Seroprevalence of *Coxiella burnetii* antibodies among farm animals and human contacts in Egypt

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Abstract: Q fever is a zoonosis with public health concern throughout the world. The disease is caused by *Coxiella burnetii* a bacterium largely carried by ruminants. In Egypt the epidemiology of Q fever is not well-known. So, the present study was carried out to investigate the seroprevalence of C. *burnetii* antibodies among different ruminant species and human contacts collected from some governorates of Egypt. For this purpose, serum samples obtained from 184 ruminants (55 sheep, 30 goats, 54 cattle and 45 buffaloes) were examined for the presence of IgG *C. burnetii* antibodies against phase I and phase II antigens by using enzyme linked immunosorbent assay (ELISA). In addition, sera from 92 persons in intimate contact with ruminants were also tested for the presence of IgG *C. burnetii* antibodies against phase II antigen by using ELISA. The overall seroprevalence in ruminants was 17.4%while displayed in different species as (32.7%, 23.3%, and 13%) for sheep, goats and cattle respectively whereas none of examined buffaloes was positive. On the other hand, the seroprevalence in the tested persons was 16.3% with significantly high seroprevalence among those live in agricultural districts. In conclusion, the high seroprevalence of Q fever among sheep and goats highlighted the potential role which may be played by these animals in the epidemiology of Q fever being important reservoirs for *C. burnetii* and its zoonotic implications in Egypt.
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1. Introduction

Q fever is a worldwide zoonotic disease that affects man and wide variety of animals caused by an obligatory intracellular bacterium *Coxiella burnetii*. The disease in man is usually mild, however sometimes associated with conditions with public health burden such as pneumonia, hepatitis and endocarditis (**Parker *et al.*, 2006**). On the other hand, the vast majority of infected animals do not show any signs of illness; nevertheless, the clinical outcomes of *C. burnetii* infection in ruminants seemed to have an economic impact as *C. burnetii* has been implicated in many cases of abortion and mastitis (**Woldehiwet, 2004**). Despite of *C. burnetii* has a wide range of animal reservoirs including rodents, ruminants, carnivores, lagomorphs, ticks and even birds and some wild animals (**Sawyer *et al.*, 1987; Gardon *et al.*, 2001**) , ruminants were considered to be the main reservoirs for human infections (**Muskens *et al.*, 2007**). The diagnosis of Q fever usually depends on serological tests such as indirect fluorescent-antibody (IFA), enzyme linked immunosorbent assay (ELISA) and complement fixation (CF) while ELISA was found to be more sensitive than IFA and CF tests (**Peter *et al.*, 1987**).In Egypt, there is a lack of information about the epidemiology of *C. burnetii* infections. So, the current study was conducted to investigate the seroprevalence of Q fever among ruminant populations and human contacts to improve the knowledge about the epidemiology of Q fever in Egypt.

2. Materials and Methods

Animal samples: Blood samples were collected from the jugular vein of 184 apparently healthy ruminants (55 sheep, 30 goats 54 cattle and 45 buffaloes (*Bubalus bubalis*)) from three Egyptian governorates (Giza, Cairo and El-Fayum) then sera were obtained after centrifugation of blood at 2500 r.p.m for 10 – 15 minutes. The obtained sera were stored at -20˚C until the test was conducted (**Dorko *et al.*, 2008**). Animal sera were tested by ELISA for the presence of IgG antibodies against both phase I and phase II *C. burnetii* antigens using Chekit (Idexx, Liebefeld-Bern, Switzerland) and the test was carried out according to the manufacturer's directions.

Human samples: Venous blood samples were collected from 92 apparently healthy persons in intimate contact with ruminants (Veterinarians, veterinary workers and farmers). The examined persons were randomly selected from villages (agricultural districts) and towns (urban districts) in the previously mentioned governorates. Sera were obtained and stored by the aforementioned method. Human sera were examined for the presence of IgG antibodies against phase II *C. burnetii* antigen by using ELISA kit (Vircell, Granada, Spain) the test was performed according to the instructions of the kit.

Statistical Analysis:

Data was analyzed using SPSS 12.0 software and comparison was done using Chi- square tests, P value < 0.05 was considered statistically significant.

3. Results

Out of 184 examined ruminants, 32 animals were positive for the presence of IgG *C. burnetii* antibodies giving a ratio 17.4% with species-wise seroprevalence (32.7%, 23.3% and 13%) for sheep, goats and cattle respectively whereas none of examined buffaloes was positive (Table 1). On the other hand, 15 of 92 examined persons in intimate contact with ruminants were positive giving a prevalence 16.3% with high seroprevalence in persons reside in agricultural districts (villages) rather than those live in urban districts (Table 2).

Table (1): Seroprevalence of IgG *Coxeilla burnetii* antibodies among different ruminant species

Species	Number of examined animals	Positive	Percentage
Sheep	55	18	32.7%
Goats	30	7	23.3%
Cattle	54	7	13%
Buffalo	45	0	0
Total	184	32	17.4%

Table (2): Seroprevalence of IgG *Coxeilla burnetii* antibodies in humans with intimate ruminant contact live in agricultural and urban districts

Residence	Number of examined persons	Positive	Percentage
Agricultural	65	14	21.5%
Urban	27	1	3.7%
Total	92	15	16.3%

4. Discussion

The results of the current study revealed high seroprevalence of *C. burnetii* specific IgG antibodies among ruminants specially sheep and goats (32.7% and 23.3%) respectively, which are higher than those previously obtained in Egypt by **Mazyad and Hafez, 2007** who reported seroprevalence 22.5% and 16.5% for sheep and goats respectively. On the other hand, the prevalence of IgG antibodies against phase II *C. burnetii* antigen in examined persons was 16.3% a result which is greater than that obtained by **Mazyad and Hafez, 2007** (3.3%) but lower than that recorded by **Botros *et al.*, 1995** who found a seroprevalence 25% among cattle workers in Egypt. The high seroprevalence of *C. burnetii* antibodies among sheep and goats rather than that of cattle underlined the potential role which may be played by these animals in the epidemiology of Q fever infections in Egypt. This high seroprevalence among sheep and goats may demonstrate high prevalence of current or past infections with *C. burnetii* and thus may be accompanied by shedding the organism in vaginal mucus, milk, feces and urine of these animals as long as being infected mentioning that the infection in animals usually persists for several years and possibly lifelong (**CFSPH, 2007**). Whenever, sheep and goats are grazing animals pass long distances everyday so it can distribute this pathogen everywhere. It is noteworthy that *C. burnetii* can persist for long time in the environment and able to withstand harsh environmental conditions like high temperature, dryness, Ultra Violet light and even chemical disinfectants. Thus, once the area become contaminated with C. *burnetii*, it is difficult to be decontaminated (**Oyston and Davies, 2011**). Moreover, this organism is also transmitted by the wind to surrounding areas and thereby ensures a widespread of this pathogen in the environment. Regarding airborne infection is the major route through which humans contract Q fever while very few organisms of *C. burnetii* can produce disease in man (**CDC, 2009**) this may magnify the hazard of environmental contamination by *C. burnetii* and highlight the crucial role of sheep and goats in the epidemiology of Q fever in Egypt. The concept of the role of environmental contamination and accordingly the role of sheep and goats which appeared to be the major source of this contamination in the epidemiology of human Q fever infections in Egypt was confirmed by the results of human samples as all examined persons were in intimate contact with ruminants while there was a significant high seroprevalence of Q fever in persons live in agricultural districts rather than those live in urban districts (P value < 0.05) as these agricultural districts were heavily concentrated by ruminants specially sheep and goats whereas in urban sites ruminants present in sporadic foci. This concept was proposed by **Thomas *et al.*, 1995** who concluded that the risk of acquiring Q fever is related to the contact with farm environment rather than any specific animal exposure and also augmented by **Schimmer *et al.*, 2008** who reported a large outbreak in humans lived in agricultural provinces in Netherlands where high density of dairy goats were located whereas most of human victims were persons who never had contact with animals (**Ensernik, 2010**). Finally, none of the

examined buffaloes has antibodies against *C. burnetii* although living with seropositive sheep and cows in the same yard. This leads us to conclude that buffaloes may be less susceptible to *C. burnetii* and so, further studies are required to estimate the resistance of buffaloes (*Bubalus bubalis*) to harbor *C. burnetii* infection in Egypt. In conclusion, the current study demonstrates that sheep and goats constitute the most potential reservoirs for *C. burnetii* and may be responsible for many zoonotic implications of Q fever in Egypt. Therefore, the control plan of this disease in both man and animals should rely on control the infection among sheep and goats through periodical surveillances, treatment of infected animals and hygienic disposal of their wastes to reduce the input of C. *burnetii* to the environment and subsequently decrease human and animals environmental exposure to such pathogen.

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5. References:

1- Botros BA, Soliman AK, Salib AW, Olson J, Hibbs RG, Williams JC, Darwish M, El-Tegani A, Watts DM(1995): *Coxiella burntii* antibody prevalences among human populations in North-east Africa determined by enzyme immunoassay. J Trop Med Hyg.; 98: 173-178.
2- CDC (Centers for Disease Control and Prevention). Q fever. 2009. www.cdc.gov. (Last accessed on 12 February 2011).
3- CFSPH (the Center for Food Security & Public Health) Q fever. 2007. www.cfsph.isolate.edu. (Last accessed on 12 February 2011).
4- Dorko E, Kalinova Z, Weissova T, Pilipcinec E(2008): Seroprevalence of antibodies to *Coxiella burnetii* among employees of the Veterinary University in Kosice, eastern Slovakia. Ann. Agri. Environ. Med.; 15: 119 – 124.
5- Enserink, M (2010): Questions abound in Q-fever explosion in the Netherlands. Science; 327: 266–267.
6- Gardon J, Héraud JM, Laventure S, Ladam A, Capot P, Fouquet E, Favre J, Weber S, Hommel D, Hulin A, Couratte Y, Talarmin A(2001): Suburban transmission of Q fever in French Guiana: evidence of a wild reservoir. J Infect Dis.; 184: 278-284.
7- Mazyad SA and Hafez AO(2007):. Q fever (*Coxiella burnetii*) among man and farm animals in North Sina. J Egypt Soc Parasitol.; 37: 135-42.
8- Muskens, J, Mars MH, Franken P(2007): Q fever: an overview. Tijdschr Diergeneeskd; 132: 912 – 917.
9- Oyston PCF, Davies C(2011): Q fever: the neglected biothreat agent. J Med. Microbiology.; 60: 9 – 21.
10- Parker NR, Barralet JH, Bell AM(2006): Q fever. Lancet.; 367, 679- 688.
11- Peter O, Dupis G, Peacock MG, Burgdorfer W (1987): Comparison of Enzyme- Linked Immunosorbent Assay and Complement Fixation and Indirect Fluorescent-Antibody tests for detection of *Coxiella burnetii* antibody. Journal of Clinical Microbiology.; 25: 1063- 1067.
12- Sawyer LA, Fishbein DB, McDade JE(1987): Q fever: current concepts. Rev. Infect. Dis.; 9: 935–946.
13- Schimmer B, Morroy G, Dijkstra F, Schneeberger PM, Weer-pothoff G, Timen A, Wijkmans C, Van der Hoek W(2008): Large ongoing Q fever outbreak in the south of The Netherlands, 2008. Euro Surveillance.; 13 (31).
14- Thomas DR, Treweek L, Salmon RL, Kench SM, Coleman TJ, Meadows D, Morgan-Capner P, and Caul EO (1995): The risk of acquiring Q fever on farms: a seroepidemiological study. Occup. Environ. Med.; 52 : 644-647.
15- Woldehiwet Z (2004): Q fever (coxiellosis): epidemiology and pathogenesis. Res Vet Sci.; **77**: 93–100.

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