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Seroprevalence of *Toxoplasma gondii* in farm-reared ostriches and wild game species from Zimbabwe

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Abstract

One hundred and seventy one serum samples from 10 game species from Zimbabwe were tested for IgG antibodies to *Toxoplasma gondii* infection using the modified agglutination test (MAT). Significantly higher seroprevalences were found in the felidae (*Panthera leo*) (92% of 26), bovidae (*Tragelaphus* species) (55.9% of 34) and farm-reared struthionidae (*Struthio camelus*) (48% of 50) compared to the other groups tested. Among the bovidae, the nyala (*Tragelaphus angasii)* had the highest seroprevalence of 90% (9/10). Anti-*Toxoplasma* antibody prevalences in browsers [greater kudu (*Tragelaphus strepsiceros*) (20% of 10), giraffe (*Giraffa camelopardalis*) (10% of 10) and elephant (*Loxodonta africana*) (10% of 20)] were generally in the lower range. No antibodies were detected in the wild African suidae [warthog (*Phacochoerus africanus*) and bushpig (*Potamochoerus larvatus*)]. Attempts to isolate *T. gondii* from the heart muscles of seropositve ostriches by subinoculation in BALB/c mice were unsuccessful.

Keywords: *Toxoplasma gondii*; Antibody prevalence; Modified agglutination test; Game species; Ostriches; Zimbabwe

1. Introduction

Since the beginning of the 20th century, the majority of the large wild game mammals in Zimbabwe have been limited to large national parks or conservancies. However, in recent years a number of commercial game parks have sprung up on farms that had not had game for decades. Hunting of some of these animals for their meat and skin is very popular with tourists. Ostriches are also reared commercially for their meat, skin and feathers. Preparation of the meat and skin from the slaughtered animals is often done on-farm without proper protective gear. If these animals harbour zoonotic pathogens like *Toxoplasma*, there is a risk of contracting infection either through oocyst-contaminated food or water or through ingestion.

Toxoplasma gondii is a tissue cyst-forming coccidian with a facultative, heteroxenous life cycle (Tenter and Johnson, 1997). Domestic and wild felids are the definitive hosts whilst domestic and wild mammals (in-

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cluding man and felids) and birds act as the intermediate hosts. The parasite can be maintained by cycling between the intermediate hosts without intervention of the definitive host and it can also be maintained by propagation in between the definitive hosts without intervention of the intermediate host. It has been demonstrated that a wide range of tropical and temperate wild mammals and birds have specific anti-*T. gondii* antibodies (Tenter et al., 2000).

The objective of this study was to determine the prevalence of *T. gondii* infection in wild game species common in Zimbabwe and farm-reared ostriches using the modified agglutination test (MAT).

2. Materials and method

Sera from 10 wild game species were collected from national parks and conservancies in 1997. Fifty ostriches (*Struthio camelus*) from five different farms, aged between 14 and 20 months, were sampled at a commercial abattoir 40 km from Harare in the period 2001/2002. On the farm of origin, the birds were kept in paddocks and given a grain-based supplement with lucerne. Blood and matching heart samples collected from each bird were transported to the Faculty of Veterinary Science in a cooler box. Sera were separated from the clotted blood and stored at −20 °C until used. Organ samples were kept in a cold room with a temperature range of 4–10 °C until biossayed in mice.

The sera were tested for the presence of anti-*T. gondii* antibodies using the MAT incorporating 2-mercaptoethanol and Evans Blue dye as described by Dubey and Desmonts (1987). Wild game species sera were tested at dilutions of 1:25, 1:50 and 1:500 whilst ostrich sere were only screened at dilutions of 1:25 and 1:50 due to limited supplies of antigen. The seroprevalences between the different groups of animals were compared using a non-parametric χ^2 test (Brandt and Snedecor method).

Bioassay in mice was attempted from all the seropositive ostriches as described by Dubey (1997). Fifty grams of heart muscle was digested in acid-pepsin (pepsin, 2.6 g; NaCl, 5.0 g; HCl, 7 ml; distilled H_2O up to 500 ml). Each isolate was inoculated into six susceptible BALB/c mice. Two control mice inoculated with PBS only were included in each group. At ≥8 weeks post infection, mice were bled through the orbital sinus before sacrifice. All mouse brains were screened for the presence of *T. gondii* cysts and sera were tested for antibodies to *Toxoplasma* using the MAT.

Table 1
Seroprevalence of anti-*Toxoplasma gondii* IgG antibodies in sera of wild game species and farm-reared ostriches from Zimbabwe

Animal species	No. of samples	No. of positive (%)
Class Mammalia, order Artiodactyla, family Suidae	20	0 (0)
Warthog (*Phacochoerus africanus*)	18	0 (0)
Bushpig (*Potamochoerus larvatus*)	2	0 (0)
Class Mammalia, order Artiodactyla, family Giraffidae	10	10 (10)
Giraffe (*Giraffa camelopardalis*)	10	1 (10)
Class Mammalia, order Artiodactyla, family Bovidae	34	19 (55.9)
Greater kudu (*Tragelaphus strepsiceros*)	10	2 (20)
Nyala (*Tragelaphus angasii*)	10	9 (90)
Bushbuck (*Tragelaphus scriptus*)	14	8 (57.1)
Class Mammalia, order Perissodactyla, family Rhinocerotidae	11	3 (27.3)
Black rhino (*Diceros bicornis*)	11	3 (27.3)
Class Mammalia, order Proboscidae, family Elephantidae	20	2 (10)
African elephant (*Loxodonta africana*)	20	2 (10)
Class Mammalia, order Carnivora, family Felidae	26	24 (92.3)
Lion (*Panthera leo*)	26	24 (92.3)
Class Aves, order Struthioniformes, family Struthionidae	50	24 (48)
Ostrich (*Struthio camelus*)	50	24 (48)

3. Results

The seroprevalence results are shown in Table 1. No anti-*T. gondii* antibodies were detected in the wild suidae, the warthog (*Phacochoerus africanus*) and the bushpig (*Potamochoerus larvatus*). The overall seroprevalence in the bovids was high (55.9%) though the greater kudu (*Tragelaphus strepsiceros*) had a prevalence (20%) that was significantly lower than that of its counterparts, the nyala (*Tragelaphus angasii*) (90%) and the bushbuck (*Tragelaphus scriptus*) (57.1%).