

PREVALENCE OF SARCOCYSTOSIS IN DROMEDARY CAMELS FROM INDIA

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Sarcocystis species are intracellular protozoan parasites with a requisite 2 host life cycle based on a prey-predator (intermediate- definitive) host relationship (Fayer, 2004). The disease is zoonotic and has been reported worldwide (Hamidinejat *et al*, 2013). *Sarcocystis cameli* is the only species of sarcocysts reported from camel for which the dog remains the final host (Boid *et al*, 1985). The *Sarcocystis* infections in livestock are usually self-limiting, of short duration, and often asymptomatic. However, acute infections can result in loss of weight, anaemia, haemorrhages in skeletal and heart muscles and abortion (Dubey *et al*, 1989). Studies in India point to a vast reservoir of infection with high prevalence rates in cattle and other livestock species (Chhabra and Samantaray, 2013). However, *Sarcocystis* infection in camels has remained totally unexplored so far in India.

Materials and Methods

The camels of the present study were from an organised camel herd having total herd strength of 350 camels and located at the Bikaner district (Rajasthan State, India). These camels were raised under semi-intensive system of management in outdoor facilities and fed with pellet feed, hay, and water *ad libitum*. These camels were regularly sent for grazing in nearby field area inhabited by stray dogs. During the study period of 5 years (2010-2015), total 92 camels were presented for routine post-mortem which includes 39 males and 53 females. These camels were categorised into 3 age groups i.e. 2 years and below (n= 31), 3-9 years (n= 35) and 10 years and above (n= 26). After observation and recording of gross lesions, the heart tissues were collected in 10% formal saline for histopathology. The formalin fixed tissue samples were embedded in paraffin, cut into 4-5 micron sections and stained with haematoxylin and eosin (HE) stain. The degree of association between each risk factor and the occurrence of sarcocystosis was assessed using the

Pearson Chi-square (χ^2) test in SPSS 16 statistical software.

Results

No macroscopic sarcocysts were found in cardiac muscle tissues during carcass examination, but *Sarcocystis* bradyzoites were found by microscopical examination of histological slides in 33 (35.87%) out of 92 investigated camels. The incidence of sarcocystosis was not significant between the camels of age group 10 years and above (57.14%) and 3-9 years (50%) whereas, none of the calves (below 2 years) were found infected. Sex wise there was no significant difference between occurrence of sarcocystosis in male (30.76%) and female (39.62%) camels.

Grossly, there were no significant gross changes in the heart of affected camels except incidence of hydropericardium in 5 (15.15%) of the infected camels. Microscopically, the sarcocysts were thin walled and dark blue coloured in HE stain (Fig 1). There was no significant pathological reaction in cardiac muscles surrounding to sarcocyst in majority of the cases. However, mild eosinophil and

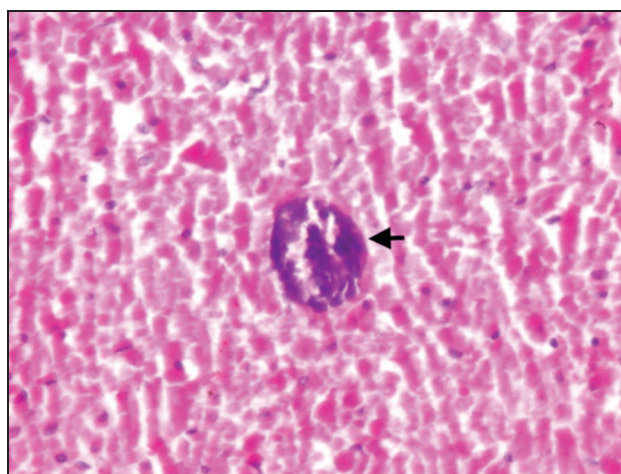


Fig 1. A sarcocyst in the cardiac muscle (arrow) (Haematoxylin & Eosin stain. 400X).

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mononuclear infiltration was observed in 12 (36.36%) and myocardial necrosis was observed in 9 (27.27%) infected camels.

Discussion

The results of the present study revealed a moderate prevalence of *Sarcocystis* infection among camels of the present study. This prevalence is comparable to those reported from other parts of the world such as Afghanistan (47.3–66.3%) (Kirmse and Mohanbabu, 1986) and Iran (52.3% and 51.5%) (Shekarforoush *et al*, 2006; Hamidinejat *et al*, 2013). However, comparatively higher prevalence rates were reported in Iraq (91.6%) (Latif *et al*, 1999) and Saudi Arabia (88.4 %) (Fatani *et al*, 1996). In India, the studies in cattle reported prevalence rate of sarcocysts as high as 80% (Jain and Shah, 1987). Differences between the previously reported infection rates may be due to different husbandry management systems in these countries, as well as use of different diagnostic methods and examination of different tissues for infection. The tissue distribution of *Sarcocystis* in different organs of camels reported by different investigators is also variable. The previous studies in camels detected high prevalence in oesophagus (Shekarforoush *et al*, 2006), diaphragm (Fatani *et al*, 1996) and tongue (Hussein, 1991).

There was no significant difference in frequency of sarcocystosis between male and female camels of the present study. Lack of relationship between sex and infection rates has shown in similar studies on camels before (Shekarforoush *et al*, 2006; Valinezhad *et al*, 2008; Hamidinejat *et al*, 2013). In the present study, higher infection rate was observed among adult and aged camels, which is in accordance with previous studies (Shekarforoush *et al*, 2006; Hamidinejat *et al*, 2013).

The moderate incidence of the sarcocyst in camel population of the farm indicated major role of carnivores invading the grazing areas of camels. Since camels are the browsing animals, the infection through pasture contaminated with dog faeces may be the important transmission source for Sarcocystosis in camels of the present study. The key to control sarcocystosis is in the interruption of the life cycle by preventing the carnivore definitive hosts from eating raw meat or offals of slaughtered/ dead animals, and contaminating the feed and water of livestock with their faeces (Bhatia *et al*, 2010). Therefore, an effort should be made to control the transmission of sarcocystosis by the safe disposal of infected offal and the control of stray dog population from the camel grazing areas.

The histopathological findings in heart muscles of camels of the present study were in agreement with those described by Valinezhad *et al* (2008). The present study showed that the examined camels have infected only with microscopic form of *Sarcocystis* which is in agreement with previous studies (Shekarforoush *et al*, 2006; Valinezhad *et al*, 2008; Hamidinejat *et al*, 2013).

In conclusion, the incidence of sarcocystosis in Indian camels showed important role of camels in the continuation of the *Sarcocystis* life cycle.

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