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Authors: Mohammed, Osama B., and Hussein, Hussein S.

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Antibody Prevalence of Toxoplasmosis in Arabian Gazelles and Oryx in Saudi Arabia

Osama B. Mohammed[1] and Hussein S. Hussein,[2,3] [1] King Khalid Wildlife Research Center, Thumamah, National Commission for Wildlife Conservation and Development, P.O. Box 61681, Riyadh 11575, Saudi Arabia; [2] Department of Zoology, College of Science, King Saud University, P.O. Box 2455, Riyadh 11451, Saudi Arabia; [3] To whom reprint requests should be addressed

ABSTRACT. We determined the antibody prevalence of toxoplasmosis (*Toxoplasma gondii* infections) in antelopes in Saudi Arabia. Serum samples from 324 *Gazella subgutturosa marica*, 202 *Gazella gazella*, 70 *Gazella dorcas*, and 12 Arabian oryx (*Oryx leucoryx*) were tested by the indirect hemagglutination test. Antibodies to *T. gondii* were detected in 13(4.0%) *G. subgutturosa marica*, 12(5.9%) *G. gazella*, 3(4.3%) *G. dorcas*, and in none of the Arabian oryx sampled. More adult gazelles were seropositive than juveniles; males and females were similar. The highest reciprocal antibody titer recorded (262,144) was in a *G. subgutturosa marica* serum.

Key words: Arabian gazelles, *Gazella subgutturosa marica*, *Gazella gazella*, *Gazella dorcas*, Arabian oryx, *Oryx leucoryx*, *Toxoplasma gondii*.

Toxoplasmosis is prevalent in Saudi Arabia, both in humans and domestic animals and the highest risk group comprises people in direct contact with domestic or wild animals (Al-Jasser, 1987). Moreover, laboratory personnel who handle human or animal tissues, feline fecal specimens, or cultured organisms might represent another high risk group (Herwaldt and Juranek, 1993). These high risk groups are represented by workers at King Khalid Wildlife Research Center (KKWRC) at Thumamah, Saudi Arabia (25°07′N, 46°49′E). At the Center, herds of several endangered species of wild animals indigenous to Saudi Arabia have been maintained for research, breeding, and later reintroduction into their now protected natural habitats (Mohammed and Hussein, 1992).

Our objective was to determine the antibody prevalence of toxoplasmosis among herds of Arabian gazelles and Arabian oryx at KKWRC. This would enable us to assess the risk hazard to workers, and to prevent seropositive animals hitherto from being introduced into the natural habitats in the country.

The herds of antelopes maintained at KKWRC include the rheem (*Gazella subgutturosa marica* Thomas), also known as the Arabian sand gazelle; the idmi (*Gazella gazella* Pallas), also called the Arabian mountain gazelle; the ifri (*Gazella dorcas* L.) or the Arabian dark-colored gazelle; and the Arabian oryx (*Oryx leucoryx*). These animals were born at the Center and each has a detailed record book. Gazelles >1 yr old were recorded as adults, those <1 yr old as juveniles. The animals frequently were captured by any of the several mass capture methods for wild ungulates (boma capture, net capture, passive capture, net gun, or dart gun), as described by Flamand (1989). Blood samples were collected periodically in the Center, and then released. Jugular venipuncture was the method used for blood collection. Some of the blood was allowed to clot at 25 ± 2 C for serum separation, and sera were stored at −20 C, until use.

Sera from 608 antelopes of all ages and both sexes, comprising 324 rheem, 202 idmi, 70 ifri, and 12 Arabian oryx were collected during June 1990 through July 1991 and tested for *T. gondii* antibodies using Carter Wallace Toxo-IHA (indirect haemagglutination test) Kits (Carter Wallace, Inc., Cranbury, New Jersey, USA) according to the manufacturer's instructions. Two-fold dilutions of the test sera were used and the microtiter plates were incubated at 25 ± 2 C for 24 hr before reading and calibrating the test using crosses according to the method of Curnow (1968). Any sample giving ++ or more at 1:64 dilution was considered positive and the titer end point was determined. Sera

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TABLE 1. Prevalence of antibodies to *Toxoplasma gondii* in male and female Arabian gazelles at King Khalid Wildlife Research Center, Saudi Arabia.

Gazelle species	Number examined	Number positive	Prevalence (%)
Gazella subgutturosa marica	324	13	4.0
Gazella gazella	202	12	5.9
Gazella dorcas	70	3	4.3

also were collected from 15 live-trapped, feral domestic cats (*Felis catus*) that frequented the premises of KKWRC at night as scavengers and were tested for *T. gondii* antibodies. The cats were kept at the Center for other investigations.

The data were analyzed statistically using a 2 × 2 contingency table (Sokal and Rohlf, 1981).

Twenty-eight (4.7%) of 596 Arabian gazelles sampled had antibodies against *T. gondii* (Table 1). There were no significant differences in antibody prevalence by age or sex among all gazelles, collectively. None of 12 Arabian oryx sampled were seropositive. However, 12 of 15 feral cats sampled were seropositive; the difference in antibody prevalence between the cats and the gazelles was significant ($P < 0.001$).

Nineteen of 28 *T. gondii* seropositive Arabian gazelles had a reciprocal antibody titer of 64: three *G. dorcas*, eight *G. gazella* and eight *G. subgutturosa marica*. One each of the seropositive *G. gazella* had a reciprocal titer of 128, 256, 2048, and 131,072, respectively. Four *G. subgutturosa marica* had a reciprocal titer of 256 and one had a reciprocal titer of as high as 262,144.

Our report is the first on the antibody prevalence of toxoplasmosis in Arabian gazelles indigenous to Saudi Arabia. Mas Bakal et al. (1980) reported an antibody prevalence of toxoplasmosis of 85% among *Gazella* spp. in Kenya, though Reimann et al. (1975) did not detect such prevalence in members of that genus in the whole of East Africa.

The Arabian oryx, though kept under the same conditions as gazelles at KKWRC, had no antibodies against *T. gondii*. Mas Bakal et al. (1980) attributed the prevalence of antibodies against *T. gondii* in a particular animal species to the feeding habits of that species. However, both the oryx and gazelles at KKWRC ate the same food in the same way; both were offered freshly cut alfalfa forage grown at the Center. Hence, perhaps the lack of antibodies against *T. gondii* in the Arabian oryx was due to a lesser susceptibility of the oryx compared to the gazelles.

Contamination by cat feces of the alfalfa fields at KKWRC probably was the main source of toxoplasmosis at the Center. Most feral domestic cats trapped at the Center were seropositive to toxoplasmosis, a rate much higher than that previously reported from domestic cats elsewhere in Saudi Arabia (Hossain et al., 1986). Moreover, all seropositive cats sampled in our study had a mean reciprocal antibody titer of 1,024. Oocysts are extremely resistant to unfavorable conditions and can remain viable for long periods of time in pastures (Frenkel and Dubey, 1973). Additional sources of *T. gondii* oocysts at KKWRC could be wild felines such as *Felis margarita, Felis silvestris, Acinonyx jubatus* and *Panthera pardus* which occur in Saudi Arabia (Harrison and Bates, 1991). Another possible source of *T. gondii* infection to female gazelles could be from infected males through coitus; stages of *T. gondii*, especially tachyzoites, can persist in the semen of infected males of susceptible species (Dubey and Sharma, 1980).

Our finding of no difference in prevalence of toxoplasmosis antibodies among male and female Arabian gazelles was similar to the observations of Mas Bakal et al. (1980), Dorny and Van Aken (1992) and Pandey and Van Knapen (1992) in other animal species.

The highest reciprocal titer recorded (262,144) was from a hand reared *G. subgutturosa marica* that has been kept in a stable area which later proved to be a

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site where feral cats frequently defecated. Hence, that animal may have swallowed large quantities of *T. gondii* oocysts and consequently suffered from acute toxoplasmosis. Westphal and Bauer (1952) did not consider toxoplasmosis as a disease, but merely as a condition of symbiosis between the host and the parasite; yet severe toxoplasmosis can result if animals ingest large quantities of the parasite stages (Ippen et al., 1981).

Following our study, it became the KKWRC policy that no *T. gondii*-seropositive gazelles are reintroduced into the natural habitats, as a measure of limiting the spread of toxoplasmosis.

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