

MANAGING NEW INTRAMAMMARY INFECTIONS IN THE FRESH COW

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Milk production has dramatically increased over the past 3 to 4 decades. Producers attempt to increase milk yield as a means to increase profitability. However, several studies have demonstrated that high-producing cows are at increased risk of infectious diseases (Grohn et al., 1994). Among those diseases, clinical mastitis is the most costly disease of the dairy industry (Esslemont and Peeler, 1993). Costs associated with clinical mastitis include decreased production, cost of treatment, extra labor, and an increased rate of cow replacement (Bartlett et al., 1990).

The immune response to an incoming infection into the mammary gland is of utmost importance for the health of the dairy cow. We will not deal with the biology of the cow's immune system in this presentation. However, understanding the basic principles of the immune response is important to be able to guide dairymen in the management of risk factors and to determine reasonable goals with regard to somatic cell counts and clinical mastitis.

Mastitis and the Periparturient Period

The incidence of both clinical and subclinical mastitis is greatest in most herds during early lactation and is most often caused by opportunistic environmental pathogens (*Strep sp* and coliforms) (Barkema et al., 1998). The intramammary infection rate is 2–12 times higher during the dry period than at any other time during the lactation cycle of the cow. These infections usually persist through the dry period and are still present at parturition. They usually result in clinical mastitis at or within 60 days of calving. The proportion of all cases of clinical mastitis due to coliform infections at 2, 4 and 8 weeks postpartum are 25%, 45% and 60% respectively. Poor hygiene and frequent inattention to the dry cow nutrition causes these animals to be more readily infected by opportunistic bacteria.

Increased infection rate is not limited to the mammary system. Infectious diseases of the GI, respiratory, and reproductive system and multiple organ systems are more common at this stage of the gestation cycle of dairy cattle.

It is not the purpose of this presentation to review the immune system of the fresh cow. However, it has become clear and important to know that opportunistic infections are associated with severe compromises of host defense mechanisms and are specifically related to immuno-suppression of cattle during the periparturient period. Research has demonstrated critical PMN (neutrophil) dysfunction affecting chemotaxis and phagocytosis. Lymphocyte function at this time is depressed as indicated by depression of immunoglobulin production and decreased cytosine production. Causes for these phenomena are unknown but are believed to be associated with basic endocrine changes associated with pregnancy and impending parturition. There is a specific and broad range of suppression of antigen

specific immunity in the periparturient animal. (The purpose of this innate phenomenon – in case you wondered – is to prevent development of immunity to self, paternal and offspring antigens that could ordinarily occur with pregnancy and parturition.)

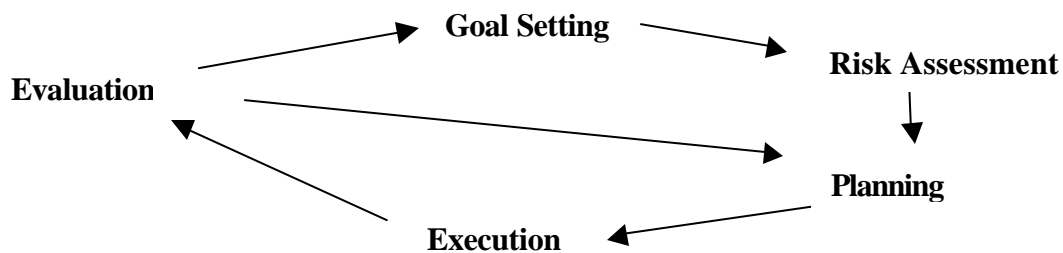
The immune mechanisms of the mammary gland of the dairy cow are complex and affected by a multitude of internal and external factors including the stage of gestation, lactation, nutritional status and the presence of concurrent disease. External factors include environmental and housing factors, health management factors such as immunization, feeding and nutritional management, and existing level of disease in the herd. The immune response of the normal healthy dairy cow is capable of resisting and clearing many infection challenges very effectively.

It has become obvious however; that the immunosuppression associated with the peri-parturient period of the dairy cow is a major contributing factor in the overall incidence of mastitis in a herd and is particularly associated with the level of opportunistic environmental infections that take place during the dry period. These infections are often expressed as clinical mastitis or elevated somatic cell counts during early lactation (first 100 days). Since the changes in immune function associated with the peri-parturient period of the cow are innate and serve a greater purpose it is more appropriate to take other more obvious steps to protect her from infection during this period. The dry period of the cow and peri-parturient period for the soon to calve heifer represent that period of the gestation cycle that is most often neglected by management. **Prevention of mastitis** and other diseases commonly associated with the early postpartum period are dependent upon a superior level of hygiene and the need to provide appropriate and adequate nutrition. Herd managers must develop specific management protocols for animals during this period.

Managing the Dairy for a Quality Product:

Dairy product prices have been depressed for the past 2 years. Production of a higher quality product is one way to affect the farm's bottom line. High somatic cell counts and mastitis negatively affects the product (milk), the cow's level of production and ultimately, the profitability of the dairy. In order to effectively manage our business to achieve a positive outcome, we must implement a "management circle" (figure 2.) approach for producing a high quality product.

Figure 2. Management Circle.



Goal Setting has two distinct components. First, Where am I going? Second, How long will it take me to get there? For example, general udder health goals may be the following:

- low mean SCC (- 200,000) in 2 years.
- low incidence of clinical mastitis (- 15%) in 3 years.
- low culling rate for mastitis (- 5% of cows) in 5 years.

Goals may be more aggressive and specific such as the following table demonstrates:

Criteria	Ideal Udder Health Targets
Bulk milk somatic cell count	- 250,000 cells/ml
Herd average (actual)	- 200,000 SCC
Herd average (DHI Linear Score)	- 3.0 LS SCC
100% of first calvers (DHI)	- 100,000 SCC
- 85% of herd	- 200,000 SCC
- 95% of herd	- 500,000 SCC
Incidence of clinical mastitis	- 25 cases/100 cows per year
Number of culls due to mastitis or related udder health problems	- 5 cases/100 cows per year

On the subject of SCC. It's no accident that some farms achieve low somatic cell counts on a consistent basis.

In fact, a Dutch study reported in the July 1998 edition of the *Journal of Dairy Science* found certain similarities among farms that maintain their SCC below 150,000. These herds pay close attention to **hygiene**. And, a number of management practices contribute to the lower cell counts, including the proper prep procedure and timing, removal of udder hair, ample bedding, clean milking parlors, consistent dry cow treatment, fresh feed in bunks as cows return after milking and nutrient supplementation for springing heifers, dry and lactating cows.

Based on this and other studies, University of Minnesota dairy scientist Dr. Jeff Reneau developed the following **Somatic Cell Count Risk Assessment Quiz**. Read each of the statements and then rate your farm on a scale of 1-5, with 5 being the best and 1 the worst. Add up your score to see how your dairy rates.

- ___ Cows have no visible manure or dirt on flanks, udder or lower rear legs and feet.
- ___ Udder hair is removed every three months.
- ___ Stalls are cleaned frequently. Soiled bedding is removed at each milking. Fresh organic (sawdust, straw, etc.) bedding is added daily, or fresh sand bedding is added weekly.
- ___ Generous amounts of bedding are used.
- ___ Dry cows are checked daily for evidence of clinical mastitis.
- ___ Calving pens are clean. Pens are completely cleaned and fresh bedding is added between calvings.
- ___ Milking parlors are clean. There is no buildup of manure or dirt on the milking equipment.

- ___ Milk is kept out of the bulk tank at least 48 to 72 hours after calving.
- ___ Post-milking teat dip is used consistently.
- ___ All quarters of all dry cows are properly dry-cow treated.
- ___ Transition diets and nutrient supplementation are used for springing heifers and dry and lactating cows.
- ___ Producers and employees keep abreast of current practices to improve milk quality and udder health by reading and/or attending workshops.
- ___ Detailed herd records, including clinical mastitis treatment records, are kept.
- ___ Milkers enjoy milking cows.
- ___ Emphasis is on getting the job done right rather than getting the job done quickly.

- ___ Total Score

Scoring system: 61-75: Excellent, keep up the good work!
 46-60: Good job. However, there is still room for improvement.
 31-45: Fair. Time to get serious about milk quality.
 30 or less: Get with it! Are you producing food or running a summer camp for bacteria?

Back to **setting goals**. To set goals specifically for your farm we use three steps. Step 1 is to evaluate the general performance of your herd. Step 2 is to evaluate udder health. Step 3 includes identification of major problems, analyzing existing data and finally, the collection of new data. This normally requires culturing, a review of management practices, housing/hygiene issues, an incidence of other disease occurrence and other factors that may influence quality milk production at your facility.

Risk assessment and **planning** looks at how cows will enter the lactation herd (both heifers or purchased cows). The new infection rate is monitored closely, both in the lactation and dry cow herds. The cure of infections are planned for by utilizing SOP's, both spontaneous cures and treatment cures during lactation and dry-off. Finally, a decision criterion is established for culling of infected cows.

Evaluation of risk factors and evaluation of udder health of the current herd is done by the following five steps:

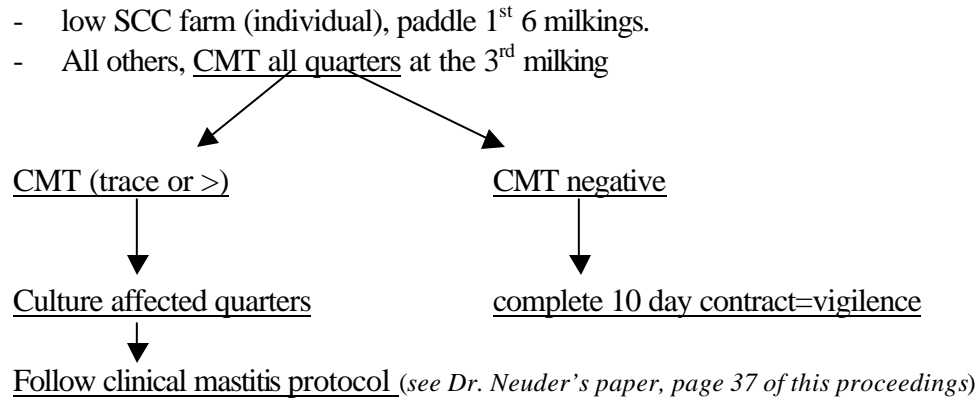
- CMT (all cows on the 3rd milking, suspect cows for the 1st 6 milkings.)
- Bulk tank monitoring. String sampling is used in large herds.
- Routine cultures of clinical cases (see attached Bulk Tank bacteria types).
- Treatment record use and monitoring.
- Milking equipment maintenance and service.

A few other very important risk factors to watch are the following:

- Milking prep and procedure – products used.
- Hygiene: clean, dry, comfortable.
- Space and stalls available.
- Isolation and culture of replacements purchased.
- Dry cow therapy / teat sealant.
- Milking time / standing time.

How to monitor the fresh cow:

1. Culture all incoming fresh cows, or all new heifers, purchased cows.
2. CMT.



3. DHIA records. Watch the farm trends and specific individuals. Note the SCC, the new IMI rate and of those “new infection” individuals, those who are cured and those that become chronic (chronic infection rate is not the same thing).

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