Journal of Animal and Veterinary Advances 7 (12): 1610-1612, 2008
ISSN: 1680-5593

Brucella abortus Antibodies in the Sera of Indigenous Chickens Around Gaborone, Botswana

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Abstract: A study was conducted to detect the presence of antibodies to *Brucella abortus* in the sera of indigenous chickens in 4 villages in Botswana. A total of 220 serum samples were collected from Sebele, Mmopane, Bokaa and Oodi locations. Two out of 220 serum samples had demonstrable antibodies to *B. abortus* by the Rose Bengal plate test. Only one out of 220 samples was positive in the more sensitive Brucella serum agglutination test. The results of the study suggest that avian brucellosis is present in the indigenous chickens. The public health significance of the disease is highlighted and control measures suggested.

Key words: *Brucella abortus* antibodies, serum, indigenous chickens, Botswana

INTRODUCTION

Brucella abortus is a small Gram-negative non-sporulating, non-motile, non-encapsulated coccus, coccobacillus or short rod 0.6-1.5 μm long and 0.5-0.7 μm wide (Alton *et al*., 1975). *B. abortus* normally infect cattle causing abortion in pregnant cows (Carter *et al*., 1995). The disease caused by *B. abortus* is known as brucellosis. *B. abortus* may be dropped in faecal material which may contaminate food material. Although, *B. abortus* is a bacterial organism that normally infects cattle, humans and other animals may be susceptible (Radostits *et al*., 1994). Free ranging chickens that come into contact with infected material may be susceptible to the bacterium (Adesiyun and Abdu, 1984).

Chickens feeding on cattle droppings as may be the case at the cattle post are likely to pick these bacteria when searching for food. Chickens may succumb to infection with a subsequent reduction in egg production (Adesiyun and Abdu, 1984). There are several reports of spontaneous brucellosis of poultry based on mortality and positive agglutination tests (Bale and Nuru, 1982; Chukwu, 1988; Kudi *et al*., 1997). In some of these cases brucellae were isolated from these chickens. When chickens were fed massive doses of brucellae, serum agglutination antibodies were present for as long as 5 weeks post ingestion followed by shedding of the bacterium in the faeces for a period up to 4 weeks. Furthermore, infections due to this bacterium spread to uninoculated pen mates.

The aim of the study, was to detect *B. abortus* antibodies in the sera of indigenous chickens around Gaborone, Botswana with a view to assessing the epidemiological role of the indigenous chicken in the spread of the disease.

MATERIALS AND METHODS

Serum samples were collected from villages surrounding the Botswana College of Agriculture namely: Bokaa, Sebele, Mmopane and Oodi. Blood samples were collected from chickens from the brachial vein in the wing into vacutainer tubes without anticoagulant. Sera were separated and aliquoted into 5 mL sterile plastic vials, stored at -20°C until ready for use.

All the sera were screened for agglutinins using *B. abortus* Rose Bengal Plate Test (RBPT). The RBPT antigen was obtained from Central Veterinary Laboratory, Weybridge U.K. and used as recommended by the manufacturer. Briefly, one drop of antigen (30 μL) and test serum were placed on a glass plate and then mixed thoroughly using a wooden applicator stick. The plate was hand rocked and left standing for 2 min at room temperature. Samples that showed signs of agglutination were recorded as positive while those with no sign of agglutination were recorded negative. Known positive and negative control sera were always included as part of quality control.

Serum agglutination test was carried out as previously described (Alton *et al*., 1975) was performed on the serum samples that were positive in the RBPT. Briefly, two fold dilution of test serum were mixed with an equal volume of antigen and the mixture thereafter incubated at 37°C for 24 h. A positive reaction was a

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serum-antigen mixture with a precipitate at the bottom not disrupted by gentle agitation. For a negative reaction, the serum-antigen mixture was turbid and there was no precipitate at the bottom.

RESULTS AND DISCUSSION

A total of 220 serum samples were collected from apparently healthy adult indigenous (backyard chickens) in four locations namely Bokaa, Sebele, Mmopane and Oodi (Table 1). Antibodies to *B. abortus* were demonstrated in 0.90% (n = 2) and 0.45% (n = 1) using the Rose Bengal Plate Test (RBPT) and Serum Agglutination Test (SAT), respectively.

Antibodies to *B. abortus* were demonstrated only in sera of chickens from Mmopane (1.4%) and Oodi (1.25%). Only chickens from Mmopane village were positive for these antibodies in both the Rose Bengal and the Serum Agglutination (SAT) tests. None of the serum samples collected from Bokaa (n = 55) and Sebele (n = 15) had demonstrable antibodies to *B. abortus* in both the RBPT and SAT tests.

In the present study, only 0.9% of serum originating from 220 indigenous chickens in four villages in Botswana was positive for demonstrable antibodies to *B. abortus* using the Rose Bengal Plate Test (RBPT) and serum agglutination tests, respectively. This level of seroprevalence was higher than that reported for Trinidad for the same pathogen (Adesiyun and Cazabon, 1996). However, it was lower than that reported for chickens in Nigeria (Adesiyun and Abdu, 1984; Chukwu, 1988). The highest seroprevalence was reported for guineafowls in Nigeria (Kudi *et al*., 1997). It was suggested that perhaps the level of seroprevalence might have been a direct reflection of the prevalence of *B. abortus* in the natural hosts, cattle.

Although, this level of seroprevalence was comparatively low, the presence of antibodies to *B. abortus* may have been suggestive of natural exposure to *B. abortus*. The latter hypothesis may have been supported by absence of interference from vaccinal antibodies encountered in vaccinated cattle in other parts of Africa (Chukwu, 1988). Since, chickens are known to retain antibody titres to *B. abortus* for a short period of time (Angus *et al*., 1971), the most likely source of these antibodies in the present investigation may have been through natural exposure to the bacterium. There is documentary evidence to suggest that *B. abortus* can be transmitted from cattle to chickens (Angus *et al*., 1971). There has been mounting serological evidence about the existence of avian brucellosis in the indigenous chicken population (Bale and Nuru, 1982). Perhaps, previous

Table 1: *B. abortus* RBPT and SAT agglutinins in Tswana chickens

Village	Number tested	RBPT reactors	SAT reactors
Bokaa	55	0	0
Sebele	15	0	0
Mmopane	70	1(1.4%)	1(1.4%)
Oodi	80	1(1.25%)	0
Total	220	2(0.90%)	1(0.45%)

unsuccessful attempts to isolate *B. abortus* from organs of seropositive birds may have in part been attributed to relative resistance of birds to this bacterium (Kumar *et al*., 1984).

Cattle usually become infected after grazing contaminated pastures or drinking contaminated water or after licking infected placenta, calf, foetus or genitalia of an infected cow. This occurs soon after calving when large numbers of *B. abortus* are present in the placental lochia (Radostits, *et al*., 1994). Animals may also become infected by inhaling the micro-organism or through the conjunctiva (Nicoliti, 1980). Survival *B. abortus* outside the host is dependent on environmental conditions. The pathogen may survive in an aborted fetus in the shade for up to 8 months, for 2-3 months in the wet soil, 1-2 months in dry soil and 4 months in faeces (Nicoliti, 1980). Permanent calving camps and lush pastures particularlyif they are wet may play an important role in the spread of contagious abortion (Ray and Hendrick, 1974).

Brucellosis or undulant fever in humans is mainly an occupational disease occurring mostly in veterinarians, stock inspectors, abattoir workers, laboratory personnel and farmers. People at risk become infected by contamination of abraded or intact skin or mucous membranes or inhalation when in contact with infected cattle, aborted fetuses, fetal membranes and calves (Currier, 1989).

The possible immune modulating effect of the endocrine system on lymphocytes in the initiation of humoral antibodies to invading pathogens such as *B. abortus* has been alluded to (Mashaly *et al*., 1993). Since, the chickens sampled in the present study were apparently clinically healthy, it was assumed that they were able to mount an immune response and thus, engender resistance to this bacterium.

Since, by definition free range chickens roam freely scavenging for food and water in their immediate environment and beyond, they may be more predisposed to the bacterium through ingestion of infected materials. In view of the possible interspecies transmission of Brucellae organisms, it is recommended that cattle and chickens are not reared together. Furthermore, public awareness campaigns to poultry owners and handlers should be used to highlight the danger of contracting *B. abortus* from backyard chickens.

CONCLUSION

Antibodies to *Brucella abortus* were demonstrated in the sera of indigenous chickens by the Rose Bengal precipitation and serum agglutination tests. These chickens were in contact with free ranging beef cattle. Such chickens could be a source of brucellosis infections in cattle.

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