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SHORT COMMUNICATION

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Seroprevalence of *Neospora caninum* and *Toxoplasma gondii* in camels (*Camelus dromedarius*) in Mashhad, Iran

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Abstract One hundred twenty camels were blood-sampled and used to evaluate serological screening for *Neospora caninum* and *Toxoplasma gondii* infection by indirect fluorescent antibody test (IFAT) in Mashhad, Iran, during years 2004–2005. Of the 120 camels, antibodies to *N. caninum* were found in three in titers of 1:20 and in four in titers of 1:40 using whole *N. caninum* tachyzoites as IFAT slide (VMRD Inc., Pullman, WA 99163, USA). Antibodies to *T. gondii* were found in three camels in titers 1:20 and in two camels in titers 1:40 using whole *T. gondii* tachyzoites as IFAT slide (BIOGENE, Iran).

Introduction

Neospora caninum is a protozoan parasite that was first described in a litter of dogs in Norway in 1984 (Bjerkas et al. 1984). Today, it is recognized predominantly worldwide as an infection; sheep, goat, deer, horses, water buffalo, and camel have also infrequently been reported to be naturally infected (Dubey and Lindsay 1996). The dog and coyotes have been identified as definitive hosts for *N. caninum* (McAllister et al. 1998; Gondim et al. 2004). The etiological agent *N. caninum* is closely related to the apicomplexan protozoan *Toxoplasma gondii*, but they can be distinguished by their ultrastructural, antigenic, and genetic properties (Speer and Dubey 1989; Marsh et al. 1995). Serological tests used to diagnose *N. caninum* infection include the indirect fluorescent antibody test (IFAT), *Neospora* agglutination test (NAT), immunoblot analysis, and enzyme linked immunosorbent assay (ELISA) (Von Blumroder et al. 2004; Bjorkman and Uggla 1999; Dubey 2003). The aim of this study is to investigate the seroprevalence of *N. caninum* infection in camel in Mashhad, Iran.

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Materials and methods

Collection of sera

Blood samples were taken in 2004–2005 in a slaughterhouse in Mashhad. All the samples were immediately transported to the diagnostic laboratory. Serum was removed after centrifugation at 1,000×*g* for 10 min. All the sera were kept in a microtube and stored at −20°C until tested for antibodies to *T. gondii* and *N. caninum* (Frossling et al. 2003). The source or country of origin of the camels was unknown.

Serology

The test procedures were performed using a Teflon-masked 12-well *N. caninum* NC-1 antigen slide (VMRD Inc Pullman, WA 99163, USA), within which whole *N. caninum* tachyzoites were used as antigen and *T. gondii* tachyzoites as IFAT slide (BIOGENE, Iran), fluorescein-conjugated, affinity-purified rabbit anticamel IgG (Central laboratory, Veterinary Faculty, Tehran University, Iran) (Bjorkman and Uggla 1999).

Results

Of the 120 camels, antibodies against *N. caninum* were found in seven (5.83%), in three (2.5%) in titers of 1:20, and in four (3.3%) in titers of 1:40. Antibodies to *T. gondii* were found in five (4.16%), in three (2.5%) in titers 1:20, and in two (1.66%) in titers 1:40. All the seven sera with *N. caninum* antibodies had no *T. gondii* antibodies in 1:20 titers.

Discussion

Presence of antibodies against *N. caninum* in aborted and healthy dairy cattle was detected (Sadrebazzaz et al. 2004), but there was no information on *N. caninum* infection in other hosts in Iran. Camels constitutes an important economical activity in the desert population in east and central regions of Iran. The camel is used as a load animal, which is an important role in transportation in rural areas; in addition, it is also a source of meat, skin, and leathers.

The 5.83% prevalence of *N. caninum* antibodies in the present study is similar to the 3.72% prevalence in Egypt, but the 4.16% prevalence of *T. gondii* antibodies in our study is lower than that of the 17.4% of the camels from Egypt (Hilali et al. 1998), 11.8% of the camels from eastern Sudan (Elamin et al. 1992), and 16% of the camels from Saudi Arabia (Hussein et al. 1988). However, seroprevalence rates do vary depending on the serologic test and the initial serum dilution tested. The sylvatic and heteroxenous transmission cycle of *N. caninum* is unknown in Iran, and finding of *N. caninum* antibodies in camels extend geographic range and host for *N. caninum*.

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