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## The Seroprevalence of Coxiellosis in Farmers and Cattle in Erzurum District in Turkey\*

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**Abstract:** Coxiellosis is a zoonosis caused by *Coxiella burnetii*. This study conducted to determine the prevalence of coxiellosis in cattle and farmers in Eastern Turkey. A total of 230 cattle and 92 human sera were collected and tested for antibodies against *C. burnetii* by a commercial ELISA kit. The antibodies to *C. burnetii* were detected in 22 (9.56%) cattle and 18 (19.5%) healthy farmers. Seropositivity was found in 12 of 53 (22.6%) cattle with an abortion history, and 10 of 177 (5.6%) cattle without an abortion history ( $P < 0.05$ ). There was a correlation between animal and human seroprevalence in the same district. It was observed that the seroprevalence of coxiellosis was higher in northern districts (32.4% in farmers and 15.4% in cattle) than in other districts (12.1% in farmers and 6.5% in cattle) both for humans and animals ( $P < 0.05$ ). Coxiellosis was an important health problem in both humans and cattle, and the disease may cause abortion in cattle in Eastern Turkey.

**Key Words:** Coxiellosis, Q fever, *Coxiella burnetii*, farmer, cattle

### Erzurum ve Çevresinde Sığırlarda ve Çiftçilerde Coxiellosis Seroprevalansı

**Özet:** Q fever *Coxiella burnetii*'nin etken olduğu bir zoonozdur. Bu çalışma Erzurum ve çevresinde sığırlarda ve çiftçilerde Q fever seroprevalansını saptamak için yapıldı. Toplam 230 sığır ve 92 sağlıklı çiftçiden kan örneği alınarak *C. burnetii* antikorları ticari ELISA kiti ile araştırıldı. Test edilen 230 sığır kan örneğinin 22'sinde (% 9,5) ve çiftçilerden alınan 92 kan örneğinin 18'inde (% 19,5) *C. burnetii* antikorları saptandı. Abortus öyküsü olan 53 sığırın 12'sinde (% 22,6) ve abortus öyküsü olmayan 177 sığırın 10'unda (% 5,6) *C. burnetii* antikorları pozitif bulundu ( $P < 0,05$ ). Hayvan ve insanlara ait seropozitivitenin paralel olduğu gözlemlendi. Q fever seroprevalansı hem sığırlarda hem de çiftçilerde kuzey ilçelerinde (sığırlarda % 15,4 çiftçilerde % 32,4) diğer ilçelere (sığırlarda % 6,5 çiftçilerde % 12,1) oranla daha yüksek bulundu ( $P < 0,05$ ). Çalışmanın sonuçlarına göre Q fever bölgemizde çiftçilerde ve sığırlarda önemli bir sağlık problemidir ve sığırlarda düşüğe yol açabilmektedir.

**Anahtar Sözcükler:** Coxiellosis, Q fever, *Coxiella burnetii*, çiftçi, sığır

### Introduction

Coxiellosis is a worldwide zoonosis caused by *Coxiella burnetii* (1). The reservoir is large and includes many wild and domestic mammals, birds, and arthropods such as ticks (2). The most common reservoirs are domesticated ruminants, primarily cattle, sheep, and goats. Humans are infected mainly by inhalation of contaminated aerosols or by ingestion of milk or fresh dairy products. Although up to 60% of initial infections are asymptomatic in humans, acute disease can manifest as a relatively mild,

self-limited febrile illness, or more moderately severe disease characterized by hepatitis or pneumonia. People who have close contact with animals, such as farmers, veterinarians, abattoir workers and laboratory workers, are at higher infection risk (1-4). Although *C. burnetii* infection is usually not harmful in infected animals, abortions in sheep and goats and lower birth weight and infertility in cattle have been associated with chronic *C. burnetii* infection (2). Since coxiellosis is a cause of abortion in animals, it can lead to economic losses.

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The epidemiology of coxiellosis varies from country to country (1). This study was conducted to investigate the seroprevalence of coxiellosis in cattle and farmers in Eastern Turkey. This was the first study performed with ELISA in our region, where no study has been conducted on this subject for the last 3 decades.

**Materials and Methods**

This study was conducted in Erzurum district, in Eastern Turkey. Three villages from each of 11 districts were visited. A total of 230 blood samples were collected from cattle in 33 herds. The abortion history of the cattle was obtained and recorded by asking the farmers whether they had ever had abortions in their animals, herds or flock.

Additionally, 92 blood samples were collected from healthy farmers all of whom were the owners of these cattle. The serum samples were separated and kept at -20 °C until assayed.

*C. burnetii* IgG antibodies were investigated by a commercial ELISA kit (CHEKIT-Q-Fever, Bomelli Diagnostics, Switzerland) in blood sera of cattle according to the manufacturer’s instructions. For human sera anti-human IgG peroxidase (PO) conjugate was used instead of anti-ruminant IgG PO conjugate. Positive and negative human sera were provided from Dr. Cetinkaya (3), who performed a similar study previously.

All statistical analyses were performed by chi-square test.

**Results**

There was a history of abortion in 53 of 230 (23.1%) cattle. *C. burnetii* antibodies were detected in 22 of 230 (9.6%) cattle. Seropositivity was detected in 12 of 53 (22.6%) cattle with an abortion history, and 10 of 177 (5.6%) cattle without an abortion history. The difference was statistically significant ( $P < 0.05$ ). Rates of seropositivity in animals are shown in Table 1. *C. burnetii* antibodies were detected in 18 of 92 (19.6%) healthy farmers. Thirteen of 18 farmers who were antibody positive had seropositive animals, and there were seropositive animals in the villages of the remaining 5. It was observed that the seroprevalence of coxiellosis was higher in northern districts (in animals 15.4%, in humans 32.4%) than in other districts (in animals 6.5%, in humans 12.1%) both for humans and animals. The difference was statistically significant ( $P < 0.05$ ) (Table 2).

**Discussion**

Coxiellosis has been reported to be widespread throughout the world. It has been reported from at least 51 countries on five continents (1).

The seroprevalence of coxiellosis was reported to be 77% to 83% in the USA, 33% to 82% in Canada, 26% to 58% in Switzerland, 40.2% to 46.6% in Japan, 40.4% in Sudan, 40% in Australia, 23% in Mexico, 17.5% in Sri Lanka, 14.4% in Italy, 3.8% to 13.4% in Germany, and 5% to 31% in Bulgaria in cattle (2,5-9). In Turkey, the seroprevalence rate in cattle was reported to be 5.8% to 21.7% (3,5,10,11). There was only one

Table 1. Seroprevalence of coxiellosis in cattle in Erzurum (in Eastern Turkey) according to the abortion history.

	Abortion History		P	Total
	Yes	No		
	n (%)	n (%)		
<i>C. burnetii</i> Positive	12 (22.6)	10 (5.6)	< 0.05	22 (9.6)
<i>C. burnetii</i> Negative	41 (77.4)	167 (94.4)	< 0.05	208 (90.4)
Total	53 (23.1)	177 (76.9)		230 (100)

Table 2. Geographical distribution of the seroprevalence of coxiellosis in cattle and farmers in Erzurum (in Eastern Turkey).

Location	Districts	Cattle		Farmers	
		Samples	Positivity	Samples	Positivity
		n	n (%)	n	n (%)
North	İspir	20	3 (15.0)	9	3 (33.3)
	Oltu	18	3 (16.6)	8	3 (37.5)
	Narman	20	4 (20.0)	9	3 (33.3)
	Horasan	20	2 (10.0)	8	2 (25.0)
Total of north	78	12 (15.4)*	34	11 (32.4)*	
Others	Centre	27	1 (3.7)	10	2 (20.0)
	Ilica	25	3 (12.0)	8	1 (12.5)
	Pasinler	21	1 (4.8)	8	1 (12.5)
	Çat	20	2 (10.0)	9	1 (11.1)
	Karayazı	20	1 (5.0)	8	1 (12.5)
	Hinis	19	2 (10.5)	7	1 (14.2)
	Tekman	20	0 (0)	8	0 (0)
Total of others	152	10 (6.5)*	58	7 (12.1)*	
Total of all	230	22 (9.56)	92	18 (19.5)	

\*P < 0.05 both animals and humans between north and other districts

study (12) from our region, performed 27 years ago. In that study, the seroprevalence of coxiellosis in cattle was reported to be 12.0%, and we found it to be 9.6%.

Coxiellosis may cause abortion and some other reproductive system disorders in goat, sheep and cattle (3,13). In cattle with a history of abortion, the seroprevalence of coxiellosis was reported to be 19.4% from the former Yugoslavia and 30% from Japan (14,15). To et al. (13) found that antibodies to phase I and phase II antigens of *C. burnetii* were 58.9% and 60.4% in cattle with reproductive disorders. Bildfell et al. (16) found a significant association between *C. burnetii* antigen-positivity and placental inflammation and placental necrosis in cases of bovine abortion. In Turkey, the seroprevalence of coxiellosis was previously found to be 20.0% to 44.5% in cattle with abortion in Southeastern Turkey (3,11). Özyer et al. (11) found antibodies to *C. burnetii* as 44.5% in cattle with an abortion history versus 11.6% in cattle without an abortion history. In this study, the seroprevalence of coxiellosis was significantly higher in cattle with an

abortion history (22.6%) than in those without (5.6%).

In humans, the seroprevalence of coxiellosis was reported to be 27.5% in Sri Lanka, 27.5% in El Salvador, 27.5% in Iran, 22% in Germany and 3% in Bulgaria (6-9). It was reported to be 8.3% to 25% in healthy people in nonrisk groups in Turkey (4,11,17).

In humans in a risk group, the seroprevalence of coxiellosis was reported to be 30% in France, 27.3% in the United Kingdom, 26% in North Ireland, 21.1% in Switzerland and 11.6% to 60% in Spain (3,18-20). In Turkey, seroprevalence was reported in risk groups of people to 51.8% from İstanbul and Trakya, and 10.2% and 12% from Elazığ district (3,4,17). It was reported to be 11.2% in nonrisk people in 1977 (12). The 92 farmers sampled in this study were apparently healthy and reported having no symptoms of Q fever but they had high-risk occupations, and *C. burnetii* antibodies were 19.5% in our region.

In farmers, the seroprevalence of coxiellosis was reported to be a minimum of 10.7 from Australia and a

maximum of 60% from Spain (18-20). In Turkey, it was reported to be 10.2% and 12% from Elazığ, 14.6% from Çukurova district, and 51.8% from İstanbul and Thrace district in farmers (3,4,11,17), while it was 19.6% in Erzurum district in farmers.

Epidemiological studies show that dairy cows are infected with *C. burnetii* more frequently than sheep and thus may represent the most important source of human infection (2). In this study, the seroprevalence of coxiellosis was correlated in farmers and cattle. While 13 seropositive farmers had also seropositive animals, there were seropositive animals in the villages of remaining 5. Of the other farmers, there were seropositive animals in their village. A similar association was observed in Cetinkaya and colleagues' (3) study in which all 8 seropositive farmers had seropositive animals.

In this study, it was found that the seroprevalence of coxiellosis was higher in northern districts (having drier and warmer climate) than in the others. The disease was focused more in these regions than in the others. The dry atmosphere might enhance the dispersion of aerosols, thus explaining why the risk of infection for the cattle is higher than in other regions. Nakoune et al. (21) found similar differences in their regions. Additionally, coxiellosis is a tick-borne zoonosis. This climate is more appropriate for tick activation and wildlife reservoirs in this region. Crimean-Congo hemorrhagic fever, another tick-borne zoonosis, is endemic in the same location in Erzurum (22).

*C. burnetii* has been isolated from *Dermacentor* and *Ornithodoros* species in the east of Turkey, but the

strains detected were reported to have low virulence. The possibility that the strains of *Coxiella* present in this region are of low virulence may explain why the infection generally does not include clinical signs in either animals or people (12).

This study and previous ones (3,4,10-12,17) performed in various regions of Turkey indicate that coxiellosis is an important health problem both in farmers and in cattle in Turkey.

Although vaccination programs are generally inadequate for eradication of *C. burnetii*, such programs can decrease the number of organisms shed by infected animals (3). In Cyprus, a program, in which aborted material was destroyed, affected dams were isolated, and the premises were disinfected, reduced the incidence of *C. burnetii* infection among sheep and goats (1). Control of ectoparasites on cattle, sheep, and goats is also important in the control of Q fever (1).

In the control of coxiellosis, it is important to develop some strategies such as isolation of seropositive animals, vaccination of seronegative animals, the education of farmers with respect to transmission route, signs and symptoms of the disease, pasteurization of milk, disinfection of contaminated animal wastes, protection of individuals in high-risk groups from inhalation of dust and eradication of ticks.

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