Targeted treatment for clinical mastitis

A Soil Association/Duchy Originals/
The Prince’s Trust Field Lab

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Endell Veterinary Group, Salisbury
Antibiotics in livestock – UK sales figures

Source: VMD
Five Year Strategy for Reducing Antibiotics 2013-2018

• ONE HEALTH APPROACH
• Seven key areas:

  1. Improving infection prevention and control
  2. Optimising prescribing practice
  3. Improving professional training, education and public engagement
  4. Developing new drugs, treatments and diagnostics
  5. Better access to and use of surveillance data
  6. Better identification and prioritisation of AMR research needs
  7. Strengthened international collaboration
Bacteriological Cure Rates of Bacteria in 2\textsuperscript{nd} + Lactation Cows, adapted from Pinzon-Sanchez et al 2011

<table>
<thead>
<tr>
<th>Bacterium</th>
<th>No Treatment</th>
<th>5 day treatment</th>
</tr>
</thead>
</table>


Bacteriological Cure Rates of Bacteria (2\textsuperscript{nd} + Lactation Cows)

<table>
<thead>
<tr>
<th>Bacterium</th>
<th>No Treatment</th>
<th>5 day treatment</th>
</tr>
</thead>
<tbody>
<tr>
<td>Staph aureus</td>
<td>0 %</td>
<td>20 %</td>
</tr>
<tr>
<td>CNS</td>
<td>55 %</td>
<td>75 %</td>
</tr>
<tr>
<td>Strep uberis</td>
<td>25%</td>
<td>65 %</td>
</tr>
<tr>
<td>E coli</td>
<td>75 %</td>
<td>85 %</td>
</tr>
<tr>
<td>Klebsiella</td>
<td>35 %</td>
<td>45 %</td>
</tr>
<tr>
<td>No growth</td>
<td>90 %</td>
<td>90 %</td>
</tr>
</tbody>
</table>
What has been done

- Previous field lab on reducing cell counts with ‘Uddermint’ (Zaralis, Waterfield, Padel)
- Work in the US and Canada on on-farm culture followed by selective treatment
US study design (Lago et al 2011)

• Eight conventional herds
• Herd sizes 144 to 1795 cows
• Yields 9545 to 12818 kg per cow per year
• SCC 182,000 to 535,000 cells/ml
• Four herds were using on farm culture before the study
• Random assignment of each case to either on farm culture or standard treatment
• Standard conventional treatment:
  • Cephapirin tube, two tubes 12 hours apart.
• Four days meat and milk withdrawal
US study outcomes (Lago et al 2011)

- Reduction of antibiotic usage by 50 %
- Trend towards earlier return to the bulk tank
- No significant differences in
  - Days to clinical cure
  - Percentage of bacteriological cure
  - Risk of new intramammary infection within 21 days
  - Treatment failure risk
  - Risk of recurrence in the same quarter
  - Linear somatic cell count
  - Daily yield
  - Risk of culling
Canadian work (MacDonald 2011)

- Used different test kit (3M Petrifilm)
- Small farms
- 82% correctly identified if at least one clinical case per month
- 64% if less than one case per month
- \( \Rightarrow \) overall lower probability of clinical cure and more days to clinical cure in culture group, but not in correctly diagnosed cases
On-farm culture

• Only to be used for individual treatment decision
• For farm investigations your vet must be involved and an accredited lab must be used.
  • *Staph aureus* v coagulase negative *staphylococci*
  • *Strep uberis* v *Strep agalactiae*
The Vetorapid on farm culture

Vetorapid dish compartments for bacterial identification:

Section 1
Selective for Gram negative bacteria

Section 2
Selective for staphylococci

Section 3
Selective for streptococci and enterococci
Comparison with standard culture

<table>
<thead>
<tr>
<th>Treatment outcome based on ‘Vetorapid’ test kit</th>
<th>Treatment outcome based on standard laboratory culture</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Antimicrobials</td>
</tr>
<tr>
<td>Antimicrobials</td>
<td>21</td>
</tr>
<tr>
<td>No antimicrobials</td>
<td>2†</td>
</tr>
<tr>
<td>Total</td>
<td>23</td>
</tr>
</tbody>
</table>

Antimicrobial therapy was assigned only when a Gram-positive bacterium was isolated

*Plate result false positive for Enterococcus spp. (4), CNS (2), Streptococcus uberis (2), Staphylococcus aureus (S. aureus) and S. uberis (1), Streptococcus dysgalactiae (1)
†Plate result false negative for S. uberis (1) and S. dysgalactiae (1)
CNS, coagulase-negative staphylococci

Viora et al 2014
Only mild or moderate cases (1 or 2) included in the trial

MASTITIS GRADES:

• Grade 1 (mild): milk changes only
• Grade 2 (moderate): milk changes plus inflammatory signs in the udder (heat, swelling, pain, redness)
• Grade 3: the above plus sick cow (depressed, off feed, dehydrated, temperature high or low, etc)
Trial protocol

Mild/moderate case of mastitis

Odd cow number

Culture

Gram +
Treat with AB

Gram -, No growth
Don’t treat with AB

Even cow number

Treat with AB

Record details of drug usage, clinical cure, and time of milk withhold, monitor SCC
Outcomes

• Primary Outcomes
  • Antibiotic usage
  • Clinical cure rates
  • Recurrence rate
  • Cell counts for the remainder of the lactation

• Secondary Outcomes
  • Days to return to bulk tank
  • Economic cost benefit
Cost-benefit of on-farm testing

• Cost:
  • Price of kit and consumables
  • Cost of incubator
  • Time

• Benefit:
  • More saleable milk

• Wider benefits:
  • Better picture
  • More diagnostics
  • Less resistance
  • Less risk of residue failures
Cost of Mastitis

• Treatment cost (drugs + time) £ 12.00
• Discarded milk (9 days, 20 l, 32ppl) £ 57.60
• Reduced yield (5%/300l @ 25ppl margin) £ 75.00

→ Total direct cost £144.60

• Cull cost £900
• 10 % increased chance of cull (indirect cost) £ 90

→ TOTAL COST PER CASE £234.60
Thank you to...

- The participating farmers and their vets
- Soil Association and Duchy Originals Future Farming Programme for funding and coordinating the field lab
- Kristen Reyher from Bristol University for helping with study design and statistics
- Vetoquinol for providing the Vetorapid test plates