RESEARCH NOTE

ANTIBODIES TO *ORIENTIA TSUTSUGAMUSHI* IN SOLDIERS IN NORTHEASTERN THAILAND

SP Frances[1], Chirapa Eamsila[2] and D Strickman[1]

[1]Department of Entomology, US Army Medical Component, [2]Research Division, Royal Thai Army Component, Armed Forces Research Institute of Medical Sciences, 315/6 Rajvithi Road, Bangkok 10400, Thailand

Abstract. The prevalence and incidence of antibodies to *Orientia tsutsugamushi*, the etiologic agent of scrub typhus, in Thai soldiers living and working near the Thai-Cambodian border in Si Sa Ket Province was investigated. The point prevalence of antibodies varied from 0 to 4.1%. The incidence of antibodies, calculated from individuals who seroconverted following a negative result in a previous bleeding 3 to 5 months earlier, was 4.21% (9/214) in January 1992, 0 in April 1992 and 3.76% (8/213) in September 1992. An annual infection rate of 2.66% was estimated.

Scrub typhus is a febrile disease caused by infection with *Orientia tsutsugamushi*. The etiologic agent of the disease was previously known as *Rickettsia tsutsugamushi*, and was recently re-classified in a new genus (Tamura *et al*, 1995). The disease occurs in rural areas of Thailand, and was recently reported near urban areas of Bangkok (Eamsila *et al*, 1990). The prevalence of the disease in Thailand is reported to be low, with only 1,196 cases reported country wide in 1991 (Division of Epidemiology, 1992). Despite this, serosurveys in rural Thailand have found a high point prevalence, with 77% of inhabitants of a village in northeastern Thailand (Johnson *et al*, 1982), and 59% of inhabitants of 2 villages in northern Thailand with antibodies (Takada *et al*, 1984). Exposure to scrub typhus is related to behavior and occupation (Strickman *et al*, 1994), and historically has been a problem for military troops due to their activities which bring them into close contact with the vectors, larval Trombiculid mites (Berman *et al*, 1973).

During a study to investigate the use of permethrin impregnated uniforms as protectants against malaria (Eamsila *et al*, 1994), we investigated the prevalence of antibodies to *O. tsutsugamushi* in soldiers living and working in an endemic area in northeastern Thailand over a 1 year period. Since volunteers remained in the study area for at least six months, we were also able to investigate the incidence of seroconversions to *O. tsutsugamushi*.

The volunteers were Royal Thai Army troops deployed to 3 areas near the Thai-Cambodian border in Si Sa Ket Province, northeastern Thailand between September, 1991 and October, 1992. In September 1991, 403 soldiers were recruited in the study (Eamsila *et al*, 1994). Following a six month deployment some of the volunteers left the study area and were replaced by new recruits. In April, 1992, a total of 292 volunteers were participating in the study. Troops were deployed under primitive conditions, were constantly on duty, and performed patrols under a real combat threat. Blood samples were collected by finger stick method in heparinized capillary tubes, spun at 10,000*g* for 2 minutes, and the plasma transferred into clean tubes before transport on dry ice to the laboratory in Bangkok. Plasma was stored at -70°C until testing using an indirect fluorescent antibody assay (IFA), with two-fold dilutions beginning at 1:50 (Robinson *et al*, 1976). Antigen spots consisted of a mixture of Karp, Kato, and Gilliam strains of *O. tsutsugamushi* grown in eggs and control spots consisted of normal yolk sac protein. The conjugated detection antibody was rabbit anti-human mixed immunoglobu-lins (Progress Laboratories, Inc, Baltimore, MD, USA). Samples were collected in the last week of September, 1991 and January, April and September, 1992. There was no opportunity to record illness in the volunteers during their deployment and all troops were afebrile at the time of blood sampling.

Correspondence: SP Frances, Australian Army Malaria Institute, Gallipoli Barracks, Enoggera, Brisbane, 4052 Australia.

Table 1

Prevalence and incidence of IgG antibody titers (≥ 1 : 50) to *O. tsutsugamushi* in Thai soldiers participating in field exercises in Si Sa Ket Province, Thailand, September, 1991 to September, 1992.

	Percentage positive (No. tested)			
	Sept 91	Jan 92	Apr 92	Sep 92
Prevalence	1.80 (333)	3.33 (270)	0 (292)	4.10 (244)
Incidence		4.21 (214)	0 (193)	3.76 (213)

The percentage of soldiers with antibody at a titer of ≥ 1 : 50 in all seasons was low, with a point prevalence of 0 to 4.1% (Table 1). In Thailand, scrub typhus is usually associated with the wetter months of the year (Silpapojakul *et al*, 1991). There were no individuals with antibodies in April, 1992, following the dry season in the current study. The incidence of infection, calculated from those individuals with a negative result in the previous bleeding who seroconverted to *O. tsutsugamushi* when re-bled, was 4.21% (9/214) in January 1992, 0 in April 1992 and 3.76% (8/213) in September 1992 (Table 1). Using these data, an annual infection rate of 2.66% was estimated.

The occurrence of scrub typhus in this region of Thailand is reported to be low. In 1991, there was a total of only 54 cases reported to the Ministry of Health in Si Sa Ket Province (Division of Epidemiology, 1992). Paul *et al* (1987) reported 40 cases of scrub typhus in a group of approximately 38,000 Cambodian refugees at Greenhill Site B, Surin Province, a prevalence of approximately 0.1%. The point prevalence of elevated antibody titers to *O. tsutsugamushi* in troops based in Ubon Ratchathani Province was 7.3% in April 1989, and 9.1% in July 1989 (Eamsila *et al*, 1996).

The current study shows that the prevalence and incidence of antibodies to scrub typhus in this region is low relative to other areas of Thailand (Eamsila *et al*, 1996). The increased incidence of antibodies in the wetter months of the year shows that the disease will continue to be a concern for military personnel working in this region. Foreign troops who might participate in exercises in eastern Thailand should maintain a high level of suspicion for this potentially serious disease.

ACKNOWLEDGEMENTS

We thank soldiers of the RTA for their participation; Kittithep Krinchai, Pradith Kaewsathien, Naruphon Kuttasingki and Tawatchai Chaiyamanurat for field and technical assistance; Somyod Buranavichetkul for laboratory assistance; and KJ Linthicum for valuable comments on the manuscript. This study was conducted under WRAIR protocol 396, and was approved by the WRAIR ethics committee and Director General of AFRIMS. This article is published with the approval of the Director General of Army Health Services (Austraria).

REFERENCES

Berman SJ, Irving GS, Kundin WD, Gunning J-J, Watten RH. Epidemiology of the acute fevers of unknown origin in South Vietnam: Effect of laboratory support upon clinical diagnosis. *Am J Trop Med Hyg* 1973; 22 : 796-801.

Division of Epidemiology, Ministry of Public Health. Annual Epidemiological Surveillance Report 1991, Ministry of Public Health, Bangkok, Thailand, 1992.

Eamsila C, Buranakitjaroen P, Tanskul P, Watcharapichat P. Scrub typhus in suburban Bangkok: First cases. *J Med Assoc Thailand* 1990; 73 : 585-91.

Eamsila C, Frances SP, Strickman D. Evaluation of permethrin-treated military uniforms for personal protection against malaria in northeastern Thailand. *J Am Mosq Control Assoc* 1994; 10 : 515-21.

Eamsila C, Singsawat P, Duanovaraporn A, Strickman D. Antibodies to *Orientia tsutsugamushi* in Thai soldiers. *Am J Trop Med Hyg* 1996; 55 : 556-9.

Johnson DE, Crum JW, Hanchalay S, Saengruchi C. Sero-epidemiological survey of *Rickettsia tsutsugamushi* infection in a rural Thai village. *Trans R Soc Trop Med Hyg* 1982; 76 : 1-3.

Paul SR, Karanth S, Dickson C. Scrub typhus along the Thai-Kampuchean border: new treatment regimen. *Trop Doctor* 1987; 17 : 104-7.

Robinson DM, Brown G, Gan E, Huxsoll DM. Adaption of a microimmunofluorescence test to the study of human *Rickettsia tsutsugamushi* antibody. *Am J Trop Med Hyg* 1976; 25 : 900-5.

Silpapojakul K, Chupuppakarn S, Yuthasompob S, *et al.* Scrub and murine typhus in children with obscure fever in the tropics. *Pediatr Infect Dis J* 1991; 10 : 200-3.

Strickman D, Tanskul P, Eamsila C, Kelly DJ. Prevalence of antibodies to rickettsiae in the human population of suburban Bangkok. *Am J Trop Med Hyg* 1994; 51 : 149-53.

Takada N, Khamboonruang C, Yamaguchi T, Thitasut P, Vajrasthira, S. Scrub typhus and chiggers in northern Thailand. *Southeast Asian J Trop Med Public Health* 1984; 15 : 402-6.

Tamura A., Ohashi N, Urakami H, Miyamura S. Classification of *Rickettsia tsutsugamushi* in a new genus, *Orientia* gen nov, as *Orientia tsutsugamushi* comb nov. *Int J Syst Bacteriol* 1995; 45 : 589-91.