MASTITIS PROBLEMS IN LOW CELL COUNT HERDS

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INTRODUCTION

In the early 1990s dairy farmers in Somerset started to complain to their veterinarian that mastitis was making some cows in their herds very sick and that often it was their 'best', lowest cell count cows that were affected. This triggered much of the research into low cell counts and clinical mastitis in herds in the UK over the last ten years. Similar investigations have been carried out simultaneously in both the Netherlands and France. Some results have been consistent, others apparently contradictory. However, as the threads of the research have been pulled together some of the contradictions have proved to be complementary pieces of information.

This paper summarises the results of the last few years' observational research on clinical mastitis and somatic cell counts and attempts to identify strategies that may be adopted to reduce the problem of clinical mastitis in low cell count herds. You will see that we know far more about the problems than what we should do about them!

MASTITIS AND SOMATIC CELL COUNTS IN MILK

Mastitis and milk somatic cell count concentrations are closely linked. Milk SCC increases in response to intra mammary infection. It now appears that quarter SCC concentrations before infection affects the risk of subsequent clinical mastitis.

Current levels of mastitis

Current estimates of clinical mastitis are that it occurs at a rate of approximately 40-quarter-cases per 100 cows per year irrespective of bulk milk somatic cell count BMSCC (Figure 1). This figure has remained unchanged for almost 20 years.
There is a wide variation in the incidence of mastitis in individual herds. A recent study identified between 0 - 165.6 quarter cases per 100 cows per year in herds with a BMSCC<150,000 cells/ml (E. Peeler, pers. comm.).

**Somatic cell count - herds and cows and quarters**

Somatic cell count concentration (SCC) can be measured from an individual quarter, cow or from bulk tank milk. Measuring quarter SCC provides the most accurate estimates for studying SCC and mastitis, since both occur in individual quarters of cows, but it is not currently economically feasible on commercial farms.

**Bulk tank somatic cell count**

The economic pressure to reduce BMSCC in the UK has been intense and the current estimate is that the national herd BMSCC is approximately 170-180,000 cells/ml, although this figure is hard to verify. If this is accurate then >50% of herds have a BMSCC less than this figure.

**Cows in herds**

The BTSCC estimate is a product of each cow’s somatic cell count concentration and the volume of milk she is producing. Using data from 100 herds with a BMSCC <150,000 cells/ml, one of us found that the proportion
of cow SCC less than 20,000 cells/ml was 34% for herds when the BMSCC was <50,000 cells/ml and 13.5% for herds with a BMSCC >150,000 cells/ml. Conversely, the proportion of cows with SCC >200,000 cells/ml was 5% and 18% in these same herds respectively. These results indicate that the distribution of cow cell counts differs as BMSCC increases. There is a greater proportion of cows with very a low SCC when the BMSCC is low. Beaudeau et al., (2) demonstrated that for a given BMSCC the proportion of cows with low, medium and high SCC may vary considerably.

**QUARTER SCC AND THE RISK OF MASTITIS**

**It is better to have low SCC quarters than high, but how low?**

Edmund Peeler studied 3 herds in Somerset for 12 months. He recorded the quarter SCC concentration of all milking cows each month for one year and related these to all cases of organism specific mastitis. He found that quarters with a SCC less than 20,000 cells/ml were at an increased risk of:

a) all mastitis  
b) *Escherichia coli* mastitis  
c) *Streptococcus uberis* mastitis

Consider that 30% of quarter SCC were ≤10,000 and 50% ≤20,000 cells/ml, this risk becomes considerable for many herds (Figure 2).

**Figure 2. “J” shaped distribution of risk of clinical mastitis against quarter SCC derived from multi-level model of clinical mastitis**
Additionally, after the clinical case the quarter SCC tended to remain higher and did not always return to the pre-infection level during that lactation, so, quarters that had had mastitis tended to have a higher SCC over the whole lactation (Green et al., these proceedings). However, quarters with pre-infection levels of less than 20,000 cells/ml had a SCC similar to quarters that had not been infected.

**Increase in the severity of mastitis**

There is also evidence that when low SCC cows suffer clinical mastitis they are more likely to be sick (7). The incidence of clinical mastitis with severe systemic signs was also significantly higher in low cell count herds (3, 1, 8).

**Cow SCC and the risk of mastitis**

Just as the BMSCC is a product of volume and SCC from each cow so the cow SCC is a product of the volume and SCC from each quarter. This effectively makes the association between quarter and cow SCC quite variable. A cow with an SCC <20,000 cells/ml has a high probability of having 2 quarters with SCC <5-10,000 cells/ml. Once a cow has a SCC ~60,000 cells/ml she is likely to have only one quarter at <5-10,000 cells/ml. Effectively halving her risk of mastitis from low quarter SCC. Surprisingly, once a cow has SCC >60,000 cells/ml she appears to be at no greater risk of having more than one quarter <20,000 cells/ml than a cow with SCC >200,000 cells/ml.

So, ideally all the cows in a herd should have a SCC of 40-100,000 cells/ml. In reality this stability appears uncommon, why is not known.

**Other determinants**

Two important determinants of mastitis and somatic cell count are the host immune function and any inherited traits, both discussed elsewhere in these proceedings. Various other management factors have been linked to mastitis independently of BMSCC. Peeler et al. (5) presented those associated with herds with a BMSCC <100,000 cells/ml. These included many factors previously identified e.g. farmers that reported higher levels of mastitis had cows that leaked milk, also they cleaned loafing yards and bedded less frequently. Many of the management factors that prevented mastitis in these low cell count herds (<100,000 cells/ml) are part of the five-point plan. The one controversial piece of evidence that has now come from several studies is that the use of post milking teat disinfection is associated with higher levels of clinical mastitis in herds with a low BMSCC. However, Lam et al. (4) tested this in an intervention study and found that when producers stopped using post milking teat disinfection mastitis caused by 'environmental organisms' decreased, but in some of the herds mastitis caused by contagious organisms increased. So, use of post milking teat disinfection remains controversial.
CONTROL

We are attempting to control mastitis all the time.

What can we do?

- Ensure that the 5-point plan is being carried out properly,
- Keep lying and loafing areas and pre and post milking yards clean with cleanable surfaces,
- Consider using sand as bedding substrate,
- Record individual cow SCC,
- Monitor cows with a SCC <40,000 cells/ml and check them frequently for early signs of mastitis or systemic disease.

CONCLUSION

There is not a linear relationship between bulk milk somatic cell count and the incidence rate of clinical mastitis. There appears to be a greater proportion of severe (toxic) cases in low bulk milk somatic cell count herds. Evidence is accumulating that at the very low end of the distribution of somatic cells (<20,000 cells/ml), cows may be at higher risk of clinical cases of mastitis, or show more severe signs when becoming infected.

Clearly, somatic cells play an important role in the immunity of the uninfected and not inflamed mammary gland. A complete absence of cells would put cows at risk for disease, and the current reports suggest that a very low concentration of somatic cells increase the risk of clinical mastitis and of severe clinical mastitis.

Where the bulk tank milk SCC averages <200,000 cells/ml it appears that there are susceptible cows within the herd. Not only are the few cows with high SCC at risk of mastitis but those with low SCC (<20,000 cells/ml) are at increased risk as well. This can be a considerable proportion of the herd in herds with a BMSCC less than 150,000 cells/ml.

In herds with bulk milk SCC <150,000 cells/ml there is still sufficient variation in clinical mastitis incidence to identify some management procedures that are associated with both a low bulk milk somatic cell counts and a low incidence of clinical mastitis (5,1). However, we are far from identifying useful and tested strategies that consistently result in low levels of mastitis in low cell count herds.
REFERENCES


