A New Look at Old Pathogens—*Streptococcus Agalactiae* and *Staphylococcus Aureus*

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These two organisms are the most common of the contagious pathogens. Their primary reservoir is the cow herself, and in particular, the infected mammary gland. Transmission occurs mainly at milking time; vectors are the milking machine, and probably less important, hands of milkers and contaminated udder cloths.

With practical mastitis control methods now available these types of mastitis can be effectively controlled in most herds. These control measures attempt to a) reduce the spread of infection to uninfected quarters and cows, and b) reduce the reservoir of infection.

Reducing the spread of infection. As transmission occurs primarily at milking time, reducing the spread of infection depends upon effective milking time hygiene. The single most effective control measure is postmilking teat dipping with an *effective* germicidal dip. There is no evidence that predipping will have an additional benefit in reducing the spread of contagious organisms. Automated backflushing of milking units may be useful in reducing the spread of contagious organisms, especially staph (and mycoplasma) in highly infected herds. However, additional benefits of backflushing are likely to be small when postmilking teat dipping is conscientiously done.

Milking infected cows last has been recommended as a way to reduce transmission. The chief drawback of this advice is that in the absence of completed herd culture, not all infected cows can be identified. In addition, it is usually inconvenient. An alternative is to milk first lactation cows, those least likely to be infected, before the older cows.

Reducing the reservoir of infection. As the number of infected quarters in the herd is reduced, the exposure of the remaining cows is consequently reduced. The two methods of eliminating infections are a) antibiotic therapy, and b) culling.

Antibiotic therapy of subclinical infections with *Str. agalactiae* and *S. aureus* is generally not recommended because a) any increase in production during the current lactation is likely to be small and will not pay for the costs of therapy and milk withheld, and b) cure rate for *S. aureus* will likely be less than 50%. However, the possible advantages of reducing the reservoir by such treatment and the possibly higher cure rates resulting from early treatment have not been evaluated and cannot be completely discounted.

Therapy during the dry period is the most effective means of eliminating *Str. agalactiae* and *S. aureus* infections. Therapy of all quarters of all cows using an FDA-approved dry cow product is recommended. Such therapy will also reduce the new infection rate during the dry period. Use of a germicidal teat dip before and after infusion will reduce teat skin and teat canal colonization that may subsequently result in intramammary infection.

Some infections, especially those caused by *S. aureus,* will be resistant to all therapy. Although dairymen are understandably reluctant to cull good cows, the risk that they pose to other cows in the herd should be evaluated in making culling decisions.

Special characteristics of Str. agalactiae.

a. Can be highly contagious; in the absence of effective control can infect a high proportion of cows.

b. Frequently subclinical, but does increase SCC.

c. Long-standing cases result in permanent scarring and loss of secretory tissue. Production loss can be large.

d. In my experience, a high prevalence of *Str. ag.* is the most frequent cause of bulk tank SCC at or near the regulatory limit.

e. **Rarely,** *Str. ag.* infections are a cause of high bacteria counts in herd milk.

f. **OPINION:** a high prevalence of *Str. ag.* is most likely to occur in poorly managed herds.

Diagnosis of Str. agalactiae.

a. Presence of *Str. ag.* in herd milk indicates infected glands in the herd.

b. Prevalence in the herd can be estimated from culture of a representative sampling of cows selected on the basis of CMT or DHIA SCC. Include some cows with CMT 1 and 2 or DHIA SCC scores of 5-7 in the sample,

c. Complete herd culture not necessary unless treatment of all infected cows is contemplated.

Control of Str. agalactiae.

a. *Str. agalactiae* is an easily controllable disease, and eradication is possible.

b. Teat dipping and complete dry cow therapy will markedly reduce the prevalence of *Str. agalactiae* in most herds in one year and will eradicate it from many within three years.

c. Blitz therapy of all cows or of all infected cows will produce a rapid decrease in the prevalence of *Str. ag.*

However, this approach is probably indicated only in small herds in danger of losing their market.

d. *Str. ag.* responds well to therapy in both lactating and dry cows. A few older cows with long-standing infections may need to be culled.

e. Once *Str. agalactiae* is controlled, avoid reintroducing it into the herd. Avoid purchase of cows that have been milked in other herds unless they are cultured first.

Special characteristics of S. aureus.

a. The udder is the chief reservoir of infection but the organisms may exist at other sites on the cow. Teat sores are often colonized with *S. aureus.* Heifers occasionally calve with *S. aureus* infections; source is unknown.

b. Usually causes mild, subclinical infections. Occasionally it may cause acute cases and, rarely, gangrene may develop.

Diagnosis of S. aureus

a. Presence of *S. aureus* in herd milk probably indicates the presence of udder infection.

b. Prevalence can be estimated from sampling of repretative cows as for *Str. ag.*

c. It is important to differentiate between *S. aureus* and other staphylococcal species that commonly infect the udder and teat canal but are only mildly pathogenic.

Control of S. aureus

a. Teat dipping and complete dry cow therapy will effectively control *S. aureus* in most herds. Although a few herds appear to be free of *S. aureus,* it is not certain that achieving and maintaining a *S. aureus*-free herd is a practical goal.

b. Cure rates for *S. aureus* infections will usually be less than 50% in lactating cows and less than 80% after dry cow therapy. Culling of cows with Staph infections that have resisted dry cow therapy should be considered.

c. *S. aureus* isolated from mastitis are frequently resistant to penicillin and ampicillin but not to cloxacillin or cephapirin. Therefore, running antibiotic sensitivity tests may be helpful in selecting dry cow products for the herd.

d. Controlled studies of vaccination for *S. aureus* mastitis are not encouraging. There is some evidence that vaccination may reduce the severity of infection and possibly reduce the duration.

Influence of selenium (and vitamin E?) status on prevalence of mastitis. In a recent Pennsylvania study high SCC herds had lower blood glutathione peroxidase and blood selenium levels than low SCC herds. Furthermore, among the high SCC herds the prevalence of *Str. ag.* and *S. aureus* infection was inversely related to blood glutathione peroxidase and blood selenium levels. These findings from field studies are supportive of earlier work by K. L. Smith that indicated a role for selenium and vitamin E in resistance to mastitis. In the Pennsylvania study no effect of vitamin E was found, but the study was conducted in spring and early summer when vitamin E requirements were probably met from pasture and forage. In dealing with any mastitis problem herd, it is wise to insure that selenium and vitamin E nutrition is adequate.

Uncommon Mastitis Pathogens

Pseudomonas aeruginosa. Within the last year Pseudomonas outbreaks in four Pennsylvania herds have been traced to colonization of wash hoses in milking parlors. In each herd iodophors have been metered into the wash water; quaternary ammonium disinfectants have previously been reported as involved in similar outbreaks. Bacterial concentrations are highest in the water that has remained in the hose between milkings. Although we have found it difficult to completely eliminate the organism from contaminated water systems, the numbers of organisms can be reduced by replacing hoses and nozzles, assuring that iodine concentrations are correct and by flushing hoses and water lines at milking time before any cows are washed.

Most Pseudomonas infections have been subacute clinical cases with intermittent subclinical phases. Therapy has usually been unsuccessful, partly because the organism is resistant to most common antibiotics. Gentamycin is usually inhibitory *in vitro,* but response to therapy has been poor. Numbers of organisms shed in milk are often low, and the organism may be missed if small volumes of milk (.01 ml) are plated.

Mycoplasma mastitis

Mycoplasma mastitis occurs occasionally in Pennsylvania. This type of mastitis does not respond to antibiotic therapy, and because it can spread rapidly in a herd, it can be devastating. Clinical signs are rather characteristic, and when it is suspected a cultural diagnosis should be obtained as quickly as possible. Suggestive signs are:

a. all four quarters, or two quarters on a side are: usually affected.

b. cows may be off-feed and have low grade fever for a brief time, but mastitis is not usually acute.

c. there is no response to antibiotic therapy.

d. routine cultures are negative.

e. more than one cow is similarly affected.

f. purchased dry cows or pregnant heifers may have mastitis at calving.

Recommended control practices are:

a. segregation of cows with clinical mastitis.

b. excellent milking time hygiene, including postmilking teat dipping.

c. culture of all cows for mycoplasma.

d. culling of all known infected cows.

e. subsequently, all calving cows and cows with clinical mastitis should be cultured.

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