

Detection of *Anaplasma* spp. and *Bartonella* spp. from wild-caught rodents and their ectoparasites in Nakhon Ratchasima Province, Thailand

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ABSTRACT: The objective of this study was to investigate evidence of emerging anaplasmosis and bartonellosis in rodents from endemic areas of Nakhon Ratchasima, Thailand. Rodent trapping was undertaken in 13 sub-districts of Muang District. The live-capture traps were set up in three locations of selected scrub typhus patient houses for three consecutive nights. Wild-caught rodent whole blood samples and associated ticks and fleas were collected and tested for *Anaplasma* spp. and *Bartonella* spp. In addition, heat maps using GIS software were used to determine the density of infection of positive wild-caught rodents. A total of 347 wild-caught rodents of nine species was captured. *Rattus rattus* (38.6%) was the dominant species. A total of 1,518 *Heamaphysalis bandicota* ticks and 57 *Xenopsylla cheopis* fleas was removed. Twenty-two of the 347 tested blood samples (6.3%) were *Anaplasma bovis*-positive and 121 blood samples and five out of 27 pools of *X. cheopis* fleas were *Bartonella queenslandensis*-positive. Of these infected rodents, dual-infections between *A. bovis* and *B. queenslandensis* were found in three *B. indica* rodents. Our results offer new information concerning the infections of *A. bovis* and *B. queenslandensis* in both rodents and their ectoparasites collected in high-risk areas of rodent-borne diseases in Thailand. **Journal of Vector Ecology 45 (2): 241-253. 2020.**

Keyword Index: *Anaplasma*, *Bartonella*, dual-infection, rodents, ectoparasites, QGIS.

INTRODUCTION

The greater frequency of emerging infectious disease outbreaks emphasizes the importance of several zoonotic and rickettsial pathogens that are easily transmitted from their natural animal hosts to humans. As humans extend their activities into undisturbed habitats, they come into close contact with animals that play important roles as reservoirs, especially within the group Rodentia. Rodents are recognized as reservoir hosts for more than 60 zoonotic pathogens that represent serious threats to human health (Luis et al. 2013). Rickettsial diseases, including anaplasmosis and bartonellosis, are among some of the most significant rodent-borne diseases that are indirectly transmitted to humans by intermediate arthropod vectors.

Anaplasmosis is a tick-borne disease caused by various species of *Anaplasma*, a gram-negative bacteria in the family Anaplasmataceae. Several *Anaplasma* species, such as *Anaplasma marginale*, *Anaplasma centrale*, *Anaplasma ovis*, and *Anaplasma bovis*, are bacteria of higher vertebrates. *Anaplasma platys* is mainly a pathogen of canines and *Anaplasma phagocytophilum* is a pathogenic bacterium of humans and domestic animals. Several species of ticks, including *Ixodes scapularis*, *Ixodes pacificus*, *Amblyomma americanum*, *Dermacentor variabilis*, and *Dermacentor andersoni*, are the main vectors of anaplasmosis in the United States. Over 30 species of *Bartonella* have been identified (Kosoy et al. 2010), and about fifteen species have been

detected from various wild-caught rodent species (Bai et al. 2009). Among these are at least seven species (*Bartonella birtlesii*, *Bartonella elizabethae*, *Bartonella grahamii*, *Bartonella rattimassiliensis*, *Bartonella tamiae*, *Bartonella tribocorum*, and *Bartonella washoensis*) that are known to be causative agents of human illnesses (Kosoy et al. 2010). Various arthropods, such as fleas, mites, sand flies, and ticks, have been incriminated as vectors of bartonellosis in animals and humans. However, fleas, especially *Xenopsylla cheopis*, are considered to be the main vectors of *Bartonella* infection in rodents.

Human cases of bartonellosis have been reported in Chiang Rai and Khon Kaen provinces of Thailand (Kosoy et al. 2010) where the presence of *B. elizabethae*, *B. rattimassiliensis*, *B. tribocorum*, *B. henselae*, *Bartonella vinsonii*, and *B. tamiae* was detected in blood clots from 14 febrile patients (Foongladda et al. 2011). Among the positive patients, 71% reported rat exposure during the two weeks prior to the onset of illness (Kosoy et al. 2008, 2010).

Little is known about the infections of *Bartonella* and *Anaplasma* pathogens in potential animal reservoir hosts as well as in humans in this area (Kosoy et al. 2010), most likely because of patients being asymptomatic or experiencing mild symptoms for both diseases. In addition, the clinical manifestations of both scrub typhus and anaplasmosis are similar (Zhang et al. 2012), leading to missed and under-reported disease.

The main objective of this study was to investigate the