

Bovine Tuberculosis: Economic importance and zoonotic risk in the Wolaita region, Ethiopia

Melese Yilma^{1,2} (PhD Candidate), Prof. Stephen Gordon¹ (Supervisor), Prof. Asefa Asmar² (Co-supervisor)

¹ School of Veterinary Medicine, University College of Dublin

² School of Veterinary Medicine, Wolaita Sodo University

Background and Justification

Bovine tuberculosis (bTB) is an endemic disease in Ethiopia. The disease bTB is zoonotic and it is one of the neglected diseases in southern Ethiopia particularly in Wolaita. Thus, twenty years back in 1999 Ameni and Regasa (2001) reported that there is 14.2% farm tuberculin skin test prevalence. Since then, no research has been conducted about the disease dynamics in the area. Wolaita is known by the traditional beef cattle locally called 'Xehho Borraa' which is known by its perceived beef flavour. Through in the existing production system both human and animals are in close contact in a confined traditional housing system called 'Gaaxaattaa' where ventilation is poor, and the social custom like consumption of raw meat and other factors, risk of human infection is increasing. According to Wolaita zone health office report (2017/18) there is increasing case of extrapulmonary human infection in health post. Also, the disease imposes direct economic loss, due to condemnation of edible organs and carcass. This study pursues to address the underlying knowledge gaps on bTB in the Wolaita through a combination of economic analysis and pathogen identification using tissue lesion and sputum sample from abattoir and hospital.

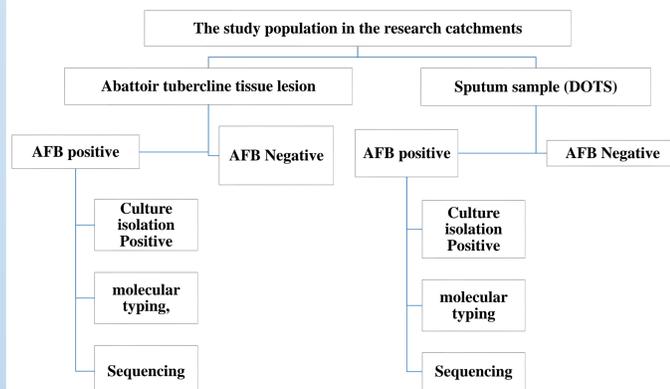
Table 1. Bovine tuberculosis (bTB) studies report in the southern, Ethiopia

Study area	Sample size	CIDT skin testing (%)	PM lesion score in cattle (%)	Culture isolation Positive (%)	m-PCR positive (%)	Sources
Hamer (South Omo)	499	0.8	ND	ND	ND	(Tschopp et al., 2010)
Butajira	446	ND	9	13	8	(Biratu et al., 2014)
Hossana, SNNPR	751	ND	4.5	11.8	ND	(Teklu et al., 2004)
Hawassa, SNNPR	413	11.6	1.1	ND	ND	(Regassa et al., 2010)
Meskan, Gurage region	1214	6.8	ND	25.9	27.3	(Tschopp et al., 2011)
Wolaita Sodo	780	14.2	ND	ND	ND	Ameni and Regasa (2001)

Research question

- ✓ What is the magnitude of economic loss caused by bTB lesions in cattle slaughtered at district municipal abattoirs?
- ✓ What is the *M. bovis* strains that are circulating in the area? Is there evidence that similar strains are causing disease in humans? Are they similar to *M. bovis* strains isolated elsewhere in Ethiopia?

Flow chart on laboratory analysis



Estimation of Financial Loss

The total economic loss will be calculated as the summation of the cost of offal condemned plus the cost of carcass weight losses (Ogunrinade and Ogunrinade, 1980).

A) Direct loss from organ condemnation: Annual economic loss = $(PI1 \times Tk \times C1) + (PI2 \times Tk \times C2) + (PI3 \times Tk \times C3) + (PI4 \times Tk \times C4) + (PI5 \times Tk \times C5)$.

B) Indirect loss from carcass weight loss: Annual economic losses due to carcass weight loss = $Ns \times Ci \times Pa$ (Zinsstag et al., 2006).

Annual economic losses were calculated by adding both direct and indirect lost.

General objective

- ✓ This project seeks to deliver data on the prevalence of bTB through abattoir inspections, assessment of economic losses due to edible offal's condemnation, and culture of suspect

Specific objectives

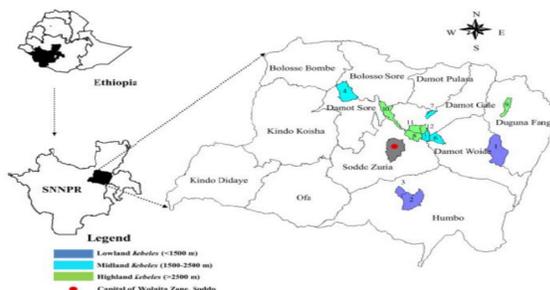
- ✓ To quantify the magnitude of gross lesion compatible with bovine tuberculosis in cattle slaughtered at a range of district municipality abattoirs
- ✓ To isolate Mycobacterium pathogen and molecular typing to define the strain circulating in the area
- ✓ To estimate the abattoir economic loss caused by condemnations of edible organ due to tuberculous lesions.

Achievable Targets

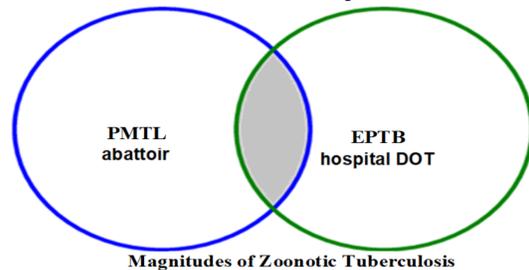
- ✓ Determining the prevalence of bTB in slaughtered animals in Wolaita region
- ✓ Estimating the risk of zoonotic transmission of *M. bovis* from animals to humans in the Wolaita region
- ✓ Informing local public health authorities as to our findings so as to inform policy around the control of zoonotic infections.
- ✓ Identifying whether novel strain type of *M. bovis* are circulating in the Wolaita region

Methodology

The research study will be conducted in Wolaita zone selected municipality abattoir and hospital, suspected tissue lesion and sputum will be collected for pathogen isolation and identification.



Selected District Abattoir and Hospitals: Data Source



Risks and contingency plan

- ✓ The major risk will be if we fail to find bTB in abattoirs the Wolaita region; however, even though we don't know exact prevalence, there is plenty of evidence for bTB lesions being identified in abattoirs, so this risk will be mitigated.
- ✓ Lack of sufficient facilities to perform the bacteriology work at Wolaita may slow down our ability to culture bacteria from lesions. To mitigate this risk, we will form linkages with regional veterinary laboratories to provide a contingency plan for bacterial culture.
- ✓ The budget to deliver the work is limited, but culture and molecular characterization of mycobacteria can be expensive. We have kept all costs to a minimum to ensure that we can deliver the work as described to at least definitive identification using PCR. We will apply for funding through other sources to obtain funding for more sophisticated molecular analyses, such as genome sequencing of the *M. bovis* isolates.

Deliverables

- ✓ Publish a review on current understanding of bTB in Ethiopia and its impact on animal productivity, economic losses, and risks to human health.
- ✓ Publish original research article on bTB in the Wolaita region from the viewpoint of economic impact and risk to human health.
- ✓ Publish a short article on a molecular analysis of the strains of *M. bovis* in the Wolaita region, and their comparison to global *M. bovis* strains.

References

- Ameni, G. and Regasa, A., 2001. Survey on bovine tuberculosis in cattle and its public health implications to cattle raising families in Wolaita Sodo, Southern Ethiopia. *Ethiopian Journal of Animal Production*.
- Biratu, N., Gebremedhin, G., Tadesse, B., Habtamu, T., Gebrehiwot, T. & Belayneh, G. 2014. Epidemiology of bovine tuberculosis in Butajira, Southern Ethiopia: A cross-sectional abattoir-based study. *African Journal of Microbiology Research*, 8, 3112-3117.
- Regassa, A., Tassew, A., Amenu, K., Megersa, B., Abunna, F., Mekibib, B., Macrotty, T. & Ameni, G. 2010. A cross-sectional study on bovine tuberculosis in Hawassa town and its surroundings, Southern Ethiopia. *Tropical Animal Health and Production*, 42, 915-920.
- Teklu, A., Asseged, B., Yimer, E., Gebeyehu, M. & Woldeesenbet, Z. 2004. Tuberculous lesions not detected by routine abattoir inspection: the experience of the Hossana municipal abattoir, southern Ethiopia. *Revue Scientifique et Technique-Office International Des Epizooties*, 23, 957-964.
- Tschopp, R., Bobosha, K., Aseffa, A., Schelling, E., Habtamu, M., Iwnetu, R., Hailu, E., Firdessa, R., Hussein, J., Young, D. and Zinsstag, J., 2011. Bovine tuberculosis at a cattle-small ruminant-human interface in Meskan, Gurage region, Central Ethiopia. *BMC infectious diseases*, 11(1), p.318.