

Mastitis: A Bacterial Infection in Dairy Cattle

MILK IS SOMETIMES CALLED nature's near-perfect food. Milk provides calcium, proteins, and other important nutrients. The supply of milk in the United States is constant and something most people take for granted. However, people in the dairy industry know that bacterial infection can halt production from individual cows.



Objective:



Explain mastitis, a bacterial infection in dairy cattle.

Key Terms:



anorexia

antibodies

chronic

inflammation

leukocytes

mastitis

peracute

phagocytes

somatic cell count

Staphylococcus aureus

Streptococcus

agalactiae

subacute

subclinical

Mastitis

Dairy producers need to be especially careful of a condition called **mastitis**, which is an infection of the udder caused by bacteria. Some common species of bacteria that can cause mastitis are *Streptococcus agalactiae*, *Staphylococcus aureus*, and *Escherichia coli*. All these bacteria are treatable with antibiotics, but because of the bacteria's variations and degrees of resistance, different antibiotics are required. Mastitis can easily spread from one cow to the next. The infection can occur in goats, sows, and ewes but is especially common in dairy cows.

Mastitis occurs when teats become infected with certain bacteria. Because of the frequency of milking dairy cows, the teats are more often exposed to various types of bacteria, and mastitis can develop. Several situations increase the chances of a cow developing mastitis. Some of

these include improper sanitation of milking equipment, injury to or chilling of the udder, teat sores, and environmental pathogens. If not treated, mastitis can be fatal in cows.

Disease prevention is the key to animal health management. Prevention is often more beneficial, and cheaper, than treating an outbreak of the disease. **Somatic cell count**, or the number of infection-fighting cells present in the milk, is a good indication of the presence of infection. The greater the number of somatic cells, the more likely infection or disease is present.

A cow has primary and secondary defenses against bacterial infection. Primary defenses inhibit the ability of the bacteria to enter the body of the animal. Examples would be the skin and the mucus lining of the nasal and throat cavities. Secondary defenses directly fight the pathogen once it has gained entrance to the body. Examples are antibodies and phagocytes. **Antibodies** are protein-like substances that combat and destroy bacteria. **Phagocytes** are living, sometimes moving, cells that ingest microorganisms or other cells. Phagocytes can be found in the blood, lymph nodes, spleen, and bone marrow, to name a few locations.

CLINICAL LEVELS OF MASTITIS

Mastitis can be classified into several levels.

Peracute is a level of mastitis characterized by a hot, swollen quarter of the infected udder; a sudden onset of high fever; depression; **anorexia** (failure to eat); and a sudden drop in milk production.

Subacute is a level characterized by a warm, swollen quarter, along with decreased appetite and decreased milk production. This level is less obvious than peracute.



FIGURE 1. Sanitation of milking equipment is important in preventing mastitis.



FIGURE 2. Milking management is key in preventing mastitis. (Courtesy, Agricultural Research Service, USDA)

Subclinical is a level that has no clinical signs of mastitis, but milk production may be decreased. The appetite of the cow remains normal during this level. Somatic cell counts in the milk will be the only real indication of an infection. **Streptococcus agalactiae** and **staphylococcus aureus** are both types of bacteria that live in mammary and udder tissues and account for 95 percent of subclinical cases of mastitis.

Chronic is the level of mastitis that is most severe, usually characterized by a continual inflammation of the mastitic quarter of the udder and leading to abscesses of the udder.

Inflammation is a protective tissue response caused by the host's immune system in response to bacterial infection.

CALIFORNIA MASTITIS TEST

Of the many tests available for use in the detection of mastitis, the California Mastitis Test (CMT) is the most prevalent and the easiest to interpret. The CMT is a test used to identify the number of **leukocytes**, or white blood cells, present in the milk. Since white blood cells are produced to combat infection and disease, the greater the number of leukocytes, the greater the indication of an infection.

It is important to test only raw milk with the CMT. Pasteurized milk will not contain any bacteria because of the high heat during pasteurization.

The CMT is completed by filling each quadrant of the four-quartered paddle with a small amount of raw milk. Reagent is then added to the milk in each quarter, and the paddle is gently swirled and tilted to mix the reagent with the milk. Results should appear almost instantly.

The degree of mastitis present is directly related to the amount of precipitate, or gel, the mixture forms. The greater the gel formation, the more assured the producer can be about the presence of mastitis.



ON THE JOB...

CAREER CONNECTION: Dairy Farmer

Dairy farmers breed and raise cows and supply milk to the milk and milk products industries. Most dairy farms are owned and operated by families. However, some very large farms are owned by corporations and operated by farm managers and dairy production technicians.

Dairy farmers work long hours every day of the year. They rise early to milk and feed the cows. The cows are milked morning and evening by machines. The cows' udders are washed to ensure the purity of the milk and to protect the health of the cows. In addition, dairy farmers deliver milk to designated destinations, clean the cows' resting areas, and take care of sick animals.

Many dairy farmers produce hay, grain, and other kinds of feed for their herds. A dairy farmer maintains careful records on each cow so that he or she can measure the cost of keeping the cow against the income the animal produces.

THE ECONOMIC IMPORTANCE OF MASTITIS

Mastitis infection can result in a substantial economic loss for the producer. Mastitis causes a cow's milk production to decrease, necessitates discarding the mastitic milk, and requires that the cow be "dried off" (have her milking discontinued) during treatment with antibiotics. The milk of a cow treated with antibiotics cannot be used for human consumption until the antibiotics are out of the animal's system.

Any cow showing even slight signs of mastitis must not be allowed to contribute milk to the daily farm bulk tank. Infected milk can and will contaminate any milk with which it comes into contact.

If mastitis is not caught early and the cow is not removed from the milking schedule, the entire volume of milk from the farm may be contaminated. If this milk is put on a truck with other milk, it may contaminate the entire truckload, causing serious financial loss to the producer.

While a cow exhibiting signs of mastitis is dried off during treatment, the dairy farmer is still feeding, housing, and medicating the animal. However, the producer is not receiving any income from the cow's milk production.

Contagious mastitis bacteria are commonly spread at milking time through the milking machine. The producer can help control mastitis by following a few precautions. Teat dipping with antibiotic solution will decrease the bacteria being transferred to the milking machine and other cows. Back-flushing the milking machine will also rid the machine of any bacteria that may have been transferred through the milk. General cleanliness of the milking parlor and all equipment is always important for good herd health.



FIGURE 3. Maintaining a clean milking parlor is important.

Summary:



Mastitis is an infection of the udder caused by bacteria. Some common species of bacteria that can cause mastitis are *Streptococcus agalactiae*, *Staphylococcus aureus*, and *Escherichia coli*. All these bacteria are treatable with antibiotics. Situations that increase the chances of a cow developing mastitis include improper sanitation of milking equipment, injury to or chilling of the udder, teat sores, and environmental pathogens.

Mastitis can be classified as peracute, subacute, subclinical, and chronic.

The California Mastitis Test (CMT) is the most prevalent test and the easiest to interpret. It identifies the number of leukocytes produced to combat infection and disease present in the milk.

Mastitis infection can result in a substantial economic loss for the producer. Mastitis causes a cow's milk production to decrease, necessitates discarding the mastitic milk, and requires the cow be "dried off" during treatment with antibiotics.

Checking Your Knowledge:



1. What is mastitis?
2. What causes mastitis?
3. How do the classes of mastitis compare?
4. What is the California Mastitis Test?
5. What is the economic impact of mastitis?

Expanding Your Knowledge:



Prepare a research paper on mastitis in dairy cattle. Be sure to explore the causes, prevention, and economic impact. Present your paper in an oral report to the class.

Web Links:



Dairy Cattle Mastitis and Milking Management

<http://www.extension.org/pages/15600/dairy-cattle-mastitis-and-milking-management>

CMT: A Simple and Useful Tool

<http://www.youtube.com/watch?v=BvbZPk5riEc&feature=related>