

# PREVALENCE OF BRUCELLOSIS IN GOAT AND SHEEP IN THE LAKE VICTORIA ZONE OF TANZANIA AS DETERMINED BY SERUM AGGLUTINATION TEST (SAT).

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## SUMMARY

A total of 1655 unvaccinated goats and sheep of both sexes aged 6 months and above belonging to a total of 22 animal establishments and comprising 17 units of Local Small East African (SEA) goats (n=396) and Local Masai Red (MR) sheep (n = 318); and 5 units of Exotic Kamorai Boer crosses (KB) goats (n= 499) and Exotic Black Head Persian (BHP) sheep (n=442) were screened by serum agglutination test (SAT) method as a directive from Tanzania Ministry of Agriculture to control Brucellosis in cattle, sheep and goats. This exercise began with screening of all farms practising good management which had controlled grazing and receiving regular veterinary supervision and inputs. Indigenous animals kept by local subsistence farmers receiving no veterinary supervision and inputs found in the vicinity of the former category were also screened. Generally all exotic breeds were comparatively better cared for than all the local breeds. Breed prevalence rates were Exotic KB goats 0.8% < Local MR sheep 1.3% < Local SEA goats 2.3% < and Exotic BHP sheep 4.3%. Statistical analyses indicated no significant difference ( $p>0.05$ ) between exotic and local goats. Values between exotic and local sheep were deemed significant ( $p<0.05$ ). Moreover breed prevalence between Local goats and sheep revealed no significant difference in sero-prevalence rates at  $p>0.05$ . However similar comparisons between Exotic goats and sheep were found to be highly significant ( $p<0.001$ ).

## INTRODUCTION

Tanzanian Ministry of Agriculture, Livestock subsection began a countrywide attempt to establish status of Brucellosis in food animals in 1974. The directive included screening by SAT method (WHO, 1975) all cattle sheep and goats and other susceptible livestock maintained under good management. This exercise began with screening of bovine and

subsequent monitoring between 1974 and 1985. A year later goats and sheep under good management and similar animals under traditional management residing in close proximity to the former group were also screened. In addition, a total of 4 Large White pigs, 24 Egyptian water buffaloes and 9 elands co-residents with Mwanza area animals were also tested.

Lake Victoria zone of Tanzania is bordered by Kenya, Uganda, Rwanda and Burundi. The last three of these borders have had ethnic conflicts leading to entry of humans and livestock into the area under survey. Furthermore, there is an active movement of livestock via water carriers plying between the lake shore towns and villages belonging to the three riparian states sharing Lake Victoria. The eastern land border of this zone abuts onto epidemiologically sensitive Serengeti wildlife national park which continues northwards into Kenya as Masai-Mara national park. Here brucellosis susceptible wild game ruminants make annual migration into Kenya thus risking transfer of disease like brucellosis into both directions. Many more wild game ruminants are also known to cross into settled areas during dry seasons in search of water while livestock enters parklands for grazing (Jiwa *et al.*, 1996). Lake Victoria zone is reputed to hold around one fifth of Tanzania's livestock population of 13.2 million cattle, 3.6 million sheep and 9.1 million goats (O.I.E., 1992).

Exotic Kamorai x Boer (KB) and exotic Black Head Persian (BHP) sheep were introduced in the country during colonial days and since then they have been kept under good management having controlled grazing and having no financial or technical constraint. Conversely Local Small East African (SEA) goat and Local Masai Red (MR) sheep owned mainly by peasant farmers practising communal grazing and having no veterinary supervision and inputs.

None of the animal types had any vaccination records though sporadic cases of abortion and epididymitis were not uncommon (Jiwa and Tungaraza, 1975). This report deals with the outcome of goats and sheep findings in Lake Victoria zone of Tanzania (Figure 1). Cattle findings are reported elsewhere (Jiwa *et al.*, 1996).

## **MATERIALS AND METHODS**

### **Sampling of animals**

The area surveyed is shown in Figure 1. In pursuance of Tanzania's Ministry of Agriculture directive, a total of 22 animal establishments and comprising 17 poorly managed animal establishments of Local Small East African (SEA) goats (n=396) and Local Masai Red (MR) sheep (n = 318); and 5 establishments practising good management with Exotic Kamorai Boer crosses (KB) goats (n= 499) and Exotic Black Head Persian (BHP) sheep (n=442) were a total of 499 KB goats and 422 BHP sheep were bled for serum collection. Out of the former category 86 goats and 58 sheep sera came from an abattoir. Sera of all samples came from unvaccinated animals. All sera excepting abattoir samples were obtained by jugular vein puncture. Blood was collected into sterile McCartney bottles filled three quarters full, closed lightly and placed in slanting position in a metal basin containing wet sand for 18-24 hours. Sera were either decanted or pipetted into sterile Bijou bottles, closed tightly and stored in portable gas freezer under field conditions and transferred in a cool box to

Veterinary Investigation Centre, Mwanza which acts as a zonal laboratory for all animal health matters. Here sera were stored at -70°C and tested within one week of arrival.

#### **Serum agglutination test (WHO.,1975):**

This test using serial double dilution was modified to use 3% saline instead of 0.85% saline as diluent. Rows of 4 Kahn tubes placed in copper racks were made out into 1:10, 1:20, 1:40 and 1:80 solutions. Trocken *Brucella abortus* antigen (Behringwerke, Germany) and supplied by Bundesgesundheitsamt Labs., Berlin, Germany were standardised using 0.5% phenol saline according to the manufacturer's instructions and prepared to resemble 1:10, 1:20, 1:40 and 1:80 positive using sera of known strength. Test sera were thawed and warmed in a

water bath at 56°C for 15 minutes. The mixing of the reagents and sera was done according to the protocol described by WHO manual, the prepared reactions were then incubated at 37°C for 18-24 hours prior to reading the results. Interpretation of the result was performed as described by Chengappa and Carter (1988) and summaries in Table 1.

#### **Statistical analysis**

Statistical analysis was performed with the help of EPITABLE facility of the EPINFO version 6.0 software (Centre for Disease Control, Epidemiology Program Office, Atlanta, Georgia, USA/World Health Organisation, Global Programme on AIDS, Geneva, Switzerland). The Chi square ( $\chi^2$ ) Yates corrected analysis was used for comparisons of sero reactivities among the different animal groups (Anon., 1988).

**Table 1 Interpretation of results (Chengappa and Carter, 1988)**

Titre	Animal types	
	Goats, Egyptian, Water buffaloes, Elands, Pigs	Sheep
Negative	No agglutination	No agglutination
Doubtful	1:20	1:10
Positive	1:40 and above	1:20 and above

#### **RESULTS**

Prevalence rates of brucellosis as determined by SAT revealed overall prevalence for goats and sheep was at 1.01% and 3.03% respectively. The disposition of positive sera according to type and breeds sheep

and goats showed a varying prevalence rates; KB goats 0.8%, MR sheep 1.3%, SEA goats 2.3% and BHP sheep 4.3% (Table 2). The proportion of sheep and goats which produced doubtful results were 4.1 and 6.1% of the total number of number tested

respectively. Majority of the sera (90.5 to 96.2 %) were negative (Table 2).

The details of statistical analyses of comparison of various variables are summarised in Table 3. Briefly,  $\chi^2$  Yates corrected analysis showed a significantly high ( $p < 0.05$ ) sero-positive sera from sheep as compare to those from goats. The difference in sero-positive sera was even very significant ( $p < 0.001$ ) when comparison was made between exotic breed of sheep (BHP) and that of goats (KB). Local breeds of sheep (MR) and goats (SEA) did differ significantly ( $p < 0.05$ ) in expressing antibodies to brucella antigens. Within species difference was only noticeable amongst sheep ( $p < 0.05$ ), whereas exotic and local goat had an insignificant difference ( $p > 0.05$ ) in sera positive to brucella serum agglutination test.

## DISCUSSION

Brucellosis is a disease of man and animals i.e. a zoonosis caused mainly by *Brucella abortus* and *B. melintensis*. The latter species is the principal cause of this condition in goats and sheep, although natural infections of *B. abortus* and *B. suis* may occur at times. Conversely cattle are known to be infected occasionally with *B. melintensis*, yet commonly encountered species is *B. abortus*. Moreover *B. ovis* infection is strictly species specific to sheep (WHO, 1975 and Alton, 1973). Abortions among cattle kept under good management and cases of abortions among sheep and goats and epididymitis among rams kept

under both good and bad types of management prompted the Tanzania's Ministry of Agriculture to enforce control measures directing use of SAT method (WHO, 1975). This method is relatively inexpensive and simple that could be used by auxiliary technical staff without complications under Tanzanian conditions. Though Rose-Bengal Test (RBT) compliment fixation (CFT) and enzyme linked immunosorbent assay (ELISA) methods are known to be more sensitive, their test specificity in unvaccinated animals is not any more superior to SAT method (Madsen, 1994). However, the major drawback is that the major immunoglobulin produced in response to *B. abortus* is IgG1 whereas SAT detects mainly IgM and IgG2 immunoglobulin subclasses and this may sometimes produce false negative reactions (Mittal and Tizard, 1983; and Jiwa *et al.*, 1996). To counteract partially the action of blocking antibodies the authors herein used 3% saline instead of 0.85% and warmed sera at 56°C for 15 minutes prior to use. The present survey began with cattle surveillance and post surveillance monitoring (Jiwa *et al.*, 1996) and a year later started with goats and sheep with compulsory slaughter of all positive reactors under veterinary supervision. Negatives reactors constituted nucleus of "clean" animals and would only permit brucellosis-negative animals to join the herd (Jiwa *et al.*, 1996, and Jiwa and Tungaraza, 1975).



There have been scanty reporting on small ruminants brucellosis from this epidemiologically sensitive area in East Africa (Fig. 1 and 2). The present report is probably the first attempt to assess prevalence of this disease in the last two decades. The exotic sheep appeared to be more susceptible to the disease than either the local sheep or any of the goats breeds (Tables 2&3) regardless of the level of management. This should mean that, more attention to vaccination and post vaccination screening would be required for the newly introduced BHP sheep. However, the number of animals observed in this survey was rather small and conclusive remarks should be taken with caution. A wider survey extended over a longer period is required to include use of RBT, CFT and ELISA methods known for their higher sensitivity and test specificity (Madsen, 1994). But the authors are of opinion that in the absence of any similar studies in this important livestock raising area of Eastern Africa, these SAT findings albeit having some drawback of possible few false negative reactions (Mittal and Tizard, 1983; Jiwa et al., 1996) be chronicled for their usefulness as true record of SAT findings in sheep and goats of Sukuma land where other diagnostic tests are not available at local Veterinary Investigation Centre.

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**Figure 1. The location of Veterinary Investigation Centres (asterisk) and the Lake Victoria Zone in Tanzania.**