

## ***Staphylococcus aureus* mastitis in dairy animals – Key points on characteristic, transmission, detection, prevention, and control**

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*Staphylococcus aureus* or *S. aureus* can cause clinical mastitis (especially early in lactation), however, most of the time, infection is usually subclinical, with no signs of abnormal milk or udder but only increased values of somatic cell count (SCC). Still, there are some reports showing cows infected with *S. aureus* do not necessarily have an elevated SCC. The bacteria are classified as contagious and can colonize teats and persist in teat canals, and mammary glands of infected cows spreading to other cows mainly at milking time by teat cup liners, milkers' hands, and washcloths.

Heifers infected throughout the first lactation can also act as reservoirs for infecting other cows in the herd. Still open for debate is the route of *S. aureus* infection in heifers prior to first calving. Flies can play a role, and studies have shown feeding colostrum from an *S. aureus*-infected dam can also be a likely source.

The use of antibiotics to prevent and treat bovine mastitis is common. Important to note that treatment effectiveness decreases as the cow becomes older and even as the first lactation progresses. However, *S. aureus* infections do not respond well to antibiotic therapy, thus segregation and/or selective culling of infected animals are suitable practices to control this pathogen. The efficacy of pirlimycin treatment (according to the manufacturer, one of the most effective compounds against *S. aureus* both in heifers prior to calving as in lactating cows as an extended therapy results in field cases, found very low cure rates (around 12% or less) for chronically infected *S. aureus* cows during lactation.

Numerous mechanisms allow *S. aureus* to evade detection by the immune system- it can produce toxins that destroy cell membranes, and damage milk-producing tissue eventually leading to the formation of scar tissue. The destruction of alveolar and ductal cells can also obstruct the milk ducts contributing to reduced milk yield and further scar tissue formation. The spread of *S. aureus* within the gland results in the formation of additional abscesses detected visually as lumps within the udder. *Staphylococcus aureus* can produce a large array of toxins and other virulence factors that contribute to the pathogenesis, manifestation, and severity of staphylococcal infections. A study suggests a potential role of the virulence gene (LukMF<sup>3</sup>) during intramammary infection. *S. aureus* from cows is commonly recognized as a biofilm producer, a trait frequently associated with bacterial persistence and increased tolerance to antibiotics.

With the emergence of antimicrobial resistance and consumer concern about food safety, additional strategies to control mastitis have been proposed. Over the last years, an increased number of studies have been focusing on alternative treatment using natural products, bacteriocins, bacteriophages, and nanoparticles.

**Detection of *S. aureus*** can be done initially by monitoring the herd bulk tank. In a positive herd, culturing all high SCC cows - SCC values can vary by herd (usually more than 400,000 cells/mL) is recommended. Alternatively, on herds with DHI testing, cows with elevated SCC can do a California Mastitis Test (CMT) to determine which quarters may be infected and then selectively culture positive quarters. For those herds not enrolled on DHI, the regular use of the CMT on all cows might help to identify quarters for culturing. Early identification is crucial to prevent the spread to other cows and increase the chances of control.

A more detailed mastitis **control program** can be found it here [Key points Mastitis control program 2021 Final.pdf \(osu.edu\)](#). Specifically for *S. aureus* some points, described below, are extremely important.

#### **Milking practices:**

1. Milkers should always wear **gloves** and **change** them frequently, especially **when dirty or after stripping an infected animal**.
2. **Strip** 4-5 squirts of milk from each quarter before preparing the cow. Do a strip cup test routinely to identify the cases of mastitis at an early stage. Perform stripping correctly, avoiding spreading the milk skirts in other directions than the strip cup or floor.
3. Dirt should be brushed off teats with the use of a dry, **single use towel**. **Water should not be used** as part of any milking procedures.
4. Pre-dip teats with an effective germicide (iodine, chlorine dioxide, hydrogen peroxide, lactic acid, glycolic acid, or chlorhexidine) and allow 30 seconds of contact time. Caution must be taken to ensure that adequate parts per million of the active ingredients reach the teat end and teat skin.
5. Dry teats thoroughly using individual paper towels or cloths. **Use one towel per cow**.
6. Milking units should be attached 90 seconds after first tactile stimulation (stripping or wiping, whichever comes first).
7. **Teat ends** should be **examined** for evidence of chapping, cracks, or lesions, which may harbor mastitis-causing bacteria.
8. An effective **post-milking** teat dip should be applied after milking, ensuring that the entire barrel of each teat is covered. and
9. **At the end of each milking**, discard teat dip contaminated with manure or dirt- it has lost its efficiency. **Cups** should be **rinsed** with water and allowed to **dry**.

10. Milk *Staphylococcus aureus* last or segregate those cows. If culling those cows is not possible, cows should be separated to prevent the spread of contagious pathogens. If creating a separate group is not possible, it is best to identify these animals with a leg band to ensure proper care in the parlor, such as changing gloves after prepping.

**Milking equipment:**

1. Properly functioning equipment is essential in preventing new infections. Irregular vacuum fluctuations caused by e.g. liner slips, and flooded lines, may cause a backflow of milk and bacteria can be propelled up into the teat canal and teat cistern.

There is no question that “**Prevention is the best treatment**”, and “**An ounce of prevention is worth a pound of cure**” and those are completely true for *S. aureus* mastitis.