Journal of Animal and Veterinary Advances 7 (6): 685-688, 2008
ISSN: 1680-5593

Serological Prevalence of Q Fever and Chlamydiosis in Camels in Saudi Arabia

[1]Mansour F. Hussein, [1]M. AlShaikh, [2]M.O. Gad El-Rab,
[1]R.S. Aljumaah, [1]A.R. Gar El Nabi and [1]A.M. Abdel Bagi
[1]Department of Animal Production, College of Food Science and Agriculture, Saudi Arabia
[2]Division of Immunology, Department of Pathology, College of Medicine,
King Saudi University, P.O. Box 2451, Riyadh 11451, Saudi Arabia

Abstract: Tests for antibodies against *Coxiella burnetii* and *Chlamdophila abortus* were conducted in 460 and 186 Saudi camels, respectively, using an enzyme immunoassay technique. The serological prevalence of coxiellosis was 62% while that of chlamydiosis was 19.4%. Neither of these infections was associated with overt clinical disease in the camels and in both cases seropositivity was higher in adult than young camels. The prevalence of antibodies against *C. burnetii* was closely similar in male and female camels, while a much higher prevalence of anti-chlamydial antibodies was observed in female as compared to male camels. This is the first record of both infections among indigenous camels in Saudi Arabia.

Key words: Q fever, chlamydiosis, *Coxiella burnetii*, *Chlamydophila abortus*, camels, Saudi Arabia

INTRODUCTION

Q fever is a rickettsial zoonosis of worldwide distribution. Its causative agent, *Coxiella burnetii*, employs a wide range of vertebrate hosts as natural reservoirs, but the vast majority of human infections are acquired as a result of close contact with infected livestock or consumption of contaminated products, including milk. The disease has long been known to be hyperendemic among the human population of Saudi Arabia (Gelpi, 1966; Lippe *et al*., 1968), however, extremely little is known about its prevalence in indigenous livestock. This includes camels which have not been previously investigated for Q fever infection in the Kingdom, despite their potential importance in the epidemiology of this disease, not only because of their significance as a source of meat, but also due to the wide-spread custom of consuming raw camel milk (Wernery and Kaaden, 1995). Elsewhere, serological evidence of Q fever in camels has been reported from many countries, including the Sudan, Egypt, Tunisia, Morocco, India; Kazakhstan, Iran, Kenya, Central Africa, Ethiopia, Nigeria, United Arab Emirates and Chad (Wernery and Kaaden, 1995).

The present study was primarily undertaken to determine the serological prevalence of *C. burnetii* in Saudi Arabian camels (*Camelus dromedarius*). However, some of the samples were also tested for antibodies against chlamydiosis, an infection which, like *C. burnetii*, has not been previously reported in camels in Saudi Arabia and only rarely described in other camel rearing countries (Burgmeister *et al*., 1975; Schmatz *et al*., 1978; Wernery and Wernery, 1990).

MATERIALS AND METHODS

Serological tests for *Coxiella burnetii* antibodies were conducted in 460 camels (335 females and 125 males) of different local breeds in the Central Region of Saudi Arabia. The animals varied in age from <1-20 years and were sampled randomly from both housed and nomadic herds. Two 10 mL blood samples were drawn from the jugular or milk vein of each camel into plain vacuotainer tubes and the sera were separated by centrifugation from clotted blood samples and stored at -20°C until tested. Any sample showing hemolysis or hyperlipemia was discarded.

At the time of sampling the animals were observed for clinical signs and records were kept of their age, sex and clinical history. Sera of 186 camels (24 males and 162 females) were also tested for anti-chlamydial antibodies. The tests for both *C. burnetti* and chlamydial antibodies were performed according to manufacturers' procedure using, respectively, CHEKIT *C. burnetii* and CHEKIT *Chlamydophila abortus* enzyme immunoassay kits (IDEXX Laboratories Inc., USA).

Corresponding Author: Mansour F. Hussein, Department of Animal Production, College of Food Science and Agriculture, Saudi Arabia

RESULTS AND DISCUSSION

Antibodies against *C. burnetii* were detected in 78 (62.4%) out of 125 male camels and 207 (61.8%) out of 335 female camels, giving an overall prevalence of 62% (Table 1). The results indicated that the serological prevalence was comparable in both sexes. Using competitive ELISA techniques, similarly high serological prevalence of Q fever in camels was reported from Egypt (Soliman *et al*., 1992) and Chad (Schelling *et al*., 2003). In the former country, a prevalence rate of 66% was recorded in randomly sampled camels, while in Chad the prevalence was as high as 80%. A high prevalence of Q fever was also reported among camel herders in Chad, which was found to be strongly associated with the consumption of raw camel milk and exposure to the camel's placenta during birthing (Schelling *et al*., 2003).

No significant difference in prevalence was found between the different local breeds and seropositive camels were found among all age groups, including 2 animals under one year old. This suggests that camels might become exposed to infection from an early age, probably through suckling of infected milk. However, the overall prevalence of Q fever antibodies in adult camels (4 or more years old) was around 71% as compared to 57% in younger camels ($p<0.05$). The study also showed a higher prevalence in nomadic versus housed camels. Out of 363 nomadic camels, 230 (63.4%) were positive for *C. burnetii* antibodies, as compared to 55 (56.7%) out of 97 housed camels. More than 40% of seropositive females were pregnant and/or lactating at the time of sampling and many of them harbored ticks. No specific clinical signs were, however, recorded during sampling in any of the camels that were subsequently found to be positive for *C. burnetii* antibodies, including those which originated from herds having previous history of abortion of undetermined cause. Many other authors previously have reported anti-*C. burnetii* antibodies in the sera of camels without signs of disease in the affected animals (Wernery and Kaaden, 1995). It is generally known that farm animals serve primarily as asymptomatic carriers of *C. burnetii* and that the organism resides abundantly in their placenta and udder and may be shed for extended periods in the milk, urine, feces and birth fluids thus exposing other animals, as well as people, to infection (Aitken, 1989; Maurin and Raoult, 1999). Occasionally, *C. burnetii* has been found to cause abortion, mastitis, pneumonia and other clinical signs in small ruminants and cattle (Lang, 1990). Richard (1979) suggested that similar manifestations might sometimes occur in infected dromedaries.

Table 1: Serological prevalence of q-fever and chlamydiosis In Saudi Arabian camels

	Q-fever			Chlamydiosis		
	Males	Females	Total	Males	Females	Total
Number tested	125	335	460	24	162	186
Number positive	78	207	285	2	34	36
Prevalence	62.4%	61.8%	62.0%	8.3%	21%	19.4%

The high prevalence of Q fever in camels-and presumably other species of farm animals-in Saudi Arabia and the fact that large sectors of the human population throughout the Arabian Peninsula live in rural areas and consume raw camel milk (Scrimgeour *et al*., 2003) could be major contributing factors to the highly endemic nature of this disease among inhabitants of the Kingdom (Gelpi, 1966). Q fever in humans and coxiellosis in farm animals is an emerging problem of increasing public health concern in many other parts of the world, largely due to increasing animal concentrations, agricultural industrialization and oversight of the infection in farm animals (Lang, 1989; Yoshiie *et al*., 1991). The possibility of acute Q fever in humans being underestimated or misdiagnosed is a further cause for concern (Yoshii *et al*., 1991). Initiative for controlling coxiellosis in camels and other animals in Saudi Arabia should therefore be encouraged to ensure safety for workers and to protect the general population.

Of the 186 camels tested for anti-chlamydial antibodies, 36 were found to be positive giving an overall prevalence of 19.4% (Table 1). In contrast to Q-fever, the serological prevalence of chlamydiosis was higher by more than 2 folds in female (21%) than male (8.3%) camels and nearly 95% of all seropositive camels were adults aged ≥4 years, 70% of them being at least 8 years old. All seropositive animals were clinically normal at the time of sampling.

This is the first serological evidence of chlamydiosis in camels in Saudi Arabia. Extremely little is also known about camel chlamydiosis in other countries. Anti-chlamydial antibodies were, however, detected in the sera of 4 (7.6%) out of 52 camels in Tunisia (Burgmeister *et al*., 1975) while in Egypt a serological prevalence of 11% was reported by Schmatz *et al*. (1978). In the United Arab Emirates, Wernery and Wernery (1990) detected antibodies in the sera of both breeding and racing camels, with respective prevalence rates of 24 and 15%. There is no published information on the clinical significance of chlamydiosis in camels. Wernery and Wernery (1990)

suggested that the chlamydial infection might not affect pregnancy in these animals since no increase in abortion rate was observed in infected herds, while attempts to detect chlamydia in uterine swabs of the animals were unsuccessful. It is known, however, that some species of Chlamydia, such as *Chlamydophila abortus*, are major causes of abortion and infertility in sheep, goats and cattle in many parts of the world (Aitken, 2000). Furthermore, chlamydial infection has been associated with abortion in New World camelids, such as llamas and alpacas (Wernery and Wernery, 1990). The organism is also important from a zoonotic standpoint, particularly as an occupational hazard and in pregnant women exposed to aborting animals. Human infections with *Chlamydophila abortus* have been associated with various clinical manifestations ranging from a flu-like disease to pneumonitis, in addition to abortion, stillbirth and gestational sepsis in pregnant women (Pospischil *et al*., 2002; Annon, 2003; Walder *et al*., 2005). Further studies should therefore be undertaken to elucidate the epidemiology, clinical significance and control of chlamydiosis in camels.

CONCLUSION

The serological prevalence of *C. burnetii* and chlamydiosis in Saudi Arabian camels (*Camelus dromedarius*) is high, suggesting that these animals might have an role in the epidemiology of these highly endemic infections among the Kingdom's human population

ACKNOWLEDGEMENT

This study was supported by a grant from the Agricultural Research Council of the College of Food Science and Agriculture, King Saud University, which is gratefully acknowledged. Thanks are also extended to Mr. M. Al-Otaiby for technical assistance.

REFERENCES

Aitken, I.D., 1989. Clinical aspects and prevention of Q fever in animals. Eur. J. Epidemiol., 5 (4): 420-424.

Aitken, I.D., 2000. Chlamydial abortion. In: Diseases of Sheep. 3rd Edn. Martin W.B. and I.D. Aitken (Eds.). Blackwell Scientific Ltd., Oxford, UK, pp: 81-86.

Annon, 2003. Chlamydial Infections. *Chlamydophila abortus*: Human Infection. Health Protection Agency (U.K). www.chlamydiae.com/restricted/docs/infections/vet_cabortus_human.asp.

Burgmeister, R., W. Leyk and R. Gossler, 1975. Untersuchungen ubedr vorkomen von parasitosen, bakteriellen und viralen infektionskran-kheiten bei Bromedaren in Suedtunesien. Deutsche tierarztliche Wochenschrift, 82: 222-225.

Gelpi, A.P., 1966. Q fever in Saudi Arabia. Am. J. Trop. Med. Hygiene, 15 (5): 785-798.

Lang, G.H., 1989. Q fever: An emerging public health concern in Canada. Can. J. Vet. Res., 53 (1): 1-6.

Lang, G.H., 1990. Coxiellosis (Q fever) in animals. In: Q Fever. The Disease, Marrie, T.J. (Eds.). CRC Press, Boca Raton, USA, I: 23-48.

Lippe, M., A. Seebastiani and H. El-Mutabakani, 1968. Investigation of serum antibodies to rheovirus, adenovirus and *Coxiella burnetii* in a group of inhabitants of Riyadh, Saudi Arabia. Archivio Italiano di Scienze Mediche Tropicali e di Parassitologia, 49: 129-136.

Maurin, M. and D. Raoult, 1999. Q fever. Clin. Microbiol. Rev., 12: 518-553.

Pospischil, A., R. Thom, M. Hilbe, P. Grest, D. Zimmermann and J.O. Gebbers, 2002. Abortion in humans caused by Chlamydophila abortus (Chlamydia psittaci serovar 1). Schweizer Archiv fur Tierheilkunde, 144 (9): 463-466.

Richard, D., 1979. Study of the Pathology of the Dromedary in Borana, Awarja (Ethiopia). Thesis, Doctor of Veterinary Medicine, Ecole Nationale Vétérinaire d'Alfort, Cretail 1975, No. 75, pp: 181.

Schelling, E., C. Diguimbaye, S. Daoud, J. Nicolet, P. Boerlin, M. Tanner and J. Zinsstag, 2003. Brucellosis and Q-fever seroprevalences of nomadic pastoralists and their livestock in Chad. Preventive Vet. Med., 61 (4): 279-293.

Schmatz, H.D., H. Kraus, P. Viertel, A. Ismail and A. Hussein, 1978. Seroepidem-iologische Untersuchungen zum Nachweis Antikörpern gegen Rickettsien und Chlamydien bei Hauswiederkauern in Agypten, Somalia and Jordanien. Acta Tropica, 35: 101-111.

Scrimgeour, E.M., S.I.N. Al-Ismaily, J.M. Rolain, S.N.S. Al-Dhahry, H.S. El-Khatim and D. Raoult, 2003. Q fever in human and livestock populations in Oman. Ann. N.Y. Acad. Sci., 990: 221-225.

Soliman, A.K., B.A.M. Botros and D.M. Watts, 1992. Evbaluation of a competitive enzyme immunoassay for detection of *Coxiella burnetii* antibody in animal sera. J. Clin. Microbiol., 30(6): 1595-1597.

Wernery, U. and R. Wernery, 1990. Seroepidemiologische Untersuchungen zum achweis von Antikoerpern gigen Brucellen, Chlamydien, Leptospiren, BVD/MD, IBR/IPV und Enzootischen Bovinen Leukosevirus (EBL) bei Dromedarstuten (Camelus dromedarius). Dtsch. tierartztl. Wochenschr., 97 (3): 134-135.

Wernery, U. and O.R. Kaaden, 1995. Infectious Diseases of Camelids. 1st Edn. Blackwell Wissenschafts-Verlag, Berlin, pp: 60.

Walder, G., H. Hotzel, W. Gritsch, R. Tauber, R. Würzner and F. Ploner, 2005. An unusual cause of sepsis during pregnancy: Recognizing infection with *Chlamydophila abortus*. Obstet. Gynecol., 106 (5 pt 2): 1215-1217.

Yoshiie, K., H. Oda, N. Nagano and S. Matayoshi, 1991. Serological evidence that the Q fever agent (Coxiella burnetii) has spread widely among dairy cattle of Japan. Microbiol. Immunol., 35 (7): 577-581.