Effects of Experimental Control Works Against Vector Mosquitoes of Bancroftian Filariasis in Japan*,**

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Abstract

The most important vector of bancroftian filariasis in Japan is *C. p. pallens* and the secondary but only a little important one is *Ae. togoi*. Against the former species larvicide application once a week is practicable and very effective, but against the latter it is difficult. Residual spray by organophosphorous imagicide is very effective for the adults of both species, reducing almost perfectly the population density for a month and suppressing the transmission of the disease for about two months. Experimental eradication of filariasis by only vector control has been carried out in a village since 1962 under the cooperation of villagers in practice of timely applications of larvicide and imagicide. The success seems probably achievable by about the end of 1969.

Introduction

The object of the field experiments here reported was to learn mainly the effect of residual spray upon the transmissibility of vector mosquitoes of bancroftian filariasis in Japan. The effect was appraised by the reduction, after the residual spray, in the density of females caught in dwelling houses, in the rate of those having second or third stage filaria larvae, and in the percentage age distribution of those of the vector mosquitoes.

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Vector Mosquitoes of bancroftian filariasis in Japan

The principal vector is the house mosquito, *Culex pipiens pallens*. The mosquito breeds in cesspools, sewers, tubs and earthen jars with stagnant foul water around houses, and fertilizer pits in the field near villages. It is the predominant species among those found in houses and is strongly anthropophilic. It begins to appear from early May reaching a high peak in late June to early August, and disappears in early October. Its active feeding hours at night covers from 9 p.m. to 4 a.m. It has a strong tendency to rest in houses. It is the highest in experimental as well as in natural infection rate. Owing to these habits and to its high susceptibility, the house mosquito can be said to be the most dangerous vector of bancroftian filariasis in Japan.

Secondary vector is *Aedes togoi*. It breeds in rainwater, salty or even saltier water than sea water, in many pools found on rocky seashore and also in bilge water and artificial containers of many kinds found around houses in fishing villages, while, it is very rare in inland farm villages. The breeding season covers from May to November but the breeding is rather active in late May and in autumn becoming inactive in hot and dry season depending on the amount of rainfall. The feeding is nocturnal. It is not so predominant in houses and not particularly fond of human blood. The experimental infection rate is very high but natural one is much lower than in house mosquito. Thus, *Aedes togoi* can be said to be secondary vector but is not so important in most villages locating even at or near rocky seashore.

Method of vector control

As residual imagicide, 5% Diazinon emulsion concentrate, 5% Nankor E. C., 20% Malathion E. C., 5% Baytex E.C., or 10% Sumithion E.C. was used. A diluted solution given in the attached Tables, for example, as 0.5% Diazinon E., was sprayed from a distance of about 40cm by 40 p.s.i. against walls, furniture surfaces, and ceiling if necessary. The spray area per house including a cow-shed when existed was about 150 to 200 m^2 depend ing on the size of the house. The residual spray was carried out simultaneously for all houses in a village only once a year at a different time with village or year.

Larvicide, the same organophosphorous compounds as used in each village as imagicide, was applied once a week at a rate of 1 ppm to all the breeding places of the house mosquito excepting for the fertilizer pits where it is used in and after 1963 at NAGATE village at a rate of 2 ppm every two weeks.

For the breeding places of *Aedes togoi*, no larvicide application was made, because the number of its breeding places is too many, and the number and size are too variable depending on the amount of rainfall to apply the larvicide timely and adequately. The mosquitoes of the other species collected in dwelling houses were found without filariae or with only younger stage filaria larvae in a very low

percentage, showing that they have no bearing on the transmission of the disease.

Means of appraisal of the effect of control work

1) *MOSQUITO DENSITY*

Mosquito survey in each village was made twice to four times during the period prior to the residual spray. After the spray, similar survey was conducted, as a rule, weekly and in some cases, every two weeks or so for three or four months. At one time, collections were made in several tens of dwelling houses in total, at daytime, at evening or in the early morning, by one collector for about twenty minutes. Mosquito density was given by the number of females per house per day (or per collection), for each species.

Here, it is to be noted that the mosquito survey was made mainly in houses with one or more microfilarial carriers throughout the experiment, excepting in MATSUSHIMA village where all carriers had been cured by drugs by the end of 1962.

2) *NATURAL INFFCTION RATE*

Mosquitoes collected as above were dissected and after being removed the ovaries they were examined for the number and developmental stage of filaria larvae. Although the rate of mosquitoes infected with first stage larvae was very high when collected in highly endemic village, the rates of those having second and especially third or infective stage larvae were very low. In the attached Tables, therefore, to compare the states of natural infection of *C. p. pallens* and *Ae. togoi* before and after the residual spray, the total infection rate and the rates of females having 2nd stage and infective stage larvae were only presented.

3) *PARITY OF FEMALE MOSQUITOES*

Ovaries removed from the abdomen of the females were examined for the number of times of oviposition by means of the occurrence of dilatations in the posterior part of ovarioles.

Relation between the days required for females to reach the situation possible to transmit the infective filaria larvae and the days necessary for filariae to reach maturity in mosquitoes

Observations for age distribution and natural infection of *C. p. pallens* and *Ae. togoi* were made with the mosquitoes collected at OKUBO village during from late June to early August in 1964 and 1965. The results are presented in Table 1 which shows that at 22°C and above

Table 1. Relation between the expected days for 3-parous females of *C. p. pallens* and *Ae. togoi* to come to bite man from the initial feeding and the days necessary for filariae to reach maturity in mosquitoes at each natural mean air temperature

Natural mean air temperature	The expected days for 3-parous females to come to bite man from the initial blood meal	Days necessary for filariae to reach maturity in mosquitoes
21°C	18–19 days	22–23 days
22°C	18 days	16–17 days
23–25°C	15 days	14–15 days
27°C and above	12 days	11 days

filaria larvae can reach maturity by or on the day of the feeding of 3-parous females, if microfilariae were picked up at the initial feeding of the females, while at 21°C and below filaria larvae can not do so by the day of the feeding of 3-parous females because of very much being delayed in development.

Interesting to say, however, 4-parous females were very much rarely found throughout the experiments as will be seen in Tables 2 to 5. It can be said therefore that the transmission of filariasis is possible only when the mean temperature stands at or above 22°C, in other words, it is possible during a period covering from late June to mid September at the longest in Kyushu, Japan.

Results of field experiments shown in Tables 2 to 5

Tables 2 and 3 show the change in mosquito density, natural infection rate, and percentage age grading of *C. p. pallens* (Table 2) and *Ae. togoi* (Table 3), before and after the residual spray in 1964 and 1965 in the three filariasis endemic villages. In these villages residual spray was carried out once a year, but no larvicide was used and microfilarial carriers were left untreated.

OKUBO is in UKU Island and the most highly endemic in filariasis among four villages now under study. It is a farm village and about 1.2 km apart from seashore and other three villages. It had 54 houses, 284 persons, and 75 microfilarial positives (or 26.4% in prevalence) in November 1964. There were many favorable breeding places of *C. p. pallens* but nearly no ones of *Ae. togoi* within the village. The latter species was breeding in many small pools on rocky seashore extending along the seacoast.

KARITATE is a farm village and one of the four ones in UKU Island. It is 1-1.5km apart from seacoast and 180-1020 meters apart from the other three villages. Within the village there were fair number of breeding places of the house mosquito, while on the seacoast only a small number of those of *Ae. togoi*. It had 33 houses, 159 persons, and 20 positives (or 12.6% in prevalence) in November 1964. The other two villages were in nearly similar situation in filariasis to this village and so these are omitted from the Tables.

ABUMIZE is in FUKUE Island and located on sandy soil facing to the wide rocky seashore and is over 2km apart from the other villages. It had 20 houses, 88 persons, and 6 positives (or 6.8% in prevalence) in October 1964. In this village the breeding numbers of *C. p. pallens* and *Ae. togoi* were greatly fluctuated depending on the rainy weather, because the houses was standing on the sandy soil and pools on the rocky seashore were generally shallow and therefore the breeding places were dried up when fine days lasted for a long period.

Table 4 shows the results of similar examination conducted at NAGATE village, FUKUE Island. It had 145 houses 577 persons, and 81 positives (or 14.0% in prevalence) in September 1961. It was a farm village near seacoast and had many favorable breeding places of *C. p. pallens*, though very few ones of *Ae. togoi*. In this village residual spray (once

a year) and larvicide application (weekly) have been carried out without using any drugs for microfilarial carriers as will be stated later.

Table 2. Effect of residual spray upon the rate of females found with older filaria larvae and the age grading of the females in *C. p. pallens* (The results were obtained in OKUBO, KARITATE, and ABUMIZE villages where no larvicide was used and where microfilarial prevalences were respectively high, moderate and low)

Village name	%⊕ for Mf	Period of examination before & after residual spray	Catch of mosqs. per house per day	Infection rate of mosqs.	% mosqs. with filaria larvae		% mosqs. being 2-parous, etc.		
					2nd stage	3rd stage	2-p	3-p	4-p
OKU. 1964	26.4	Jun. 28-Aug. 9	6.66	40.68	1.52	1.90	8.37	1.90	0
		R.S.: On Aug. 9 by 0.5% Baytex E.							
		During 1st month	0.02	0	0	0	0	0	0
		During 2nd month	0.20	2.44	0	0	0	0	0
OKU. 1965	26.4	Jun. 24-Aug. 5	3.81	41.78	0.44	0	0.89	0	0
		R.S.: On Aug. 7 by 0.5% Baytex E.							
		During 1st month	0.02	0	0	0	0	0	0
		During 2nd month	0	0	0	0	0	0	0
KAR. 1964	12.6	Jun. 27-Aug. 10	1.03	12.50	2.50	0	5.00	2.50	0
		R.S.: On Aug. 11 by 0.5% Diazinon E.							
		During 1st month	0.04	0	0	0	0	0	0
		During 2nd month	0	0	0	0	0	0	0
KAR. 1965	12.6	Jun. 25-Aug. 4	0.35	0	0	0	4.76	0	0
		R.S.: On Aug. 6 by 0.5% Diazinon E.							
		During 1st month	0	0	0	0	0	0	0
		During 2nd month	0	0	0	0	0	0	0
ABU. 1964	6.8	Jun. 22-Jul. 13	4.28	9.24	0	0	4.35	0	0
		R.S.: On Jul. 13 by 0.5% Sumithion E.							
		During 1st month	0.03	0	0	0	0	0	0
		During 2nd month	0.10	0	0	0	0	0	0
ABU. 1965	6.8	Jul. 21-Aug. 2	0.15	0	0	0	33.33	0	0
		R.S.: On Aug. 2 by 1% Sumithion E.							
		During 1st month	0	0	0	0	0	0	0
		not examined							

Table 3. The same in females of *Ae. togoi* (The results were concurrently obtained in the same villages under the same conditions as those given in Table 2)

Village name	%⊕ for Mf	Period of examination before & after residual spray	Catch of mosqs. per house per day	Infection rate of mosqs.	% mosqs. with filaria larvae		% mosqs. being 2-parous, etc.		
					2nd stage	3rd stage	2−p	3−p	4−p
OKU. 1964	26.4	Jun. 28−Aug. 9	2.95	18.03	0.86	0.43	3.00	1.29	0
		R.S.: On Aug. 9 by 0.5% Baytex E.							
		During 1st month	0.07	0	0	0	0	0	0
		During 2nd month	0.76	9.68	0	0	6.45	0	0
OKU. 1965	26.4	Jun. 24−Aug. 5	1.73	11.76	0.98	0	1.96	2.94	0
		R.S.: On Aug. 7 by 0.5% Baytex E.							
		During 1st month	0.49	6.25	0	0	0	0	0
		During 2nd month	0.07	0	0	0	0	0	0
KAR. 1964	12.6	Jun. 27−Aug. 11	0.28	0	0	0	0	0	0
		R.S.: On Aug. 11 by 0.5% Diazinon E.							
		During 1st month	0.08	0	0	0	0	0	0
		During 2nd month	0.70	28.57	0	0	7.14	0	0
KAR. 1965	12.6	Jun. 25−Aug. 4	0.30	0	0	0	0	0	0
		R.S.: On Aug. 6 by 0.5% Diazinon E.							
		During 1st month	0	0	0	0	0	0	0
		During 2nd month	0.07	0	0	0	0	0	0
ABU. 1964	6.8	Jun. 22−Jul. 13	1.40	0	0	0	9.10	0	0
		R.S.: On Jul. 13 by 0.5% Sumithion E.							
		During 1st month	0.03	0	0	0	0	0	0
		During 2nd month	0.20	0	0	0	0	0	0
ABU. 1965	6.8	Jul. 21−Aug. 2	0.20	0	0	0	0	0	0
		R.S.: On Aug. 2 by 1% Sumithion E.							
		During 1st month	0	0	0	0	0	0	0
		not examined							

Table 4. The same in females of *C. p. pallens* in NAGATE village where microfilarial prevalence in 1961 was 14.0%, and a residual spray and weekly larvicide application during breeding season of the house mosquito was continued between 1962 to 1966, without using any drugs for carriers (In the village *Ae. togoi* was very rare)

Village name	%⊕ for Mf	Period of examination before & after residual spray	Catch of mosqs. per house per day	Infection rate of mosqs.	% mosqs. with filarila larvae		% mosqs. being 2-parous, etc.		
					2nd stage	3rd stage	2-p	3-p	4-p
NAG. 1963	10.9	Larvicide: From Jun. 4 by Diazinon 1 ppm.							
		Jnu. 5-10	3.65	8.22	0	0	-	-	-
		R.S.: On Jun. 12 by 0.5% Diazinon E.							
		During 1st month	0.03	0	0	0	-	-	-
		During 2nd month	6.55	6.87	0	0	-	-	-
		10 weeks later	14.0	14.29	0	7.14	-	-	-
NAG. 1964	9.8	Larvicide: From May 16 by Diazinon 1 ppm.							
		Jun. 6-Jun. 14	1.14	0.04	0	0	0.08	0	0
		R.S.: On Jun. 15-16 by 0.5% Diazinon E.							
		During 1st month	0.10	0	0	0	0	0	0
		During 2nd month	0.25	20.00	0	0	0	0	0
		During 3rd month	0.17	40.00	0	0	0	0	0
NAG. 1965	7.9	Larvicide: From Jun. 9 by Diazinon 1 ppm.							
		Jun. 16-17	0.88	14.29	0	0	0	0	0
		R.S.: On Jun. 18-19 by 0.5% Diazinon E.							
		During 1st month	0	0	0	0	0	0	0
		During 2nd month	0.47	0	0	0	0	0	0

Remarks —: not examined.

Table 5 shows the change in mosquito density and age grading before and after the residul spray in MATSUSHIMA village. This farm village consists of three sections (or small villages) lying along seacoast but 500-600 meters apart from it and nearly in a line at foothill area of a small island, MATSUSHIMA. Detailed account of past endemic situation of filariasis and control work done by us are presented in the footnote of Table 5.

Table 5. Effect of residual spray upon the age grading of females of *C. p pallens* in MATSUSHIMA village (In this village *Ae. togoi* was very rarely found. For details of filariasis control work, see footnote)

Village name	%⊕ for Mf	Period of examination before & after residual apray	Catch of mosqs. per house per day	Infection rate of mosqs.	% mosqs. with filaria larvae		% mosps. being 2-parous, etc.		
					2nd stage	3rd stage	2-p	3-p	4-p
MAT. 1963	0	Larvicide: From Jun. 10							
		Jun. 23-Jul. 20	2.62	—	—	—	1.74	0	0
		R.S.: On Jul. 21-23							
		During 1st month	0.11	—	—	—	0	0	0
		During 2nd month	0	—	—	—	0	0	0
MAT. 1964	0	Jul. 5-25	1.03	—	—	—	0	0	0
		R.S.: On Jul. 27-28. Larvicide: From Aug. 7							
		During 1st month	0.13	—	—	—	0	0	0
		During 2nd month	0	—	—	—	0	0	0
MAT. 1965	0	Jul. 22-Aug. 11	3.04	—	—	—	3.70	1.23	1.23
		Larvicide: From Jul. 26-27. R.S.: On Aug. 11-12							
		During 1st month	0	—	—	—	0	0	0
		During 2nd month	0	—	—	—	0	0	0

Remarks: In 1960, microfilarial prevalences in three sections of the village, A (27 houses and 153 persons), B(64 and 310), and C(26 and 115) were 13.1%, 15.8%, and 21.7% respectively. In August 1960 mass treatment by diethylcarbamazine and mosquito control work by residual spray (R. S.) at intervals of once a year and larvicide application (L. A.) at weekly intervals were begun. As a result, the prevalences decreased to zero in all the sections by August 1962. Thereafter mosquito control work alone was continued to the present time. In 1963, R.S. for A, B, and C were conducted by Diazinon E. (0.5%), and Malathion E. (1%). As a larvicide, the same insecticide as used for R.S. in each section was applied at a rate of 1ppm once a week for ditches and 2 ppm every two weeks for fertilizer pits. By the end of 1963 the villager drained all three sections and in and after 1964 larvicide was only applied to fertilizer pits at a rate of 2ppm every two weeks. Insecticide (used for R. S. and L.A,) for each section in 1964 and 1965 were Diazinon (0.5% and 2ppm), Nankor (0.5% and 2ppm), Baytex (0.5% and 2ppm); Diazinon (0.5% and 2ppm), Sumithion (1% and 2ppm), and Baytex (1% and 2ppm) respectively.

Summary of the experimental results given in Tables 1 to 5

From Tables 1–5, the results of examinations carried out in these villages are summarized as follows:

(1) The average density or the number of females of *C. p. pallens* captured in a house in a collection before residual spray is constantly much larger than that of *Ae. togoi* even in the case of many favorable breeding places for the latter being existed nearby villages.

(2) Natural infection rate of vector mosquitoes is naturally depend greatly on the microfilarial prevalence and micro filarial count of carriers in the village. The rate is markedly higher in *C. p. pallens* than in *Ae. togoi*. This is of interest in view of the fact that in experimental infection rate the latter is nearly as high as the former.

(3) The rate of mosquitoes infected with 2nd stage and especially that of those with infective filaria larvae are very low. The rates are lower in *Ae. togoi* mainly because of being lower in total infection rate in this species.

(4) The fact that no more than 3-parous females could be found and only in a very low percentage in both species seems to show that the longevity of the females in nature would be unexpectedly short. However, there were a few exceptions: Only one 4-parous *C. p. pallens* female was found in MATSUSHIMA village in 1965 before the residual spray, and one 4-parous and two 5-parous *Ae. togoi* females were collected, curiously enough, in human-baited-traps set up outdoors at OKUBO village in 1965.

(5) The females of *C. p. pallens* and *Ae. togoi* can have the chance of transmitting the infective larvae only once on the day of coming to bite man one or two days after becoming 3-parous, because filariae can reach maturity just prior to or on the day of becoming 3-parous, at mean air temperatures of 22°C or above, while, they can not have the chance at 21°C or below because of being much delayed in development of filariae in mosquitoes.

(6) Residual imagicide is effective to reduce the density in both species of vector mosquitoes almost perfectly for about a month and to suppress perfectly the emergence of females infected with infective filaria larvae or of 3-parous females for about two months.

(7) For the prevention of filariasis transmission by the vector mosquitoes in Japan, it is desirable to carry out residual spray once a year in late June or, if necessary, twice a year on mid June and again on late July or early August.

Filariasis control experiment by only vector mosquito control, without using any drugs for microfilarial carriers

A farm village, NAGATE had been insanitary, ill drained, and had many favorable breeding places of *C. p. pallens* till about 1961 when we started to examine filariasis situation and prevalence of mosquitoes and found that the only vector mosquito was *C. p. pallens* and *Ae. togoi* was very rare around the vil-

lage.

Since 1962, residual spray has been carried out once a year, by 5% DDT E. in 1962 and thereafter by 0.5% Diaz. E. and larvicide application has been continued once a week by Diazinon at a rate of 1ppm every year during the breeding season of the vector mosquito. The seasonal prevalence of females of *C. p. pallens* and the prevalence of infected ones under the controlled conditions for the vector mosquito are illustrated in Fig. 1, together with those under the uncontrolled conditions in 1961. In 1962, larvicide application was started one and a half months after the residual spray because of gradual rise in number of adults being observed. In 1963, sudden rise in number of adults took place on from late July which was found on inspection to have been due to unexpected new breeding places being formed carelessly by the sewerage works within the village. This resulted in the appearance of a female infected with infective filaria larvae as shown in Tables 4 and 6.

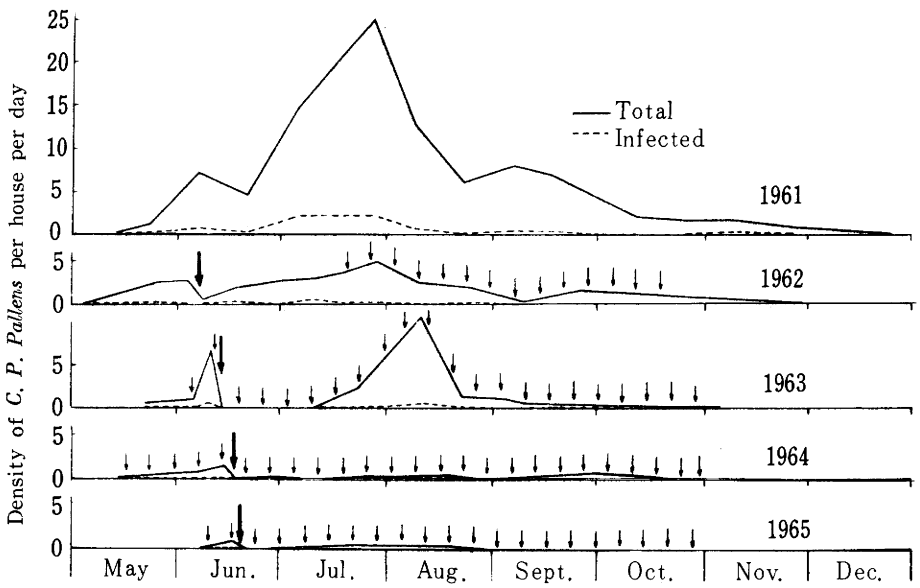

Fig. 1. Seasonal prevalence of *C. p. pallens* collected in houses with one or more microfilarial carriers at NAGATE village in successive five years (Large arrow shows the date of operation of residual spray; small arrows show the dates of larvicide application)

As the years went on, villagers became aware of where the house mosquito breeds from and how to dispose of the newly found breeding sites. Thus, in 1964 and 1965 the control work was very successfully carried out.

The number of *C. p. pallens* and that of those infected are tabulated in Table 6 which shows that the number of females per house markedly decreased year by year, but total infection rate not necessarily decreased because the catches were made only in houses having one or more carriers. Thus, the rate of females with 2nd stage and infective stage larvae reduced to zero after 1963, with only one

Table 6. Natural infections with each stage larvae of *Wuchereria bancrofti* in *C. p. pallens* collected at dwelling houses having microfilarial carriers in NAGATE village under mosquito controlled condition from 1962

Year	Total houses examined	No. of mosquitoes collected	No. of mosquitoes per house	No. (%) of mosquitoes infected	No. (%) of mosquitoes infected		
					with 1st stage larvae	with 2nd stage larvae	with 3rd stage larvae
1961	96	555	5.78	43(7.7)	38(6.8)	5(0.9)	0
1962	201	392	1.95	53(13.5)	52(13.3)	1(0.3)	0
1963	90	241	2.68	20(8.3)	19(7.9)	0	1(0.4)
1964	155	32	0.21	4(12.5)	4(12.5)	0	0
1965	49	18	0.37	1(5.6)	1(5.6)	0	0

exception mentioned above.

The states of annual reduction in the microfilarial prevalence of the villagers, and the mean microfilarial count of the carriers are presented in Table 7 which shows that the prevalence and the count decreased gradually year by year. The slow reduction was due mainly to the occurrence of a few new infections in several persons every year till 1965 which must be thought to have caught during their stay in fishing in the neighboring villages of being moderately endemic in filariasis, and maybe partly to a fewer new infections within the village especially in the early years of the control work when it was not necessarily ideally operated.

A consideration on the effect of filariasis control by only vector control

To control the larvae of the secondary vector, *Aedes togoi*, is very difficult because the breeding places are usually distributed in a wide area and are subjected to a great variation in size and depth depending on the amount of rainfall. Fortunately, however, the mosquito is minor in epidemiological significance because it is restricted in distribution and very low in natural infection rate.

Table 7. Reduction in microfilarial prevalence and density in 60mm^3 blood in NAGATE village

Year	1961	1662	1963	1964	1965	1966
No. of persons examined	577	571	567	541	493	514
No. of positives	81	71	62	53	39	30
% positive	14.0	12.4	10.9	9.8	7.9	5.8
Total No. of microfilariae	6408	4794	3851	1761	1057	818
No. of microfilariae per positive	79.1	67.5	62.1	33.1	27.1	27.3

A good control of the larvae of the principal vector, *C. p. pallens* may be possible if villagers were well trained in finding the possible breeding places and in using larvicide.

On the other hand, residual imagicide (organophosphorous compounds) is rather easy in operation and is very effective for both species suppressing the transmission of the disease for about two months.

Now, in NAGATE village, *Ae togoi* was very rare and was quite out of question. The control work for the house mosquito by imagicide and larvicide has gradually produced a good result especially since 1964, and villagers began to take care of preventing from mosquito bite while staying at other villages. Then, we can expect that filariasis in this village may be reduced to near zero in the near future.

General summary on the effect of control work against vector mosquitoes in Japan

Larvicide application must be effective to reduce the density of the vector mosquitoes, if it could be made continuously, timely, and properly. In fact, however, to answer the purpose, villagers must have special training in finding out the possible breeding places and in using larvicide timely and properly. In this meaning, larval control of *C, p. pallens* which is breeding nearby houses may be possible, while, that of *Ae. togoi* seems hardly possible because it breeds in a variety of pools on rocky seashore of being changeable in existence, size, and depth by the environmental factors. Fortunately, however, this secondary vector, *Ae. togoi* is very restricted in distribution and very low in natural infection rate as mentioned above, and seems quite minor in epidemiological significance.

On the contrary, residual spray for adults is effective not only in reducing mosquito density for about a month but also in suppressing the occurrence of aged females or of those having developed filaria larvae for about two months, as far as the principal vector, *C. p. pallens* and the secondary one, *Ae. togoi* are concerned. Moreover, the operation of residual spray for all houses in a community is rather easy, if it is made under the supervision of specialist.

To suppress the transmission of filariasis in Japan, it is desirable to carry out the residual spray at least once a year on late June, and it is more desirable to do that twice a year on mid June and again on late July or early August, and it is furthermore desirable to carry out larvicide application concurrently.

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日本に於けるバンクロフト糸状虫症の伝搬蚊に対する駆除作業の効果

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摘　　要

日本での最も重要なバンクロフト糸状虫症の伝搬蚊はアカイエカで，あまり重要ではないが第二番目の伝搬蚊はトウゴウヤブカである．前者に対しては週１回の幼虫駆除が実行可能であり極めて有効である．然し，後者に対しては幼虫駆除は困難である．成虫に対する有機燐剤による残留噴霧は両種の伝搬蚊に対して極めて有効であって約１ケ月間は成虫の生息密度を殆んど完全に抑圧し，約２ケ月間は蚊による感染を防止し得る．伝搬蚊を駆除する事のみによる糸状虫症の撲滅を計画し1962年以来某部落で，村民の協力を得て，幼虫駆除及び残留噴霧を適正に実施しているが，1969年の末頃迄にはその撲滅は可能であると思われる．