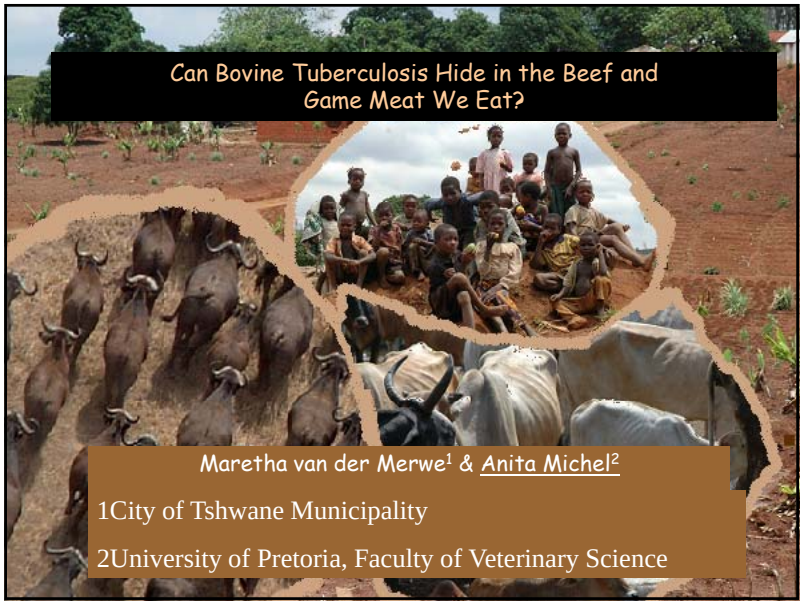

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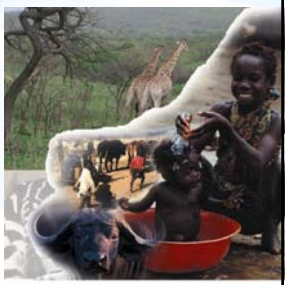
INTRODUCTION - Bovine tuberculosis

- Infectious disease, closely related to human tuberculosis, which affects livestock, wildlife and humans
- Chronic progressive disease
- Cattle:
  - Occurs in all provinces of SA (herd prevalence: SA: < 0.2%),
  - Mozambique, Zambia, Tanzania etc.
  - Zimbabwe, Botswana?
- Wildlife
  - Very broad host spectrum
  - Confirmed in 14 animal species in GKNPC, HiP (incl. buffalo, kudu, warthog, etc.)
  - Recent spread to Gonarezhou confirmed

Eradication: mission impossible?

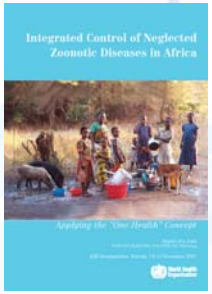
INTRODUCTION – Zoonotic tuberculosis

- Low - moderate susceptibility in immunocompetent individuals
- Increased risk for young children, elderly and immunocomprised individuals, esp. under prolonged exposure
- Significance at present?
  - EU: 60 cases per year
  - Latin America: 7000 new cases per year
  - Mexico: 13.8% (of TB patients)
  - Africa: prevalence???
    - Nigeria: 5%
    - Tanzania: 18 – 30%
    - South Africa: unknown
    - WHO estimate: 10% of sputum samples may be positive



INTRODUCTION – Zoonotic tuberculosis (2)

- Neglected zoonotic disease (WHO)
- Spillover of *M. tuberculosis* to cattle?
- Transmission via close contact with infected animals, infected raw milk & dairy products



What about edible tissues?

- Carcass meat
- Organ tissues

- Risk ultimately depends on secondary processing
  - cooking
  - drying (biltong)

Game meat

Game industry has developed into a fully-fledged supplier of meat to *local and international* markets

- Increasing demand for game meat as an important *protein source* for a growing population.
- Harvesting on small scale (hunters) or larger scale operations
- Secondary processing and preserving of red meat: by *cooking or drying* (biltong)

Objectives

Study 1

- To determine the survival of *M. bovis* in uninfected, spiked organ and muscle tissue samples from cattle subjected to standard secondary meat processing protocols (cooking and drying)

Study 2

- To determine the survival of *M. bovis* in organ and muscle tissues of naturally infected buffalo and kudu under standard secondary meat processing protocols

MATERIALS AND METHODS – Tissue samples

Study 1

Bovine tissues collected from 8 carcasses (uninfected) at the abattoir (total: 48 samples):

Muscle, kidney, liver, heart, lung and lymph nodes (*Lnn mandibulares* and *parotideus*)

Study 2

Muscle, kidney, liver, heart, lung and lymph nodes (*Lnn mandibulares* and *parotideus*) collected from the carcasses of 7 buffalo and 7 greater kudu with tuberculous lesions

Total: 84 samples

MATERIALS AND METHODS

- Spiking of tissue samples with *M. bovis* (study 1)

Dose: 8 x 10^7 injected into each tissue sample (multiple sites)

MATERIALS AND METHODS - Processing of tissue samples (study 1 & study 2)

Cooking

2 time periods: a) 10 minutes
b) 20 minutes

Drying (biltong making)

A hurdle effect of preservation (salt, pH and drying) was reached by:

- Cutting of meat strips from the diaphragm (20 g each),
- Curing (12–18 hours) thereof in a standard mixture of salt, sugar (optional), vinegar and spices (only as a flavouring)
- Drying in a biohazard cabinet (class II)

Mycobacterial culture: according to standard procedures

RESULTS

- **Spiked tissues:**
  - Drying (biltong): no isolation of *M. bovis*
  - Cooking: Lung samples: no isolation of *M. bovis*
    - Muscle, lymph nodes, liver, kidney, heart: overall isolation of *M. bovis* from 2.9% of culture slants
  - no statistically significant difference between 10 and 20 min cooking time
- **Naturally infected tissues:**
  - Drying: no isolation of *M. bovis*
  - Cooking: no isolation of *M. bovis*

BUT

Isolation of high numbers of non-tuberculous mycobacteria (NTM) from 4/7 buffalo and 1/7 kudu

Isolation of NTM from organ tissues of wildlife

Tissue and treatment type	Buffalo	Kudu
Lung (n=7) t = 10 min	0	0
(n=7); t = 20 min	0	0
Muscle (n=7); t = 10 min	0	0
(n=7); t = 20 min	0	0
Lymph node (n=7); t = 10 min	5	0
(n=7); t = 20 min	3	0
Liver (n=7); t = 10 min	7	0
(n=7); t = 20 min	2	0
Kidney (n=7); t = 10 min	3	1
(n=7); t = 20 min	0	0
Heart (n=7); t = 10 min	2	0
(n=7); t = 20 min	4	0

Density and consistency of the tissue influences survival of microorganisms

Meaning what?

- NTM are abundant in the environment and mostly non-pathogenic to humans and animals
- Cause interference in immune response to BCG vaccine & cross-reactivity in TB diagnosis
- Some NTM species are recognised opportunistic pathogens (mycobacterioses)
- An increasing number of NTM have been identified as cause of complicating infections in immuno-compromised patients (*M. avium, M. fortuitum, M. kansasii* etc.)

CONCLUSION

- The zoonotic threat from *M. bovis* through consumption of cooked meat or biltong (low water content) from infected cattle, buffalo and kudu is minimal/negligible
- However, the detection of NTM in 4/7 buffalo (multiple organs) and 1/7 kudu raises concern as they were resistant to both the cooking and drying (pH, salt, dehydration) processes
- Significance for human health unknown – warrants further investigation (distribution, speciation)
- Take home message?

Biltong


KARKASHANTERING EN
VLEISVERWERKING 6
Maak van biltong en wors

- Strips of meat (beef or game) preserved by drying under the influence of salt, vinegar and spices
- Typically dried in the cold air (rural settings), cardboard or wooden boxes (urban) or climate-controlled dry rooms (commercial).
- Exported to Australia, New Zealand, USA (FDA approved)

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