Understanding mastitis in dairy cows

Ralph Bruno, Robert Hagevoort, Kevin Lager, Pablo Pinedo and Daniela Bruno

Texas AgriLife Extension Service
Texas A&M University / West Texas A&M University
New Mexico State University – Dairy Extension
Mastitis

• The most common and costly disease affecting dairy cows worldwide

• Loss of the affected quarter
• Loss of milk production
• Loss of the animal- replacements are expensive
• Low milk quality
• High somatic cell count
• Antibiotic residues in milk
What is Mastitis?

- Inflammation of the mammary gland due:
  - Physical
  - Chemical
  - Infectious (Bacteria, Virus, Fungi, Yeast)

- Body responses:

  Somatic Cell (SCC) into the mammary gland

- Clinical Signs:
  Swollen udder, redness, increased udder temperature, pain, abnormal milk.
Risk factors for mastitis

- Infectious organisms
- Characteristics of the cow
- Milking machine
- Milking procedure
- Environment
Mastitis During The Lactation Cycle

When

Infection Rate

Calving

Dry Period

Lactating

Lactating

Dry
Around parturition

• Cows are metabolically stressed.
• Hormonal changes
• Outbreaks of subclinical infections (eg. IMI acquired during the dry period or at calving time).
At Dry Period

- No flushing action
- No teat dipping
- Accumulation of milk – perfect environment for bacteria
- Inhibited defenses cells function (removing fat and debris)
Tissue damage due to mastitis

Bacteria invasion

Intact cells

Damaged cells

Blood vessel

Circulating leukocytes

Leukocyte phagocytosing bacteria

Dead cells in shrinking alveolus

Intact cells

Bacteria invasion

Connective tissue

Atrophied alveolus

Milk clot
Causes of Mastitis

• Bacteria (~ 70%)
• Yeasts and molds (~ 2%)
• Unknown (~ 28%)
  • physical
  • trauma
  • weather extremes
Types of mastitis

- **Clinic**: in this case we can see flakes in the milk, or one quarter can be red, inflamed and/or sensible.

- **Subclinical**: there is no clinical sign, but a decrease in milk production and affect milk quality.
Loss per type of mastitis

Clinic

• Decrease in milk production
• Duration of antibiotic elimination
• Period when animal is sick decreases cows performance.
• Costs of drugs and veterinarian
• Increase in labor costs
Loss per type of mastitis

Subclinic

- A considerable decrease in daily milk production
- Changes in milk composition
- Decrease the hygienic value of milk
- In addition to increased costs with mastitis, there is also an importance in the hygienic value of milk and other dairy products.
Animal population at the dairy

The number of subclinical mastitis cases is generally greater than the number of clinical cases.
Risk factors for mastitis

Organism

Cow

Environment
Cow factors

- Existent trauma (milk machine and milker, heat or cold)
- Teat end cracks
- Immunologic status
- Nutrition
- Age
- Breed
- Level of production
- Mammary gland anatomy
- Stage of lactation
Pathogen factor

- Exposure
  - Level of exposure
- Pathogenicity
  - Ability to cause disease
- Virulence
  - Level and severity of the disease
Environment factors

- Environment management
  - Minimize stress
  - Minimize exposure
- Milking
- Weather
- Nutrition
- Grouping
- Installations
- Cow bed
How is mastitis transmitted?

- Environmental
  - Cow bedding
  - Cleanness of animals
  - Manure splash when cows walk

Where?
- In the pens
- Where cows walk
- In the corridors that go back to the pens
How is mastitis transmitted?

- Contagious
  - Hands.
  - Towels.
  - Milking machines
  - Milking platform
  - Milk of infected cows

Where?
- Udder and teats
- During milking
- From infected to non infected cows
- Can be eliminated
Classification of mastitis causing pathogens

- Contagious microorganisms – associated to cows
  - *Streptococcus agalactiae*
  - *Staphylococcus aureus*
  - *Mycoplasma bovis*

- Environmental microorganisms – associated to environment
  - *Streptococcus uberis*
  - *Coagulase negative Staphylococcus*
  - *Enterococcus*
  - *Coliforms*
  - *Corynebacterium*
Process of infection

Invasion of teat

Migration into the teat canal and colonization of milk secretion cells

Organisms produce toxic substances that affect milk secretion cells
The immune system sends somatic cells to fight off bacteria.

- Recovery
- Clinic
- Subclinical
Mastitis cycle
Mechanisms of defense and protection of the bovine udder

- Teat barriers
  - Sphincter of the teat canal
  - Füstenberg rosette

- Defense cells and inflammatory mediators
  - Lymphocytes, neutrophils and macrophages – Somatic cells
Defense against mastitis

Teat canal is the main barrier against bacteria entrance

The canal is 8 to 9 mm and has many folds to reduce bacteria entrance
Defense against mastitis

Teat canal is the main barrier against bacteria entrance

A transversal section of 4mm of the teat end to see how tight the can is
Defense against mastitis

Longitudinal section of the folders opened
Somatic cells

- Body defenses against udder infection
Diagnostico

• Milk bacteriology exam

• CMT

• Clinical signs
• SSC
Mastitis therapy

- Antibiotics – via systemic or local
- Always follow drug label recommendation – time and amount
The 10 Steps to Mastitis Control

1. Milking hygiene
2. Good milking system
3. Good use of machinery
4. Pre-dipping
5. Monitor mastitis through SCC and milk weight
6. Treat clinical mastitis
7. Eliminate chronic cows from the herd or milk them last
8. Dry cow therapy
9. Keep environment clean as much as possible
10. Good nutrition
The 10 Steps to Mastitis Control

1. Milking hygiene
   • Prepare the udder to be milked. The appropriate use of pre-dipping is very important
   • Single use of towels
   • Use of gloves
   • Dry teats before inserting the milking machine
The 10 Steps to Mastitis Control

2. Good milking system
   • Milking equipment should be adequate in size, functioning properly, and regularly cleaned and maintained

3. Good use of machinery
   • Apply and remove machine carefully
   • Remove machine when cow is milked out, shut off vacuum at claw before removal
The 10 Steps to Mastitis Control

4. Pre-dipping
   • Effective teat disinfection post milking reduces SCC

5. Monitor mastitis trough SCC and milk weight
   • Monitor your mastitis score (DHI-SCC, CMT) regularly
6. **Treatment of clinical mastitis**
   - Treat clinical cows, follow label recommendations, treat aseptically. Withhold treated cows' milk from milk supply.
The 10 Steps to Mastitis Control

7. Elimination of chronic cows from the herd
   • Segregate chronic mastitis cows, milk them last, cull when necessary
   • Cows with chronic mastitis serve as reservoirs of organisms and could infect susceptible cows

8. Dry cow therapy
   • Dry treat each quarter using partial insertion techniques with an approved dry cow treatment at drying off.
   • Cure rate is twice high as that during lactation
   Lowers the risk of clinical and subclinical mastitis during subsequent lactation
The 10 Steps to Mastitis Control

9. Keep a clean environment
   • Keep cows clean, udders free from soil and manure.
   • Fence off wet, swampy areas.
   • Keep free stalls and stanchions bedded properly.
   • Keep calving areas clean, properly bedded (straw preferred)
The 10 Steps to Mastitis Control

10. Good nutrition
   - Properly feed and care for cows.
   - It has been shown by different studies that there is an association between mastitis and supplementation with vitamins and minerals.
Steps to Mastitis Control

These steps are the desirable, but every protocol of treatment and prevention should be followed according to what is established by the dairy and the veterinarian.
Conclusion

• Mastitis is a management problem and can be controlled
  • Mastitis control and quality milk production depend on keeping excellent hygiene standards

• Prevention programs work if followed correctly
Questions?