

3. Title : Mosquito vectors of Dirofilaria immitis in Bangkok

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OBJECTIVES

This study was undertaken to determine the incidence of larvae of Dirofilaria immitis in wild-caught mosquitoes in the Bangkok-Thonburi area, and to assess the susceptibility of several species of colonized mosquitoes to infection with this filarial parasite.

DESCRIPTION

Mosquitoes were collected by means of New Jersey type lighttraps and modified Magoon traps baited with D. immitis-infected dogs at four locations in the Bangkok-Thonburi area—Dindaeng, Thonburi, Bang Khen and at the SEATO Medical Laboratory. Light traps were operated overnight and live mosquitoes from these collections were identified and dissected on the day of collection. The dog-baited traps were kept in operation on a full time basis, and female mosquitoes were aspirated from the traps between 0700 and 0900 hours on an average of 4 days a week. Mosquitoes from the bait-traps were separated into two groups:

1. Unfed mosquitoes were dissected immediately and examined for larvae of D. immitis.

2. Freshly engorged mosquitoes were assumed to have fed upon the bait animals, and these were maintained alive in the insectary for at least 10 days before they were dissected.

Seven species of colonized mosquitoes were fed upon dogs with D. immitis microfilaremia and dissected at intervals of 3 to 17 days following the infective blood meal to determine if they were harbouring developing filarial larvae. Species of mosquitoes used in these experiments were Anopheles stephensi (Calutta strain), Aedes aegypti (Bangkok strain), Ae. albopictus (Thonburi strain), Ae. scutellaris (Prachuab strain), Armigeres subalbatus (Malayan strain), Aedes togoi (Malayan strain) and Culex pipiens quinquefasciatus (Bangkok strain).

RESULTS

The most abundant mosquito species in the light-trap collections made during this study was Culex tritaeniorhynchus, with C. gelidus and Mansonia uniformis the second and third most abundant species, respectively (Table 8). In a total of 759 live mosquitoes dissected from these light-trap collections one C. pipiens quinquefasciatus female was found with two second stage larvae of D. immitis in the malphigian tubules, one C. tritaeniorhynchus had three first stage larvae in its malphigian tubules, and one A. aegypti was found with a third stage larva in its head.

The Magoon trap collections also yielded large numbers of culicine mosquitoes. Dissections of engorged mosquitoes from the dog-baited traps (held 10 days at approximately 80°F and 80% relative humidity prior to dissection) revealed that 28% of the C. pipiens quinquefasciatus, 25% of the Aedes aegypti and 17% of the C. gelidus, had infective larvae in their heads or mouthparts. Fewer of the unfed mosquitoes (dissected on the day of collection) from the Magoon traps were found to be infected (Tables 9, 10).

The results of experimental infections of colonized mosquitoes with D. immitis suggested that three levels of susceptibility existed within the species tested. In three of the species, —C. pipiens quinquefasciatus, A. aegypti, and A. albopictus, 47, 36 and 17 per cent, respectively, of mosquitoes of these species were

found with infective stage larvae in their heads after 12–15 days incubation. On the other hand, when A. scutellaris, A. togoi and Armigeres subalbatus were fed upon dogs with D. immitis microfilaremia 7, 4 and 1 per cent, respectively, of these species had infective stage larvae after 12–17 days of incubation. No infective stage larvae were found in specimens of Anopheles stephensi infected in the same trials.

In light of recent reports of human infection with Dirofilaria immitis it is important to note that the two species with the highest incidence of natural infections in the Bangkok–Thonburi area, Aedes aegypti and Culex pipiens quinquefasciatus, are the two most common man–biting species in the area. Furthermore, other common man–biting species, such as Aedes albopictus, Mansonia uniformis, M. indiana and M. annulifera, are also highly susceptible to infection with D. immitis. While Culex gelidus, an important vector of Japanese encephalitis virus in Southeast Asia, was highly susceptible, the closely related C. tritaeniorhynchus was markedly less so. All of the anopheline species collected or tested during this study were apparently highly refractory to infection with D. immitis.

Table 8. Mosquitoes collected by light-trap in the Bangkok-Thonburi area during July to August, 1968.

Species	June (32 trap-nights)	July (59 trap-nights)	August (41 trap-nights)
<i>Culex fuscocephala</i>	712	2507	812
<i>Culex gelidus</i>	3708	12372	5258
<i>Culex pipiens quinquefasciatus</i>	39	194	157
<i>Culex sitiens</i>	6	26	12
<i>Culex tritaeniorhynchus</i>	19029	32792	15873
<i>Culex vishnui</i> complex	56	26	0
<i>Culex whitmorei</i>	40	45	0
<i>Mansonia annulifera</i>	42	0	39
<i>Mansonia indiana</i>	182	141	152
<i>Mansonia uniformis</i>	412	445	251
<i>Armigeres durhami</i>	9	52	50
<i>Armigeres subalbatus</i>	75	405	344
<i>Anopheles aconitus</i>	0	3	0
<i>Anopheles argyropus</i>	141	163	104
<i>Anopheles campestris</i>	12	53	2
<i>Anopheles crawfordi</i>	16	0	4
<i>Anopheles nigerrimus</i>	135	242	142
<i>Anopheles peditaeniatatus</i>	4	0	0
<i>Anopheles vagus</i>	102	72	39
<i>Aedes aegypti</i>	3	58	60
<i>Aedes albopictus</i>	1	14	0

Tabel 9. Results of dissections of engorged mosquitoes* collected from Magoon traps baited with *D. immitis*—Infected dogs—Bangkok Thailand area. October—December 1968 (166 collections)

Species	No. mosq. dissected	No. mosq. w/1st stage larvae	No. mosq. w/2nd stage larvae	No. mosq. w/3rd stage larvae			Percent mosq. pos.	Per cent mosq. w/ larvae in head
				Abd	Mal tub.	Hd.		
<i>Aedes aegypti</i>	195	4	15	13	24	48	53	25
<i>Anopheles nigerrimus</i>	17	0	0	0	0	0	0	0
<i>Anopheles vagus</i>	71	3	16	5	1	0	35	0
<i>Armigeres subalbatus</i>	112	19	18	3	6	7	47	6
<i>Culex gelidus</i>	1111	76	119	49	121	192	50	17
<i>Culex pipiens quinquefasciatus</i>	3341	76	181	101	162	952	44	28
<i>Culex tritaeniorhynchus</i>	500	21	25	24	18	4	18	0.8
<i>Mansonia annulifera</i>	24	1	6	2	3	3	62	12
<i>Mansonia indiana</i>	96	12	9	11	7	15	56	15
<i>Mansonia uniformis</i>	581	29	51	32	61	75	42	13

* Mosquitoes held 10 days at approximately 80°F and 80% Rel. Hum. prior to dissection.

Table 10. Results of dissections of unfed mosquitoes* collected from Magoon traps baited with D. immitis-infected dogs—Bangkok—Thonburi area, September—December, 1968 (166 collections).

Species	No. mosq. dissected	No. mosq. w/ 1st stage larvae	No. mosq. w/ 2nd stage larvae	No. mosb. w/ 3rd stage larvae			Per cent mosq. pos.	Per cent mosq. w/ larvae in head
				Abd.	Mal tub,	Hd.		
<i>Aedes aegypti</i>	146	19	4	6	3	10	29	6.8
<i>Anopheles nigerrimus</i>	28	0	0	0	0	0	0	0
<i>Anopheles vagus</i>	35	1	0	0	0	0	2.8	0
<i>Armigeres subalbatus</i>	309	14	12	9	2	1	12	0.3
<i>Culex gelidus</i>	414	11	14	3	26	12	16	2.8
<i>Culex pipiens quinquefasciatus</i>	1084	38	53	9	58	48	19	4.4
<i>Culex tritaeniorhynchus</i>	126	0	0	0	2	0	1.6	0
<i>Mansonia uniformis</i>	187	23	23	3	10	5	34	2.7

* Mosquitoes dissected on day of collection.