Milk Quality: It’s the Little things

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Agenda

• Why Milk Quality Matters
• High Cell Counts– Breaking it Down
• Milk Quality: The Little Things that Matter
• Impacts of Prevention
Why Worry About Mastitis?
Milk quality regulatory issues

- Bulk milk Somatic Cell Counts (SCC): 750,000 cells/ml
- Bacteria count SPC: 100,000 cfu
- Milk/meat Residues
Quality has Value

- Processor
  - Prolonged shelf life
  - Increased manufacturing yields
  - Improved product quality
## Mastitis & Milk Quality

<table>
<thead>
<tr>
<th>Component</th>
<th>Normal Milk</th>
<th>Mastitic Milk</th>
<th>% of normal</th>
</tr>
</thead>
<tbody>
<tr>
<td>Total Solids</td>
<td>13.1</td>
<td>12.0</td>
<td>92%</td>
</tr>
<tr>
<td>Lactose</td>
<td>4.7</td>
<td>4.0</td>
<td>85</td>
</tr>
<tr>
<td>Fat</td>
<td>4.2</td>
<td>3.7</td>
<td>88</td>
</tr>
<tr>
<td>Chloride</td>
<td>0.091</td>
<td>0.147</td>
<td>161</td>
</tr>
<tr>
<td>Total Protein</td>
<td>3.6</td>
<td>3.6</td>
<td>100</td>
</tr>
<tr>
<td>Caseins</td>
<td>2.8</td>
<td>2.3</td>
<td>82</td>
</tr>
<tr>
<td>Whey proteins</td>
<td>0.8</td>
<td>1.3</td>
<td>162</td>
</tr>
</tbody>
</table>

*Source: John C. Bruhn, Extension Food Technologist, U.C.-Davis, 1983.*
Milk Quality and Shelf Life

Ma et al. 2000 JDS
Quality has Value

• Producer
  ♦ $/cwt (premiums/debits)
  ♦ Increased production
  ♦ Fewer culls & deaths
  ♦ Less Labor

Courtesy of kidz4money.com
Costs Associated with Subclinical Mastitis

- Production loss
- Premium loss
- Transmission costs
- Culling

Aghamohammadi et al., 2018

Table 4: Relationship between SCC, Linear Scores and Milk Yield Loss

<table>
<thead>
<tr>
<th>SCC Midpoint (range)</th>
<th>Linear Score</th>
<th>Milk Loss for Lact 1</th>
<th>Milk Loss for Lact 2+</th>
</tr>
</thead>
<tbody>
<tr>
<td>25,000 (18,000-34,000)</td>
<td>1</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>50,000 (35,000-68,000)</td>
<td>2</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>100,000 (69,000-136,000)</td>
<td>3</td>
<td>200 lb</td>
<td>400 lb</td>
</tr>
<tr>
<td>200,000 (137,000-273,000)</td>
<td>4</td>
<td>400 lb</td>
<td>800 lb</td>
</tr>
<tr>
<td>400,000 (274,000-546,000)</td>
<td>5</td>
<td>600 lb</td>
<td>1200 lb</td>
</tr>
<tr>
<td>800,000 (547,000-1,092,000)</td>
<td>6</td>
<td>800 lb</td>
<td>1600 lb</td>
</tr>
<tr>
<td>1,600,000 (1,093,000-2,185,000)</td>
<td>7</td>
<td>1,000 lb</td>
<td>2,000 lb</td>
</tr>
</tbody>
</table>
My Bulk Milk SCC is $>400,000$... or $>200,000$

Now what do I do???
Mastitis Detection
---seek and ye shall find---

• Clinical
  Grade I: abnormal milk
  Grade II: abnormal milk, abnormal quarter
  Grade III: abnormal milk, abnormal quarter, abnormal cow

• Subclinical
  CMT testing
  Individual SCC
  DHIA
  Delaval SCC
  Porta SCC
  Electrical conductivity
  Culture
### SCC Dynamics in the Herd

<table>
<thead>
<tr>
<th>Type of Herd</th>
<th>New</th>
<th>Chronic</th>
<th>Fresh</th>
</tr>
</thead>
<tbody>
<tr>
<td>Top Herds</td>
<td>&lt;5%</td>
<td>≤5%</td>
<td>≤10%</td>
</tr>
<tr>
<td>OK Herds</td>
<td>~8%</td>
<td>~10%</td>
<td>~15%</td>
</tr>
<tr>
<td>Not OK herds</td>
<td>&gt;9%</td>
<td>&gt;10%</td>
<td>&gt;18%</td>
</tr>
</tbody>
</table>
Analyze High BMSCC--simplified

- High Bulk Milk SCC
  - Few Cows (<2%) contributing to SCC
  - Many Cows contribute to SCC (>2%)
    - New Infections >8%
      - Milking procedures
      - Housing hygiene
    - Chronic Infections >10%
      - Find and culture
      - Review protocols
      - Prevent
      - Cull
    - Fresh Cow Infections >15%
      - Dry Cow/Heifer management
The Little Things...
Mastitis is not a ‘single issue’ disease

Host

Environment
- Housing, equipment, hygiene, weather, bedding

Infectious Agent
- Pathogenicity, virulence, number

Resistance, nutrition, stress
1. Farm Specific Udder Goals

<table>
<thead>
<tr>
<th>Criteria</th>
<th>Ideal Udder Health Targets</th>
</tr>
</thead>
<tbody>
<tr>
<td>Bulk milk somatic cell count (SCC)</td>
<td>&lt;200,000 cell/ml</td>
</tr>
<tr>
<td>Herd average (actual)</td>
<td>&lt;200,000</td>
</tr>
<tr>
<td>Herd average (DHI Linear score)</td>
<td>&lt;3.0 LS</td>
</tr>
<tr>
<td>100% of first calvers (DHI)</td>
<td>&lt;100,000</td>
</tr>
<tr>
<td>&gt;85% milking herd</td>
<td>&lt;200,000</td>
</tr>
<tr>
<td>&gt;95% milking herd</td>
<td>&lt;500,000</td>
</tr>
<tr>
<td>Number of culls due to mastitis or other udder health problems</td>
<td>&lt;5 cases/100 cows per year</td>
</tr>
</tbody>
</table>
1. Set Farm Specific Goals

Management circle

Goal setting

Risk assessment

Planning

Execution

Evaluation
1. Set Farm Specific Goals
2. Regular Udder Health Monitoring

• Detect problems/outbreaks early
• Early intervention for minimal loss of production and profit
• Monitoring systems can be quite simple or quite complex
• Your certification paperwork has already got you trained!
2. Regular Health Monitoring
3. Proper Milking Technique

- Milking is the time of greatest risk for new infections
- Consistency and a positive attitude go a long way in helping your cows milk
- Clean environment
3. Proper Milking Technique

- Wear gloves.
3. Proper Milking Technique

**Forestripping**
- Removes milk in the teat end that is higher in bacteria and somatic cells
- Aids in the early detection of clinical mastitis.
- Helps stimulate milk letdown for faster and more complete milkout.
Adapted from The Bovine Udder and Mastitis, ed. Sandholm et al. 1995
Good letdown

Red line: Good letdown
Blue line: Poor letdown
3. Proper Milking Technique

Predip or Wash/Dry

- Dip should remain on teats for 20-30 sec for maximum bacterial kill
- Cup application preferred over spraying
- Non-return dipcup
3. Proper Milking Technique

Wipe dry

- Single service paper or cloth towels
- Cloth towels: Launder/Bleach/Spin or Launder/Heat dry
- Wet milking may result in liner slips
3. Proper Milking Technique

Post Milking Teat Dipping

The single most important procedure for controlling the spread of contagious mastitis.
Dip versus spray?
3. Proper Milking Technique

Milking order
1. Fresh heifers
2. Low SCC Cows
3. High SCC Cows
4. Contagious Mastitis Cows
4. Maintain Milking Equipment

- System airflow and reserve—is it adequate?
- Pulsation rates and ratios—are they consistent?
- Rubber parts—how often are they replaced?
5. Dry Cow Management

Dry Period Goals:
• Proper nutrition for calf development
• Prepare the mammary gland for the next lactation
• Resolve infections from the previous lactation
• Minimize metabolic problems in the next lactation
5. Dry Cow Management
5. Dry Cow Management

Giving the dry cow the upper hand (hoof)...
- Clean environment
- Dipping after dry off?
- Nutrition
  - Selenium/Vitamin E
  - Trace minerals
  - Body condition
  - Prevention of milk fever
5. Dry Cow (Transition) Management

- **Ketosis:** severity of coliform mastitis is increased (Kremer et al., 1993; Leslie et al., 2000)
  - Vitamin E/Selenium: supplementation reduces incidence and duration of clinical mastitis (Smith et al., 1984) and milk SCC (Moyo et al., 2005).

- **Hypocalcemia**
  - Clinical: OR 5.4 (Curtis et al., 1985)
  - Subclinical: calcium supplemented cows had ↓ risk of mastitis (Domino et al., 2017)
  - Association between teat canal diameter and subclinical hypocalcemia (Barragan et al., 2018)
6. Biosecurity

• What is the risk for bringing new diseases onto the farm?

- Johne's
- Contagious Mastitis
- BVD
6. Biosecurity

What are the risks for spreading disease within the farm?
7. Maintain a Healthy Environment

- Clean, dry and comfortable
- Properly sized stalls
- Ventilation
- Sunlight
- Bedding Source—which is best?
- Pasture access
7. Maintain a healthy environment

Why control flies?

- Nuisance
- Spread disease
- Decreased production
8. Vaccination

- Use strategically
- Coliform mastitis:
  - 81% reduction in new cases
  - Vaccinates with clinical mastitis: more milk, less culling
- Staph aureus mastitis:
  - 50% reduction in SCC
  - 40% reduction in IMI
  - More milk
What’s the impact of prevention?
# Expert Ranking of Preventive Measures

<table>
<thead>
<tr>
<th>Measure</th>
<th>100% Environmental</th>
<th>100% Contagious</th>
</tr>
</thead>
<tbody>
<tr>
<td>Blanket Dry Cow Therapy</td>
<td>4</td>
<td>4</td>
</tr>
<tr>
<td>Post-dipping</td>
<td>2</td>
<td>2</td>
</tr>
<tr>
<td>Prevent overcrowding</td>
<td>3</td>
<td>14</td>
</tr>
<tr>
<td>Improve nutrition</td>
<td>4</td>
<td>8</td>
</tr>
<tr>
<td>Stall hygiene</td>
<td>5</td>
<td>12</td>
</tr>
<tr>
<td>Milk subclinical cows last</td>
<td>15</td>
<td>3</td>
</tr>
<tr>
<td>Back flushing cluster (SCM)</td>
<td>12</td>
<td>4</td>
</tr>
<tr>
<td>Milk clinical cows last</td>
<td>16</td>
<td>5</td>
</tr>
</tbody>
</table>

Hoogeveen et al., 2011
## Effect of Intervention on Bulk Milk SCC Reduction (%)

<table>
<thead>
<tr>
<th>Measure</th>
<th>Environmental</th>
<th>Contagious</th>
</tr>
</thead>
<tbody>
<tr>
<td>Post milking teat dipping</td>
<td>33.84</td>
<td>36.16</td>
</tr>
<tr>
<td>Milk subclinical mastitis last</td>
<td>20.91</td>
<td>25.98</td>
</tr>
<tr>
<td>Appropriate dry cow minerals</td>
<td>20.89</td>
<td>20.18</td>
</tr>
<tr>
<td>Blanket dry cow treatment</td>
<td>18.69</td>
<td>21.10</td>
</tr>
<tr>
<td>Milk clinical cases last</td>
<td>14.37</td>
<td>17.46</td>
</tr>
<tr>
<td>Pre-stripping</td>
<td>13.62</td>
<td>14.09</td>
</tr>
<tr>
<td>Improve nutrition</td>
<td>13.45</td>
<td>14.44</td>
</tr>
</tbody>
</table>

Huijps et al., 2010
# Effect of Intervention on Clinical Mastitis Reduction (%)

<table>
<thead>
<tr>
<th>Measure</th>
<th>Environmental</th>
<th>Contagious</th>
</tr>
</thead>
<tbody>
<tr>
<td>Post milking teat dipping</td>
<td>36.51</td>
<td>37.15</td>
</tr>
<tr>
<td>Improve nutrition</td>
<td>17.00</td>
<td>16.48</td>
</tr>
<tr>
<td>Appropriate dry cow minerals</td>
<td>14.98</td>
<td>14.27</td>
</tr>
<tr>
<td>Prevent overcrowding</td>
<td>12.06</td>
<td>8.75</td>
</tr>
<tr>
<td>Blanket dry cow treatment</td>
<td>11.75</td>
<td>14.02</td>
</tr>
<tr>
<td>Clean stalls</td>
<td>11.57</td>
<td>5.55</td>
</tr>
<tr>
<td>Milk subclinical cases last</td>
<td>2.63</td>
<td>12.08</td>
</tr>
</tbody>
</table>

Huijps et al., 2010
Conclusions

• There are no silver bullets.
• Daily conscious attention to the little things drive milk quality.
• Interventions that have the biggest impact:
  o Post-milking teat dipping
  o Milk high SCC cows last
  o Nutrition: including dry cow minerals
  o Cleanliness

Thank you!