Understanding & Managing Somatic Cell Counts To Improve Milk Quality

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What is Mastitis?

• Bacterial infection of the udder
• 99% occurs when bacterial exposure at teat end exceeds ability of immune defenses of cow

• Subclinical mastitis
  – Milk appears normal but contains excessive numbers of inflammatory cells
  – This milk can be sold for human consumption

• Clinical mastitis
  – Visual abnormalities of milk
  – Cannot be sold for human consumption
Somatic Cells in Milk Indicate the Presence of Cows with Subclinical Mastitis Infections

There is no way to know how many cows are infected without performing an individual cow SCC test.
Somatic Cells are **NOT** Affected by:

- Breed
- Milk yield  
  - Unless <7 kg/cow/day
- Stage of lactation  
  - Unless there are more infected cows in later lactation
- Nutritional management  
  - Unless diet results in very loose feces and dirtier cows
- Other cow diseases
Somatic Cell Count Are Affected by

• Management practices that expose teats to bacteria that cause mastitis
  – In milk that came from infected udders of cows
    • Exposure to contagious bacteria
  – In the environment that the cow lives in
    • Exposure to environmental bacteria
Somatic Cells in Milk

- SCC composed of white blood cells & occasional dead epithelial cells
- Macrophages are predominant cell in uninfected gland
  - Provide surveillance & initiate inflammatory response
- 90% of SCC in infected gland are neutrophils
How Somatic Cells Get into Milk

Mammary Tissue

Blood Vessel Wall

Blood Flow

Adapted from Burton & Erskine, Vet Clinics Food Anim Pract, 2003
When the SCC is High Does it Mean that you can find bacteria in the milk?

<table>
<thead>
<tr>
<th>Prevalence of IMI or High SCC</th>
<th>Quarter Status</th>
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<tbody>
<tr>
<td></td>
<td>Dry Off</td>
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<tr>
<td>Bacteriology positive</td>
<td>13%</td>
</tr>
<tr>
<td>Quarter SCC &gt;200k</td>
<td>37%</td>
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</table>
Mastitis is Based on Detection of Inflammation **NOT INFECTION**

We are detecting the Results of the Immune Response!
SCC and Product Quality

- Injury to secretory cells reduces synthesis of lactose, fat & protein
- Increased permeability of cell membranes allows leakage of blood components into milk
- Reduced shelf life

Schallibaum, NMC 2001
SCC and Annual Milk Yield Loss

- $$$ Loss for 100 cows
  - $0.33 per liter
- SCC of 200,000
  - $10,200 per year
- SCC of 400,000
  - $15,300 per year

Raubertas & Shook, 1981
International Quality Standards

- Globalization has driven changes in milk quality
- National regulatory standards are less important than requirements of export market
- Processors drive change to meet those requirements
  - <400,000 cells/mL is global standard
**Change is Driven by Processors**

Data on every tank leaving farm

### SCC, LPC, E coli and SPC

<table>
<thead>
<tr>
<th>Pickup/Start Fill</th>
<th>End Fill</th>
<th>Arrive Intake Tank Temp</th>
<th>Fat %</th>
<th>Proteins</th>
<th>SCC</th>
<th>E-coli</th>
<th>LPC</th>
<th>MUN Pounds</th>
<th>Plant</th>
<th>Tanker</th>
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SCC of Milk from Healthy Udders is Low and Consistent

- SCC from uninfected quarters or cows is usually < 200,000 cells/ml.
- Many cows have SCC < 100,000 cells/ml — especially 1st lactation heifers.
- Survey of 4,213 bact. negative quarters - SCC of 29,000 cells/ml.

Cows with SCC > 200,000 cells/ml have 1 or more quarters with subclinical mastitis.
Heifers should be < 100,000.

Harmon, NMC 2001
Harmon, JDS 1994
Somatic Cell Count DHIA Thresholds

- Individual cow SCC values are comingled milk from all 4 quarters
- The SCC of a cow with a SINGLE infected quarter may be quite low
  - Causes variation in SCC values
<table>
<thead>
<tr>
<th>Indicator</th>
<th>Calculation (based on monthly tests)</th>
<th>Goal</th>
</tr>
</thead>
<tbody>
<tr>
<td>Prevalence (proportion of currently affected)</td>
<td>Number of cows with SCC &gt; 200,000 cells/ml/number of cows with SCC</td>
<td>&lt;15% of lactating cows</td>
</tr>
<tr>
<td>Incidence (new infections)</td>
<td>Number of cows with SCC &gt; 200,000 cells/ml for the first time in the time period/number of cows with SCC below 200,000 in previous time period</td>
<td>&lt;5% if determined based on 1st SCC &gt; 200k in the lactation up to 8% if based on month to month changes in SCC</td>
</tr>
<tr>
<td>Prevalence at 1st DHIA test</td>
<td>Number of cows with SCC &gt; 200,000 cells/ml at 1st monthly test/number of cows with 1st SCC tests</td>
<td>&lt;5% of 1st lactation</td>
</tr>
<tr>
<td></td>
<td></td>
<td>&lt;10% of lactation 2+</td>
</tr>
<tr>
<td>Prevalence at last DHIA test before dry off</td>
<td>Number of cows with SCC &gt; 200,000 cells/ml at last test before dry off/number of cows with last DHIA test</td>
<td>&lt;30% of cows with last test date SCC</td>
</tr>
</tbody>
</table>
Identification of Subclinical Infections

A history of SCC is more informative than data from 1 or 2 test days.

*Mastitis Cannot be Managed without Individual SCC Values for Cows*
Practical Methods to Improve Milk Bulk Tank SCC

1. Work with advisors to implement an annual udder health plan
2. Focus on prevention of new infection – NOT treatment after infection occurs
3. Identify and manage chronically infected cows
Make an Annual Udder Health Plan

- Identify a farm management team of advisors to help solve the problem
- Have a monthly meeting of the advisors to focus specifically on SCC
- Develop
  - Goals for SCC
  - Actions & ways to assess the actions
  - Responsibilities for each team member
  - Target Dates to complete the actions
  - Times to meet to evaluate progress
In Wisconsin, Producers who adopt more recommended practices produce higher quality milk
In Sicily: Herds that Adopt more Best Management Practices Produce Better Quality Milk

Mastitis Control is a Result of the Cumulative Effect of Adopting Best Management Practices
Successful Implementation of the 5 Pt Plan

1. **Effective** teat dipping
   1. 97% of farms dip but many do not dip effectively
2. **Dry cow therapy of all quarters of all cows**
   - To treat subclinical infections present at dry off
3. **Appropriate** treatment of clinical cases
   - Record all cases
   - Monitor outcomes
4. **Culling chronically infected cows**
5. **Regular** milking machine maintenance
   1. Stable teat end vacuum
Reducing BTSCC is Based on Finding Infected Cows and Making Decisions about their Futures
Options for Handling Chronic Mastitis

Treat, Segregate, Dry off Cow,
Dry off quarter, Quarter milk or Cull
Solving Mastitis Problems

- **Technically easy**
  - Keep bacteria away from teats

- **Find the infected cows**
  - Decide what to do with them
    - Treat them or EAT them

- **Determine why they get infected**
  - What is the source of infection
    - Other cows or environment?

- **Decide how to stop new infections**
  - What management changes need to occur?
• Herds can achieve improved BTSCC by adopting recommended best management practices
• Key to improved BTSCC is to
  – Know which cows are infected with subclinical mastitis
  – Prevent new infections
  – Work with a team to implement change

THANKS!