



Sero-epidemiological Study of Camel Brucellosis in Mehoni District, South Eastern Tigray, Ethiopia

EA TIRI Scholar: Habtamu Tassew Tarekegn, Mekelle University, College of Veterinary Medicine

Co-PI: Fisseha Kassahun Kebede, Mekelle University, College of Veterinary Medicine

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Abstract

Adapted to the arid climates of Ethiopia, camels serve as a vital domestic animal species for pastoralists, who rely on the animals for food security. However, infectious diseases such as brucellosis can have considerable impacts on both camel and human health. In an analysis of 450 blood samples collected from animals in the Mehoni district of northeastern Ethiopia, researchers determined the number of camels and goats that tested positive for brucellosis (i.e., sero-prevalence) in the region and identified the potential risk factors associated with the occurrence of the disease. In addition, 100 randomly selected camel owners were interviewed to determine local knowledge about zoonotic diseases and what resources and education are needed for prevention. 

Impacts of brucellosis on camel health affect the food security and health of Ethiopian pastoralists

Best adapted to the harsh environments and fluctuating nutritional conditions of arid and extreme arid zones of Ethiopia, camels (*Camelus dromedarius*) serve as a vital domestic animal species for pastoralists in this region. Endowed with extraordinary features that enable them to survive and perform in such harsh conditions, these animals ensure food security for pastoralist households even during the dry periods. Camels also serve as a means of transportation and draught power. The major ethnic groups owning camels in Ethiopia are the Beja, Rashaida, Afar, Somali and Borana.

In spite of the camel's vital importance, particularly to marginalized communities (pastoralists) in the dry zones of Ethiopia, studies about camels remain few in number, especially in regards to camel diseases, such as brucellosis, anthrax and tuberculosis. A widespread infectious disease that can cause abortions in camels, brucellosis has considerable impact on public health as camel milk is consumed in its raw form. This study aims to fill this information gap by determining the sero-prevalence of camel and goat brucellosis in the Mehoni district of northeastern Ethiopia and by identifying the potential risk factors associated with the occurrence of the disease.

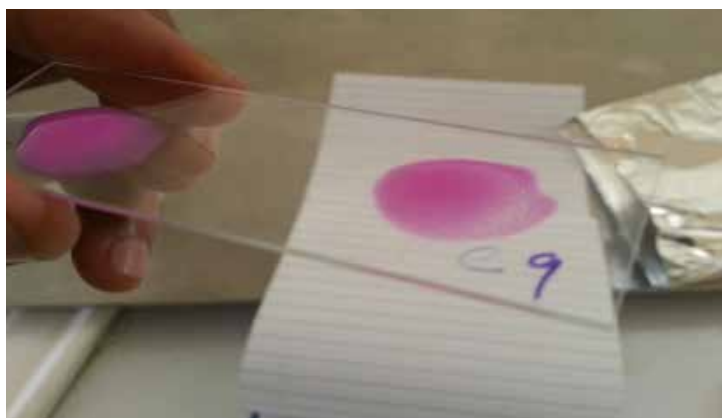


Researcher collecting a blood sample from a camel. (Photo credit: Tarekegn)



Researchers collect blood samples from 450 animals to be analyzed and tested for brucellosis

The study was carried out in three camel-rearing rural communities (Genete, Chercher and Kukuftu) in the Mehoni district in the period from November 2012 to August 2013. Located in the southeastern part of Tigray Regional State near the border of Afar, Mehoni was selected purposively based on ease of access and camel population. A total of 450 blood samples (300 camels and 150 goats) were randomly collected and screened for antibodies using the Rose Bengal Plate Test (RBPT). Those testing positive were subjected to confirmation using the Complement Fixation Test (CFT). In addition, 100 randomly selected camel owners were interviewed using a structured questionnaire. Accordingly, different models or analytical tools were employed to analyze collected data. Descriptive statistics and the chi-square test were used to analyze the majority of the data collected by the questionnaire and to rule out whether there was a significant association between the prevalence of camel brucellosis and different potential risk factors like age, parity, history of abortion, sex, etc.



RBPT positive reactor sampled from 'Kukuftu'. (Photo credit: Tarekegn)

Blood sample analysis reveals association between seroprevalence and risk factors

Almost 4 percent of animals in the study group were confirmed as seropositive reactors

After the initial round of testing, 26 animals (5.8%) were identified as seropositive reactors from the total serum sample collected. Testing positive, these blood samples underwent further analysis with the confirmation tests identifying 16 animals (3.56%) as seropositive reactors (Table 2). These findings are relatively low in comparison to other research findings.

As per the study by Abbas and Agab (2002), the sero-prevalence of brucellosis in camels appears to follow two distinct patterns: a low (2-5%) prevalence in nomadic camels and a high (8-15%) prevalence in camels kept intensively or

semi-intensively. In this study, a 3.67 percent sero-prevalence of camel brucellosis was observed, which agrees with the low prevalence as nomadic people keep most camels in this region.

Age, history of abortion and parity number found to influence likelihood of disease

A logistic regression analysis indicated a highly significant association between positive antibody status and the potential risk factors of age, history of abortion and parity number, as detailed below. A moderate association exists between positive antibody status and keeping camels in close contact with goats. In contrast, sero-positivity was not associated with sex, species or herd size (Table 3).

Age: All breeding male and female camels and goats above six month of age were included. Infection may occur in animals of all age groups but persists commonly in sexually matured animals. Younger animals tend to be more resistant to infection and frequently clear infection, though few latent infections may occur. The present study showed a slightly higher significant association with the occurrence of the disease in adult camels (> 4 years) than young camels (6 month to 4 years). The low sero-prevalence in young camels might be because of maternal immunity. Susceptibility appears to be more commonly associated with sexual maturity, and risk of infection increases with pregnancy as the stage of pregnancy increases.

Parity: There was statistically significant association between parity and the sero-prevalence of the disease. Female camels and goats that gave birth more than once were 1.59 times more likely to test positive for Brucella infection than those with no parturition. Female camels and goats that gave birth only once were 1.25 times more likely to test positive for infection than those with no history of parturition. A higher infection rate was recorded in female camels and goats that gave birth to more than one calf (7.74%) than those with single parity (0.88%) and those with no parity (1.01%).

History of abortion: Classical symptoms of brucellosis in camels include abortion, placental retention, stillbirths, delayed sexual maturity and infertility (Musa and Shigidi, 2001). In the present study, 41.38 percent of camels and goats with a history of abortion tested positive for the Brucella infection. As the number of animals with history of stillbirths and placental retention was insignificant, they were not included in the analysis of this study.

Contact with other animals: A higher sero-prevalence (4.4%) was observed in camels reared with small ruminants (goats) as compared to those kept with no contact with small ruminants (1.4%). A statistically moderate significant association exists between camel groups in contact with small ruminants and without contact with ruminants. A contributing factor to the spread of the disease may be the movement of animals for grazing and watering during the dry season; aggregating animals around a watering point will increase the contact between infected and healthy animals and thereby facilitate the spread of the disease.

Total Number of Camels and Goats Sampled in Each Pastoralist Community			
Peasant Association	Goats	Camels	Total
Genete	50 (33.3%)	50 (16.7%)	100 (22.2%)
Chercher	50 (33.3%)	125 (41.7 %)	175 (38.9%)
Kukuftu	50 (33.3%)	125 (41.7 %)	175 (38.9%)
Total (%)	150 (33.3%)	300 (66.7%)	450 (100.0%)

Table 1. Total Number of Camels and Goats Sampled in Each Pastoralist Community.

Overall Sero-prevalence of Brucellosis in Camel and Goats by RBPT and CFT			
Species	No. of Serum Test	Serological Test	
		RBPT	CFT
Camels	300	19 (6.33%)	11 (3.67 %)
Goats	150	7 (4.67%)	5 (3.33 %)
Total (%)		26 (5.78 %)	16 (3.56%)

Table 2: Overall Sero-prevalence of Brucellosis in Camel and Goats by RBPT and CFT.

Questionnaire interviews indicated that most animal owners were not aware of the zoonotic nature of brucellosis, as they drank raw milk and did not take precautions in handling aborted fetuses. Clearly, further studies need to be conducted on the risk of human brucellosis in this area to educate herders on zoonotic disease and to devise measures for disease control.

Education, resources and further research needed in order to help control brucellosis infections in camels

In conclusion, the present study provides the baseline status of camel brucellosis in Mehoni and the potential risk factors that would contribute to the occurrence of the disease in camels as well as possible zoonotic implications in human beings. Lack of awareness about the zoonotic nature of brucellosis, together with an existing habit of raw milk consumption and close contact with animals, can serve as means of infection to human beings. In view of the above facts, the following points need to be considered in order to control the disease:

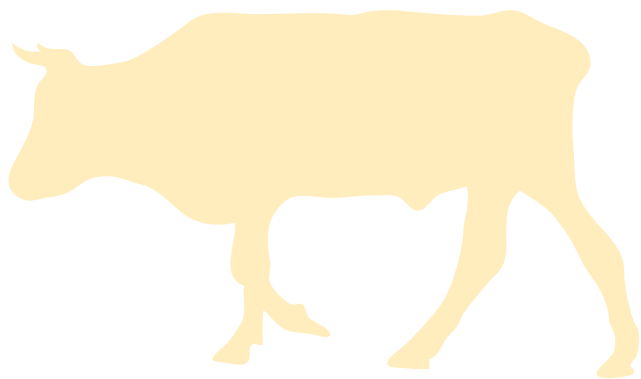
- Camel pastoralists are often neglected from public services, facilities and information. Thus, awareness about modern animal husbandry, disease prevention and risk of zoonotic diseases is quite necessary.
- Further research on the isolation of causative agents and identification of species and biotypes in Ethiopia is important.
- Camels prosper, produce and sustain the life of the pastoralists under a number of constraints. Hence, researches that support these animals and maximize their performance are recommended.
- Research that produces and develops effective vaccines against the strains of Brucella in camels should be conducted in pastoral communities.
- Adequate Brucella control programs in small ruminants may contribute to the reduction in prevalence of this disease in camels.

Overall Sero-prevalence of Brucellosis in Camel and Goats by RBPT and CFT							
Risk Factors	Category		Total sample	Positive (CFT)	% Positive (95% CI)	P- value	OR (95% CI)
Age	Camel	6 months -4 years	131	0	0	0.021	X2 = 9.6897
		> 4 years	169	11	6.51%		
	Goat	6 months -1 year	15	1	6.67%		
		> 1 year	135	4	2.96%		
Sex	Male		83	2	2.41 %	0.532	X2 = 0.3897
	Female		367	14	3.81 %		
Species	Camel		300	11	3.67 %	0.857	X2 = 0.0324
	Goat		150	5	3.33 %		
Parity	No parturition		99	1	1.01 %	0.006	X2 = 12.4754
	Single parity		114	1	0.88 %		
	More than one parity		155	12	7.74%		
History of abortion	Yes		29	12	41.38%	0.001	X2 = 129.964
	No		338	2	0.59%		
Contact with other animals	Contact		229	219	95.6%	0.082	X2 = 3.0281
	No Contact		71	70	98.6%		
Herd size	1-9		97	1	1.03 %	0.089	X2 = 4.8487
	10-19		183	5	2.73 %		
	>20		170	10	5.88 %		

Table 3: Overall Sero-prevalence of Brucellosis in Camel and Goats by RBPT and CFT.

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TIRI, Targeted Investment for Research Impact, identifies early-career researchers who are interested in tackling livestock production problems through innovative approaches and fresh perspectives. This small-grant program is open to early-career researchers (five or fewer years into research career) in any discipline, from student to professor, and from any organization that is engaged in applied research on livestock production in South Asia and East Africa — colleges and universities, government research centers or laboratories, or non-profit organizations.

Proposals are selected based on their potential to make livestock production systems more resilient to increasing climate variability and severity. At the end of one year, TIRI scholars are expected to demonstrate concrete outcomes and real potential for future impact. The 10 selected East Africa TIRI scholars and the 18 selected Nepal TIRI scholars are addressing research problems on various livestock and climate research themes.



Feed the Future Innovation Lab for Collaborative Research on Adapting Livestock Systems to Climate Change is dedicated to catalyzing and coordinating research that improves the livelihoods of livestock producers affected by climate change by reducing vulnerability and increasing adaptive capacity.

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