Brucellosis in humans and livestock in Uganda: Challenges and opportunities

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Jena, Germany
23 July 2014
Uganda

- Small landlocked country; 241,000 sq km
- 1100 m above sea level
- Population 36 million
- Equatorial climate 24-30°C temperatures
- GDP > 50% on agriculture
- Capital City - Kampala
Brucellosis in livestock in Uganda

- Brucellosis is a zoonotic disease affecting people, livestock and wildlife
- Disease & economic losses
- High prevalence in cattle
  - Herd level up to 79%
  - Individual cow prevalence 5 to 46%
- Buffaloes in national parks sero-prevalence 1.82–26.67%
- High prevalence in goats
- Abortion storms in cattle, goats and pigs
Brucellosis prevalence in cattle

Seroprevalence and potential risk of bovine brucellosis in zero-grazing and pastoral dairy systems in Uganda

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Abstract A cross-sectional study was conducted in Uganda between November 2006 and February 2007 to assess the seroprevalence and risk of brucellosis in zero-grazing and pastoral dairy systems; two major sources of milk in Uganda. 80% of which is sold unpasteurized to consumers through informal channels. A total of 725 cattle comprised of 497 animals from the pastoral system and 228 animals from the zero-grazing system were tested for antibodies against natural B. abortus infection using the competitive enzyme-linked immunosorbent assay (C-ELISA). Herd-level seroprevalence was 100% in the pastoral system and 5.3% (95% CI: 1.8, 9.2) in the zero-grazing system. The animal-level seroprevalence and within-herd range of brucellosis in cattle in the pastoral system were 34.6% (95% CI: 29.9, 38.1) and 8.1–75.9%, while for those in the zero-grazing system were 3.3% (95% CI: 0.9, 5.7) and 0–9.0%. After rates of 2.3% and 0% among seronegative cows were recorded in the pastoral and zero-grazing systems, respectively. The risk of natural B. abortus infection was higher among older cattle (>24 m) (Odds ratio [OR]=1.85, 95% CI: 1.25–2.67) and dry cows (OR=2.01, 95% CI: 1.23–3.33) in the pastoral system, and in calves aged 0–6 m (OR=5.72, 95% CI: 1.04–31.41) in the zero-grazing system. Implementing a culling program in the zero-grazing system to eliminate the existing low risk of brucellosis and targeting calves in the pastoral systems for vaccination could avert the cost-related limitation of brucellosis control in Uganda.

Keywords Dairy cattle · Brucellosis risk · Zero-grazing system · Pastoral system · Uganda

Introduction

Bovine brucellosis is a zoonotic disease caused by Brucella abortus, characterized by abortion, metritis, orchitis and epididymitis (Henny 1989) leading to impaired fertility in cattle. Brucellosis is of paramount public health importance in Uganda (Kabugho et al. 2001; Faye et al. 2003; Kyebambe 2005; Epiphinhes

Tuberculosis and brucellosis prevalence survey on dairy cattle in Mbarara milk basin (Uganda)

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Abstract

We determined the prevalence of tuberculosis and brucellosis reactors in the dairy herds in the Mbarara district of Uganda in 2002. This is one of the major dairy-producing areas of the country and includes both pastoral and agro-pastoral zones. A total of 340 (of 11,905) randomly selected herds were tested for tuberculosis, using the intradermal tuberculin-skin test and 315 (of 10,562) herds tested for brucellosis using the serum RPR test. The herd prevalence for tuberculosis reactors was 74.1% (95% confidence intervals 69.78), the individual animal prevalence was 6.0% (5.6, 6.5) and within-herd range was 1–50% (up to 100% if suspicious reactors were included). The herd prevalence for Brucellosis was 55.6% (50, 61.2) individual animal prevalence 15.8% (14.8, 16.7) and within-herd range 1–90%.

The reactor prevalence increased with the age of the animals for both tuberculosis and brucellosis. Tuberculosis reactor prevalences were higher in animals from the agro-pastoral zone. However, the individual animal and herd prevalences of brucellosis seroreactivities were higher in the pastoral zone.

Keywords: Dairy cattle; Tuberculosis; Brucellosis; Prevalence survey; Uganda
Urban and peri-urban cattle

iELISA

• Gulu town = 6%
• Soroti town = 8%
• 11 strains *B. abortus* Isolated from cow milk
Most knowledge about brucellosis

- Serological evidence
- Also through daily media

Uganda: Cattle Disease Hits Kibaale

BY ISMAEL KASOOGHA, 15 OCTOBER 2008

- Three people have contracted a highly contagious disease in Kagadi town, Kibaale district, after getting into contact with infected cattle
- The district veterinary officer, Dr. Moses Amany, confirmed that the people had been infected with brucellosis
Other livestock affected

- E.g. goats

Bacterial disease attacks Kyenjojo goats
Publish Date: Nov 02, 2008 (Brucellosis has attacked goats that the Government gave to farmers in Nyatungo sub-county in Kyenjojo district)
Brucellosis challenge in humans in Uganda

- Several reports of human brucellosis with complications (Galukande et al., 2005; Kyebambe 2005, 2012).
- A brucellosis seroprevalence of 12% and 7% in abattoir workers in Kampala and Mabarara district (Nabukenya et al. 2013)
- Mulago Hospital: 652 cases of brucellosis diagnosed between June 2004 and May 2006 (Makita et al. 2008)
- Frequent human cases could be a clear indication of disease burden in livestock
Sources of human infection

- Demand for animal products high
- Infection probably from animals and their products
- Occupational

Our research in Gulu
Poorly processed milk

Our research with SLU
Chronic brucellosis in a teenage Ugandan

- 18-year-old patient with 12-year history recurrent multiple joint and muscle pains, fevers and sweats
- Wasted pale teenager
- Marked weakness of upper limbs and inability to use her hands
- Difficulty in adducting and abducting fingers
- Reduced reflexes and muscle power

Kyebambe et al. 2012

Series of images depicting clinical and radiological findings before and after treatment.
Brucellosis misdiagnosis

- Disease cases often masked by malaria
- Medical doctors don’t have it as a forefront of health problems in Uganda

Medication in humans...

- Main source of treatment is herbal - from “traditional healers”
- The latter aggressively advertise treatment through local FM radio stations thus most people seek herbal remedies
- Herbal remedies may not be very effective and could also be responsible for late seeking of medical attention
Swine brucellosis study in Uganda

- In 2012, ILRI initiated a major engagement in Uganda to generate solutions and evidence for the development at scale of pro-poor smallholder pig value chains.
- To identify challenges and options to allow pig farmers to improve their productivity and livelihoods, while increasing the supply of critical nutrients to their communities and urban centres.
- One area for immediate attention is infectious pig diseases.
- Through ILRI, I got a small DAAD/ILRI postdoctoral fellowship on swine brucellosis (Dec 2012 to May 2013).
Brucellosis effect on swine production

- Abortions
- Birth of weak piglets
- Infertility
- Arthritis
- Lameness
- Partial or total paralysis of hind quarters
- Orchitis
Design

• Cross-sectional abattoir & farm study

• Done alongside ILRI, SPVCD & SFFF projects

• In ILRI focus districts Masaka, Mukono & Kamuli

Kristina Roesel, Safe Food, Fair Food (SFFF) project coordinator
Approach

- Take residence in district
- Meeting district office discuss approach and prepare for activities

Sometimes meeting in village with farmers
Smallholder pig farms
Smallholder pig farms
Sampling

- Questionnaires administered at each household
- Blood taken
Biosecurity measures on leaving farm
Lab team
Results

PCR on isolates from mesenteric lymph nodes from pigs in abattoir

<table>
<thead>
<tr>
<th>District</th>
<th>Number of mesenteric lymph nodes*</th>
<th>No. of <em>Brucella</em> suspect isolates</th>
<th>PCR</th>
</tr>
</thead>
<tbody>
<tr>
<td>Masaka</td>
<td>68</td>
<td>7</td>
<td>0</td>
</tr>
<tr>
<td>Mukono</td>
<td>2</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>Kamuli</td>
<td>30</td>
<td>8</td>
<td>0</td>
</tr>
<tr>
<td>Total</td>
<td>100</td>
<td>15</td>
<td>0</td>
</tr>
</tbody>
</table>

*Few pigs from Mukono were slaughtered during study period
Abattoir sero-prevalence of swine brucellosis

<table>
<thead>
<tr>
<th>District</th>
<th>Number of sera</th>
<th>No. indirect ELISA positive</th>
</tr>
</thead>
<tbody>
<tr>
<td>Masaka</td>
<td>332</td>
<td>0</td>
</tr>
<tr>
<td>Mukono</td>
<td>2</td>
<td>0</td>
</tr>
<tr>
<td>Kamuli</td>
<td>138</td>
<td>0</td>
</tr>
<tr>
<td>Total</td>
<td>472</td>
<td>0</td>
</tr>
</tbody>
</table>
## Farm sero-prevalence of swine brucellosis

<table>
<thead>
<tr>
<th>District</th>
<th>Village</th>
<th>Number samples*</th>
<th>No. brucellosis positive by iELISA</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
<td>Makerere</td>
</tr>
<tr>
<td>Masaka</td>
<td>Kisoso</td>
<td>45(4)</td>
<td>1</td>
</tr>
<tr>
<td></td>
<td>Ssenya</td>
<td>39(5)</td>
<td>0</td>
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<tr>
<td></td>
<td>Lukindu</td>
<td>38(1)</td>
<td>0</td>
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<tr>
<td></td>
<td>Kanoni-Bukunda</td>
<td>54(5)</td>
<td>0</td>
</tr>
<tr>
<td></td>
<td>Senyange A</td>
<td>53(3)</td>
<td>0</td>
</tr>
<tr>
<td></td>
<td>Kyamuyimbwa Kikalala</td>
<td>43(8)</td>
<td>0</td>
</tr>
<tr>
<td></td>
<td>Butego</td>
<td>28(1)</td>
<td>0</td>
</tr>
<tr>
<td></td>
<td>Kijjabwemi</td>
<td>45(2)</td>
<td>0</td>
</tr>
<tr>
<td></td>
<td>Kyabakuza B</td>
<td>36(1)</td>
<td>0</td>
</tr>
<tr>
<td>Mukono</td>
<td>Kazo/Kalagala</td>
<td>60(9)</td>
<td>Nd</td>
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<tr>
<td></td>
<td>Nsanja/Gonve</td>
<td>48(4)</td>
<td>Nd</td>
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<tr>
<td></td>
<td>Bugoye/Kabira</td>
<td>48(0)</td>
<td>Nd</td>
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<tr>
<td></td>
<td>Kyoga</td>
<td>54(2)</td>
<td>Nd</td>
</tr>
<tr>
<td></td>
<td>Dundu</td>
<td>63(2)</td>
<td>Nd</td>
</tr>
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<td></td>
<td>Kitete</td>
<td>58(3)</td>
<td>Nd</td>
</tr>
<tr>
<td></td>
<td>Joggo</td>
<td>68(4)</td>
<td>Nd</td>
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<tr>
<td>Kamuli</td>
<td>Balubweneiwa</td>
<td>48(2)</td>
<td>Nd</td>
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<td></td>
<td>Bukyonza B</td>
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<td>Nd</td>
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<tr>
<td></td>
<td>Butabala</td>
<td>41(1)</td>
<td>Nd</td>
</tr>
<tr>
<td></td>
<td>Isingo A</td>
<td>70(0)</td>
<td>Nd</td>
</tr>
<tr>
<td></td>
<td>Ntansi</td>
<td>114(9)</td>
<td>Nd</td>
</tr>
<tr>
<td></td>
<td>Kantu zone</td>
<td>110(0)</td>
<td>Nd</td>
</tr>
<tr>
<td></td>
<td><strong>Total</strong></td>
<td><strong>22</strong></td>
<td><strong>1193(67)</strong></td>
</tr>
</tbody>
</table>

Brackets = no. of village boars
Ugandan swine sera brucellosis free

- Putative positive sera found negative for *Brucella* antibodies by CFT
- *Y. enterocolitica* antibodies detected in these sera by SAT
- 2 positive ELISA and 10 selected sera with high ODs in ELISA were negative for *Brucella* DNA by Real Time PCR
Conclusions

- Ugandan pigs appear free of *Brucella* infection
- Since samples were collected from individual households in the major pig producing districts, we can conclude that Ugandan pigs pose a low risk of brucellosis transmission to humans
Opportunities

- Brucellosis burden is high in humans and domestic ruminants
- But limited research and capacity
- Research urgently needed to understand:
  - the disease in domestic ruminant value chains
  - factors of its transmission and persistence in humans and animals
  - bacterial strains involved
  - disease burden in humans
  - reliable diagnostics
  - potency of herbals
- These are all opportunities for partnership
Acknowledgements

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- FLI
- DAAD
- ILRI
- Makerere University
Thank you