Controlling Contagious Mastitis

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Quiz

High SCC
Objectives

- Definitions
- Causes
- Detection/Diagnosis
- Control
- Treatment
- Conclusion
Definitions

- Clinical manifestations
  - Subclinical mastitis
  - Clinical mastitis
    - Subacute
    - Acute
    - Peracute (Toxic)

- Nature of Pathogen
  - Contagious
  - Environmental
Canal and lining of Keratin

Streak Canal and lining of Keratin

Environmental

Contagious
Contagious Pathogens

- Reservoir: Mammary gland of infected cows
- Transmission
  - At time of milking
  - Fomites (Milking equipment)
  - Cow-to-cow
  - Milker’s hands
  - Reverse jetting; machine malfunction
Have ya washed your hands?
Contagious Pathogens

- *Staphylococcus aureus*
  - Most prevalent contagious pathogen
  - Most often subclinical
  - Strain differences in contagiousness & effect on mammary gland
  - Chronic infections with intermittent clinical flare-ups.
  - Fluctuating SCC and bacteria counts
  - Occasional peracute (Toxic) mastitis
  - Variable response to treatment
Contagious Pathogens

- *Streptococcus agalactiae*
  - Primarily subclinical
  - Systemic signs infrequent
  - Persistent high SCC and bacteria counts
  - Obligate pathogen of bovine udder
  - Responds well to treatment
Contagious Pathogens

- *Mycoplasma spp.*
  - Multiple quarters
  - Arthritis; Respiratory disease
  - Decreased milk production
  - High SCC
  - Emerging pathogen
  - Large herd size
  - Not treatable
Contagious Pathogens

- *Corynebacterium bovis*
  - Primary streak canal colonizer
  - Mild increases in SCC
  - Indicator of teat dip efficacy
  - Control with post-dip
## MU Coagulase Negative Staphylococci Data

<table>
<thead>
<tr>
<th>Species</th>
<th>No. of IMIs (%)</th>
<th>Median Geometric Mean SCC x 10^3 cells/ml (Range)*</th>
<th>Median Duration of IMI in Months (Range)**</th>
<th>No. of PFGE Types (No. of IMIs typed)</th>
</tr>
</thead>
<tbody>
<tr>
<td><em>S. chromogenes</em></td>
<td>30 (33)</td>
<td>207 (16-1806) ^{a,c}</td>
<td>2 (1-16) ^{a,b,c}</td>
<td>6 (27)</td>
</tr>
<tr>
<td><em>S. cohnii</em></td>
<td>14 (15)</td>
<td>13 (1-1137) ^{c,d,e}</td>
<td>1 (1-2) ^{b,d,f}</td>
<td>7 (12)</td>
</tr>
<tr>
<td><em>S. epidermidis</em></td>
<td>14 (15)</td>
<td>139 (7-2116) ^{d}</td>
<td>1 (1-10) ^{d}</td>
<td>5 (9)</td>
</tr>
<tr>
<td><em>S. simulans</em></td>
<td>11 (12)</td>
<td>272 (5-3029) ^{b,e}</td>
<td>1 (1-10)</td>
<td>5 (9)</td>
</tr>
<tr>
<td><em>S. haemolyticus</em></td>
<td>7 (8)</td>
<td>63 (1-638)</td>
<td>1 (1-5)</td>
<td>3 (5)</td>
</tr>
<tr>
<td><em>S. hominis</em></td>
<td>4 (4)</td>
<td>36 (9-127) ^{a,b}</td>
<td>1 (1) ^{a, e}</td>
<td>3 (3)</td>
</tr>
<tr>
<td><em>S. arelelttae</em></td>
<td>4 (4)</td>
<td>127 (11-304)</td>
<td>1 (1) ^{c,g}</td>
<td>2 (4)</td>
</tr>
<tr>
<td><em>S. xylosus</em></td>
<td>3 (3)</td>
<td>98 (31-702)</td>
<td>1 (1-5)</td>
<td>3 (3)</td>
</tr>
<tr>
<td><em>S. equorum</em></td>
<td>2 (2)</td>
<td>41 (38-44)</td>
<td>1 (1)</td>
<td>2 (2)</td>
</tr>
<tr>
<td><em>S. capitis</em></td>
<td>1 (1)</td>
<td>273</td>
<td>7 ^{e,f,g}</td>
<td>1</td>
</tr>
<tr>
<td><em>S. auricularis</em></td>
<td>1 (1)</td>
<td>12</td>
<td>1</td>
<td>1</td>
</tr>
</tbody>
</table>

Like superscripts differ from each other. *P = 0.023; **P = 0.047.
Detection and Diagnosis
Detection

- Physical Manifestations
  - Inflammation
  - Altered secretion
  - Dripping milk
  - Gangrene (rare)
  - Emphysema
  - Only works for CLINICAL MASTITIS
Strip Cup
Somatic Cell Count (Subclinical)

- Nucleated host cells (White blood cells)
- Normal Value (200,000 cells/ml)
- Increased
  - Intramammary infection
  - Non-septic inflammation
  - Trauma
  - Low production
California Mastitis Test (CMT)
<table>
<thead>
<tr>
<th>CMT Score</th>
<th>SCC cells/ml</th>
</tr>
</thead>
<tbody>
<tr>
<td>Negative</td>
<td>0-200,000</td>
</tr>
<tr>
<td>Trace</td>
<td>150,000-500,000</td>
</tr>
<tr>
<td>1</td>
<td>400,000-1,500,000</td>
</tr>
<tr>
<td>2</td>
<td>800,000-5,000,000</td>
</tr>
<tr>
<td>3</td>
<td>&gt;5,000,000</td>
</tr>
</tbody>
</table>
## Utility of CMT as a Screening Test to Select Cattle for Culture

<table>
<thead>
<tr>
<th>CMT $\geq$ Trace</th>
<th>All</th>
<th>CNS (S. aureus)</th>
<th>SNA</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Se</strong></td>
<td>0.61</td>
<td>0.50</td>
<td>0.86</td>
</tr>
<tr>
<td><strong>Sp</strong></td>
<td>0.80</td>
<td>0.80</td>
<td>0.80</td>
</tr>
<tr>
<td><strong>PPV</strong></td>
<td>0.58</td>
<td>0.43</td>
<td>0.21</td>
</tr>
<tr>
<td><strong>NPV</strong></td>
<td>0.82</td>
<td>0.84</td>
<td>0.99</td>
</tr>
<tr>
<td>% Correctly Classified</td>
<td>74</td>
<td>73</td>
<td>80</td>
</tr>
</tbody>
</table>
SCC Goals

- Bulk Tank <200,000 cells/ml
- 90% of herd: <300,000 cells/ml
- <5% of herd: >800,000 cells/ml
Examine The Herd

- Milking parlor (During milking)
  - Overall hygiene
  - Milking procedures (milking hygiene)
  - Machine function
  - Evaluate udders, teats, and teat ends

Contagious mastitis
Identify The Problem Cattle

- Individual cow milk cultures
  - Composite vs. Quarter
  - Which cows?
    - All
    - Random sample
    - Targeted sampling based on other indicators (e.g., SCC, CMT, clinical mastitis)
  - “Gold Standard”
  - Identify pathogen-type
    - Target control strategies
  - $$$
Milk Culture – Definitive Diagnosis

- Lab vs. On-farm
- Biplate
- Triplate
- Petrifilm

- Goal of on farm culture: Differentiate G+ from G- to make treatment decisions.
Control & Prevention
NMC 10 Point Plan

1. Establish goals for udder health
2. Proper milking procedures
3. Maintenance of a clean environment
4. Proper maintenance and use of milking equipment
5. Appropriate treatment of clinical mastitis during lactation
6. Effective dry cow management
7. Maintenance of biosecurity for contagious pathogens and culling of chronically infected cows.
8. Good record keeping
9. Regular monitoring of udder health status
10. Periodic review of mastitis control program
Milking Procedures

- Goals
  - Efficiently & consistently harvest milk in a clean, low stress environment
  - Detect mastitis
  - Milk a clean, dry teat
  - Ensure adequate milk let-down and flow
  - Minimize trauma
  - Minimize pathogen transmission
  - Manage post-milking phase
Step-by-Step Milking Procedure

- All operators responsible for milking should always follow a consistent routine and go through the recommended steps in the proper order.
- First, wash and disinfect your hands thoroughly and put clean gloves on.
- Disinfect your hands regularly during milking to avoid contamination.
- Provide a clean, low-stress environment for the animals.

**Step 1. Observation**
Examine all quarters and teats by hand to detect early signs of mastitis (redness and warmth) or other lesions. Make sure to identify cows that must be milked last or that are receiving treatment (e.g., those identified with a leg band).

**Step 2. Forestripping**
This step is essential for detecting the early signs of mastitis. It flushes out bacteria from the teat canal and stimulates the milk flow. In tie-stall barns, use a strip cup to have a better chance of detecting the presence of clotty, stringy or watery milk. The strip cup must be cleaned and disinfected after each milking. In the milking parlour, the foremilk can be discarded on the ground, but never into the hand since this can promote further contamination. Forestrip all quarters.

**Suggested milking order to avoid the spread of mastitis-causing bacteria:**
1. Healthy cows.
2. Cows with a questionable health status. (recent purchase, fresh, post-treatment)
3. Cows with chronic mastitis.
4. Cows with an infection caused by a contagious pathogen.

**Step 3. Cleaning the teats**
Use a disinfectant solution approved by Health Canada and adjust the cleaning time depending on how dirty teats are. To be effective, the pre-dip solution must remain in contact with the teats for 30 seconds. Only the teats should be wetted and then thoroughly wiped with a dry single service towel. Pay particular attention to teat ends. Alcohol swabs may also be used.
Step-by-Step Milking Procedure

**Step 4.**
Attaching the milking unit

The milking unit should be attached within 60 to 90 seconds (2 minutes at the most) after first stimulation, i.e. Step 2 (fore-stripping). This time allows the milk letdown reflex to occur and maximizes milking performance.

**Step 5.**
Adjusting the milking unit

Observe the position of the claw on the udder and quickly correct any teat cup liner that is seated too high or slipping.

**Step 6.**
End of milking

Complete milking may take from 5 to 10 minutes per cow. Observe the milk flow carefully or use milk flow indicators to determine the ideal moment for shutting off the milking unit. Avoid overmilking.

**Step 7.**
Milking unit removal

If the claw is removed manually, always shut off the vacuum before attempting to remove the milking unit. When using automatic detachers, make sure that they are properly adjusted.

**Step 8.**
Disinfection

Once milking is completed, dip the teats fully in a disinfectant solution approved by Health Canada. Teat dip cups must be clean. Discard any unused solution, clean the container thoroughly and prepare fresh solution at each milking.

[Time chart showing different stages of milking with duration ranges]

www.mastitisnetwork.org
Milking Procedures - Summary

- Forestrip to detect mastitis
- Pre-dip (remain on teat skin for 30 sec)
- Dry teats (single-use towels)
- Wear clean gloves
- Attach units squarely minimizing air inlet (within 60-120 sec)
- Avoid machine stripping
- **Post-dip**
- **Milking order based on infection status**
Score 1 or N
No ring, Teat-end is smooth

Score 2
Smooth or slightly rough ring

Score 3
Raised, roughened ring

Score 4
Very raised, roughened ring
Control – Contagious Pathogens

- Properly functioning milking equipment
- Gloves*
- Decrease potential for transmission
  - Milking order
  - Milking time hygiene
  - Treatment of *Strep. agalactiae*
- Post-milking teat dip
- Dry cow therapy
- Cull chronics
- Avoid purchase of older cattle
- Pre-purchase screening (Biosecurity)
Treatment
Subclinical Mastitis Treatment

- Cost versus benefit
- Lactating versus non-lactating
  - Withdrawal times
  - Dumped milk
  - Type of bug
Subclinical Mastitis Treatment

- **S. aureus**
  - Strict segregation/culling (Middleton et al., 2001)
  - Extended intramammary therapy (Barkema et al., 2006)

- **Streptococcus agalactiae**
  - “Blitz therapy” - 1st third to half of lactation
  - Dry cow therapy

- **Mycoplasma spp.**
  - Cull

- **C. bovis**
  - Teat dip
Bottom Line – Subclinical

- Wait until dry period to treat unless compelling reason to treat during lactation, e.g., excessive bulk tank SCC.

- Milking order
Clinical Mastitis Treatment

- Local versus Systemic Disease
- Local Disease
  - Frequent milk-out (+/- oxytocin)
  - Intramammary Antibiotics
    - Bacteria dependent (Roberson, 1999)
Bottom Line - Clinical

- Local infection
  - Treat Gram-positive
  - Don’t treat Gram-negative
  - On-farm culture

- Systemic infection
  - Economic value of cow versus cost of therapy and prognosis for future production
  - Salvage * Prognosis = $Treatment
  - Aggressive therapy = $$
Dry Cow Therapy

**Goals:**
- Prevent new IMI during early dry period (1st 14d)
- Treat existing infections at dry off

**Products**
- Long-acting antibiotics (Various)
- External teat sealer (Stronghold®)
- Internal teat sealer (Orbeseal®)
Take Home Points

- Mastitis is generally caused by bacteria
- Bacteria come from
  - Environment
  - Other cows (Contagious pathogens)
- Milking procedures
  - Mastitis detection
  - Teat sanitation (Pre versus Post-dip)
  - Milk let down & flow
  - Prevent contagious pathogen transmission
Conclusion

“Milk quality is dependent on quality attitude and quality application of mastitis control practices. The greatest impact will probably result from the development of a milk quality mind-set through a balanced program of education and encouragement.” Reneau, et al. 2002 Regional Meeting of the NMC.
Questions?