HEIFER MASTITIS: CURRENT KNOWLEDGE AND OPPORTUNITIES FOR CONTROL

Chris Compton
Animal Health Centre, Morrinsville

Summary of main points

Problem...what problem?

- In most herds, heifers suffer the highest rates of mastitis apart from cows more than six years of age, and because they are the largest age group, contribute the greatest number of mastitis cases
- Both clinical and sub-clinical mastitis is costly to farmers.

Firstly, know your enemy

- The critical time to prevent new infections is in the last seven days before calving.
- *Streptococcus uberis*, a bacteria from soil, pasture and dung, is the cause of greater than two-thirds of clinical mastitis cases.

Tools available now

- "Teatseal®" used one month before the start of calving has been shown to reduce the number of heifers with clinical mastitis by at least one-third
- Manage heifers so that they are not over-conditioned or dripping milk, their udders are kept clean and they are milked soon after calving
- Identify heifers with sub-clinical infections before they join the main milking mob.

Possible tools for the future

- Genetic markers for mastitis resistance
- New heifer group management strategies.

Notes:

Problem…what problem?

Internationally, heifer mastitis has only been recognised in the last 30 years as an important problem, as distinct from the disease in older cows. Heifer mastitis is also a significant problem for the New Zealand dairy industry, with recent studies showing that 24% of dairy heifers have one or more cases of clinical mastitis early in their first lactation - a rate higher than older age groups combined (7.5%). The vast majority of these cases occur in the first week following calving (Figure 1). Because heifers are the largest age group in most herds and they have a 'tight' calving spread, there is a high rate of disease to manage at the busiest time of the year. Heifer mastitis causes increased costs for farmers from: purchasing antibiotics for treatment and higher labour costs to managed affected animals; loss of milk for sale due to production loss and need to withhold milk for sale because of antibiotic residues; and increased risks of penalties for high bulk tank somatic cell counts and antibiotic residues in milk for supply. There is also a significant welfare cost to affected heifers.

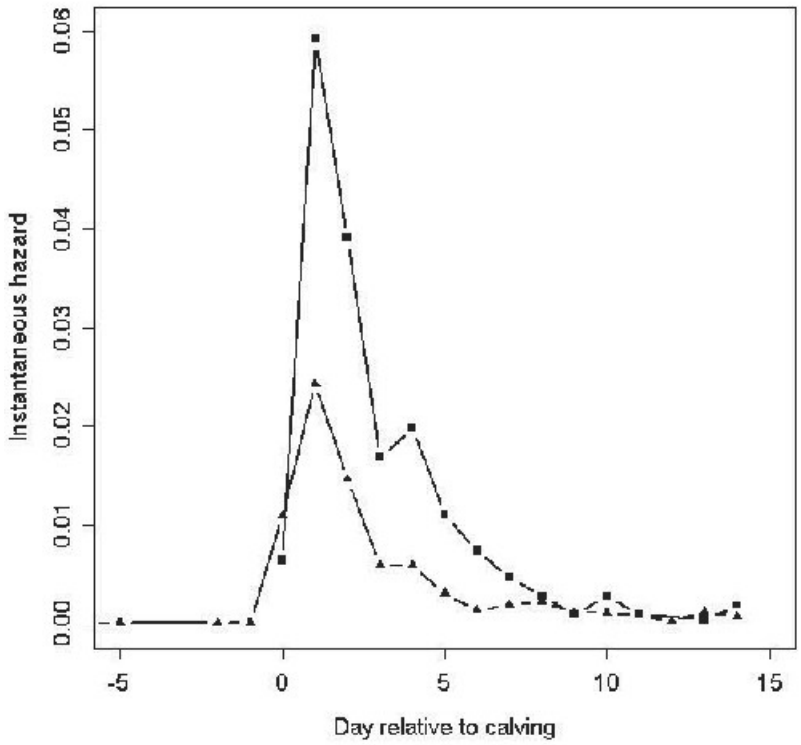

Figure 1: Daily hazard (risk) of clinical mastitis in dairy heifers (-■-) and all other age groups combined (-▲-) relative to day of calving

Firstly, know your enemy

When do most new infections occur?

Knowing when most new mastitis infections occur allows control programmes to be directed to the specific time needed for maximum effect. A previous study had found that the

majority (80%) of new mastitis infections occurred in the last 2-3 weeks of pregnancy, but the exact timing and causes were not known. In a recently completed study of 250 heifers from four herds, the following known risk factors for mastitis increased within the last 5-7 days before calving (Figure 2): increased severity of udder oedema, greater contamination of udder with mud and faeces; and opening of the teat canals. Additionally, these risk factors were more severe in rear quarters, which explains why three-quarters of infections occur in them compared to front quarters. It is likely that infections are occurring at this stage and are hidden, or incubating, until calving occurs. Farmers should be managing 'close-up' (about to calve) heifers to reduce contamination of udders, for example by minimising time on races, yards and stand-off areas and not back-fencing grazed areas. Milk-leakage and overly-tight udders pre-calving should be avoided by limiting feed quantity, and quality, to maintenance needs only. Pre-calving milking is an option for those heifers dripping milk.

Notes:

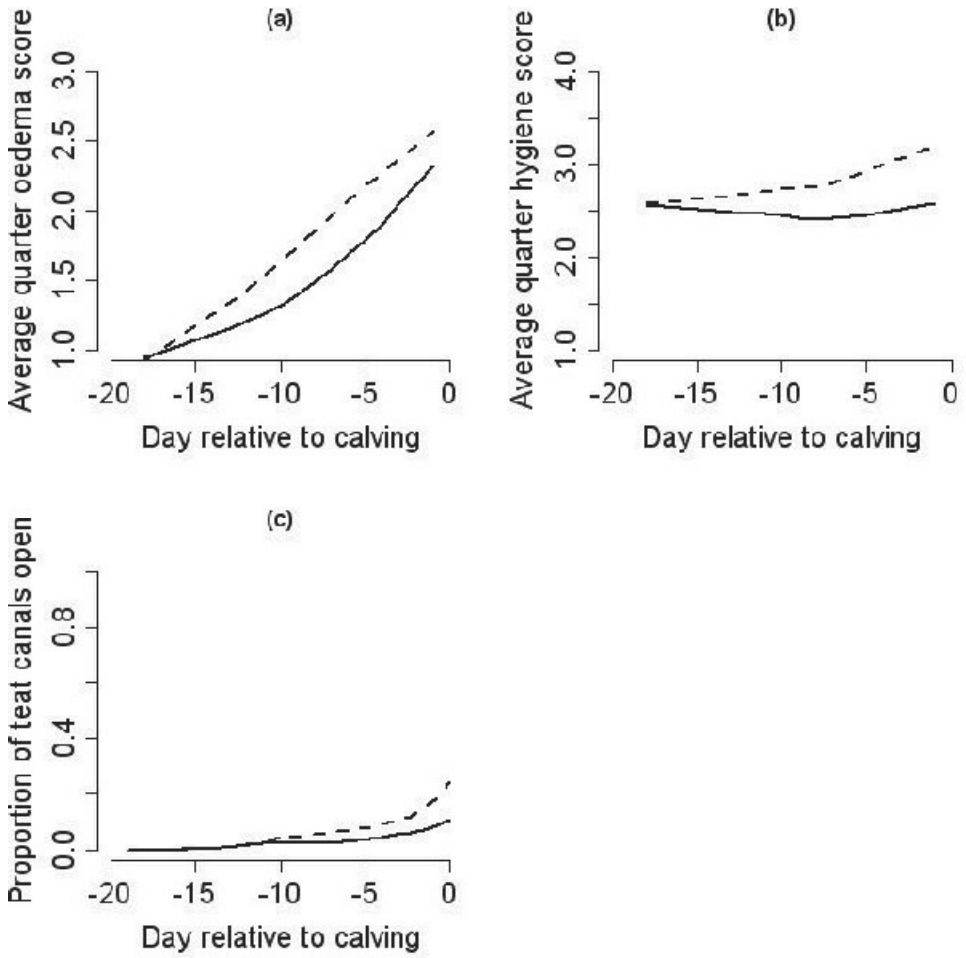

Figure 2: Change in quarter oedema* (a), quarter hygiene* (b) and proportion of open teat canals (c) for front (—) and rear (**-----**) quarters relative to day of calving. Higher scores indicate more severe oedema and poorer hygiene.

What bacteria are involved?

If farmers and their veterinarians know the bacteria that are causing the problem, they are better able to direct their control measures, as different bacteria have different predisposing factors. Streptococcus uberis has been found to cause 65% of clinical mastitis cases in New Zealand heifers, and is therefore the number one problem-causing bacteria (Table 1). These bacteria are found on pasture and soil of recently grazed paddocks and high traffic areas of races. They survive best under cool and damp conditions with low sunlight. Control of mastitis due to these bacteria is therefore directed at reducing contamination of heifer udders through avoidance of these heavily contaminated areas, and preventing milk leakage pre-calving which offers a pathway for infection into the gland.

Table 1: Number and percentage ( ) of results from culture of milk samples from 195 quarters with clinical mastitis from 163 dairy heifers

Coagulase negative staphylococcus spp.	15	(7.7)
Escherichia. coli	7	(3.6)
Staphylococcus aureus	5	(2.6)
Streptococcus dysgalactiae	6	(3.1)
Streptococcus uberis	125	(64.1)
No bacteria cultured	36	(18.5)
No sample taken	1	(0.5)
	195	(100)

Staphylococcus aureus has been found to cause fewer than 5% of cases of clinical mastitis overall, and was absent from heifers on some farms. Its main importance is that it can be difficult to treat and many infections become chronic and spread to other animals. Thus, heifers may be a reservoir of infection for these bacteria and undermine efforts to control it in herds through dry cow therapy and culling. Little is known about how these infections originate in New Zealand heifers, but infections may be due to cross-suckling or feeding of mastitic milk or be spread by flies.

Coliform mastitis (caused by a group of bacteria including *E. coli*, Pseudomonas spp., Klebsiella spp.) is not common under pasture-grazing systems, but is become more important in systems with high inputs of supplementary feeds, especially grains. In our studies, fewer than 5% of clinical mastitis cases are due to these bacteria, but with the move to intensification of production, they may become more common. Cases of coliform mastitis may be acute and severe (even fatal), and must be treated aggressively and without delay.

Coliform bacteria are faecal-borne or associated with contaminated water supplies, and hence prevention is through improved hygiene in the holding yards, feeding areas and raceways or improvements in water quality. Pre-milking teat disinfection is commonly used overseas for its control, and might be considered following professional advice (residue problems).

Notes:

Specific tools and knowledge available now

Use of Teatseal® to prevent mastitis in heifers

The prescription animal remedy, "Teatseal®", has been found to reliably reduce the incidence of clinical mastitis in heifers. Two clinical trials and four years of experience have shown that when "Teatseal®" was used one month before the start of the calving period, the number of heifers with clinical mastitis was reduced, on average, by one-third. "Teatseal®" in heifers may be economically justified when their incidence of mastitis is greater than 20%, and already many dairy clients of our practice use the product. It is critical when using "Teatseal®" that hygiene is scrupulous, and for that reason trained technicians are employed by our practice to treat the heifers.

Diagnosis of sub-clinical mastitis

A field study in five herds and 460 heifers was undertaken, where conventional milk culture and the rapid mastitis test was performed on all glands of heifers twice in the colostrum period, and the test score (severity of reaction) compared to the culture results. By day 4 or 5 post-calving, 5% of heifers were diagnosed with sub-clinical mastitis with *Streptococcus uberis.* It was found that a score 3 (on a 0 to 3 scale) on day 4 or 5 post-calving, correctly identified 86% of sub-clinical *Streptococcus uberis* infections, and only 2% were missed. Lower scores, and testing earlier after calving, gave poorer results, so adequate training of staff before performing the test is critical. Once infected heifers are identified, their milk might be withheld from supply for a period to reduce the risk of a high bulk tank milk somatic cell count or a high total bacteria count. Heifers with a score 3 were not treated, so the effect of antibiotic treatment on subsequent clinical mastitis or somatic cell count is unknown. Farmers are advised to consult with their veterinarian about options for these animals. It was concluded that the rapid mastitis test is a useful tool to detect sub-clinical mastitis on day 4 or 5 after calving, and that it should be part of a best-practice programme for milk quality.

Hay-feeding pre-calving

The effect of feeding 2.5 kg DM hay per day at least two weeks before calving in addition to pasture was examined in a study involving 530 heifers from five herds. Anecdotal reports from some farmers already doing this, and results of studies from other countries, suggested that feeding hay to heifers pre-calving reduces mastitis. However, this strategy was not proven under New Zealand conditions. Heifers from each farm were randomly divided into two groups, and managed side by side by using electric fencing, with the aim of equating dry matter intakes for each group (maintenance or approximately 8 kg DM/head/day). The control heifers were fed pasture-only and treated heifers fed pasture plus hay. Hay feeding actually increased the prevalence of heifers with sub-clinical mastitis on the day of calving (control = 25%, treated =

33%), but had no effect on days 1 to 5 after calving (control = 16%, treated = 21%). Hay-fed heifers also had a higher incidence of clinical mastitis (control = 15%, treated = 23%) in the six weeks following calving. Therefore, adding hay to the diet of pasture-grazed heifers on maintenance-only diets is not recommended for the control of mastitis. Under different management systems the effect of hay feeding may be different, but no recommendation can be made for them.

Possible tools for the future

Researchers at the Animal Health Centre are collaborating with scientists at Waikato University and Livestock Improvement Corporation to improve understanding of the immunology of the udder and genetic control of resistance to mastitis. The aim of this research is to find new ways to enhance heifer immunity to infection and to select sires which produce offspring with less mastitis.

Another area of current research is a search for effective control programmes for heifer mastitis that involve dietary changes or management, and further studies are currently underway on trace element supplementation and early milking post-calving.

Conclusion

Heifer mastitis in the pasture-grazing systems as mainly used in New Zealand is a significant animal health and welfare problem. Specific tools and advice currently exist to reduce the incidence of this disease, but further management options are required to apply at the group level.

Notes: