Managing Environmental Mastitis

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KEYWORDS

• Mastitis • Bedding • Dairy cows • Intramammary infections

KEY POINTS

- Coliform bacteria, streptococci, and enterococci are the most common etiologic agents of environmental mastitis.
- The primary agents of environmental mastitis are of fecal origin but can also heavily contaminate organic materials such as bedding, feed, and soil in the cows' surroundings.
- Washed sand contains 100-fold fewer mastitis pathogens per gram of bedding compared with common organic bedding materials.
- Management keys to reducing exposure of cows to environmental mastitis pathogens include frequent manure removal, eliminating standing water in the cow's walking lanes and loafing areas, and avoiding overcrowding of animals in barns and pastures.
- Populations of mastitis pathogens increase in the cow's environment as ambient temperature and moisture increases.
- Rates of environmental mastitis are greatest during the dry period and early lactation compared with other stages of lactation.

The most common environmental mastitis pathogens among herds of North America are those grouped as coliforms and environmental streptococci. The term *"coliform mastitis"* frequently is used incorrectly to identify mammary disease caused by all gram-negative bacteria.[1] Genera classified as coliforms are *Escherichia*, *Klebsiella*, and *Enterobacter*. Other gram-negative bacteria frequently isolated from intramammary infections include species of *Serratia, Pseudomonas,* and *Proteus.*[2] Coliform bacteria occupy many habitats in the cow's environment. *Escherichia coli* are normal inhabitants of the gastrointestinal tract of warm blooded animals. Both *Klebsiella* spp and *Enterobacter* spp populate soils, grains, water, and intestinal tracts of animals. *Serratia marcesens* share many environmental sources with *Klebsiella* spp and

Salaries and research support were provided by state and federal funds appropriated to the Ohio Agricultural Research and Development Center, The Ohio State University.
The authors have nothing to disclose.
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Vet Clin Food Anim 28 (2012) 217–224
http://dx.doi.org/10.1016/j.cvfa.2012.03.009 **vetfood.theclinics.com**
0749-0720/12/$ – see front matter

Enterobacter spp. *Pseudomonas* spp and *Proteus* spp commonly contaminate drop hoses used to wash udders before milking.

The group of bacteria collectively labeled environmental streptococci includes *Streptococcus uberis*, *Streptococcus dysgalcatiae*, and *Enterococcus* spp.[3] The environmental streptococci, *S uberis* in particular, have been isolated from bedding materials, soil, rumen, feces, vulva, lips, nares, mammary gland, and teats.[4,5] Feed stuffs such as silages and green chop forages may also be a source of these pathogens and infections of the reproductive tract may contribute to environmental and teat end contamination.[6]

STALL BEDDING IS A KEY ENVIRONMENTAL SOURCE

The key to controlling environmental mastitis to an economically acceptable level within a herd is to reduce the exposure of cows to the pathogens. Although bacteria that cause environmental mastitis are among the etiologic agents commonly responsible for infectious respiratory and urogenital diseases in dairy cows,[7] the spread of these bacteria from other regions of the body to the mammary gland via the vascular or lymphatic systems appears minimal. Intramammary infections caused by environmental mastitis pathogens typically result from the bacteria traversing the teat canal and multiplying in the gland. These bacterial species are chemotropic organisms requiring organic material to use as food. Coliforms and streptococci cannot live on teat skin for long periods of time. If these bacteria are present in large numbers on teat skin, it is the result of recent contamination. Therefore, the number of these bacteria on teat skin is a reflection of the cow's exposure to the contaminating environment.[8,9]

Cows lay down 12 to 14 hours a day, and their teats are in direct contact with the bedding or other materials where they rest. Populations of the bacteria in bedding are related to the number of bacteria on teat ends and rates of clinical mastitis.[9,10] Therefore, reducing the number of bacteria in bedding generally results in a decrease in environmental mastitis. Coliforms cannot live on teat skin for long periods of time. If these bacteria are present in large numbers on teat skin, it is the result of recent contamination from a source such as bedding. Hygiene and proper management of stall, lots, and pastures are essential.

Sand Bedding

Ideally, bedding should be inorganic materials that are low in moisture content and contain few nutrients for bacteria to use. The bedding material that we recommend most for controlling environmental mastitis is washed sand. Compared to organic materials such as sawdust, recycled manure, straw, and dirt, washed sand consistently contains 100-fold fewer mastitis pathogens per gram of bedding.[10] The effectiveness of sand for reducing exposure of mastitis pathogens to mammary glands is due to the inorganic properties of sand. However, as organic content and moisture in sand bedding increase during the common practice of on-farm reclaiming sand from sand-laden manure, the mastitis pathogen populations also increase.[11] A realistic goal for dry matter of sand used for bedding is greater than 95%. Organic matter in sand bedding should be less than 5%.

Organic Bedding

Many farms are forced to use organic bedding materials that are compatible with liquid manure–handling systems. Little advantage exists in using one organic material over the use of another. For example, straw tends to have highest streptococcal counts, while sawdust has the highest coliform counts in comparisons among these