Detection of *Brucella* spp. in milk from various livestock species raised under pastoral production systems in Isiolo and Marsabit counties, northern Kenya

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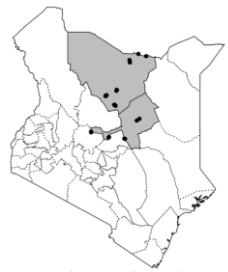
Brucellosis is regarded as a high-priority zoonotic disease in Kenya. Diagnosis of the disease in Kenya is mostly based on serological methods with limited use of molecular techniques to better understand transmission of the bacteria. Ingestion of contaminated milk remains an important means of transmission of the disease to humans.

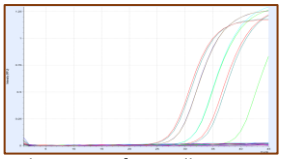
We investigated the presence of *Brucella* spp. in milk from various livestock species in pastoral households in Isiolo and Marsabit counties of northern Kenya. A total of 549 milk samples were collected in a cross-sectional survey that involved 175 households. Up to 378 samples were collected directly from lactating animals (51 cattle, 7 sheep, 317 goats and 3 camels) while 171 samples were from milk pooled of cattle, sheep, goats, camels and mixed species in households. Questionnaire surveys were also administered to determine milk consumption patterns in the target households. *Brucella* spp. prevalence and distribution was determined and risk of exposure to humans was modeled using the Codex Alimentarius framework.

Methods



Map of Kenya with Marsabit and Isiolo counties highlighted in grey and black spots showing milk sampling points

DNA extraction from milk using Qiagen DNEasy kits



qPCR detection of *Brucella spp., B. abortus* and *B. melitensis (*confirmation of detection through Sanger sequencing of some samples*)*

Milk indirect ELISAs for bovine milk samples to detect anti-LPS *Brucella* antibodies.

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ward=pooled_mar$ward, village=pooled_mar$village,
long=pooled_mar$longitude, lat=pooled_mar$latitude

alt=pooled_mar$altitude, hh_head=pooled_mar$hh_hea

hhid=pooled_mar$hh_id, species=pooled_mar$species,
sampleid=pooled_mar$pooled_milk_id,
amplespp=pooled_mar$species_pooled,
births=NA, treated="NA",
drug="NA", subject="pool")
```

Determination of prevalence and distribution with area of sampling and animal species. Risk of human exposure was determined based on the prevalence estimates and whether or not milk was boiled before consumption.

Results

- DNA was detected in fourteen (2.6%) samples and thirty-two antibody-positive cattle were detected (34.4%).
- The prevalence of qPCR *Brucella* spp. was higher in Isiolo than in Marsabit ($p<0.05$), with Isiolo having 5.8 (CI 95% 1.3 – 25.6) higher odds of positivity than Marsabit. No significance was observed with the ELISA results.
- qPCR positives were detected in goat milk samples only. Of the goat samples, 9 were individual goat samples and 5 were household pooled milk. There was no significant difference observed between directly sampled (individual) and household level (pooled) milk ($p>0.05$).
- *B. abortus* was detected in 11 of the goat samples and *B. melitensis* in 3 goats, suggesting cross-transmission of brucellosis in herds.

Conclusion

The demonstration of *Brucella* spp. in milk and the consumption of raw milk demonstrates considerable risk of exposure.

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This work is supported by the Accelerated Value Chain Development project (AVCD), funded by FtF, USAID, and the CGIAR Research Program on Agriculture for Nutrition and Health led by IFPRI