THE PREVALENCE OF BOVINE BRUCELLOSIS IN SMALL SCALE DAIRY CATTLE HERDS IN URBAN AND PERI-URBAN AREAS OF DAR-ES-SALAAM AND MOROGORO, TANZANIA

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SUMMARY

The prevalence of bovine brucellosis was determined in Small Scale Dairy Cattle Herds (SSDCH) of urban and peri-urban areas of Dar-es-Salaam and Morogoro. The influence of herd size, grazing system and type of insemination on the spread of the disease were also assessed. A total of 222 herds (154 in Dar-es-Salaam and 68 in Morogoro) comprising of 908 (40 bulls and 868 cows) sexually mature animals were screened for brucellosis in both towns. The prevalence was assessed using Enzyme-Linked Immunosorbent Assay (ELISA) serological test. Prevalence rates of brucellosis in the two towns were 7.6 % for Dar-es-Salaam and 22.1 % for Morogoro. None of the bulls reacted positive to the test. Sixty one herds (27.5 %) were infected. The prevalence increased with increasing herd size and the disease was more prevalent in grazing than in zero grazing herds ($P < 0.01$). Seropositivity was significantly higher ($P < 0.05$) in animals using natural service than in those using artificial insemination (AI). In conclusion, the high prevalence rate of brucellosis in SSDCH requires urgent control strategies if the small scale dairy sector is to avoid the big economic loss due to brucellosis.

INTRODUCTION

Bovine brucellosis is known to occur in a number of countries albeit with varying prevalence rates (Blood and Radostits, 1989). In Tanzania, its occurrence has been assessed mainly in large beef and dairy farms where its prevalence was found to be 13.5 % (Mahlau and Hammond, 1962); 97 % (Minga and Balemba, 1990) in beef farms and 15.2 % (Otaru, 1985); 5.2 % (Kitalyi, 1984) in dairy farms. The disease in cattle is caused by *Brucella abortus* (Arthur et al. 1989). However *Brucella melitensis* which occurs in the sheep and goats can also be transmitted to cattle (Mustafa and Corbel, 1990; Hellman et al. 1992).

By far the most common reservoir of *B. abortus* is cattle. Infection is most frequently introduced to clean herds by purchase of an infected animal which is either pregnant , or has recently aborted or calved (Corbel, 1988). Infection occurs following ingestion of feeds contaminated by genital discharges of aborting cows (Roberts, 1986). Transmission can also occur through the mucous membranes of

the eye (Corbel, 1988; Beck et al. 1964).

It has been found that provision of adequate floor space, running space, lighting, ventilation, good sanitation and feeding animals individually reduced the spread of the disease (Saini et al. 1992; Samaha et al. 1990). Overcrowding and shade offer good opportunities for the infection to thrive (Dafaalla and Khan, 1958). Bulls can become infected but they are rarely responsible for the introduction or spread of the disease to cows by natural service (Roberts, 1986; Hungerford, 1987; Corbel, 1988).

Once the infection occurs in sexually mature cattle, 85% remain infected for life. Young animals of up to about six months of age frequently have resistance to the disease particularly when they are the progeny of the infected cows (Hungerford, 1987).

Diagnosis of the disease is based on the demonstration of the causative organisms or antibodies using serological tests (Corbel, 1988). Because of the danger involved in handling organisms during collection of infected materials and expenses incurred in their identification, diagnosis by culture as a routine diagnostic procedure is less practical (Nielsen and Gall, 1994). Thus, one of many serological tests which has been used to diagnose brucellosis is ELISA (Weir, 1983). This test has been found to be more sensitive than conventional serological tests (Voller and Bidwell, 1986), and has been recommended for use in serodiagnosis of bovine brucelosis in Tanzania (Minga and Balemba, 1990).

No information is available in the literature on the prevalence of brucellosis in SSCDH in Tanzania. The objective of this study was to determine the prevalence of brucellosis and the role of various animal husbandry aspects in the occurrence and spread of the disease in SSCDH in urban and peri-urban areas of Dar-es-Salaam and Morogoro in view of the importance of the sector to the national economy.

MATERIALS AND METHODS

The study was conducted in urban and peri-urban areas of Dar es salaam and Morogoro in the semiarid eastern zone of Tanzania. SSDCH comprising of two to twelve animals per herd which were surveyed in this study are managed either under grazing or zero grazing management systems. In the former management system, animals are sent out to graze during the day time (8^{00}-16^{00} hrs) and in the evening they are kept indoor and provided with cut fodder, whereas in the latter system, animals are kept in door where they are provided with cut fodder, normally termed "cut-and-carry". Cow breeding is by artificial insemination or natural service or both.

Blood samples were collected from 908 animals; of which 587 (comprising 17 breeding bulls and

570 cows and heifers) were from Dar es Salaam and 321 animals (23 breeding bulls; 298 cows and heifers) were from Morogoro. Only sexually mature animals were used. A total of 154 (124 zero grazed and 30 grazed) and 68 herds (11 and 57) were surveyed in Dar es Salaam and Morogoro respectively. The herd size ranged from two to eighteen animals.

Blood samples were collected from middle coccygeal artery using sterile vacutainer tubes (Becton Dickinson vacutainers - USA). Each animal was sampled only once.

The samples were taken from the field to the laboratory where they were kept at room temperature over night to allow clotting. Serum from each of the tube was decanted into Bijou bottles and then kept frozen until the day of analysis. All sera were tested using indirect ELISA technique, according to Joint FAO/IAEA Brucellosis indirect kit bench protocol (1991):

Microplates were coated by dispensing 100 µl volumes of Brucella 5LPS diluted 1:100 into all the 96 wells, covered and incubated overnight at 4 °C to allow firm binding of the antigen. Then the microplates were washed with phosphate buffered saline (PBS) three times so as to remove unbound antigen. The test sera in three replicates were added into microplate wells at final dilution of 1:200, after which the microplates were covered and placed on an orbital plate shaker housed in 37 °C warm air incubator for one hour with continuous shaking. Microplates were washed three times to remove unbound antibody. Antiglobulin (monoclonal brucella antibody) chemically linked to enzyme (horseradish peroxidase) was added. Then the microplates were incubated for one hour at 37 °C with continuous shaking. The microplates were then washed and immediately after, 100 µl of substrate was added to each sample. The microplates were transferred to an orbital plate shaker at 37 °C for ten minutes followed by addition of stopping solution. Finally results were read in a spectrophotometer at 414 nm filter. The optical density (OD) greater or equal to 0.089 (8.9 %) was regarded as positive.

Chi square statistical test, according to Statistical Analysis System (SAS Institute, 1990), was used to determine whether there were significant differences between the prevalence of brucellosis in herds of different sizes, in herds practicing natural service and those using AI, and in animals managed under zero grazing and those under grazing system.

RESULTS

The overall herd seropositivity of the examined animals was 27.5 %. The percentage of infected herds in Morogoro (41 %) was nearly twice as much as that in Dar-es-Salaam (21.4 %). The overall Seropositivity to ELISA in the 908 dairy cattle screened was 12.7%. The prevalence in Morogoro (22.1 %)

Table 1: ELISA seropositivity to Bovine brucellosis in relation to type of insemination and herd size

Herd size	AI only		Bull and AI		Bull only	
	sero (+ve)	sero (-ve)	sero (+ve)	sero (-ve)	sero (+ve)	Sero (-ve)
< 2	0	105	0	67	1	121
3-4	3	59	4	50	10	165
5-6	0	10	2	17	19	73
7-8	0	1	7	1	16	51
> 8	0	0	0	8	54	64
Total	3	175	13	143	100	474

Table 2: Infected herds and number of cows in relation to grazing system basing on ELISA:

Town	Management system	Total		Positive reactors		Prevalence rate %	
		herds	cows	herds	cows	herd	cows
Morogoro	Zero grazing	11	93	3	12	27.3	12.9
	Grazing in fields	57	228	25	59	43.9	25.8
Dar-es-Salaam	Zero grazing	124	399	17	22	13.7	5.5
	Grazing in fields	30	188	16	23	53.3	12.2
Total	Zero grazing	135	492	20	34	14.8	6.9
	Grazing in fields	87	416	41	82	47	19.7

was significantly higher ($P < 0.05$) than in Dar-es-Salaam (7.6 %).

All positive reactors to the test were females and none of the bulls was found to be seropositive. The seropositivity appeared to be associated with herd size, the rate of infection increasing with the herd size (Table 1). For instance, the prevalence rate in herds of not more than two animals was only 0.34 %, whereas in herds with above eight animals, the infection rate was 42.8 %.The prevalence of brucellosis was significantly higher ($P < 0.05$) in herds practising natural service than in those using AI. Only three animals (1.6 %) out of 178 animals in herds that used AI were infected, whereas 100 animals (17.4 %) out of 574 in herds that used natural service (bull) were infected. The prevalence in herds practicing both AI and natural service was intermediate (9.1 %).

Twenty five (43.9 %) and 16 (53.3 %) herds grazing outdoors were seropositive in Morogoro and Dar-es-Salaam respectively (Table 2). Lower percentage tested positive in herds practicing zero grazing (27.3 and 13.7 respectively). More than 70 % of the infected animals were from herds managed under grazing system, whereas 30 % were from zero grazed herds. In both towns, the disease was more prevalent in grazed than in zero grazed herds (Table 2).

DISCUSSION

The results of this study show that brucellosis which has also been reported in large scale farms in Tanzania (Mahlau and Hammond, 1962; Staak and Protz, 1973; Kitalyi, 1984; Minga and Balemba, 1990) is also prevalent in SSDCH. The overall prevalence of 12.8 % observed in Dar-es-Salaam and Morogoro towns is considered to be high. The occurrence of this disease in SSDCH may be attributed to lack of brucellosis vaccine in Tanzania for the past ten years (Lema, B.E., personal communication, 1995).

The higher prevalence rate of the disease in Morogoro (22.1 %) than in Dar-es- Salaam (7.6 %) may be due to the different type of animal management systems. In Morogoro, most small holders (83.8 %) graze their animals whereas in Dar-es-Salaam 80.5 % practice zero grazing animal management system. In urban and peri-urban Tanzania no areas are specifically reserved for grazing and therefore animals are forced to graze in the few available open spaces (road sides and uncultivated fields). This leads to massive contamination of pastures by infective genital discharge of aborting or calving cattle thus facilitating the spread of the disease. This is contrary to the zero grazing system in which animals are confined in stalls or sheds with or without separate compartments and fed individually. This is in agreement with observation by Samaha et al. (1990); Saini et al. (1992), that out door grazing system increases whereas the zero grazing management system reduces the rate of infection.

The lack of seropositivity in the bulls including those from seropositive herds in the two towns surveyed is likely to be attributed to the few number of bulls screened. It is also an indication that bulls were not involved in the transmission of the disease. Similar observations have also been reported in studies by Roberts, (1986); Hungerford, (1987); Corbel, (1988), that bulls are rarely responsible for introduction or spread of the disease to cows by natural service unless semen of infected bulls is used in AI and especially when deposited in the uterus.

The confinement of seropositivity of the disease to females only is in contrast to what has been reported in other studies that showed the infection rate of female to male to be nearly in a ratio of 4:1 (Abdelrahim et al. 1990; Nagy and Sorheim, 1969; Sachs et al. 1968, Staak and Protz, 1973). The observed sero-negativity in bulls may be attributed to low proportion of males (4.4 %) among the animals screened in this study and that the main mode of transmission is through the oral route (Roberts, 1986).

The prevalence rate of the disease increased with increasing herd size. This variation may be due to type of management system. Most herds with more than three animals are grazed outdoors because it is expensive to feed them under zero grazing 'cut-and-carry' management system. Grazing animals in the few available open spaces which may be heavily contaminated by infective genital discharges facilitates the spread of the disease. This is more so during the rainy season with the wetness and abundance of pasture offering good opportunity for infection to thrive and spread (Dafaalla and Khan, 1958).

CONCLUSION

The findings of this study show that there is a high prevalence (12.8%) of bovine brucellosis in the SSDCH of peri-urban Dar-es-Salaam and Morogoro. This poses great danger to public health and great economic loss to the small scale dairy sector. Therefore urgent control measures need to be taken.

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