

## Introduction

- Tuberculosis causes over 65,000 deaths in Tanzania annually.
- *Mycobacterium bovis*, or bovine tuberculosis (bTB), is a significant source of infection.
- Pastoralists are at risk for bTB infection due to their contact with livestock and consumption of raw dairy products and blood.
- In areas bordering protected lands, livestock share their land and water with wildlife and people, other potential hosts of bTB.

## Aims & Hypothesis

### Aims:

- 1) Investigate prevalence and biogeographic, husbandry, and animal demographic risk factors for bTB using the BOVIGAM™ immunoassay.
- 2) Help formulate recommendations for the pastoralist communities and public health organizations to decrease the risk for bTB transmission in herds.



**Hypothesis:** Demographic, biogeographic & husbandry risk factors (e.g. exotic breeds, increased herd size) are associated with increased prevalence of bTB in cattle in rural Tanzania.

## Methods

- Study Site: pastoralist and agropastoralist households in the Ruaha and Kilombero River Valley ecosystems of south-central Tanzania.
- 394 cattle from 41 herds were sampled between April and July 2017.
- Data on risk factors at the individual and herd level variables were collected by interview.
- For the BOVIGAM™ immunoassay, whole blood was collected and mixed with phosphate buffered saline (negative control), bovine tuberculin purified protein derivative antigens (bovine PPD), and avian PPD antigens.
- If exposed to *M. bovis*, T-cells release IFN-γ when stimulated with bovine PPD.
- IFN-γ is measured through enzyme-linked immunosorbent assay (ELISA).
- *M. bovis* infection is indicated when bovine PPD stimulates more IFN-γ than both avian PPD and the negative control.



## Results

Category	N	Positive (%)	Negative (%)	Inconclusive (%)
<b>Overall</b>	394	20 (5.1)	223 (56.6)	151 (38.3)
<b>Breed</b>				
Zebu	279	15 (5.4)	171 (61.3)	93 (33.3)
Tarime	107	5 (4.7)	47 (43.9)	55 (51.4)**
<b>Herd Introductions*</b>				
Recent Acquisition	168	13 (7.7)	84 (50)	71 (42.3)
No Acquisition	226	7 (3.1)	139 (61.5)	80 (35.4)
<b>Total Cattle in Herd*</b>				
<40	181	12 (6.6)	89 (49.2)	80 (44.2)
40-90	104	6 (5.8)	51 (49)	47 (45.2)
>100	109	2 (1.8)	83 (76.1)	24 (22)**
<b>Total Animals in Herd*</b>				
<50	129	9 (7)	53 (41.1)	67 (51.9)**
50-150	117	6 (5.1)	66 (56.4)	45 (38.5)
>150	148	5 (3.4)	104 (70.3)	39 (26.4)
<b>Wild Pigs*</b>				
Contact	108	13 (12)	33 (30.6)	62 (57.4)**
No Contact	286	7 (2.4)	190 (66.4)	89 (31.1)
<b>Non-Human Primates*</b>				
Contact	140	13 (9.3)	48 (34.3)	79 (56.4)**
No Contact	254	7 (2.8)	175 (68.9)	72 (28.3)
<b>District*</b>				
Ulanga	144	13 (9)	56 (38.9)	75 (52.1)**
Iringa	250	7 (2.8)	167 (66.8)	76 (30.4)

\*Significant difference between positive and negative proportions for each factor using chi-square analyses or Fisher's exact test at P < 0.05.

\*\*Significant difference between conclusive and inconclusive proportions for each factor using chi-square analyses or Fisher's exact test at P < 0.05.

## Discussion

- High proportion of inconclusive results (151 of 394 cows) limited risk factor analysis.
- Inconclusive results may be a potential effect of coinfection or cross-reaction.
- As results were promised to each family, high inconclusivity is a scientific & social problem.
- Data suggests that BOVIGAM™ is not an ideal test for this environment.
- Recent cow acquisition increases bTB risk, as close contact and mixing of herds at the market can spread disease.
- Wild pig & primate contact might also represent overall greater wildlife interaction, meaning increased contact with other species that also carry bTB.
- Ulanga showed a cluster of positive herds in one village, possibly representing increased transmission among herds when grazing.



Veterinarian Goodluck Paul discusses the benefits of deworming while administering ivermectin to a goat.



The field team forms relationships and answers questions about animal care and the research during lunch.

### Future Directions:

- Tuberculosis eradication is difficult here, even with a perfect test, due to the multi-host nature & lack of government compensation for culling combined with the high cultural value of cows.
- Focus could instead be on prevention of bTB transmission including improved husbandry & food handling.
- Emphasis could also be on veterinary care & education occurring alongside research, as teams provide recommendations.
- A pamphlet with pictorial descriptions of bTB risk & prevention will be developed.
- Future studies could investigate the cause of the inconclusive BOVIGAM™ results.

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