Preliminary findings of a three-year retrospective study of the dynamics in red offal condemnation at a cattle abattoir Q in Namibia

By
Background

• Namibian agriculture = 10-11.7% of GDP
• Commercial sector = 85% of Namibian agriculture
• Lucrative beef market = EU, UK, Norway and China
• Namibian meat inspection follows Meat Safety of RSA Act guidelines
• Provision of wholesome, attractive and safe meat
• Importance of abattoir data
  ✓ good epidemiological tool
  ✓ Detection and control of zoonotic diseases
Significance of study

• To salvage valuable demographic, epidemiological information which is otherwise locked up in annual reports
• Expose risk factors associated with red offal condemnations at a Namibian abattoir
• To publish information on abattoir condemnations to act as a reference point for future studies, beef producers and policy makers in Namibia
• To highlight the financial implications of diseases and conditions responsible for red offal condemnations in a Namibian setting
Objectives

• Overall objectives
  ✓ To investigate the monthly, seasonal and annual condemnation of red offal at a Namibian abattoir

• Specific objectives
  ✓ To investigate the association of monthly, seasonal and annual patterns with the most common causes of red offal condemnation
  ✓ To investigate the association of monthly, seasonal and annual patterns with the most common organ/offal condemnation
Literature review

• General reasons for offal condemnation
  ✓ Developmental, degenerative, inflammatory or neoplastic lesions
  ✓ Infectious conditions (viral, bacterial and parasitic)
  ✓ Non-infectious conditions (traumatic, neoplastic and contamination)

• Major reported reasons for offal condemnation
  ✓ Parasitic, bacterial and traumatic

• Monthly, seasonal and yearly patterns observed in condemnations due to bacterial and parasitic diseases

• Major reported organ/offal condemnation
  • Liver (fasciola, echinococcosis, abscesses, cirrhosis, jaundice, discoloration)
  • Lungs (pneumonia, echinococcosis, emphysema, congestion, abscesses)
Limitations

• Myriad reasons for condemnation leads to complicated statistical analyses with unclear inferences

• Classification of offal too variable between countries
Delimitations

• Reasons for condemnation were grouped into designated categories to facilitate statistical analysis.

• All assumptions on offal classification adopted in this study were stated within the methodology.
Methodology

• Slaughter procedure
• Classification of offal
  ✓ Red offal (head, tongue, heart, lung, livers and kidneys)
  ✓ White offal (brain, spine, bone marrow, testicles and udder)
  ✓ Green offal (forestomach, abomasum, trimmings, fat, intestines and bladder)

• Designated pathological categories
  ✓ Contamination
  ✓ Infections
  ✓ Inflammation
  ✓ Miscellaneous

• Temporal categories
  ✓ Years
  ✓ Months
  ✓ Seasons

• Enumeration and tallying of recorded data
• Statistical analysis
  ✓ Descriptive
  ✓ Inferential (Chi square, Z-test, significance level; \( p \leq 0.05 \))
Results

• Overall proportional **annual** distribution of **red offal** condemnation
• Overall proportional **monthly** distribution of condemned **red offal**
• Proportional **annual** distribution of condemned **red offal**
• Proportional **seasonal** distribution of condemned **red offal**
• Proportional **annual** red offal condemnation according to **causal category**
• Proportional **monthly** red offal condemnation according to **causal category**
• Proportion **seasonal** red offal condemnation according to **causal category**
• Proportional **annual** distribution of causes for **liver condemnations**
• Proportional **seasonal** distribution of causes for **liver condemnations**
• Proportional **annual** distribution of causes for **lung condemnations**
• Proportional **seasonal** distribution of causes for **lung condemnations**
Figure 1: Annual proportional total distribution of slaughter and red offal condemnation
Figure 2: Overall monthly proportional distribution of condemned red offal
Figure 3: Proportional annual distribution of condemned red offal
Figure 4: Seasonal distribution of organ condemnations from 2016 to 2018
Figure 5: Annual proportional red offal condemnation according to causal category
Table 1: Monthly proportional red offal condemnation according to causal category

<table>
<thead>
<tr>
<th>Month</th>
<th>Contaminations (%)</th>
<th>Inflammation (%)</th>
<th>Infections (%)</th>
<th>Miscellaneous* (%)</th>
<th>Total (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>January</td>
<td>110 (0,3)</td>
<td>321 (0,8)</td>
<td>168 (0,4)</td>
<td>454 (1,2)*</td>
<td>1053 (2,7)</td>
</tr>
<tr>
<td>February</td>
<td>341 (0,9)</td>
<td>554 (1,4)</td>
<td>335 (0,9)</td>
<td>989 (2,5)*</td>
<td>2219 (5,7)</td>
</tr>
<tr>
<td>March</td>
<td>666 (1,7)*</td>
<td>1188 (3,0)*</td>
<td>606 (1,5)</td>
<td>1215 (3,1)</td>
<td>3675 (9,4)</td>
</tr>
<tr>
<td>April</td>
<td>794 (2,0)*</td>
<td>788 (2,0)</td>
<td>961 (2,5)*</td>
<td>1709 (4,4)</td>
<td>4252 (10,9)</td>
</tr>
<tr>
<td>May</td>
<td>756 (1,9)</td>
<td>924 (2,4)</td>
<td>1206 (3,1)*</td>
<td>1457 (3,7)</td>
<td>4343 (11,1)</td>
</tr>
<tr>
<td>June</td>
<td>852 (2,2)</td>
<td>1679 (4,3)*</td>
<td>922 (2,4)</td>
<td>1772 (4,5)</td>
<td>5225 (13,3)</td>
</tr>
<tr>
<td>July</td>
<td>630 (1,6)</td>
<td>1234 (3,2)</td>
<td>407 (1,0)</td>
<td>1822 (4,7)*</td>
<td>4093 (10,5)</td>
</tr>
<tr>
<td>August</td>
<td>639 (1,6)</td>
<td>1322 (3,4)*</td>
<td>608 (1,6)</td>
<td>1475 (3,8)</td>
<td>4044 (10,3)</td>
</tr>
<tr>
<td>September</td>
<td>450 (1,1)</td>
<td>1076 (2,7)*</td>
<td>380 (1,0)</td>
<td>1265 (3,2)</td>
<td>3171 (8,1)</td>
</tr>
<tr>
<td>October</td>
<td>412 (1,1)</td>
<td>1105 (2,8)*</td>
<td>375 (1,0)</td>
<td>929 (2,4)</td>
<td>2821 (7,2)</td>
</tr>
<tr>
<td>November</td>
<td>370 (0,9)</td>
<td>997 (2,5)</td>
<td>332 (0,8)</td>
<td>1493 (3,8)*</td>
<td>3192 (8,2)</td>
</tr>
<tr>
<td>December</td>
<td>154 (0,4)</td>
<td>334 (0,9)</td>
<td>182 (0,5)</td>
<td>399 (1,0)</td>
<td>1069 (2,7)</td>
</tr>
<tr>
<td>Total</td>
<td>6174 (15,8)</td>
<td>11522 (29,4)</td>
<td>6482 (16,6)</td>
<td>14979 (38,3)</td>
<td>39157 (100,0)</td>
</tr>
</tbody>
</table>
Figure 6: Seasonal proportion red offal condemnation according to causal category
## Table 2: Annual proportional distribution of causes for liver condemnations

<table>
<thead>
<tr>
<th>Reason for condemnation</th>
<th>Year</th>
<th>2016</th>
<th>2017</th>
<th>2018</th>
<th>Overall</th>
</tr>
</thead>
<tbody>
<tr>
<td>Abscess (%)</td>
<td></td>
<td>3137 (14,75)</td>
<td>4283 (20,14)*</td>
<td>2054 (9,66)</td>
<td>9474 (44,54)</td>
</tr>
<tr>
<td>Contamination (%)</td>
<td></td>
<td>287 (1,35)*</td>
<td>243 (1,14)</td>
<td>138 (0,65)</td>
<td>668 (3,14)^a</td>
</tr>
<tr>
<td>Haematomas/blood vessel lesions (%)</td>
<td></td>
<td>627 (2,95)*</td>
<td>555 (2,61)</td>
<td>251 (1,18)</td>
<td>1433 (6,74)</td>
</tr>
<tr>
<td>Hydatidosis (%)</td>
<td></td>
<td>161 (0,76)</td>
<td>134 (0,63)</td>
<td>403 (1,89)^*</td>
<td>698 (3,28)^a</td>
</tr>
<tr>
<td>Peritonitis (%)</td>
<td></td>
<td>2924 (13,75)*</td>
<td>2386 (11,22)</td>
<td>1882 (8,85)^*</td>
<td>7192 (33,81)</td>
</tr>
<tr>
<td><em>Stilesia hepatica</em> (%)</td>
<td></td>
<td>255 (1,20)</td>
<td>856 (4,02)^*</td>
<td>146 (0,69)</td>
<td>1257 (5,91)</td>
</tr>
<tr>
<td>Melanosis (%)</td>
<td></td>
<td>53 (0,25)</td>
<td>346 (1,63)^*</td>
<td>7 (0,03)</td>
<td>406 (1,91)</td>
</tr>
<tr>
<td>Septicaemia (%)</td>
<td></td>
<td>1 (0,005)</td>
<td>3 (0,01)</td>
<td>0 (0,00)</td>
<td>4 (0,02)</td>
</tr>
<tr>
<td>Blood splash (%)</td>
<td></td>
<td>0 (0,00)</td>
<td>109 (0,51)^*</td>
<td>0 (0,00)</td>
<td>109 (0,51)</td>
</tr>
<tr>
<td>Actinomycosis (%)</td>
<td></td>
<td>0 (0,00)</td>
<td>13 (0,06)</td>
<td>17 (0,08)^*</td>
<td>30 (0,14)</td>
</tr>
<tr>
<td>Total (%)</td>
<td></td>
<td>7445 (35,00)</td>
<td>8928 (41,97)</td>
<td>4898 (23,03)</td>
<td>21271 (100,00)</td>
</tr>
</tbody>
</table>
Table 3: Seasonal proportional distribution of causes for liver condemnations

<table>
<thead>
<tr>
<th>Reason for condemnation</th>
<th>Summer</th>
<th>Winter</th>
<th>Overall</th>
</tr>
</thead>
<tbody>
<tr>
<td>Abscess (%)</td>
<td>3743 (17,60)</td>
<td>5731 (26,94)</td>
<td>9474 (44,54)</td>
</tr>
<tr>
<td>Contamination (%)</td>
<td>302 (1,42)</td>
<td>366 (1,72)</td>
<td>668 (3,14)</td>
</tr>
<tr>
<td>Hematomas/blood vessel lesions (%)</td>
<td>781 (3,67)*</td>
<td>652 (3,07)</td>
<td>1433 (6,74)</td>
</tr>
<tr>
<td>Hydatidosis (%)</td>
<td>464 (2,18)*</td>
<td>234 (1,10)</td>
<td>698 (3,28)</td>
</tr>
<tr>
<td>Peritonitis (%)</td>
<td>2555 (12,01)</td>
<td>4637 (21,80)*</td>
<td>7192 (33,81)</td>
</tr>
<tr>
<td><em>S. hepatica</em> (%)</td>
<td>248 (1,17)</td>
<td>1009 (4,74)*</td>
<td>1257 (5,91)</td>
</tr>
<tr>
<td>Melanosis (%)</td>
<td>339 (1,59)*</td>
<td>67 (0,31)</td>
<td>406 (1,91)</td>
</tr>
<tr>
<td>Septicaemia (%)</td>
<td>0 (0,00)</td>
<td>4 (0,02)</td>
<td>4 (0,02)</td>
</tr>
<tr>
<td>Blood splash (%)</td>
<td>0 (0,00)</td>
<td>109 (0,51)*</td>
<td>109 (0,51)</td>
</tr>
<tr>
<td>Actinomycosis (%)</td>
<td>13 (0,06)</td>
<td>17 (0,08)</td>
<td>30 (0,14)</td>
</tr>
<tr>
<td>Total (%)</td>
<td>8445 (39,70)</td>
<td>12826 (60,30)</td>
<td>21271 (100,00)</td>
</tr>
</tbody>
</table>
Table 4: Annual proportional distribution of causes for lung condemnations

<table>
<thead>
<tr>
<th>Reason for condemnation</th>
<th>2016</th>
<th>2017</th>
<th>2018</th>
<th>Overall</th>
</tr>
</thead>
<tbody>
<tr>
<td>Abscess (%)</td>
<td>487 (4.16)</td>
<td>538 (4.60)</td>
<td>372 (3.18)</td>
<td>1397 (11.94)</td>
</tr>
<tr>
<td>Contamination (%)</td>
<td>906 (7.74)*</td>
<td>735 (6.28)*</td>
<td>288 (2.46)</td>
<td>1929 (16.49)</td>
</tr>
<tr>
<td>Pleuritis (%)</td>
<td>188 (1.61)</td>
<td>402 (3.44)*</td>
<td>239 (2.04)</td>
<td>829 (7.09)</td>
</tr>
<tr>
<td>Hydatidosis (%)</td>
<td>1504 (12.85)</td>
<td>1341 (11.46)</td>
<td>1210 (10.34)*</td>
<td>4055 (34.66)</td>
</tr>
<tr>
<td>Emphysema (%)</td>
<td>1198 (10.24)*</td>
<td>588 (5.03)</td>
<td>487 (4.16)</td>
<td>2273 (19.43)</td>
</tr>
<tr>
<td>Pneumonia (%)</td>
<td>289 (2.47)</td>
<td>248 (2.12)</td>
<td>192 (1.64)</td>
<td>729 (6.23)</td>
</tr>
<tr>
<td>Melanosis (%)</td>
<td>136 (1.16)</td>
<td>244 (2.09)*</td>
<td>108 (0.92)</td>
<td>488 (4.17)</td>
</tr>
<tr>
<td>Total (%)</td>
<td>4708 (40.24)a</td>
<td>4096 (35.01)a</td>
<td>2896 (24.75)a</td>
<td>11700 (100.00)</td>
</tr>
<tr>
<td>Reason for condemnation</td>
<td>Season</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>-------------------------</td>
<td>--------------</td>
<td>-------</td>
<td>-------</td>
<td>-------</td>
</tr>
<tr>
<td></td>
<td>Summer</td>
<td>Winter</td>
<td>Overall</td>
<td></td>
</tr>
<tr>
<td>Abscess (%)</td>
<td>573 (4.9)</td>
<td>824 (7.0)</td>
<td>1397 (11.9)</td>
<td></td>
</tr>
<tr>
<td>Contamination (%)</td>
<td>787 (6.7)</td>
<td>1142 (9.8)</td>
<td>1929 (16.5)</td>
<td></td>
</tr>
<tr>
<td>Pleuritis (%)</td>
<td>329 (2.8)</td>
<td>500 (4.3)</td>
<td>829 (7.1)</td>
<td></td>
</tr>
<tr>
<td>Hydatidosis (%)</td>
<td>1761 (15.1)*</td>
<td>2294 (19.6)</td>
<td>4055 (34.7)</td>
<td></td>
</tr>
<tr>
<td>Emphysema (%)</td>
<td>901 (7.7)</td>
<td>1372 (11.7)</td>
<td>2273 (19.4)</td>
<td></td>
</tr>
<tr>
<td>Pneumonia (%)</td>
<td>231 (2.0)</td>
<td>498 (4.3)*</td>
<td>729 (6.2)</td>
<td></td>
</tr>
<tr>
<td>Melanosis (%)</td>
<td>230 (2.0)</td>
<td>258 (2.2)</td>
<td>488 (4.2)</td>
<td></td>
</tr>
<tr>
<td>Total</td>
<td>4812 (41.1)¹</td>
<td>6888 (58.9)¹</td>
<td>11700 (100.0)</td>
<td></td>
</tr>
</tbody>
</table>
Conclusions

• Overall condemnation (15.65%) higher than from other studies (<10%)
  ✓ Cadmus and Adesokum, 2009; Yiber et al., 2015; Shaibu et al., 2018; Mohammed et al., 2018

• Condemnation comparable to yet other studies (14-18%)
  ✓ Swai and Ulicky, 2009; Lymo et al., 2018; Chinonyerem and Kalu, 2019

• Liver had highest condemnation (54.32%) due to anatomical location and physiological function or higher abattoir standards
  ✓ Frandson et al., 2009; Cullen and Brown, 2012; Gu and Manautou, 2012

• Liver condemnation mainly due to abscess possibly from rumen acidosis in the feedlot or high concentrate feed
  ✓ Reinhardt and Hubbert, 2015; Amachawadi and Nagaraja, 2016

• Lungs had 2nd highest condemnation (29.88%) due to anatomical, physiology
  ✓ Radostits et al., 2006; Frandson et al., 2009; Lopez, 2012; Erickson et al., 2015
Conclusions (cont’d)

• Higher precipitation in 2016-7 responsible for higher condemnation rates than that in 2018
   ✓ http://weather.namsearch.com/wdhrainsummary.php

• Higher condemnation rates in June possibly due to sluggish start to work by abattoir stuff leading to more contamination-related condemnations
   ✓ Ejeh et al., 2015; Alemu et al., 2017

• Higher lung condemnations in summer due to higher rates of hydatidosis

• As expected condemnations due to pneumonia were higher in winter due to wide diurnal temperature fluctuations in semi-arid Namibian climatic conditions huddling of animals
   ✓ https://www.timeanddate.com/weather/namibia/windhoek/climate
References


• Ernest Mochankana and Robertson, 2016. A retrospective study of the prevalence of bovine fasciolosis at major abattoirs in Botswana. Onderstepoort Journal of Veterinary Research, 83(1), 1-5.

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• https://www.timeanddate.com/weather/namibia/windhoek/climate
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