Seroprevalence of Q fever in Goats in the Sudan

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Abstract

Aim: The survey was carried out to detect anti- *C. burnetii* antibodies in goat's sera samples in eight States in the Sudan during September 2010 – July 2011.

Materials and Methods: In a preliminary study, four hundred and sixty caprine sera samples collected from eight States in the Sudan were screened for anti- *Coxiella burnetii* (the causative agent of Q fever) antibodies using a commercial indirect ELISA (iELISA) kit.

Results: The results showed an overall prevalence rate 24.22% of Q fever antibodies. The prevalence rate of antibodies ranged from 6.7% in Kassala to 40% in South Darfur. The prevalence rates were highest in South Darfur (40%) and South Kordofan (34.7%), moderate in El Gazira (29.7%), Khartoum (29.1%), the Northern (24%) and the River Nile (20.2%) States. It was lowest in the White Nile (7.5%) and Kassala (6.7%) States.

Conclusion: It could be concluded that Q fever is prevalent in goats in the Sudan. Therefore, further epizootiological investigations on Q fever in other farm animals and man at the country level is important to monitor and determine the magnitude of Q fever infection in order to estimate its economic impact on animal industry and its public health hazard in the Sudan. In addition, the impact of Q fever among shepherds should be studied.

Keywords: Goats, iELISA, Sudan, Q Fever.

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Introduction

Q fever is a zoonosis, caused by *Coxiella burnetii*; an aerobic obligate intracellular gram- negative bacterium; which infects several animal species as well as man. Cattle, sheep and goats are the primary hosts; infected sheep and goats may abort in late pregnancy [1]. *C. burnetii* is shed in urine, faeces, milk and is abundant in foetal membranes and foetal fluids [2]. The organism is transmitted to human, mainly through aerosols [3]. The host range of Q fever is broad including mammals, birds and arthropods, mainly ticks [2].

In man, Q fever is a febrile illness that was first reported in 1933 among abattoir workers in Brisbane, Queensland, Australia [4]. However, attempts to isolate the aetiological agent by inoculating guinea pigs with the blood or urine of infected patients were unsuccessful. Except for New Zealand, Q fever is distributed worldwide. During the period 1999-2004, 18 outbreaks of Q fever were reported in 12 different countries [5]. The disease in animals is generally sub-clinical. However, in its acute phase, *C. burnetii* can be isolated from lungs, liver, spleen and blood. No clinical signs were manifested by chronically infected animals [2]. High abortion rates are rare, but up to 90% of pregnant nanny-goats may abort [1,5,6,7]. Occasionally, prior to abortion, the animal becomes lethargic and anoretic [1] but in most cases no preceding clinical signs are present [5]. Shedding of *C. burnetii* in milk can last for months and is more longer in goats than in sheep [5]. Chronically-infected goats may shed *C. burnetii* for two successive pregnancies after being infected [6].

Goat population in Sudan has been estimated at

Table-1. The prevalence rate of anti- Q fever antibodies in goats in eight States in the Sudan during the period September 2010 - July 2011.

State	No. of goats tested	No. positive	Prevalence rate (%)
El Gazira	37	11	29.7
Kassala	45	3	6. 7
Khartoum	55	16	29.1
The Northern	50	12	24.0
The River Nile	134	27	20.2
South Darfur	50	20	40.0
South Kordofan	49	17	34.7
The White Nile	40	3	7.5
Total	460	109	24.22

43 million head [8]. Many eco-types of goats are raised in the Sudan, but Nubian and desert types are dominant.

In Sudan, the isolation of *C. burnetii* by Taylor *et al*. [9] from ticks collected at the Cairo Municipal Abattoir infested camels and bulls imported from Sudan, appears to have been the first report of Q fever. Haseeb [10] tested 60 sera samples of Sudanese sheep for anti- *C. burnetii* antibodies, but all were negative. Taylor *et al*. [11]found that 28 out of 401 (6.9%) human sera collected from 11 areas in the Sudan gave positive reactions. Using capillary agglutination test Hamza [12] reported that 12 sera samples from cattle, goats and sheep (6/382 cattle, 4/80 goats and 2/104 sheep) were found positive for anti- *C. burnetii* antibodies.

None of 16 camels examined was positive. Harbi and Awad El Karim [13] recorded that 14 out of 118 (11.9%) Sudanese camels sera in El Butana region and 12 out 98 (12.2%) in Kassala region were positive for anti- *C. burnetii* antibodies using capillary agglutination test. Reinthaler *et al*. [14] reported that 21 out of 52 (40.4%) in cattle, 22 out of 42 (53%) in goats and 20 out 32 (62.5%) in sheep in the Upper Nile province in southern Sudan were positive for anti- *C. burnetii* antibodies using microagglutination test .

In view of recent Q fever outbreaks in goats in Europe [15] and owing to the meagre data available on Q fever disease in the Sudan, this survey was carried out to detect anti- *C. burnetii* antibodies in goat's sera samples in eight States in the Sudan during September 2010 – July 2011.

Materials and Methods

Sample collection: The investigation was carried out in compliance with the animal welfare code of Sudan. Five ml of blood sample from each of four hundred and sixty adult, apparently healthy, Nubian nanny goats were collected from eight States in the Sudan (El Gazira, Kassala, Khartoum, the Northern, the River Nile, South Darfur, South Kordofan and the White Nile States) during September 2010 - July 2011. Selection of these locations was based on them being the main potential areas for livestock rearing. In each location, samples were collected from at least four groups of goats that were kept apart. Selection of groups was made randomly and the formal mechanism used was lottery. Sera were separated by centrifugation at 1500 rpm / min. for 10 minutes and kept at -20°C until tested.

ELISA technique: Commercial indirect ELISA (iELISA) kits for detection of anti- *C. burnetii* antibodies, were purchased from Lisvet Ruminant Milk/ Serum Q fever (Nouzilly, France). Positive serum samples will present yellow colour. The colour visualized in each well is proportional to the titre of goat's antibody specific to Q fever present in the diluted sample (1/400). The test is based on the principle of an indirect ELISA in which plates are coated with *C. burnetii* antigen. Test sera are applied and specific antibodies against Q fever bind to the antigen is then detected with a monoclonal anti-protein G HRP-labelled conjugate and chromogen substrate. The cutoff value of antibody titre is $\geq$ 40 i.e. all samples which have antibody titre $\geq$ 40 are considered positive.

Results

C. burnetii antibodies were detected in goats in all areas tested with varying prevalences. This is consistent with the wide nature of Q fever worldwide [5]. The prevalence rates of antibodies ranged from 6.7% in Kassala to 40% in South Darfur. The prevalence rates were highest in South Darfur (40%) and South Kordofan (34.7%), moderate in El Gazira (29.7%), Khartoum (29.1%), the Northern (24%) and the River Nile (20.2%) States and was lowest in the White Nile (7.5%) and Kassala (6.7%) States with an overall prevalence of 24.22% (Table-1).

Discussion

Screening caprine sera samples collected from eight States in the Sudan for anti-*C. burnetii* antibodies revealed a prevalence rate that ranged from 40% in South Darfur State to 6.7% in Kassala State. Hamza [12] reported that the prevalence rate of anti- Q fever antibodies in goats in Khartoum and Malakal areas as 3.1% and 11.7%, respectively in contrast to the prevalence rate in Khartoum State (29.09%) detected in the present study. The difference in the prevalences between the two studies is hard to explain but could partly be attributed to the different techniques used in estimating these prevalences. Of course, there is 49 years difference between timing of the works, and it may be the extent of infection has intensified because of many factors. However it is strongly recommended to study Q-fever with simultaneous double tests: capillary agglutination test and iELISA.

The differences in prevalence rates between States in the current study may be attributed to local ecological factors, management's type and practices, flock size etc. that might affect the rates of infection with *C. burnetii.*

The epizootiology of Q fever and the exact modes of transmission in Sudan should be elucidated. Ticks, as well as aerosol infection, could play a role in the transmission of *C. burnetii* to domestic animals. Infected animals would then be a source for contamination of the environment. Transmission of *C. burnetii* through milk and semen are also possible routes [16]. The role of companion animals (dogs, cats) and the presence of a feral cycle in *C. burnetii* transmission is a possibility in Sudan.

All animal hosts for Q fever shed *C. burnetii* in milk. Thus, consumption of raw or unpasteurized milk could be a source of infection to humans [2]. Q fever may represent a real health hazard to certain occupational groups at risk of contracting *C. burnetii* infection such as farmers, veterinarians, abattoir workers and military recruits. Furthermore, Q fever in human is characterized by fever; this may lead to misdiagnosis on clinical grounds alone since other febrile diseases, such as: malaria, brucellosis, typhoid, visceral leishmaniasis, arboviral diseases, fevers of unknown origin (F.U.O) etc are prevalent in the Sudan [17].

Conclusion

It could be concluded that Q fever is prevalent in goats in the Sudan. Therefore, further epizootiological investigations on Q fever in other farm animals and man at the country level is important to monitor and determine the magnitude of Q fever infection in order to estimate its economic impact on animal industry and its public health hazard in the Sudan. In addition, the impact of Q fever among shepherds should be studied.

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Competing interests

Authors declare that they have no competing interests.

References

1. Wouda, W. and Dercksen, D. (2007): Abortion and stillbirth among dairy goats as consequence of Coxiella burnetii. *Tijdschr. Diergeneeskd*., 132: 908-911.
2. Maurin, M. and Raoult, D. (1999): Q fever. *Clin. Microbiol. Rev*., 12: 518-553.
3. Schimmer, B.; Dijkstra, F.; Vellema, P.; Schneeberger, P. M.; Hackert, V.; Schegget,R.; Wijkmans, C.; van Duynhoven, Y. and van der Hoek, W. (2009): Sustained intensive transmission of Q fever in the South of the Netherlands. *Eur. Surv.*, 14: P. 19, 210.
4. Derrick, E. H. (1937): Q fever, a new fever entity clinical features, diagnosis and laboratory investigation. *Med. J. Aust.*, 2: 281-299.
5. Arricau-Bouvery, N. and Rodolakis, A. (2005): Is Q fever an emerging or reemerging zoonosis? *Vet. Res.*, 36: 327-349.
6. Hatchette, T.; Campbell, N.; Hudson, R.; Raoult, D. and Marrie, T. (2003): Natural history of Q fever in goats. *Vector-borne Zoonot. Dis*., 3: 11-15.
7. Palmer, N.C.; Kierstead, M.; Key, D.W.; Williams, J.C.; Peacock, M.G. and Vellend, H.(1983): Plancentitis and abortion in goats and sheep in Ontario caused by Coxiella burnetii. *Can. Vet. J.*, 24: 60-61.
8. Anon. (2010). Annual Reports. The Federal Ministry of Animal Resources and Fisheries, Sudan (Data Center).
9. Taylor, R. M.; Mount, R.A.; Hoogstraal, H. and Dressler, H.R. (1952): The presence of Coxiella burnetii (Q fever) in Egypt. *J. Egypt. Public Health Assoc.*, 27, 123.
10. Haseeb, M.A. (1953): Report of the Medical Services, Ministry of Health, Sudan Government, 1952-1953.
11. Taylor, R.M.; Kingston, J.R. and Rizk, F. (1959): Serological (complement fixation) surveys for Q fever in Egypt and the Sudan with special reference to its epidemiology in areas of high endemnicity. *Arch. Inst. Pasteur Tunis*, 36: 529.
12. Hamza, M.E. (1962): A serological survey for

the detection of Q fever antibodies in the sera of animals in the Sudan. *Bull. Epizoot. Dis. Afr.*, 10: 55-57.
13. Harbi, M.S.M.A. and Awadel Karim, M.H. (1972): Serological investigation into Q fever in Sudanese camels. *Bull. Epizoot. Dis. Afr.*, 20: 15-17.
14. Reinthaler, F.F.; Mascher, F.; Sixl, W. and Arbesser, C/H. (1988): Incidence of Q fever among cattle, sheep and goats in the Upper Nile province in southern Sudan. *Vet. Rec*., 122(6): 137.
15. Klaasen, C. H. W.; Nabuur-Franssen, M. H.; Tilburg, J. H. C.; Hamans, M. A. W. H. and Horrevorts, A. M. (2009): Multigenotype Q fever outbreak in the Netherlands. *Emerg. Infect. Dis*., 15: 613-614.
16. Milazzo, A.; Hall, R.; Storm, P.A.; Harris, R.J.; Winslow, W. and Marmion, B.P. (2001): Sexually transmitted Q fever. *Clin. Infect. Dis.*, 33: 399-402.
17. McCarthy, M.C.; Haberberger, R.L.; Salib, A.W.; Soliman, B.A.; El-Tigani, A.; Khalid, I.O. and Watts, D.M. (1996): Evaluation of arthropode-borne viruses and other infectious pathogens as the causes of febrile illnesses in the Khartoum Province of *Sudan. J. Med. Virol.*, 48: 141-146.

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