

Original Article

Seroprevalence of *Chlamydia abortus* in camel in the western region of Libya

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ABSTRACT

Objective: The present study was primarily undertaken to determine the seroprevalence of *Chlamydia abortus* infection in the Libyan camel (*Camelus dromedarius*).

Materials and methods: Serological tests for *C. abortus* antibodies were conducted with 245 camels (205 females and 40 males) in different localities in the western region of Libya. Animals varied in age from <1 to 20 years and were sampled randomly from both housed and nomadic herds. From each animal, 10 mL blood sample was collected and sera were separated. Antibodies in the sera against *C. abortus* were detected using an indirect enzyme-linked immunosorbent assay (ELISA).

Results: Results of this study showed that out of the 245 camels tested for anti-chlamydia antibodies, 30 were found positive giving an overall prevalence of 12.25%. The seroprevalence of chlamydiosis was 2 folds higher in females (14.00%) as compared to males (5.00%).

Conclusion: The present findings signify the *C. abortus* as a potential agent to cause abortion in Libyan camel (*C. dromedarius*). Besides, the persons who handle camels in Libya are at risk of infecting with *C. abortus*.

KEYWORDS

Abortion, Camel, Chlamydia, Prevalence

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INTRODUCTION

Chlamydia abortus (*C. abortus*) is considered as an agent to cause fetal death and abortion in mammals including humans. The organism has been previously classified as *C. psittaci* along with all *Chlamydiae* except *C. trachomatis*. *C. psittaci* has 7 known genotypes (Geens et al., 2005); the serotypes are differentiated by analyzing the nucleotide sequences of outer membrane protein A (*ompA*) gene or by real-time polymerase chain reaction (PCR) targeting the *ompA* (Vanrompay et al., 1997; Geens et al., 2005). *OmpA* encodes the major outer membrane protein (MOMP) which causes immune response in the body (Mohamad et al., 2008). All the 7 genotypes are transmissible to humans causing parrot fever or psittacosis (Andersen and Vanrompay, 2003).

C. abortus is an obligate intracellular, Gram-negative organism. The organism depends on its host for its nutrition and metabolism (Everett et al., 1999). *C. abortus* can infect most domestic animals, wild mammals and many species of birds (Shewen, 1980). It causes a variety of diseases and epizootic outbreaks in mammals. In ruminants, the organism infection causes enteritis, pneumonia, conjunctivitis, polyarthritis, encephalitis and enzootic abortion, depending on factors such as the virulence of the organism, the physiological state of the host, and the environmental condition (Van Look et al., 2003; Aljumaah and Hussein, 2012).

C. abortus is considered as a the agent of causing 20 to 50% abortions and stillbirths in sheep (Aitken, 2008). In goats and sheep, most infections are asymptomatic apart from abortion or stillbirth at late pregnancy. Infection caused by *C. abortus* is manifested by placentitis, accumulation of reddish brown exudate in intercotyledonary areas, and necrotic changes in the cotyledons (Jones et al., 1997; OIE, 2012). In cattle, Chlamydial species may cause several diseases such as enteritis, pneumonia, encephalitis, polyarthritis, abortion and other urogenital tract infections mastitis, and conjunctivitis (Omori et al., 1960; Storz, 1988). However, epizootic bovine abortion may occur suddenly in a herd showing no clinical symptoms prior to abortion during late pregnancy. Occasionally, infection results in the delivery of dead calves at term or the birth of weak calves which die later. The placenta is commonly retained and milk production drops in dairy cows but overall there is little adverse effect on the dam. Seasonal occurrences observed by some authors appear to reflect breeding practices (Palotay and Newhall, 1958; Arshi et al., 2011).

In llama and alpaca, chlamydiosis is one of the major causes of abortion in dromedary camel. However, in the

Middle East and Africa, trypanosomiasis and brucellosis are reported as the main causes of infectious abortion (Tibary et al., 2006). *C. abortus* has been reported to be the major etiological agent for ovarian hydrobursitis disease in dromedary camels (Ali et al., 2012). Moreover, Wernery and Wernery (1990) reported 24% chlamydiosis in the camels that were used for racing purpose. In a study in Egypt, 11.1% of animals (6 out of 54 camels) showed antibodies against *C. psittaci* (Schmatz et al., 1978).

It is worth mentioning that *Chlamydiae* infect male genital organs of ruminants, and may spread the disease to the female at the time of breeding (Teankum et al., 2007; Kauffold et al., 2007). In pregnant woman, the organism may cause abortion and other complications (Helm et al., 1989; Jorgensen, 1997). In men, it may cause prostatitis and epididymitis (Wagenlehner et al., 2006).

Up to 60% of the animals in a particular herd may shed organisms for several years, in levels that vary from minimally detectable to 104-106 infectious units per gram of feces (Storz and Thornley, 1966). The epidemiological significance of this is undetermined. *Chlamydiae* isolated from fecal material are capable of producing pneumonia after intratracheal inoculation and abortion after parenteral infection (Storz, 1963; Popovici and Hiastru, 1967).

Although, a number of significant studies on the one-humped camel have been carried out in several African and Asian countries (Schmatz et al., 1978; Popovici and Hiastru, 1967; Vanrompay et al., 1997), epidemiological studies regarding chlamydiosis in camels seem to be scarce. Therefore, the present study was primarily undertaken to determine the seroprevalence of *C. abortus* in Libyan camel (*Camelus dromedarius*), an infection which has not been previously reported in Libya and only rarely described in other camel-rearing countries.

MATERIALS AND METHODS

Animals and sampling: The present study was approved by the local animal management and experimentation committee of our institution. All ethical measures were taken to minimize animal fear, pain, stress and suffering. Serological tests for *C. abortus* antibodies were conducted in 245 camels (205 females and 40 males) of different localities in the western region of Libya. The animals varied in age from <1-20 years and were sampled randomly from both housed and nomadic herds. From each camel, 10 mL blood sample was collected puncturing jugular vein into plain vacutainer tubes (Becton-Dickinson Co., USA). The samples were

allowed to clot at room temperature for 3 h, and sera were separated by centrifugation (1500 g for 15 min) and stored at -20°C until tested. Any sample showing hemolysis or hyperlipaemia was discarded.

At the time of sampling, the animals were observed for clinical signs and records of their age, sex and clinical history were kept. The camels were apparently healthy although in some cases there was previous history of abortion of unknown cause. No vaccination program is being used against *Chlamydoophilosis* in Libya.

Serological test: Antibodies against *C. abortus* were examined by an indirect enzyme-linked immunosorbent assay (ELISA) using a ELISA kit (CHEKIT® Chlamydia Enzyme Immunoassay; IDEXX, Switzerland), as per the procedure described by the manufacturer. Samples giving %OD of >40% were considered positive, as mentioned by [Samkange et al. \(2010\)](#).

Statistical analysis: Analysis of the data was performed using the statistical program SPSS version 18.0 computer software (SPSS, Chicago, IL, USA). The level of significance was set at $P \leq 0.05$.

RESULTS AND DISCUSSION

To our knowledge, this is the first report associates titers of serum immunoglobulin G (IgG) against *C. abortus* in dromedary camels in Libya. Similar to our findings, [Khan et al. \(2011\)](#) successfully tested *Chlamydia* infection in women. Blood sample was also reported to check Chlamydial infection ([Baud et al., 2010](#)). Polymerase chain reaction (PCR), DNA strand displacement amplification (SDA), and transcription mediated amplification (TMA) are considered as recent techniques to identify Chlamydia ([Khan et al., 2011](#)). Chlamydial identification by swabbing from cervix has some limitations as it can not identify the organism that has already moved into uterus or tubes ([Chernesky, 2005](#)). In sheep, definitive diagnosis has been observed by identification of *C. abortus* by ELISA ([Donn et al., 1997](#)). Additionally, ELISA is comparatively of lower cost and easy to perform. Considering the above facts, ELISA was used in this

study to detect prevalence of Chlamydial infection in camels.

Data of the present work showed that out of the 245 camels tested for anti-chlamydia antibodies, 30 were found positive giving an overall prevalence of 12.25%. The seroprevalence of chlamydiosis was higher by more than 2 folds in female (14.00%) than male (5.00%) camels (**Table 1**). Moreover, all seropositive animals were clinically normal at the time of sampling. *C. abortus* was associated with histories of many reproductive problems in livestock worldwide, nevertheless, little is known concerning camels. Anti-chlamydial antibodies were, however, detected in the sera of 4 (7.6%) out of 52 camels in Tunisia ([Burgemeister 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%. In Saudi Arabia, a serological prevalence of 19.4% was reported for chlamydiosis with a higher prevalence in female than male ([Hussein et al., 2008](#)).

Published information on the clinical significance of chlamydiosis in camel, seems almost lack. In this respect, [Wernery and Wernery \(1990\)](#) suggested that 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. Another study showed that *C. abortus* may be responsible for the spreading of the ovarian hydrobursitis syndrome in dromedary camels which might be the causative agent of conception failure among camels ([Ali et al., 2012](#)). It is known however, *C. abortus* is the major cause of abortion and infertility in sheep, goats and cattle in many parts of the world ([Greig and Linklater, 1985](#); [Aitken, 2008](#)). A study conducted in Hungary by [Szeredi et al. \(2006\)](#) revealed that 63% of all the abortions in sheep and goats were due to *C. abortus*. In cattle, endometritis has been experimentally induced by *C. abortus*, as reported by [Wittenbrink et al. \(1993\)](#). *C. abortus* was reported to infect bovine oviduct causing ifertility ([Appino et al., 2007](#)). Furthermore, chlamydial infection has been

Table 1: Seroprevalence of *C. abortus* in camel in the western region of Libya

| Sex | Total tested (Number) | Total Positive Number (%) | Total Negative Number (%) |
|--------|-----------------------|---------------------------|----------------------------|
| Male | 40 | 2, (5.00%) ^a | 38, (95.00%) ^a |
| Female | 205 | 28, (14.00%) ^b | 177, (86.00%) ^b |
| Total | 245 | 30, (12.25%) | 215, (87.75%) |

Values with different letters in the same column differ significantly ($P \leq 0.05$).

associated with abortion in New World camelids, such as llamas and alpacas ([Wernery and Wernery, 1990](#)).

It is also recorded in the present study that the prevalence of chlamydiosis was higher in female (14%) than in males (5%). A finding that agrees with a previous study reported by [Arshi et al. \(2011\)](#) and [Ali et al. \(2012\)](#). In ruminants, *Chlamydiae* may infect male genital organs ([Teankum et al., 2007](#); [Kauffold et al., 2007](#)) causing prostatitis and epididymitis in men ([Wagenlehner et al., 2006](#)). *C. abortus* is also important from a zoonotic standpoint, particularly as an occupational hazard and in pregnant women exposed to aborting animals. Human infections with *C. 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](#); [Walder et al., 2005](#)).

CONCLUSION

Serotesting data of the present work proved incidence of *C. abortus* in Libyan camels. Out of the 245 camels tested for anti-chlamydia antibodies, 30 were found positive giving an overall prevalence of 12.25%. The seroprevalence of chlamydiosis was 2 folds higher in female (14.00%) than in male (5.00%) camels. The findings underscore the importance of *C. abortus* as a potential cause of abortion in *C. dromedarius* in Libya as well as a public health hazard for the persons who handle these animal in Libya. Further studies should, however, be carried out to expand our knowledge regarding the prevalence, distribution, epizootiology, clinical significance and effective control strategies of camel chlamydia among indigenous and imported animals in Libya.

CONFLICT OF INTEREST

Nothing to declare.

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