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High prevalence of *Wuchereria bancrofti* infection among Myanmar migrants in Thailand

Wuchereria bancrofti is still a major public-health problem in the tropics and subtropics. This filarial nematode causes the vast majority of the 100 million human cases of lymphatic filariasis found globally (Ottesen and Ramachandran, 1995), and about 1000 million people are believed to be at risk of acquiring the infection (WHO, 1984). In Thailand, control measures have now confined the area of active transmission of this parasite to the three western provinces of Tak, Kanchanaburi, and Mae Hong Son (see Fig.). The most recent estimate of the prevalence of lymphatic filariasis in Thailand is 2.08 cases/100 000 (Anon., 1998). The *W. bancrofti* endemic to Thailand is of the nocturnal subperiodic (rural) strain that is transmitted mainly by the *Aedes niveus* group of mosquitoes (Anon., 1996). Recently, however, hundreds of thousands of migrants from Myanmar have crossed into Thailand to seek work, and it is estimated that 2%–5% of these migrants carry the nocturnal periodic (urban) type of *W. bancrofti* (Anon., 1996; Swaddiwudhipong *et al.*, 1996; Triteeraprapab and Songtrus, 1999). Since the main vector of this urban form of *W. bancrofti*, *Culex quinquefasciatus*, is prevalent in Thailand, the migrant population from Myanmar could form an important new reservoir of bancroftian filariasis in Thailand. The problem may be worse than currently recognized because all the available estimates of the prevalence of infection in the Myanmars are based on parasitological diagnosis using thick bloodsmears (Swaddiwudhipong *et al.*, 1996; Triteeraprapab and Songtrus, 1999). The relative insensitivity of this technique raises the possibility that many migrants with low microfilaraemias are being considered uninfected. The goal of the present study was to obtain a more accurate idea of the prevalence of *W. bancrofti* infection in the Myanmar migrant population, by comparing estimates produced using three methods: (1) microscopical examination for microfilariae (mff) in thick smears of night-blood (blood collected between 20.00 and 00.00 hours, and each smear examined for 3–5 mins at $\times 100$), with any mff identified to species at $\times 400$; (2) detection of the circulating parasite antigen Og4C3, using a commercial ELISA (JCU Tropical Biotechnology, Townsville, Australia); and (3) ELISA-based assessment of serum levels of specific anti-filarial IgG_4, using extracts from adult *Brugia malayi* as antigen (Chanteau *et al.*, 1991). Both of the serological assays used are known to give more sensitive measures of infection than the traditional examination of bloodsmears, although those who have been exposed in the past but do not have current infection may be seropositive for anti-filarial IgG_4 (Lal and Ottesen, 1988; Kwan-Lim *et al.*, 1990; More and Copeman, 1990; Wamae *et al.*, 1992; Kurniawan *et al.*, 1993; Turner *et al.*, 1993; WHO, 1993; Lammie *et al.*, 1994; Atmadja *et al.*, 1995).

The subjects were 371 Myanmar migrants (aged 2–56 years) who were living in the Mae Sot district of Tak province. They were selected at random (from the residents aged ≥ 2 years) during a cross-sectional survey in a community at Moo Nerng, in the Maekasa sub-district, in January–March 1999. The study was approved by the ethical committee of the Faculty of Medicine at Chulalongkorn University. Verbal informed consent was obtained from the adult subjects and (in the presence of two witnesses) from a parent or guardian of each of the children investigated. All the subjects who appeared to be infected with filarial parasites were treated with a standard dose of diethylcarbamazine (DEC), as recommended by Thailand's Filariasis Division.

The results of the three tests are summarized in the Table. All of the mff observed

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Fig. A sketch map showing the areas of Thailand where there is active transmission of *Wuchereria bancrofti* (i.e. the provinces of Kanchanaburi, Tak and Mae Hong Son).

were identified as *W. bancrofti*. Microfilariae were observed in the bloodsmears from 29 of the subjects, giving an estimated prevalence (8%) which is similar, although slightly higher, to earlier estimates based on the examination of smears (Swaddiwudhipong *et al.*, 1996; Triteeraprapab and Songtrus, 1999). However, 38 (10%) of the subjects were deemed seropositive for the Og4C3 antigen, including 27 (93%) of those found to be microfilaraemic; the two microfilaraemics who were antigen-negative had very low microfilaraemias (only one microfilaria being seen on the bloodsmear of each). Eleven (3%) of the 342 subjects considered amicrofilaraemic were antigen-positive.

The estimate of prevalence based on the demonstration of anti-filarial IgG_4 in the serum was a remarkable 42%, as 157 of the subjects—25 (86%) of the 29 recognized microfilaraemics and 132 (39%) of the 342 subjects deemed amicrofilaraemic—were con-

TABLE

Detection of Og4C3 antigen and anti-filarial IgG_4 in Myanmar migrants living in Tak province, Thailand, classified by microfilaraemic status

	No. and (%) of subjects				
	Investigated	*Antigen-positive*	*Antigen-negative*	*Antibody-positive*	*Antibody-negative*
Microfilaraemics	29 (8)	27 (93)	2 (7)	25 (86)	4 (14)
Amicrofilaraemics	342 (92)	11 (3)	331 (97)	132 (39)	210 (61)
All	371 (100)	38 (10)	333 (90)	157 (42)	214 (58)

sidered seropositive for the antibodies (Table). Ten (91%) of the subjects who appeared to be amicrofilaraemic though antigen-positive were seropositive for anti-filarial IgG_4. Overall, 44% of the subjects had at least one marker of infection: microfilaraemia; seropositivity for Og4C3; and/or seropositivity for anti-filarial IgG_4.

It is not surprising that the results of the serological assays indicated higher prevalences of infection than estimated from the results of microscopical examination of smears of night-blood. The difference is, however, alarming, with serology indicating that at least 10% of the Myanmar migrants were infected with *W. bancrofti* and that more than 40% were either infected or had been exposed to the parasite in the past. As migrants from Myanmar work in all areas of the country, including the major cities, there is now a real need to re-evaluate the national programmes for the control and surveillance of lymphatic filariasis in Thailand.

Lymphatic filariasis has been targeted by the World Health Organization for elimination as a public-health problem by the year 2020 (Behbehani, 1998). Mass treatment of the migrants will be required if the necessary reduction in filariasis-attributable morbidity is to be achieved in Thailand. The ongoing movement of the Myanmar migrants, from place to place within Thailand and during periodic trips back to Myanmar to visit families, creates significant problems for treatment programmes (Triteeraprapab and Songtrus, 1999). The observations that *W. bancrofti* is able to develop to the infective stage in Thai strains of *Cx. quinquefasciatus* (Triteeraprapab *et al.*, 2000) and that the *Cx. quinquefasciatus* in Thailand have a high annual biting rate (Anon., 1995) provide other areas of concern. It is essential that the health authorities in Thailand set up well-planned strategies to control the disease situation.

Assays for anti-filarial IgG_4 have limited use in cross-sectional surveys because they cannot discriminate between active infection and past exposure. However, when used for screening, such methods are relatively quick and easy and give a useful indicator of the burden posed by lymphatic filariasis in an area. Perhaps blood samples from subjects found to be carrying anti-filarial IgG_4 in a first screening could then be tested (for signs of active infection) with an appropriately sensitive and specific antigen-detection system. This should provide the information required to make informed policy decisions on control.

Further studies on the cost–effectiveness of each of the available diagnostic tests would provide essential data for those making the decisions about national health-care policies, especially in the many countries where lymphatic filariasis is endemic and resources are severely limited.

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