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*Citrobacter* and *Enterobacter* are bacteria that can be found in bedding, manure and soil. Like other gram negative bacteria, they may cause a life threatening acute mastitis. Exposure to these organisms occurs between milkings when teat ends contact contaminated surfaces. Following entrance of *Enterobacter* or *Citrobacter* into the mammary gland, most infections are of short duration, although a handful may become chronic, lasting more than 100 days. Animals may have a sudden onset of fever, markedly decreased milk production, loss of appetite and dehydration. Often these animals will go down and be unable to rise. Milk from the affected quarter may have large clots or be watery or bloody. Supportive therapy with anti-inflammatory drugs and fluids is usually required for these cases. Antibiotic therapy is often of little benefit. The animal's immune system will effectively kill the bacteria; most clinical signs are due to toxins produced by the bacteria. Immunization can reduce the incidence and severity of clinical cases.

**Management**

- The most effective management measure is to keep animals clean and dry, particularly in the dry animal and pre-fresh areas.
- Avoid overcrowding of pens and prevent access to muddy corrals and pastures and areas of standing water.
- Pre-dip with an approved product and dry teats well with individual use towels before attaching milking units.
- Maintain milking equipment properly to avoid liner slips, improper vacuum levels, and overmilking.
- Good nutrition and control of fresh animal metabolic diseases reduce the animal's susceptibility.
- Consider the use of immunization for coliform mastitis during the dry period and early lactation.
- For cases of severe, acute mastitis discuss treatment protocols with your veterinarian.

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**Contamination (X)**

Cultures from the submitted milk sample were contaminated by organisms found on the animal's skin, udder and teats, hands of the sampler, and in the dairy environment. Therefore, the causative organisms of mastitis could not be determined. A new milk sample should be submitted. Please see sampling instructions on our web site or contact one of our laboratories for instructions.

***Corynebacterium bovis* (C. bovis (B))**

*C bovis* are gram positive bacteria that inhabit infected udders and the teat canal. Spread of *C bovis* occurs primarily from animal to animal at milking. These bacteria can cause mild udder infections with a mild increase in somatic cell count and slight reduction in milk production. Rarely, they do cause clinical mastitis. An increased incidence of these infections in a herd warrants reassessment of the teat dip product used in the dairy and application methods. Most infections are self-limiting and do not necessitate antibiotic therapy.

**Management**

- Teats should be pre-dipped with an approved product and dried with individual use towels.
- Dip all teats with an approved product immediately after milking. Cups are preferred over sprayers for consistent teat dip application.
- Dry animal therapy will eliminate most *C bovis* infections.

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***Corynebacterium* species (C. species (O))**

Please contact your veterinarian or regional QMPS lab for more information.

***Enterobacter* (O) species**

*Enterobacter* and *Citrobacter* are bacteria that can be found in bedding, manure and soil. Like other gram negative bacteria, they may cause a life threatening acute mastitis. Exposure to these organisms occurs between milkings when teat ends contact contaminated surfaces. Following entrance of *Enterobacter* or *Citrobacter* into the gland, most infections are of short duration, although a handful may become chronic, lasting more than 100 days. Animals may have a sudden onset of fever, markedly decreased milk production, loss of appetite and dehydration. Often these animals will go down and be unable to rise. Milk from the affected quarter may have large clots or be watery or bloody. Supportive therapy with anti-inflammatory drugs and fluids is usually required for these cases. Antibiotic therapy is often of little benefit. The animal's immune system will effectively kill the bacteria; most clinical signs are due to toxins produced by the bacteria. Immunization can reduce the incidence and severity of clinical cases.

**Management**

- The most effective management measure is to keep animals clean and dry, particularly in the dry animal and pre-fresh areas.
- Avoid overcrowding of pens and prevent access to muddy corrals and pastures and areas of standing water.
- Pre-dip with an approved product and dry teats well with individual use towels before attaching milking units.
- Maintain milking equipment properly to avoid liner slips, improper vacuum levels, and overmilking.
- Good nutrition and control of fresh animal metabolic diseases reduce the animal's susceptibility.
- Consider the use of immunization for coliform mastitis during the dry period and early lactation.
- For cases of severe, acute mastitis discuss treatment protocols with your veterinarian.

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***Enterococcus* species (*Enterococcus* spp (F))*****Escherichia coli* (E. coli (E))**

*E. coli* are gram negative bacteria (coliform) commonly found in bedding, manure, water, and soil that can cause life-threatening illness. Most of these infections occur during the first two weeks prior to calving through the first two months of lactation. Infections occur when the teat end contacts contaminated material between milkings. Following entrance of these bacteria into the gland, most infections are of short duration with approximately 50% lasting less than 10 days, although a handful may become chronic, lasting more than 100 days. Approximately, 10% of the animals may have a sudden onset of fever, markedly decreased milk production, loss of appetite and dehydration. Often these animals will go down and be unable to rise. Milk from the affected quarter may have large clots or be watery or bloody. Supportive therapy with anti-inflammatory drugs and fluids are usually required for these cases. Antibiotic therapy is often of little benefit. The animal's immune system will effectively kill the bacteria; most clinical signs are due to toxins produced by the bacteria. Immunization can reduce the incidence and severity of clinical cases.

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### Management

- The most effective management measure is to keep animals clean and dry, particularly in the dry animal and pre-fresh areas.
- Avoid overcrowding of pens and prevent access to muddy corrals and pastures and areas of standing water.
- Pre-dip with an approved product and dry teats well with individual use towels before attaching milking units.
- Maintain milking equipment properly to avoid liner slips, improper vacuum levels, and overmilking.
- Good nutrition and control of fresh animal metabolic diseases reduce the animal's susceptibility.
- Consider the use of immunization for coliform mastitis during the dry period and early lactation.
- For cases of severe, acute mastitis discuss treatment protocols with your veterinarian.

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### Fungus (O)

Fungi are microorganisms that are found in a variety of areas such as soil, plants, decaying organic matter, bedding materials and water in the barn. Other on-farm sources can be contaminated multidose bottles of medication, contaminated syringes and teat cannulas. Primary sources of infection are intramammary infusions where a strict aseptic technique has not been followed. Spread can occur from animal to animal at milking when improper milking procedures or faulty milking equipment are used. Fungus mastitis is characterized by swelling of the gland, marked reduction in milk production, thick yellow or flaky mammary secretions and fever. Clinical signs may intensify after treatment with antibiotics. Most cases of fungus mastitis are self-limiting and animals usually return to normal production. Additional antibiotic therapy should NOT be used.

### Management

- Special care during disinfection (swabbing teat ends with alcohol) and single use treatment tubes should be utilized.
- Avoid treatment with multidose bottles of medication.
- Strip out affected quarters and milk infected animals last, or with a separate unit.

### Gram Negative Bacillus (G-bacillus (O))

Gram negative bacilli are commonly found in bedding, manure, water, and soil that may be contaminants in a culture sample but occasionally can cause life-threatening illness. Infection occurs when the teat end contacts contaminated material between milkings.

### Management

- The most effective management measure is to keep animals clean and dry, particularly in the dry animal and pre-fresh areas.
- Avoid overcrowding of pens and prevent access to muddy corrals and pastures and areas of standing water.
- Pre-dip teats with an approved product and dry them well with individual use towels before attaching milking units.
- Maintain milking equipment to avoid liner slips, improper vacuum levels, and overmilking.
- Good nutrition and control of fresh animal metabolic diseases reduce the animal's susceptibility.
- Consider the use of immunization for coliform mastitis during the dry period and early lactation.
- For cases of severe, acute mastitis discuss treatment protocols with your veterinarian.

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### Gram positive bacillus (G+bacillus (Z))

Gram positive bacilli are found in soil, water, dust, air, manure, wounds and abscesses. Infections often result from improper treatment technique, contaminated treatment materials, and improper teat end sanitation prior to treatment. Mastitis caused by these organisms is infrequent and may occur as a herd outbreak. Some cases may be fatal.

### Management

- Use only single dose intramammary treatment tubes and clean teat ends thoroughly with 70% alcohol prior to infusion.
- Avoid the use of multidose bottles of medication

### *Klebsiella* species (*Klebsiella* spp (K))

*Klebsiella* spp are gram negative bacteria (coliform) that are commonly found in organic bedding, manure, and soil. Many of these infections are associated with the use of green sawdust or recycled manure bedding. Rates of new infections are usually higher in the summer than in other seasons. Most of these infections occur during the first two

weeks prior to calving through the first two months of lactation. Infection occurs when the teat end contacts contaminated material between milkings. *Klebsiella* infections are typically very difficult to treat, and the infected animals or individual quarters usually have to be culled. Some animals may have a sudden onset of fever, markedly decreased milk production, loss of appetite and dehydration. Often these animals will go down and be unable to rise. Milk from the affected quarter may have large clots or be watery or bloody. Supportive therapy with anti-inflammatory drugs and fluids is usually required for these cases. Antibiotic therapy is often of little benefit. The animal's immune system will effectively kill the bacteria; most clinical signs are due to toxins produced by the bacteria. Immunization can reduce the incidence and severity of clinical cases.

### Management

- The most effective management measure is to keep animals clean and dry, particularly in the dry animal and pre-fresh areas.
- Avoid the use of green sawdust, wet wood, or recycled manure bedding.
- Avoid overcrowding of pens and prevent access to muddy corrals and pastures and areas of standing water.
- Pre-dip with an approved product and dry teats well with individual use towels before attaching milking units.
- Maintain milking equipment to avoid liner slips, improper vacuum levels, and overmilking.
- Good nutrition and control of fresh animal metabolic diseases reduce the animal's susceptibility.
- Consider the use of immunization for coliform mastitis during the dry period and early lactation.
- For cases of severe, acute mastitis discuss treatment protocols with your veterinarian.

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### **Lactococcus species (Lactococcus spp (G))**

*Lactococcus* species are mastitis causing pathogens very similar to Streptococci. They can cause clinical and subclinical mastitis that can become chronic. Little is known about the characteristics of this infection as it has only recently been identified as a major pathogen on some farms. Currently, research through QMPS in Canton is focused on this pathogen (funded through NNYADP) and new information is being gathered. Cows identified with this infection should be evaluated with SCC data to determine if they warrant treatment. If you decide to attempt treatment, it is strongly recommend that you discuss your treatment plan with your veterinarian.

### **Mold (O)**

Molds are microorganisms that are found in a variety of areas such as soil, plants, decaying organic matter, and bedding materials. Other on-farm sources can be contaminated multidose bottles of medication, contaminated syringes and teat cannulas. Primary sources of infection are intramammary infusions where a strict aseptic technique has not been followed. Spread can occur from animal to animal at milking when improper milking procedures or faulty milking equipment are used. Mold mastitis is characterized by swelling of the gland, marked reduction in milk production, thick yellow or flaky mammary secretions and fever. Clinical signs may intensify after treatment with antibiotics. Most cases of mold mastitis are self-limiting and animals usually return to normal production. Additional antibiotic therapy should NOT be used.

### Management

- Special care during disinfection (swabbing teat ends with alcohol) and single use treatment tubes should be utilized.
- Avoid treatment with multidose bottles of medication.
- Strip out affected quarters and milk infected animals last, or with a separate unit.

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### **Negative (N)**

A negative aerobic culture result means that no microorganisms grew on the culture plate. For aerobic culture, this may be due to:

- 1) The animal's immune system has already cleared the bacteria from the udder, although clinical signs of mastitis may be evident for a while longer;
- 2) The animal was not shedding organisms at the time she was sampled but may still be infected. This is frequently observed with a variety of mastitis pathogens, including *Staphylococcus aureus* and *Mycoplasma*, which are shed intermittently;
- 3) If an animal is infected with *Mycoplasma*, it will not be evident on standard aerobic culture. These organisms require culture on special media and in a special incubator to be detected. If animals with a negative aerobic culture continue to exhibit clinical signs of mastitis or have persistent elevated somatic cell counts, they should be resampled and culture for *Mycoplasma* be considered. Please discuss this further with your veterinarian.

### ***Nocardia* species (*Nocardia* spp (O))**

*Nocardia* spp are organisms found in the soil, water, grass and on skin and may cause sporadic cases of mastitis. Contaminated intramammary treatments, syringes or cannulas and improper pre-infusion sanitation may be the sources of infection. *Nocardia* spp can be spread animal to animal at milking.

*Nocardia* spp may cause subclinical or clinical mastitis with reduced milk production and abnormal milk. The udder may have hard nodules or feel woody on palpation. Some quarters may develop draining sores. Infected animals may develop high fever that can last several days or even weeks. *Nocardia* spp infections do not respond to antibiotic treatment.

#### Management

- Special care during disinfection (swabbing teat ends with alcohol) and single use treatment tubes should be used.
- Avoid treatment with multidose bottles of medication
- Strip out affected quarters and milk infected animals last, or with a separate unit.
- Keep stalls clean and dry and avoid dirty lots.
- Cull infected animals immediately from the herd.

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### **No Important Growth/NSO (N)**

Milk samples obtained aseptically from healthy mammary glands should not contain any microorganisms. However, when plates are examined after 48 hours of aerobic incubation and only a few colonies of different organisms grew on the culture medium, the laboratory diagnostician may consider such growth unimportant based on her/his knowledge of bovine mastitis. This unimportant growth arises more commonly from composite than from quarter milk samples. Some microorganisms may exist in the teat canal and the skin around the teat orifice and even the most vigorous scrubbing with alcohol may not remove them.

### ***Pasteurella* species (*Pasteurella* spp (W)) and/or *Mannheimia* species (*Mannheimia* spp)**

*Pasteurella* spp and *Mannheimia* spp are gram negative bacteria that may occasionally cause mastitis in individual animals. These organisms are normal inhabitants of the respiratory tract of animals. How this disease spreads is unknown. *Pasteurella* spp and *Mannheimia* spp may cause acute or chronic mastitis. Affected quarters may produce a thick, creamy, yellow secretion with a foul odor. Although both organisms appear susceptible to many antibiotics on the antibiotic susceptibility plate, infected animals respond poorly to intramammary or systemic antibiotics. Infected animals or quarters may require culling.

#### Management

- Maintain clean, dry, well-bedded animal areas.
- Avoid overcrowding and provide comfortable stall areas to avoid teat injuries.
- Pre-dip with an approved product and dry teats well with individual use towels before attaching milking units.
- Maintain milking equipment to avoid liner slips, improper vacuum levels, and overmilking.
- Milk animals infected with either bacteria last, or with a separate milking unit.
- Cull infected animals or quarters.

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### ***Proteus* species (*Proteus* spp (O))**

*Proteus* spp are bacteria that can be found in the animal's environment, in bedding material, feed and water. Infections generally occur between milkings when teat ends contact contaminated surfaces. It is not a common pathogen in herds but has been known to cause mastitis outbreaks. Mastitis due to *Proteus* spp is often chronic, difficult to cure, and unresponsive to antibiotics.

#### Management

- Maintain clean, dry, well-bedded animal areas. Limit access to ponds, mud, and other areas with standing water.
- Pre-dip with an approved product and dry teats well with individual use towels before attaching milking units.
- Maintain milking equipment properly to avoid liner slips, improper vacuum levels, and overmilking.
- Milk animals infected with *Proteus* spp last, or with a separate milking unit.
- Cull infected animals or quarters.

### ***Prototheca* species (*Prototheca* spp (H))**

*Prototheca* spp are algae that cause mastitis in dairy animals and have been isolated from plants, soil, mud, ponds and standing water, manure, and water troughs. These bacteria may cause acute or chronic mastitis. Clinical signs may be apparent or the infection may remain subclinical. Affected animals may experience decreased milk production and a watery mammary secretion with flakes and clots. Infections can come from teat end contact with contaminated surfaces during milking or be transferred from animal to animal at milking. These infections are unresponsive to intramammary or systemic antibiotics.

#### Management

- Maintain clean, dry, well-bedded animal areas. Limit access to ponds, mud and other areas with standing water.
- Pre-dip with an approved product and dry teats well with individual use towels before attaching milking units.
- Maintain milking equipment properly to avoid liner slips, improper vacuum levels, and overmilking.
- Milk animals infected with *Prototheca* spp last, or with a separate milking unit.
- Remove infected animals from the herd as soon as possible.

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### ***Pseudomonas* species (*Pseudomonas* spp (P))**

*Pseudomonas* spp are environmental bacteria commonly found in water, wet bedding and almost everywhere on a farm. Water supplies (ponds, troughs, wells, and wash hoses), contaminated teat dips and contaminated multidose bottles of medications can be sources of udder infections on a dairy farm. *Pseudomonas* spp gain access to the udder via teat end contact with contaminated material. *Pseudomonas* spp usually cause chronic infections that respond poorly to antibiotic therapy requiring the culling of animals or individual quarters. Infection rates in dairy herds are generally less than 1% and usually involve higher producing dairy animals in early lactation. Clinical outbreaks can occur with swelling of the udder, high fevers, and abnormal, watery milk. *Pseudomonas* spp can cause gangrenous mastitis.

#### Management

- The most effective management measure is to keep animals clean and dry, particularly in the dry animal and pre-fresh areas and avoid access to ponds, low wet areas, and standing water.
- If clinical outbreaks occur, water supplies on the dairy should be cultured.
- Pre-dip with an approved product and dry teats well with individual use towels before attaching milking units.
- Maintain milking equipment properly to avoid liner slips, improper vacuum levels, and overmilking.
- Good nutrition and control of fresh animal metabolic diseases reduce the animal's susceptibility.
- Dry animal treatment tubes should not be warmed in buckets of water during cold periods.
- For cases of severe, acute mastitis discuss treatment protocols with your veterinarian.

### ***Serratia* species (*Serratia* spp (I))**

*Serratia* spp are gram negative bacteria that are commonly found in soil and water. Exposure of udders to these bacteria occurs between milkings when teat ends contact contaminated surfaces. They may cause clinical mastitis or a major drop in milk production, and do not respond well to lactating animal antibiotic treatment. These bacteria often cause chronic infections lasting several lactations.

#### Management

- Maintain clean, dry, well-bedded animal areas. Limit access to ponds, mud, and other areas with standing water.
- Pre-dip with an approved product and dry teats well with individual use towels before attaching milking units.
- Maintain milking equipment properly to avoid liner slips, improper vacuum levels, and overmilking.
- Milk animals infected with *Serratia* spp last, or with a separate unit.
- Cull infected animals or quarters.

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### ***Staphylococcus aureus* (*Staph aureus* (R))**

*Staph aureus* are the organisms responsible for causing the most common type of contagious mastitis in dairy cattle. Udders are the usual source for new infections; however these bacteria are also found on the skin of most animals and in the environment. Mastitis caused by *Staph aureus* damages the milk producing tissues and can decrease milk production by 45% per quarter. These bacteria establish pocket areas of infection in udder tissues with subsequent abscess formation and walling-off of bacteria by scar tissue. This phenomenon is partially responsible for *Staph aureus* infections being unaffected by antibiotic therapy. In addition to milk production losses, elevated somatic cell



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counts are seen and may be accompanied by recurrent bouts of clinical mastitis. *Staph aureus* are spread primarily from an infected animal to its herdmates by milking equipment, milkers' hands, common towels and other items used during milking. It may colonize lesions on teat ends and thereby gain entrance to the gland through the teat canal. Teat injuries or teat chapping may also introduce *Staph aureus* mastitis into a herd. Calves that can cross-suckle can also spread this disease.

*Staph aureus* commonly produce chronic infections that will persist from a lactation to the following despite dry animal therapy. New infections in your animals may respond to antibiotic therapy but often these animals are infected for life. Animals that do not respond to treatment should be culled.

### Management

- Milk known *Staph aureus* animals last, or with a separate unit, for as long as they are in the herd. If possible, segregate them to their own group or area of the barn.
- Dip all teats with an approved product immediately after milking. During cold weather use teat dips containing sufficient levels of emollients to avoid chapping.
- Wear latex or nitrile gloves and frequently disinfect when contaminated with milk or manure.
- Maintain milking equipment to avoid liner slips, improper vacuum levels, and overmilking.
- Change rubber inflations every 800 individual animal milkings.
- Use effective dry animal treatments based on culturing and antibiotic susceptibility results.
- Separate calves that are fed discarded milk so that cross suckling does not occur.
- Cull chronically infected animals.
- Avoid housing pregnant heifers with dry animals when a significant number of animals in the herd are known to be infected with *Staph aureus*.
- Milk purchased animals separately and culture milk samples before mixing these animals with the remainder of the herd.

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### ***Staphylococcus species (Staph spp (C))***

*Staph spp* live on the animal's skin and in the environment, such as soil and dust. Infections may happen at milking (contagious spread) or between milkings (environmental infection). *Staph* species can cause elevated SCC in the bulk tank milk. Frequently, they are associated with faulty milking equipment, improper milking procedures or sanitation. Infections due to *Staph* species are hard to cure during lactation, and except for severe clinical signs, are not worth treating until the dry period. Control of mastitis due to *Staph* species depends on good pre-milking teat sanitation and post-milking teat dipping, as well as maintenance of a clean animal environment between milkings.

### ***Streptococcus agalactiae (Strep ag (A))***

*Strep ag* are common contagious mastitis pathogens. Most animals infected with these bacteria will not exhibit signs of clinical mastitis but will have decreased milk production and extremely high somatic cell counts. In small herds even one animal infected with *Strep ag* can raise the bulk tank cell count. These bacteria multiply only in the udder but can survive for short periods on skin and milking machine parts. *Strep ag* infections are spread from an infected animal to herd mates on hands, inflations, common towels, and other items used during milking. Calves that can cross-suckle can also spread this disease. Purchased animals can bring *Strep ag* into the herd. Use of contaminated milking equipment at fairs or auctions will also spread these infections. Because animals exhibit no clinical signs when infected with these organisms, *Strep ag* can spread insidiously throughout the herd and are usually only identified when high bulk tank somatic cell or bacteria counts are noticed.

### Management

- Culture milk from all animals in the herd.
- Treat all animals that culture positive for *Strep ag* at the same time in all four quarters with an approved intramammary treatment. Penicillin drugs are usually effective.
- Milk all infected animals last until subsequent cultures are negative. Dip all teats after milking with an approved product.
- Eliminate use of common wash towels.
- Wear latex or nitrile gloves and frequently disinfect them when contaminated with milk or manure.
- Separate calves that are fed discarded milk so that cross suckling does not occur.
- Milk purchased animals separately and culture milk samples before commingling these animals with the home herd.
- Treat all animals at dry off with an approved intramammary product.
- Cull the rare animals that do not respond to therapy.

Once *Strep ag*-infected animals have been eliminated from the herd, monthly bulk tank cultures should be done for at least 6 months to ensure that the herd is free of this mastitis pathogen.

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### ***Streptococcus dysgalactiae* (*Strep dysgalactiae*) (D)**

*Strep dysgalactiae* are bacteria that have characteristics of both contagious and environmental pathogens. They can exist in infected mammary glands and are transmitted primarily during milking. Other sources of *Strep dysgalactiae* are teat injuries and cattle tonsils, mouth and vagina. *Strep dysgalactiae* multiply at the teat orifice and readily colonize teat lesions. Therefore, control of these organisms can be achieved during lactation by milking time hygiene. *Strep dysgalactiae* are usually readily eliminated by intramammary therapy with penicillins. These bacteria may cause either clinical mastitis with abnormal milk and swelling of the gland, or a subclinical mastitis. Individual animal somatic cell counts are usually elevated and infected animals can shed millions of bacteria into the bulk tank. Culturing animals with clinical mastitis or those that have chronically elevated somatic cell counts (greater than 4.5 linear score on two consecutive DHIA tests) and conducting antibiotic susceptibility tests will provide information that will allow you and your veterinarian to design the most effective treatment protocols.

#### Management

- Minimize exposure to dirty environmental conditions. Adequate amounts of clean, dry bedding should be provided in all stalls. Inorganic bedding (sand) is associated with fewer pathogens than organic bedding (straw, shavings, sawdust, and paper pulp). Wet or soiled bedding should be removed daily. Alleys, walkways, and holding areas should be scraped free of mud and manure on a regular basis.
- Only attach milking units to clean, dry teats. Teats should be pre-dipped with an approved product and dried with individual use towels.
- Strip 4-5 squirts of milk from each teat prior to milking to detect clinical mastitis earlier.
- Maintain milking equipment properly to avoid liner slips, improper vacuum levels, and overmilking.
- Wear latex or nitrile gloves and frequently disinfect when contaminated with milk or manure.
- Establish treatment protocols based on culture and antibiotic susceptibility results and keep accurate records to determine treatment effectiveness.
- Use teat disinfection and dry animal antibiotic treatment to reduce rates and levels of intramammary infection.
- Consider dipping teats for two weeks after dry off and for two weeks prior to freshening.
- Ensure that adequate amounts of Vitamin E and selenium are fed.

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### ***Streptococcus* Group G (*Strep* Group G (O))**

*Strep* Group G (also known as *Strep canis*) are unusual streptococci that may cause bovine mastitis, but when present may involve many infected quarters within the herd. These environmental/contagious mastitis agents appear to spread somewhat like a contagious infection through the herd. It may come from dogs as well as the nose, throat, skin, and the normal flora of vagina and digestive tract of humans. Group G *Strep* mastitis is often chronic and non-responsive to antibiotic treatment, often persisting for life. They may cause mastitis outbreaks in individual herds. Pre-dipping and post-milking teat dipping should help control the spread.

#### Management

- Infected animals with non-responsive clinical mastitis or chronically elevated somatic cell counts should be considered for culling.
- Only attach milking units to clean, dry teats. Teats should be pre-dipped with an approved product and dried with individual use towels.
- Strip 4-5 squirts of milk from each teat prior to milking to detect clinical mastitis earlier.
- Maintain milking equipment properly to avoid liner slips, improper vacuum levels, and overmilking.
- Wear latex or nitrile gloves and frequently disinfect when contaminated with milk or manure.
- Ensure that adequate amounts of Vitamin E and selenium are fed.

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### ***Streptococcus* species (*Strep* spp (S))**

*Strep* spp (non-agalactiae strep) includes *Streptococcus uberis* and *Streptococcus dysgalactiae* as well as many other species of *Streptococcus* and *Streptococcus*-like organisms. The environment is the primary source for these bacteria; hence they are called 'environmental streptococci'. These bacteria can be found in bedding, manure, and mud and infections are frequently acquired during the dry period, either during the first two weeks after drying off or



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during the two weeks prior to calving. These bacteria may cause either a clinical mastitis with abnormal milk, swelling of the gland, and fever or subclinical mastitis with no apparent signs. Individual animal somatic cell counts are usually elevated and infected animals can shed millions of bacteria into the bulk tank. Most of the infections caused by strep species are eliminated by the animal's immune system or by antibiotic therapy within 60 days; however some infections (~18%) will become chronic.

Culturing animals with clinical mastitis or those that have chronically elevated somatic cell counts (greater than 4.5 linear score on two consecutive DHIA tests) and performing antibiotic susceptibility tests will provide information that will allow you and your veterinarian to design the most effective treatment protocols.

### Management

- Minimize exposure to dirty environmental conditions. Adequate amounts of clean, dry bedding should be provided in all stalls. Inorganic bedding (sand) is associated with fewer pathogens than organic bedding (straw, shavings, sawdust and paper pulp). Wet or soiled bedding should be removed daily. Alleys, walkways, and holding areas should be scraped free of mud and manure on a regular basis. Ponds, streams, and shady areas should be fenced.
- Only attach milking units to clean, dry teats. Teats should be pre-dipped with an approved product and dried with individual use towels.
- Strip 4-5 squirts of milk from each teat prior to milking to detect clinical mastitis earlier.
- Maintain milking equipment properly to avoid slips, improper vacuum levels, and overmilking.
- Wear latex or nitrile gloves and frequently disinfect when contaminated with milk or manure.
- Establish treatment protocols based on culture and antibiotic susceptibility test results and keep accurate records to determine treatment effectiveness.
- Use effective dry animal treatments based on culturing and antibiotic susceptibility test results.
- Consider dipping teats for two weeks after dry off and for two weeks prior to freshening.
- Ensure that adequate amounts of Vitamin E and selenium are fed.

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### ***Streptococcus uberis* (Strep uberis (U))**

*Strep uberis* are one of the most frequently cultured streptococci from bovine udders. Animals become infected from environmental sources between milkings when teat ends contact surfaces contaminated with manure, soiled bedding, and mud. *Strep uberis* is the most common intramammary infection contracted during the dry and pre-fresh periods. These bacteria may cause either a clinical mastitis with abnormal milk, swelling of the gland, and fever or a subclinical mastitis with no apparent signs. Individual animal somatic cell counts are usually elevated and infected animals can shed millions of bacteria into the bulk tank. Most of the infections caused by *Strep uberis* are eliminated by the animal's immune system or by antibiotic therapy within 60 days; however some infections (~18%) will become chronic. Culturing animals with clinical mastitis or those that have chronically elevated somatic cell counts (greater than 4.5 linear score on two consecutive DHIA tests) and performing antibiotic susceptibility tests will provide information that will allow you and your veterinarian to design the most effective treatment protocols.

### Management

- Minimize exposure to dirty environmental conditions. Adequate amounts of clean, dry bedding should be provided in all stalls. Inorganic bedding (sand) is associated with fewer pathogens than organic bedding (straw, shavings, sawdust, and paper pulp). Wet or soiled bedding should be removed daily. Alleys, walkways, and holding areas should be scraped free of mud and manure on a regular basis. Ponds, streams, and shady areas should be fenced.
- Only attach milking units to clean, dry teats. Teats should be pre-dipped with an approved product and dried with individual use towels.
- Strip 4-5 squirts of milk from each teat prior to milking to detect clinical mastitis earlier.
- Maintain milking equipment to avoid liner slips, improper vacuum levels, and overmilking.
- Wear latex or nitrile gloves and frequently disinfect when contaminated with milk or manure.
- Establish treatment protocols based on culture and antibiotic susceptibility test results and keep accurate records to determine treatment effectiveness.
- Use effective dry animal treatments based on culturing and antibiotic susceptibility test results.
- Consider dipping teats for two weeks after dry off and for two weeks prior to freshening.
- Ensure that adequate amounts of Vitamin E and selenium are fed.

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### ***Trueperella pyogenes (T pyogenes (T))***

T pyogenes are gram positive bacteria that is frequently the cause of 'summer mastitis'. Sources for these bacteria include wounds, abscesses, and damaged teat ends. These infections are frequently spread by flies or by teat end contact with a contaminated surface. Once an infection is established, the prognosis is poor and loss of the quarter is expected. The severe clinical mastitis caused by T pyogenes is characterized by a thick, yellow, foul smelling discharge. These infections are unresponsive to antibiotic therapy.

#### Management

- Maintain clean, dry, well-bedded cow areas. Stalls should be comfortable and overcrowding should be avoided to minimize teat injuries.
- Establish an effective fly control program.
- Separate calves so that cross-suckling does not occur.
- Pre-dip with an approved product and dry teats well with individual use towels before attaching milking units.
- Maintain milking equipment to avoid liner slips, improper vacuum levels, and overmilking.
- Milk cows infected with T pyogenes last, or with a separate unit.
- Cull infected cows or quarters.

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### **Yeast (Y)**

Yeast are microorganisms that are found in a variety of areas such as soil, plants, fruits, decaying organic matter, exudates of animals, and bedding materials such as sawdust. Other on-farm sources can be contaminated multidose bottles of medication, contaminated syringes and teat cannulas. The primary means of spread is by intramammary infusions where a strict aseptic technique has not been followed. Spread can also be animal to animal at milking when improper procedures or faulty milking equipment is used and from environment to animal. Mastitis due to yeast is usually infrequent in dairy herds, but sometimes occurs in epidemic proportions. Yeast mastitis is characterized by swelling of the gland, marked reduction in milk production, thick yellow or flaky mammary secretions and fever. Clinical signs may intensify after treatment with antibiotics. Most cases of yeast mastitis are self-limiting and animals usually return to normal milk production. Additional antibiotic therapy should NOT be used.

#### Management

- Special care during disinfection (swabbing teat ends with alcohol) and single use treatment tubes should be used.
- Avoid treatment with multidose bottles of medication.
- Strip out affected quarters and milk infected animals last, or with a separate unit.
- Pay attention to teat injuries.
- When there are multiple cases of yeast mastitis, possible source/s of infection should be identified.

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