

EPIDEMIOLOGY OF MASTITIS



BASICS

OVERVIEW

This chapter describes the terminology and patterns associated with mastitis epidemiology, the typical frequency of mastitis, the means of transmission and sources or reservoirs of mastitis pathogens. This information will be useful for the practitioner who is faced with a mastitis outbreak or simply needs to know what might be considered a normal frequency of mastitis on a dairy farm.

INCIDENCE/PREVALENCE

- Although there is certainly variation due to geography, bulk tank somatic cell count levels and management systems, a typical prevalence survey of whole herd (lactating) individual composite milk cultures reveal 50% no growth, 25% coagulase negative staphylococci, 10% environmental streptococci, variable contagious pathogens (0-50%), < 5% other and 1% coliform.
- The incidence of clinical mastitis is commonly around 25% of cows per year but the range can be quite wide.

GEOGRAPHIC DISTRIBUTION

Worldwide

SYSTEMS AFFECTED

Although mastitis is indicative of inflammation of the mammary gland, effects of clinical mastitis may cause septicemia and or endotoxemia and death.

SIGNALMENT

Female bovine, ovine, caprine

CAUSES AND RISK FACTORS

The vast majority of all mastitis pathogens are bacterial. The primary contagious pathogens are *Staphylococcus aureus*, *Streptococcus agalactiae* and *Mycoplasma bovis*. The primary environmental pathogens are the coliforms and environmental streptococci. There are, on occasion, cases of fungal, algal and viral mastitis. Viral mastitis is more common in sheep and goats than cattle. Risk factors include, but are not limited to, exposure to contagious mastitis pathogens during the milking process, exposure to environmental mastitis pathogens due to an unsanitary environment and the stress of disease and parturition.

EPIDEMIOLOGY

Terminology

- Contagious mastitis pathogens: These are pathogens that are typically spread during the milking process and their primary source or reservoir is the infected mammary gland.
- Environmental mastitis pathogens: These are pathogens that are found primarily in the environment.
- Incidence is defined as the number of new cases of mastitis that have occurred in a dairy herd in a given time period.
- Prevalence is a measure of the amount of existing cases of mastitis in a dairy at a given point in time.
- Clinical mastitis has been defined by redness, swelling, heat and pain but is more aptly defined as abnormal milk as many cases of clinical mastitis do not have apparent redness, swelling, heat or pain.
- Subclinical mastitis may be defined as a microbial infection in a mammary gland in which the typical signs of inflammation are not present and the milk is clinically normal.

Mastitis Presentations (Patterns of Disease)

- Although mastitis may happen at almost any time in the female, there are 3 typical patterns of herd mastitis presentations. The patterns or presentation of the mastitis problem tends to indicate where to look to solve the mastitis issue.
 1. The clinical mastitis outbreak: usually occurs due to failure of management practices that lead to increased new infections causing clinical mastitis. These are most often environmental pathogens but could occur with contagious pathogens due to introduction of carriers via purchase of new cattle.
 2. The increasing somatic cell count herd: This is the herd that had mastitis and somatic cell counts under control but some management change or addition of new cows has increased the risk of infection. This presentation is most likely due to environmental pathogens but could also be contagious pathogens.
 3. The chronically high somatic cell count herd: These are most often due to contagious pathogens but environmental streptococci should be considered as well.

Sources/Reservoirs

- Contagious pathogens live on and within mammals but can also live in the environment.
 - *Staphylococcus aureus*: the primary reservoir of *S. aureus* is the infected mammary gland. However, *S. aureus* has also been found on other mammals, including man where it has been estimated to persistently colonize 1/3 of the human population. In addition, *S. aureus* can be found practically anywhere in the environment. Thus, it is unlikely that any herd is totally *S. aureus*-free.
 - *Streptococcus agalactiae*: the primary and only significant reservoir of *S. agalactiae* is the infected mammary gland. It may survive on the teat surface for short periods of time. Due to its susceptibility to common intramammary antibiotics and limited sources, it can be eradicated.

- *Mycoplasma*: Although the infected mammary gland may be the primary reservoir for mycoplasma, others reservoirs are the respiratory and reproductive tracts.
- *Corynebacterium bovis*: This bacterium is considered a minor pathogen as it only rarely causes a high somatic cell count. It is an obligate udder pathogen. The prevalence of mammary infections with this pathogen is correlated with post teat dipping with a germicide. The higher the prevalence, the less likely that teat dipping is being performed.
- *Trueperella pyogenes*: This is the most common agent of bovine abscesses and a common bacteria found in metritis cases thus may be contagious in nature. This organism can be spread by biting flies. Trueperella mastitis is foul smelling.
- Coagulase-negative Staphylococci: This group of over 25 species has both contagious and environmental sources; many of which can routinely be isolated from bovine body surfaces and cavities.
- Environmental pathogens primarily occur in the environment with some having specific environmental preferences. In addition, a few have some characteristics of contagious pathogens.
 - *Escherichia coli*: Because this pathogen is in the feces, it will be present in any bovine area. Cattle bedded on manure packs do tend to have a higher percentage of mastitis due to *E. coli* compared to other mastitis pathogens.
 - *Klebsiella (pneumoniae/oxytoca)*: These are environmental pathogens with a preference for wood bedding products.
 - *Serratia marcescens*: Can be found in the environment but has been associated with contaminated intramammary treatment and teat dips.
 - *Pseudomonas*: Preference for water and has been found in drop hoses within the milking parlor.
 - Yeast: Outbreaks have occurred when yeast was added to feedstuffs. Yeast mastitis is also known to occur during clinical mastitis outbreaks when sloppy intramammary infusions practices are employed.
 - Prototheca: associated with water sources
 - *Streptococcus uberis*: found in bovine feces and other areas of the environment but has a preference for straw bedding.
 - *Streptococcus dysgalactiae*: also has a preference for straw bedding but shares characteristics of contagious mastitis pathogens in that it can live on teat surfaces.

Transmission

- Contagious mastitis pathogens are most often transmitted from the infected quarter to the non-infected quarter via transmission on fomites during the milking process. Anything coming in contact with the infected milk can transmit the pathogen. Pathogens gain entrance into the mammary gland via the teat duct.
- Environmental pathogens are most often opportunists taking advantage of an open teat canal just prior to milking, during milking or after the milking process. Environmental mastitis may also occur through unsanitary intramammary infusions or during the use of teat cannulas.
- Mycoplasma mastitis, a contagious pathogen, is the only mastitis pathogen that may be able to reach the mammary gland via the vascular system. It is also thought to be able to cross the membrane barrier from one quarter to another.
- Milk culture results of newly purchased dairy animals should be obtained and assessed for contagious pathogens, including mycoplasma, prior to adding them to the indigenous herd.

- Zoonotic Potential-*Brucella*, *Listeria* and *Leptospira* have all been isolated from milk.



MISCELLANEOUS

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Author Jerry R. Roberson

Consulting Editor Christopher C.L. Chase

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