harboured *Brugia malayi* microfilariae. Elephantiasis was found in 5.3 per cent of the population.

2. Microfilarial periodicity was studied in 25 persons. All showed nocturnal periodicity.

3. The blood of the cats, dogs and monkeys in the area was also examined every year during 1963-1969. No *B.malayi* microfilariae were found.

4. Mosquitoes were caught (by human bait method), identified and examined for *B.malayi* larvae. In the initial survey (before mass treatment), 4,136 mosquitoes were examined (including 338 *Mansonia uniformis*). Stage II *B.malayi* larvae were found in one *M.uniformis* and stage III in another; the infection rate in *M.uniformis* was 0.6 per cent.

5. Spraying with D.D.T. (according to the Malaria Eradication Project of Thailand) was carried out once or twice yearly in all houses in the village. It resulted in a considerable decline in the total number of mosquitoes and the percentage of *Mansonia* caught.

6. Diethylcarbamazine was administered to as many of the villagers as possible, at a dose of 5 mg. of the citrate salt per kgm. body weight once weekly for six weeks. Initially (in 1963) 888 persons received the drug (86.8 per cent of the population). Considerable side-effects were observed in nearly all microfilaria-carriers. Blood examinations were repeated one month and again one, two, three, five and six years after the treatment. It was found that the proportion of microfilariae-carriers decreased from 21.1 per cent to 2.2, 2.2, 0.4, 0.4, 0.9 and 0.5 per cent respectively, the filariasis infection rate from 26.1 per cent to 8.6, 8.5, 7.0, 6.8, 7.3 and 6.4 per cent, and the mean microfilarial density of all films from 4.8 per 20 c.mm. blood to 0.48, 0.12, 0.002, 0.03, 0.04 and 0.02. Larvae of *B. malayi* were not found in mosquitoes dissected during 1963-1969 except in 1965 (the second year) when Stage II larvae of *B. malayi* were found in two *M.uniformis*.

7. The results of this pilot project for control of *B.malayi* filariasis in Village No. 2, Kanjanadit district, Surat-thani province of South Thailand seem to be promising. The programme included mass therapy with diethylcarbamazine at a dosage of 5 mg. per Kg. body weight once weekly for six weeks and spraying with D. D. T. once or twice yearly.

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