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Field Epidemiology Training Program, Bureau of Epidemiology
Department of Disease Control, Ministry of Public Health, Thailand
Tel: +6625901734-5, Fax: +6625918581, Email: osireditor@osirjournal.net, http://www.osirjournal.net

Q Fever among Dairy Cattle in Chiang Mai Province, Thailand, 2012: A Preliminary Study

Pranee Rodtian[1,*], Nuamjit M[1], Srijan M[2], Opaschaitat P[3], Ekgatat M[3]

1 Fifth Regional Livestock Office, Chiang Mai Province, Thailand

2 Provincial Livestock Office, Chiang Mai Province, Thailand

3 National Institute of Animal Health, Thailand

* Corresponding author, email address: pranee.rodtian@gmail.com

Abstract

Q fever is an emerging zoonosis in Thailand caused by *Coxiella burnetii*. The purpose of this study was to explore the presence of *C. burnetii* antibody in dairy cattle, an important reservoir of Q fever, in Chiang Mai Province. Sera collected from dairy cattle by convenience sampling in San Pa Tong, Mae Wang and Mae On Districts in Chiang Mai were analyzed by the National Institute of Animal Health using indirect enzyme-linked immunosorbent assay (ELISA). Proportions of seropositive dairy cattle at herd and individual levels were 62% (13/21) and 5% (28/581), respectively. Mae On District had the highest proportion of seropositive dairy cattle in this study. This result suggested that dairy cattle might be an important carrier of Q fever in farming communities and further investigation on Q fever burden in both livestock and farmers was warranted.

Keywords: Q fever, dairy cattle, Chiang Mai

Introduction

Q fever is a zoonosis caused by *Coxiella burnetii*, strict obligate intracellular Gram negative bacteria highly resistant to the environment. Domestic animals have commonly been identified as reservoirs, including cattle, sheep and goats. It was estimated that up to 30% of people in agriculture communities may be exposed to Q fever, including farmers, veterinarians and others in contact with animals.[1] The bacteria can be transmitted through inhalation of contaminated particles with *C. burnetii*, physical contact with vaginal mucus, milk, feces, urine or semen of infected animals, and bites by infected tick.[2] In Thailand, the first Q-fever antigen was detected in sera collected from workers in a slaughter house of Bangkok during 1966.[3] Nine acute clinical cases were also reported in 2003.[4] Seroprevalence of Q fever in asymptomatic domestic animals was the highest in dogs (28.1%) while prevalence in goats, sheep and cattle varied from 2.3-6.1%.[3] However, there was no updated information on seroprevalence of Q fever among animals in Thailand. In 2011, a study on human endocarditis in Khon Kaen Province identified four confirmed cases of Q fever related to endocarditis.[5] All patients had a history of contact with dairy and beef cattle.

The aim of this study was to explore presence of *C. burnetii* antibody among dairy herds in San Pa Tong, Mae Wang and Mae On Districts of Chiang Mai Province, Thailand.

Methods

Study Area and Population

This was a retrospective cross-sectional study conducted in San Pa Tong, Mae Wang and Mae On Districts of Chiang Mai Province between January and March 2012. Serum was tested for brucellosis and paratuberculosis as part of an annual survey program in Chiang Mai Province. Total 10 ml of whole blood was collected from each cow aged more than one year. Samples tested positive for tuberculosis in the annual survey were stored in a frozen serum bank and were included in this study. Total 581 specimens from 21 dairy herds were taken by convenience sampling and sent to the National Institute of Animal Health for Q fever testing.

Laboratory Testing

Serum samples were thawed and tested for presence of antibodies against *C. burnetii* using indirect enzyme-linked immunosorbent assay (ELISA) kit based on bovine antigen (Chekit-Q-fever, IDEXX)

according to the manufacturer's instructions. A conjugate that detected a specific ruminant immunoglobulin G (IgG) antibody was used to provide evidence of exposure to *C. burnetii* infection. A seropositive case was defined as an ELISA optical density (OD) greater than 40%. Test sensitivity for cattle was 62.5% (35.4-84.8) and specificity was 90.4% (85.9-94.5) as indicated by Horigan et al.[6]

Statistical Analysis

Data were collected from farmers using a questionnaire and extracting from history records of dairy cows. Proportion positive of *C. burnetii* antibody were calculated at individual and herd levels.

Results

Proportions positive at herd and individual levels were 61.9% (13/21) and 4.8% (28/581) respectively. San Pa Tong District had the highest proportion of positive herd (100%) while Mae On District had 50.0% and Mae Wang District had 45.4% (Table 1). Geographical distribution of Q fever in villages of San Pa Tong, Mae Wang and Mae On Districts was illustrated in figures 1-4.

In San Pa Tong District, samples from 215 dairy cattle were tested for Q fever and 14 were resulted positive. While eight out of 54 dairy cattle were revealed positive for Q fever in Mae On District, only six out of 312 dairy cattle in Mae Wang District were positive (Table 2). The highest proportion of positive samples at individual cattle level was 14.8% in Mae On District followed by San Pa Tong (6.5%) and Mae Wang (1.9%).

Table 1. Proportion positive of Q fever at dairy herd level in San Pa Tong, Mae Wang and Mae On Districts, Chiang Mai Province, Thailand, 2012

District	Number of dairy herd (herd)		Percent of proportion positive	95% CI
	Total	Positive		
San Pa Tong	6	6	100.0	54.1-100.0
Mae Wang	11	5	45.4	16.7-76.6
Mae On	4	2	50.0	6.8-93.2
Total	21	13	61.9	38.4-81.0

Discussion

This was the preliminary finding on Q fever among dairy cattle in San Pa Tong, Mae Wang and Mae On Districts in Chiang Mai. Although this study used convenience sampling on tuberculosis herd with poor sanitation, it was shown that some herds in these three districts were exposed to *C. burnetii*.

Table 2. Proportion of Q fever at individual cattle level in San Pa Tong, Mae Wang and Mae On Districts, Chiang Mai Province, Thailand, 2012

District	Number of dairy cattle (head)				Percent of Q fever positive	95% CI
	Total	Positive	Suspected	Negative		
San Pa Tong	215	14	3	198	6.5	3.6-10.7
Mae Wang	312	6	0	306	1.9	0.7-4.1
Mae On	54	8	1	45	14.8	6.6-27.1
Total	581	28	4	549	4.8	3.2-6.9

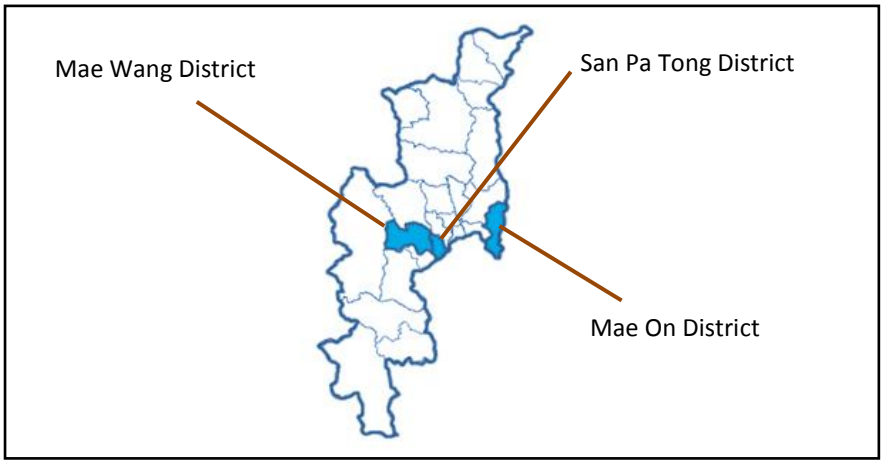

Figure 1. Map of San Pa Tong, Mae Wang and Mae On Districts in Chiang Mai Province, Thailand

Proportion of *C. burnetii* seropositive cattle (14.8%) was less than the average seroprevalence in dairy cow (10.1%) in northeastern China which used ID Screen® Q Fever Indirect ELISA kit.[7] Nevertheless, there was potential opportunity of exposure to farmers, abattoir workers, veterinarians and laboratory personnel who were high risk contacts.

Seropositive cattle did not show typical or apparent clinical signs. Thus, further specimen collection such as aborted fetus, placenta, milk or fluid secretion from these dairy herds must be confirmed for presence of *C. burnetii* by polymerase chain reaction (PCR). In addition, it may be useful to investigate other animals in the farms and design a specific study to determine prevalence of Q fever in dairy cattle and animal keepers. The results of this preliminary study could be used to estimate an adequate sample size required to detect antibodies against *C. burnetii* in dairy cattle and promote understanding of Q fever at the human-animal interface.

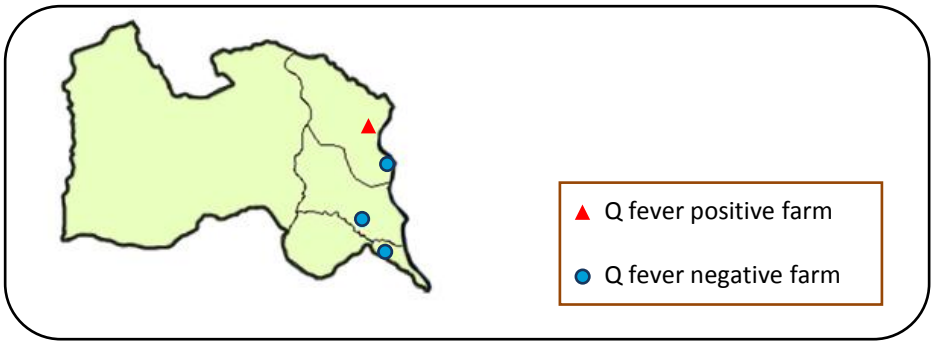

Figure 2. Distribution of Q fever in Mae Wang District, Chiang Mai Province, Thailand, 2012

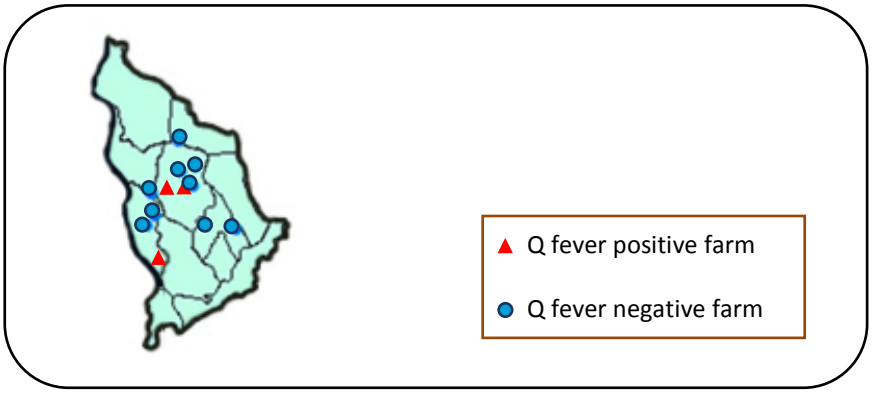

Figure 3. Distribution of Q fever in San Pa Tong District, Chiang Mai Province, Thailand, 2012

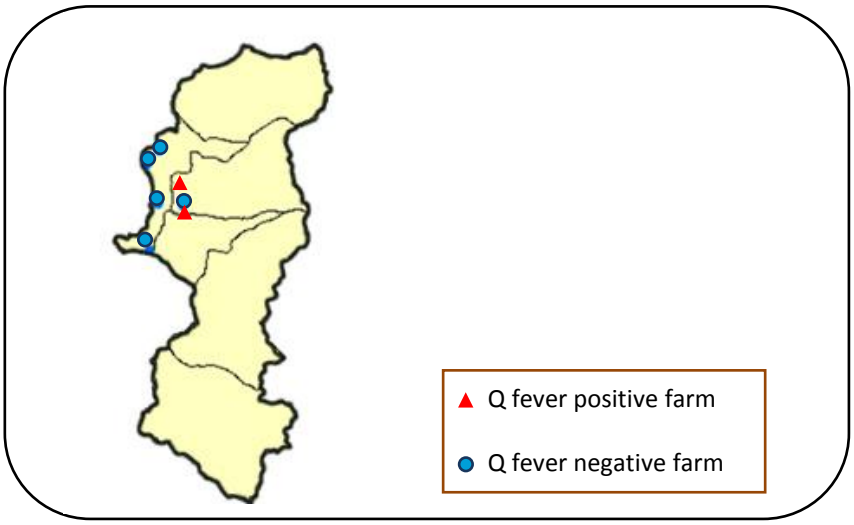

Figure 4. Distribution of Q fever in Mae On District, Chiang Mai Province, Thailand, 2012

Among samples collected from an annual survey program in Chiang Mai Province, only samples tested positive for tuberculosis were included in this study. Thus, either sampling from all samples of the annual survey or stratified sampling in future studies would provide higher representativeness of cattle population. In addition, this study could not identify relationship between tuberculosis and Q fever in dairy cattle, which should be studied more in the future.

Conclusions and Recommendations

Although no human Q fever cases was reported in northern part of Thailand, serological evidence of Q fever exposure among dairy cattle in San Pa Tong, Mae Wang and Mae On Districts in Chiang Mai Province was observed. In order to prevent transmission of the disease from dairy cattle to human, farmers should ensure to pasteurize milk properly, disinfect animal facilities regularly especially in parturition areas, keep pregnant animals in separate pens, remove and dispose all birthing matters such as aborted fetuses quickly and properly to prevent contact with domestic animals or wildlife, and keep manure of infected herds away from gardens and populated areas.

Most importantly, good farm practice could help to reduce human and animal health risks. Prevention and control of Q fever in human include maintaining good personal hygiene, handling animals with water-proof gloves and using additional personal protective equipment (face masks and goggles) for high risk activities such as birth assistance, placenta removal, handling carcass, milking and farm cleaning. In addition, all late abortions in animals should be investigated for Q fever. Communication and public education for high risk occupational groups should be conducted. All farmers, workers, livestock officers, veterinarians and their families should be advised on precautions to be taken when handling animals. Moreover, pregnant women should avoid exposure to animals during delivery or post-partum period.

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