RESEARCH NOTE

POSSIBLE TRANSMISSION OF TWO TYPES OF *WUCHERERIA BANCROFTI* IN MUANG DISTRICT, CHIANG MAI, NORTHERN THAILAND

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Filariasis due to *Wuchereria bancrofti* is still a major health problem in the world, particularly in tropical and sub-tropical regions (WHO, 1992). In Thailand, an endemic area is distributed throughout the Thai-Myanmar border, *ie* Ratchaburi, Kanchanaburi, Tak and Mae Hong Son. The area is rural, hilly, semi-forested and all of the cases were Thai-Karens. The periodicity behavior is nocturnally subperiodic type with a peak microfilaremia at 20.00 hours and *Aedes harinasutai, Ae. desmotes, Ae. annandalei, Ae. imitator* and *Mansonia dives* are the important vectors (Harinasuta *et al*, 1970; Gould *et al*, 1982; Division of Filariasis, 1995). Recently, another type of nocturnally periodic *W. bancrofti* transmitted by *Culex quinquefasciatus* was brought to Thailand by exodus of Myanmar laborers (Division of Filariasis, 1996). This filarial type has been questioned up to this time, whether active transmission occurs in the Thai population.

Chiang Mai Province is situated at latitude 18° 47' N and longitude 98° 59' E in northern Thailand and is approximately 750 km far from Bangkok, central Thailand. The mean height is about 312 meters above sea level and covered the area of about 20,107 km^2. The population (1997) was approximately 1,578,028 people comprising 273,563 in the urban area and/or Muang district with covered an area of about 152 km^2. Like other big cities, rapid extension of urbanization and industrialization in Chiang Mai Province enhanced the immigration of both Thai-Karens and Myanmar migrants and lead to the new settlement localities. We became aware of a new focus of bancroftian filariasis in Muang District, Chiang Mai Province and/or associated areas from the Annual Report of the Division of Filariasis, Department of Communicable Disease Control, Ministry of Public Health in 1997. The blood survey of Thai-Karens and Myanmar migrants revealed 0.44 and 2.19 of microfilaremic rates, respectively. Therefore, the present study is carried out to determine whether *Cx. quinquefasciatus*, the abundant mosquito species in urban area of Chiang Mai are potentially transmitted these two types of *W. bancrofti.*

Blood containing microfilariae of both nocturnally periodic and subperiodic *W. bancrofti* were obtained from positive carriers recorded by the Division of Filariasis, Ministry of Public Health. Since the marked difference in microfilarial density might be reflected in the number of microfilariae ingested by mosquito vectors and consequently effected on the infective rate, to rule out this variable factor, microfilarial densities from 40-60 microfilariae per 60 mm^3 of blood carriers were used. For the nocturnally periodic type, one positive carrier (Burmese, imported case) was obtained from Muang District Ranong Province. The peak count of microfilariae in peripheral blood of the carrier was at 02.00 hours. For the nocturnally subperiodic type, two positive carriers (Thai-Karen, indigenous cases) were obtained from Mae-Ramat District, Tak Province. The peak count of microfilariae in peripheral blood of these two carriers was at 02.00 hours.

In order to determine the potential transmission of two types of *W. bancrofti*, *Cx. quinquefasciatus*, the common and abundant mosquito species in the urban area of Muang District, Chiang Mai Province were used. Larvae of mosquitos were taken from their breeding places in Suan Dok Campus, Tambon Sriphum, Muang District and reared in the insectarium (12 hours illumination, 27 ± 2°C, 70-80% RH). Prior to the infections, blood was drawn from the median-cubital vein of the carriers and heparin added to a concentration of ten units per ml of

blood. The number of microfilariae in blood was counted in wet films of 20 mm^3 (three replications). Three to five-day-old adult females *Cx. quinquefasciatus* (fasted for 12 hours) were allowed to feed on heparinized blood using the artificial membrance feeding technic as described by Chomcharn *et al* (1980). Fifteen days after feeding, all mosquitos were dissected in normal saline solution and examined under a dissecting microscope. The number of mosquitos with one or more infective larvae in any parts of the body (head, thorax, abdomen) were recorded.

The infective rates and parasite loads of *Cx. quinquefasciatus* are shown in Table 1. The results of dissection of all infected mosquitos on day 15 revealed that *Cx. quinquefasciatus* was the susceptible mosquito species having infective rates of 68.97% (Case I; nocturnally periodic), 30.77% (Case II; nocturnally subperiodic) and 23.53% (Case III; nocturnally subperiodic). Statistical analysis of the infective rates revealed that the rate obtained from experimental feeding on nocturnally periodic microfilariae was significantly higher than that from feeding on nocturnally subperiodic microfilariae (Case I/Case II, $X^2 = 3.90$, $p < 0.05$; Case I/Case III, $X^2 = 7.14$, $p < 0.05$). It is pertinent to note that, all infective larvae obtained from the three experimental feedings were very active and found distributed in all regions of the head, thorax and abdomen and they behaved similarly: more than 59% of infective larvae could migrate from the thorax to the head and proboscis (Table 2).

The investigation of susceptibility of *Cx. quinquefasciatus* from the urban area of Muang District, Chiang Mai Province to both nocturnally periodic and subperiodic *W. bancrofti* suggested that it could serve as an efficient vector in the laboratory. The present results generally agree with reports of Sucharit and Harinasuta (1975), but differ in the ability of potential natural transmission. Because of the short life span and unassociated biting activity with the microfilarial periodicity, *Cx. quinquefasciatus*

Table 1

The infective rates and parasite loads in *Cx. quinquefasciatus* after artificial feeding on blood infected with nocturnally periodic (NP) and subperiodic (NSP) *W. bancrofti*, all dissected 15 days after feeding.

Type of *W. bancrofti*	Mf density per cmm	No. dissected	No. infected (%)	Average No. larvae per infected mosquito (range)
NP				
Case I	0.72	29	20 (68.97)	4.20 (1-21)
NSP				
Case II	1.02	13	4 (30.77)	6.25 (3-11)
Case III	0.90	17	4 (23.53)	2.50 (1-4)

Table 2

The distribution of infective larvae of nocturnally periodic (NP) and subperiodic (NSP) *W. bancrofti* in head, thorax and abdomen of *Cx. quinquefasciatus*, all dissected 15 days after feeding.

Type of	No. infective larvae found in			
W. bancrofti	Head (%)	Thorax (%)	Abdomen (%)	Total
NP				
Case I	50 (59.52)	17 (20.24)	17 (20.24)	84
NSP				
Case II	17 (68.00)	7 (28.00)	1 (4.00)	25
Case III	8 (80.00)	2 (20.00)	0	10

in Bangkok, central Thailand, was not considered as a problem of spreading the *W. bancrofti* infection (Sucharit *et al*, 1981). In contrast, this mosquito species (strain from Muang District, Chiang Mai Province) was proven to be an efficient laboratory and natural vector of dog heart worm, *Dirofilaria immitis*, which has the same duration of larval development in mosquito vector as *W. bancrofti* (Choochote *et al*, 1987, 1992). Additionally, its biting rate on dogs and humans was very similar.

Exodus of Myanmar and Karen laborers both from legal and illegal immigration could be easily done since Chiang Mai is close to the endemic area and to the neighboring country. The rapid extension of urbanization and industrialization in Chaing Mai Province would enhance the immigration of infected people and this could give rise to new foci of bancroftian filariasis transmission, particularly in the growing and crowded areas which have become both temporary and permanent homes of immigrants. In the light of this information and because of the significant role to *Cx. quinquefasciatus* mentioned above, the danger of the establishment of bancroftian filariasis in urban area of Chiang Mai Province exists. Monthly surveys of filarial larvae in man and mosquitos in suspected areas are strongly recommended. Effective surveillance of the immigrants are needed to reduce the risk.

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