



Seroprevalence of *Toxoplasma gondii* infection in domestic goats in Satun Province, Thailand

Sathaporn Jittapalapong^a, Arkom Sangvaranond^a, Nongnuch Pinyopanuwat^a,
Wissanuwat Chimnoi^a, Witaya Khachaeram^b, Seiichi Koizumi^c, Soichi Maruyama^{d,*}

^aDepartment of Parasitology, Faculty of Veterinary Medicine, Kasetsart University, Bangkok 10900, Thailand

^bDepartment of Livestock Development, Satun Provincial Livestock Office, Satun, Thailand

^cLaboratory of Management of Animal Industry, Department of Animal Science and Resources,
College of Bioresource Sciences, Nihon University, 1866 Kameino, Fujisawa, Kanagawa 252-8510, Japan

^dLaboratory of Veterinary Public Health, Department of Veterinary Medicine, College of Bioresource Sciences,
Nihon University, 1866 Kameino, Fujisawa, Kanagawa 252-8510, Japan

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Abstract

Goats are important domestic animals in the south of Thailand due to the minimal cost of rearing and maintaining them, and their production of both meat and milk. Toxoplasmosis is one of the most threatening parasitic zoonoses and the causative agent *Toxoplasma gondii* uses a wide range of warm-blooded intermediate hosts including the goat. The objective of this study was to assess the seroprevalence of antibodies to *T. gondii* in goats of Satun Province in Thailand. A total of 631 goat sera were examined for antibodies against toxoplasmosis with commercial latex agglutination test kits (Toxocheck-MT 'Eiken'). Of these, 176 (27.9%) were found to be positive to *T. gondii*; antibody titers ranged from 1:64 to 1:4096 (1:64 cut-off). Female goats were 1.73 times more likely than male to be seropositive (odds ratio [OR] = 1.73; 95% confidential interval [CI] = 1.11, 2.73). Dairy goats were more likely to be seropositive than meat goats (OR = 1.36; 95% CI = 0.84, 2.20). Goats were infected with *T. gondii* with acquisition of age because older goats were more likely to be seropositive than young goats under 1-year-old (for 1–2 years, OR = 19.6; 95% CI = 0.92, 4.15, for >2 years, OR = 2.70; 95% CI = 1.26, 5.80). The high seroprevalence of *T. gondii* antibodies found in the present study suggested widespread exposure of goats in Satun Province to *T. gondii*.

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Toxoplasma gondii is an important zoonotic protozoon with a worldwide distribution. The organ-

ism is capable of infecting all warm-blooded animals and is estimated to infect 4–77% of the human population (Tenter et al., 2000). Although not normally a significant problem for healthy individuals, *Toxoplasma* infection can be life threatening for infants infected congenitally and pharmacologically

* Corresponding author. Tel.: +81 466 84 3636;
fax: +81 466 84 3636.

E-mail address: maruyama@brs.nihon-u.ac.jp (S. Maruyama).

immunosuppressed patients (Chintana et al., 1998). However, its greatest impact is in late AIDS patients, where up to 25% of patients will develop toxoplasmic encephalitis (Luft et al., 1984; Lucas et al., 1993). In humans, *T. gondii* is transmitted either by direct animal contact, ingesting oocysts or by eating raw, undercooked meat or unpasteurised milk containing infective stages of the parasite (Riemann et al., 1975; Sacks et al., 1982). In animals, *T. gondii* infection not only results in significant reproductive and hence economic losses, but also has implications for public health since consumption of infected meat or milk can facilitate zoonotic transmission.

Serological studies in Thailand have shown widespread cases of infection in humans (Morakote et al., 1984; Maruyama et al., 2000), dogs (Nishikawa et al., 1989), cats (Sukthana et al., 2003), elephants (Tuntasuvan et al., 2001), and cattle (Suteeraparp et al., 1999). However, *T. gondii* infection in meat-producing animals, particularly goats in the south, is questionable to date. Goats are regarded as the most important source of meat and milk to Islamic people and are mostly reared and maintained on public lands (Jittapalpong et al., 2003). Lack of modern farming has increased the prevalence of *T. gondii* in many countries, including Thailand. After transport from slaughterhouses, meat can easily be contaminated with *T. gondii* oocysts in the surrounding area later on and unpasteurized goat milk is commonly consumed

by Islamic people due to their cultural traditions. These factors result in a higher potential risk of infection after consumption of these foodstuffs.

The epidemiology of toxoplasmosis in goats in Thailand has not been sufficiently studied, particularly in the south. Satun Province, which is one of the most southern provinces in Thailand, is the top four provinces in terms of goat population. Therefore, we chose this province to examine the seroprevalence of *T. gondii* infection among goats in this study.

The number of goat farm holders in Thailand is approximately 20,734 farms and goat population of Thailand in 2003 is 213,917 (each farm roughly contains two to five goats and breed such as meat and dairy was not classified). Sampling was performed between September 2002 and February 2003 from small farm holders in Satun Province (Fig. 1). Sample size was determined based on an assumed prevalence of 25% and was calculated with 90% confidence at an absolute precision of 5% assuming random sampling. The sample size in this study was calculated by EpiCalc 2000, Version 1.2 with 80% power of the test and 95% confidence interval. Individual sampling points were sampled at 90% confidence with an absolute precision of 10%. Therefore, around 5% of farm holders were randomly selected from each district.

A total of 631 blood samples of goats were collected from 125 farm holders located in seven

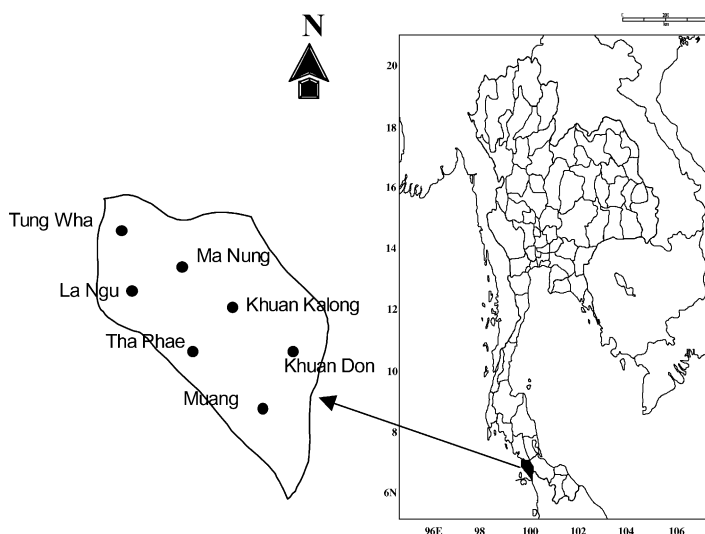


Fig. 1. Map of Thailand and Satun Province where samples were collected.

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