Filariasis in a Rubber Plantation in Negeri Sembilan, West Malaysia:

by C.P. Ramachandran
T.J. Dondero Jr.
Johns Hopkins University, C.M.R.T. and University of California, I.C.M.R.T.
S.W. Mullin
University of California, I.C.M.R.T.
S. Sivanandam and S. Stevens

Institute for Medical Research, Kuala Lumpur

PREVIOUSLY, FILARIASIS has not been documented in the state of Negeri Sembilan, West Malaysia. Although isolated cases of elephantiasis have occasionally been reported, there has been no published confirmation of whether these cases originated in the state.

Following the recognition of a number of cases suggestive of filarial elephantiasis on a rubber and oil palm estate in the Port Dickson area, the Senior Medical and Health Officer, Negeri Sembilan, requested that a filarial survey of the estate be made by the Filariasis Division, Institute for Medical Research, Kuala Lumpur. This survey was performed in May 1970.

Description of the Site

Located in the Port Dickson district of the state of Negeri Sembilan, Sua Betong Estate lies some five miles from the coast, 10 miles southeast of Port Dickson town and 30 miles southwest of Seremban (see map). The estate contains 7,123 acres of rolling hills with several low-lying areas, some 400 acres in total, which become freshwater swamps during the rainy season. Most of the estate is planted in rubber, with about 12 percent devoted to oil palm. About one-fifth of the estate is bordered by jungle, the remaining portion surrounded by other rubber estates.

The estate is split into four geographical "divisions", (three agricultural and one factory and processing). Each division has its own residential areas. The workers' accomodations consist of ground level buildings without window screens.

The estate personnel, including dependents, numbered 2,165 at the time of the survey. Ethnically, about two-thirds were Indians, less than one-third were Chinese, and there were a small minority of Malays. The various ethnic groups were relatively evenly distributed among the four divisions and among the various occupations.

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Fig 1

Map of West Malaysia showing the location of Sua Betong.

Methods and Materials

Working in three independent units, a research team from the Filariasis Division, Institute for Medical Research, examined the estate personnel at several sites in or near housing divisions. All work was done between 1900 and 2300 hours on two successive days. Name, age and sex were recorded for each subject. Ethnic group was judged from the names, which are highly characteristic.

Employing a graduated capillary pipette fitted to a modified Sinton's pipette, a finger prick blood specimen of 20 cmm. was made for each subject. Films were dried overnight, then stained one hour with Giemsa (Revector, Hopkin & Williams Ltd., Chadwell Heath, England) using 35 drops of 7.6% concentrate per 100 ml. buffered distilled water, pH 7.2. The number and species of microfilariae were recorded for each film. The same films were assessed for malarial parasites by the Division of Malaria Research, Institute for Medical Research, Kuala Lumpur.

No studies of vectors or of microfilarial periodicity were attempted, and few clinical examinations were performed.

Results

Thanks to the fine cooperation of the Sua Betong Estate management and staff, 1,866 (87.1%) of the 2,165 persons on the estate were examined. Of these, 903 were males and 963 were females. Ages ranged from 20 days to 85 years. Ethnically, 65 per cent were Indian (non-Muslim), 30 per cent Chinese, and 5 per cent Muslims (mostly Malays but with a few Muslim Indians). The great majority were workers and families but some supervisory personnel were included. Among the 1,866 subjects, 96 (5.1 per cent) were positive for microfilariae, all morphologically consistent with the sub-periodic strain of **Brugia malayi.**

Microfilarial densities tended to be quite low as shown in **Table 1.** The highest was 100 microfilariae per 20 cmm.

The microfilarial carriers were unevenly distributed among the four geographical divisions as shown in **Table 2.**

As recorded in **Table 3,** microfilariae were found in persons in all age groups. The youngest positive was one year, the oldest 85 years. Proportionately, more males than females were found to be microfilariae carriers. Statistically, the difference in the proportions of microfilarial carriers among the two sexes is highly significant (chi square – 12.1, $P < 0.005$). This difference, however, is not noted in the children below 10 years of age.

The microfilarial prevalence rates vary among the three ethnic groups as shown in **Table 4.** The difference between the microfilarial rates of the Indians and Chinese is statistically significant (chi square – 9.2, $P < 0.005$). However, there is no significant difference between the proportions of microfilarial positives among the (non-Muslim) Indians and the Muslims (chi square – 1.34, $P = 0.25\pm$).

Search for malarial parasites revealed six positives among the 1,866 smears examined. This represents a prevalence rate of 0.3 per cent. Four of the parasites

TABLE I

Microfilarial density (per 20 cmm.) distribution among 96 infected subjects, Sua Betong Estate, Negeri Sembilan, West Malaysia.

	1–9 mff	10–19	20–29	30–39	40–49	50–59	60 & over
Number of subjects	60	19	8	3	1	2	3

TABLE 2

Distribution of microfilarial carriers among the four geographical "divisions" of Sua Betong Estate, Negeri Sembilan, West Malaysia.

Division	Number examined	Number positive	Percent positive
South	637	26	4.1%
Sg. Ujong	588	33	5.6%
Dodum	327	31	9.5%
Factory	314	6	1.9%
All divisions	1866	96	5.1%

were identified as **P. vivax,** one **P. falciparum;** one remained unidentified.

Discussion

As the data show, infection with sub-periodic **Brugia malayi** occurs in all age groups and in all ethnic groups among the personnel of the Sua Betong Estate, although microfilarial densities are generally quite low.*

* As a result of these findings the entire estate population, excluding infants and pregnant women, received treatment with diethylcarbamazine, 5 mg/kg body weight, once a week for six weeks.

The overall prevalence, 5.1 per cent, determined from a single blood specimen of 20 cmm. for each subject, is probably a considerable underestimate. Edeson (1959) demonstrated that where microfilarial loads were low, as in the present case, 25 per cent or more of the carriers may be missed if only 20 cmm. films are examined. However, 20 cmm. films remain useful if large numbers of subjects are surveyed in an untreated area.

Although clinical examinations were not generally performed on the subjects, several cases of minimal elephantiasis involving the feet and ankles were observed. In addition, some fifty cases, mostly mild, of filarial-type elephantiasis had been seen by the estate's medical staff. The degree of morbidity in terms of episodic adenolymphangitis and fever among estate personnel is unknown.

The finding that significantly more men than women have patent filarial infection is interesting, particularly as it is not noticed in children under 10 years old. This may reflect a difference in exposure, due to different occupational patterns or sleeping habits. Rubber tapping, begun about dawn, however involves roughly as many men as women. Men rather than women are apparently more apt to sleep outside the houses at night.

The differences of microfilarial prevalence in the various geographical divisions may reflect differences in exposure to mosquitoes. "Factory division" workers, who have the lowest prevalence, spend much less occupational time in the rubber forests. The reasons why Dodum division has the highest microfilarial rate are not presently clear. It has much less swampy area than the Sg. Ujong division.

The significantly lower microfilarial prevalence rate among the 557 persons of Chinese origin is difficult to explain. Most of these people have

TABLE 3

Distribution of microfilarial carriers by age group and by sex among 1,866 persons surveyed at Sua Betong Estate, Negeri Sembilan, West Malaysia.

Age group	Number of males examined	No. males positive	Percent males positive	Number of females examined	No. females positive	Percent females positive	Total number examined	Total number positive	Percent positive
0–4	131	3	2.3	137	3	2.2	268	6	2.2
5–9	159	6	3.8	165	10	6.1	324	16	4.9
10–14	154	17	11.0	161	4	2.5	315	21	6.7
15–19	105	7	6.7	126	4	3.2	231	11	4.8
20–24	60	9	15.0	80	3	3.8	140	12	8.6
25–29	53	4	7.6	49	1	2.0	102	5	4.9
30–34	69	3	4.4	69	0	0	138	3	2.2
35–39	34	2	5.9	45	1	2.2	79	3	3.8
40–44	41	3	7.3	28	0	0	69	3	4.4
46–49	21	2	9.5	29	1	3.5	50	3	6.0
50–54	23	1	4.3	39	3	7.7	62	4	6.5
55–59	23	2	8.7	27	3	11.1	50	5	10.0
60 and over	25	4	16.0	13	0	0	38	4	10.5
TOTAL	903	63	7.0	963	33	3.4	1,866	96	5.1

occupations similar to those of the other employees and share the same living quarters. They are relatively evenly distributed among the geographical divisions. Greater susceptibility of one racial group than another is not a demonstrated feature in filariasis. The living habits of the estate's various ethnic groups, such as use of mosquito nets, burning pyrethrin coils, or sleeping outdoors are not known.

Entomological studies to identify the important filarial vectors were outside the scope of the present survey; however, such work is planned by the Division of Entomology of the Institute for Medical Research.

Since the sub-periodic form of **B. malayi** naturally infects a number of animals as well as man, and may have an animal reservoir (Laing et al, 1960), a search for animal carriers in the region might be useful. According to a member of the estate management, leaf monkeys **(Presbytis spp.)**, which are known to be reservoirs elsewhere in West Malaysia, are found on the estate.

Sua Betong Estate is surrounded by similar rubber growing areas. It would seem likely that filariasis reaches beyond the estate boundaries. However, at present the extent of **B. malayi** infection and the degree of public health problem it presents in the

TABLE 4

Comparison of Microfilarial positive subjects by ethnic group, Sua Betong Estate, Negeri Sembilan, West Malaysia.

Group	Number	Number positive for microfilariae	Percent positive
Indian	1,218	77	6.3%
Chinese	557	16	2.9%
Muslim*	91	3	3.3%
Total	1,866	96	5.1%

* Mostly Malays but includes a few Indian Muslims.

surrounding region and in the state of Negeri Sembilan at large is unknown. Further investigation is recommended.

Summary

1. The status of filariasis in the state of Negeri Sembilan, West Malaysia, is unknown but has been assumed to be insignificant.
2. A total of 1,866 persons, representing 87.1 per cent of the total living on a rubber estate in Negeri Sembilan, were surveyed for microfilariae. An overall microfilarial rate of 5.1 per cent was found. All sub-periodic form of **Brugia malayi**.
3. The microfilarial carrier rates were unevenly distributed: men had a higher rate than women, ethnic Chinese had a lower rate than the other groups, and markedly different rates were found in different geographical divisions within the estate.

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