Milk Quality and Quality Milk

Reference: Dr. Larry Fox
College of Vet Med
WSU

Quality Milk is a Function of:
- Healthy Cows
- Healthy Farms

Healthy Cows
- Cows free of mastitis and other diseases and good milk production
- Cows are on a good plane of nutrition.

Healthy Farms
- Employ practices to keep cows healthy:
  - Maintenance of milking equipment
Good Housing

• Loafing area clean
• Bedding Clean and Dry
• Ventilation adequate

Why Worry About Quality

• Pasteurized Milk Ordinance (PMO)
• Profit
  – Premiums
  – Milk Yield

The PMO is designed to

1. Regulate all milk that is produced in this country
2. The trade of milk that passes interstate lines
3. Be developed by the NCIMS and FDA
4. To effect only the processors
5. To effect only the dairy producers

NDA Quality Program

<table>
<thead>
<tr>
<th>ITEM</th>
<th>NDA QUALITY STANDARDS</th>
<th>PRICE ADJUSTMENT IF STANDARDS ARE EXCEEDED</th>
</tr>
</thead>
<tbody>
<tr>
<td>Raw Bacteria</td>
<td>100,000 or less</td>
<td>-5 cents</td>
</tr>
<tr>
<td>Preincubation</td>
<td>50,000 or less</td>
<td>-5 cents</td>
</tr>
<tr>
<td>LPC</td>
<td>&lt; 100</td>
<td></td>
</tr>
<tr>
<td>Sediment</td>
<td>#1 or #2</td>
<td>-5 cents</td>
</tr>
<tr>
<td>Water</td>
<td>Normal</td>
<td>-5 cents</td>
</tr>
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Topics to Cover

• What is Quality Milk
• What impacts Quality Milk
• Mastitis impact on Quality Milk
• New and old methods in mastitis control

What is Quality Milk

• Standard Composition
  – Protein: 3.5% (casein-2.8%)
  – Lactose: 4.9%
  – Fat: 3.5%
  – Minerals: 0.8%
  – Water: ~ 87%
  – Spg: 1.01

What is Quality Milk

• Organoleptic appeal
• Slightly sweet
• Pleasant in the mouth

How is Quality Milk Secreted

Essential nutrients from the ration
Proper blood flow
Good secretory cell health
Question on Milk Quality

- Quality Milk is:
  1) The taste
  2) The normal milk components
  3) The integrity of the blood milk barrier
  4) The amount of residues and other foreign substances
  5) All of the above
  6) None of the above

Contamination from Outside

- “Chemicals”
  - Disinfectants
- Bacteria-
  SPC- specific plate count (raw or total count)
  LPC- Lab Pasteurized count
  PI- Preliminary Incubation Count
  Coliforms (lactose and gram neg rods)

Standard Plate Count

- Causes of high SPC
- Bacterial origin:
  - Inside the gland….hold this thought
  - Outside the gland-
    - Unclean udders- wet udders
    - Contamination of the milking system
    - Poor cleaning of the milking system (time, temperature, concentration of disinfectant)
Standard Plate Count

- Milk Cooling problem
- Counts should be less than 10,000* bacteria (CFU)/ml, but……
- Many farms can maintain counts less than 1000 bacteria/ml of milk.

* ten fold less than PMO

Preliminary Incubation Count - PI
Psychrotrophic Bacteria

Raw Sample

7° C (~ 50 ° F)
10 Days

(Shortcut: Hold sample for 18 h, 13 C, then plate on agar)

Preliminary Incubation Count

- Good milk cooling can keep the PI count organisms (psychrotrophs) low…..but…..
- Some psychrotrophs will live through pasteurization and then will multiply in milk on the supermarket shelf.
- Will reduce the shelf life of milk considerably.

Preliminary Incubation Counts-Psychrotrophs

- Poor udder prep (poor cleaning and drying of the udder)
- Inadequate post-dipping
- Poor cleaning of the milking system
- Cracked rubber surfaces (liners, o-rings, etc.)
- Not sanitizing milking system before each milking
- PI counts < 50K but best if < 10K
**LPC - Lab. Pasteurized Count**

Thermoduric Bacteria

- 62.8°C for 30 min
- Std Plate Count

**Lab Pasteurized Count**

- Bacteria that will survive pasteurization
- Very good cooling will keep counts down on the farm.....but.....these will grow up on the shelf in milk cartons!

**Lab- Pasteurized Count**

- Less likely to be a cow-cleaning problem and more likely to be a milking system cleaning problem!

- LPC < 200 bacteria/ml, but excellent herds: <100.

**Coliform Count**

- 37°C for 48 hours
Coliform Count

• Sources
  – Poor milking preparation and very dirty cows
  – Water contamination
  – Severe milking equipment problems

• < coliforms/ml of milk <100

Bacteria can affect milk quality and can be measured by

1. Total bacteria count which selectively measures all mastitis causing bacteria
2. The PI count that measures the psychrotrophs or cold loving bacteria
3. Lab Pasteurized count that measures the thermoduric organisms which affect shelf life

Differential

<table>
<thead>
<tr>
<th></th>
<th>Low Coliform &lt;100</th>
<th>High Coliform &gt;750</th>
</tr>
</thead>
<tbody>
<tr>
<td>Low LPC</td>
<td>No problem</td>
<td>Teat Contam Cow Env</td>
</tr>
<tr>
<td>&lt;300</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Low LPC</td>
<td>Machine Cleaning</td>
<td>All</td>
</tr>
<tr>
<td>&gt;500</td>
<td></td>
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</tbody>
</table>

Other Tests of Quality “Added Water”

• Addition of water dilutes salts and lactose
• Tested for using a cryoscope
• Freezing pt. Of >-.530 Hortvet indicates that milk composition is abnormal
• Intentional addition of water, poor system drainage, use of excessive water during prep, backflushing units with the vacuum on, rinsing top of bulk tank, freezing bulk tank milk

Cook, Univ. WI

Ruegg, Univ. WI
Other Tests of Quality

“Rancidity”

- Result of hydrolysis of fatty acids
  - Violent agitation, air leaks or excessive pumping
- Causes objectionable flavors
- Psychrotrophic organism in milking equipment can produce lipases
  - Pseudomonas, aerobacter & bacillus
- Expressed as acid degree value (ADV)
  - ml of 1 N base required to neutralize acids in 100 g of fat
- Normal value of milk: 0.25 to 0.40
  - Not considered abnormal until ADV > 1.0

Ruegg, Univ. WI

Other Tests of Quality

“Sediment”

- Required test but frequency of testing is undefined
- Sediment scores on filters
- Excessive udder hair + sand bedding + poor premilking premilking hygiene

Ruegg, Univ. WI