

Technical Series

ONLINE

Treasure the heifer

Continue protecting your investment, up until the day they calve

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Key Facts

- Heifers are the most susceptible cows in the dairy herd to mastitis.
- Heifers that are infected at calving produce less milk during their first lactation compared to uninfected heifers.
- Internal teat sealants, administered 4-6 weeks pre calving by trained personnel, have proven the most effective protection
- Regular teat spraying and/or milking within the first 12h after calving are low cost approaches that can also reduce the risk of clinical mastitis.

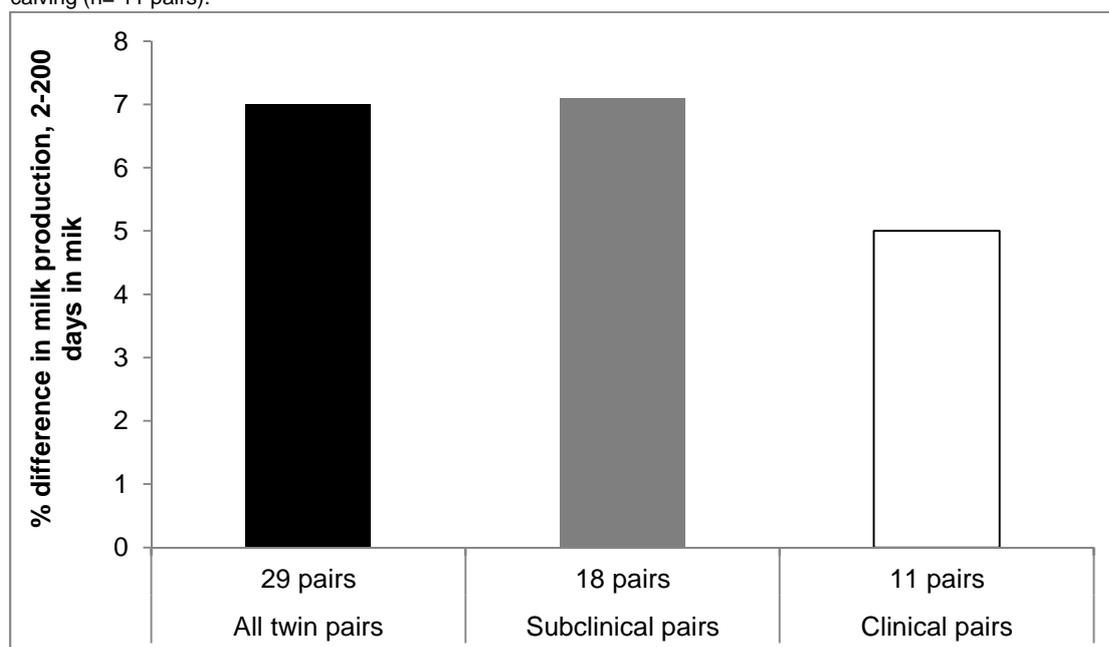
Heifers are most at risk of mastitis prior to calving. As the udder develops in size, milk often leaks from open teat canals allowing bacteria, such as *Streptococcus uberis* or coagulase negative staphylococci (CNS), to colonise the udder tissues, resulting in infection before calving.

A study using the DairyNZ identical twin herd¹ found that heifers which calved down with a subclinical *Strep. uberis* infection produced 7% less milk than their uninfected twin mates throughout their first lactation. Twins which were detected and treated for clinical mastitis due to *Strep. uberis* showed similar losses.

This degree of loss has not previously been reported because subclinical cases are usually not detected. It is possible that damage to the milk producing tissues had occurred, prior to calving.

No production losses were observed for animals that calved down with CNS infections, but these cows tended to have higher SCC throughout lactation.

Figure 1 Loss in milk production for infected identical twin heifers, compared to their uninfected twin pair, where one member had subclinical mastitis due to *Strep. uberis* at calving (n = 18 pairs) or one member had clinical mastitis due to *Strep. uberis* at calving (n= 11 pairs).



This research indicates that prevention of all *Strep. uberis* infections is important, not just the clinical cases. A number of approaches have been tested under research and field conditions, and are summarised in SmartSAMM Technote 2 – Take care with heifers.

They focus on four control points:

1. reducing the risk of udder oedema, and milk leakage;
2. reducing the numbers of bacteria at or around the teat canal before calving;
3. placing a barrier at the teat canal to block entry of bacteria; or
4. supporting the animal to deal quickly with new infections.

Before calving, farmers are encouraged to develop a mastitis management approach with the vet that works best for their herd and management system.

1. Reducing the risk of oedema and milk leakage

Oedema is the swelling that occurs under the skin of the udder and sometimes along the belly, of the heifer prior to calving. It is a significant risk factor² for heifer mastitis, but the underlying mechanisms that contribute to it are poorly understood. Contributing factors appear to include:

- excessive feeding immediately prior to calving,
- excessive dietary sodium or potassium levels
- over-fat heifers, and
- hereditary predisposition.

Hay feeding

The proportion of hay or silage in the diet pre-calving has been suggested to aid oedema and reduce milk leakage³. However a controlled study in NZ⁴, involving 531 heifers from 5 herds, whereby heifers were

supplemented with 2 kg DM hay in addition to pasture for their pre-calving diet, showed no difference in levels of udder oedema, or clinical mastitis following calving. It was suggested that the experimental design, whereby heifers were restricted in their pasture allowance to encourage consumption of the hay, created a more dirty environment before calving, and counteracted any positive impact of the hay itself.

Ionophores

Use of ionophores (e.g. lasalocid sodium and sodium monensin) has also been tested, with the intention of changing the bacterial microflora of the rumen, to reduce risk of ketosis and udder oedema.

In a study⁵ involving over 700 heifers from 11 herds, treatment with a slow-release intraruminal device 30 d before calving reduced udder oedema to some extent, and the risk of ketosis but did not lead to significant reductions in mastitis at calving.

Farmers who are concerned about udder oedema in heifers should consult with their veterinarian to identify likely causes.

Twice daily calf pick up

Milking heifers within the first 12 hours after calving is another way that may reduce udder oedema and milk leakage. It also reduces the opportunity for environmental bacteria to enter the teat canal and establish an infection.

In practice, this involves twice-daily pick up of new calves, and bringing freshly calved heifers in for milking at both the morning and afternoon milkings.

Using 480 heifers from 4 commercial herds, a NZ study⁶ found that halving the interval between calving and first milking, from 20h to below 10h, led to a 45% reduction in clinical mastitis, less subclinical mastitis and less udder oedema.

Less mis-mothering of calves and greater ease of dealing with smaller batches of freshly calved heifers were also seen as benefits by farmers involved in the study.

2. Reducing bacterial numbers at or around the teat canal

Teat spraying before calving

Using normal disinfectant teat spray at regular intervals before calving is a relatively low-cost approach for reducing the number of bacteria on heifer's teats. It can work well in situations where heifers or cows can be regularly walked over an automatic teat sprayer when moved onto new grazing breaks, or brought through the farm dairy at regular intervals.

In a NZ study⁷ involving 397 heifers from six farms, applying an iodine-based teat spray three-times weekly for the last 3 weeks before calving led to reductions in the number of *Strep. uberis* on the teat-ends at 24-48 hours before calving.

Although there were fewer *Strep. uberis* infections at calving and 50% fewer *Strep. uberis* clinical cases, the incidence of clinical mastitis caused by all pathogens was not significantly reduced.

3. Placing a barrier at the teat canal

Treatment with an internal teat sealant pre-calving

Using an internal teat sealant has proved to be the most effective strategy for reducing environmental mastitis in heifers.

It involves introducing a non-antibiotic material into the udder about 4-6 weeks before calving to provide a physical barrier to the entry of bacteria.

Figure 2 shows an x-ray image of teat sealant inside a teat.

Figure 2 An x-ray radiograph, showing internal teat sealant inside the teat of a cow (right teat, circled), compared to a teat which has not been treated (left teat).



Bismuth subnitrate, the active ingredient in internal teat sealants, is a very stable and dense material that cannot be absorbed. Once introduced through the teat canal, it stays in place, blocking movement of bacteria into the udder.

Following calving, the calf strips out some of the teat sealant when suckling, and the rest is removed by manual stripping, before attaching the teat cups. However, milking staff need to be aware that flecks of teat sealant may persist in milk for some weeks after calving and may be incorrectly diagnosed as cases of clinical mastitis.

Two NZ herd studies have proven the effectiveness of internal teat sealants. The first study⁸ involved 255 heifers and 5 herds. An internal teat sealant, infused after aseptic preparation of the teat ends approximately 1 month before planned start of calving, reduced the risk of *Strep. uberis* intramammary infection after calving by 84%, and the risk of clinical mastitis by 68%.

In a second study⁹ using more than 1000 heifers from 30 herds, teat sealant reduced the prevalence of post-calving infection by 65% and incidence of clinical mastitis by major mastitis pathogens by 70%.

Good hygiene at the time of application is imperative and some veterinary practices provide technicians to perform the task. For herds with an above average rate of heifer mastitis (15% or more heifers clinical at calving), this approach becomes cost effective.

Application of an external teat sealant pre-calving

This involves application of non-irritant latex, acrylic or polymer-based films which, when applied like a teat dip, produce a thin layer over the teat end that stops bacteria from entering the teat canal. Unfortunately these sealants last for less than a week, so reapplication is often required to improve effectiveness.

In a US study¹⁰, treatment applied approximately 10 days before calving, and again as required, reduced the prevalence of infection by all pathogens by 19%, of major pathogens by 40% and of environmental streptococci (generally *Strep. uberis*) by 50%.

In a NZ study⁵ involving 4 herds and over 400 heifers, twice weekly application of an external teat sealant before calving reduced the risk of new infections after calving by about 27%. Although infections due to major mastitis pathogens were reduced by 36%, the risk of clinical mastitis was not significantly reduced.

4. Supporting the animal to deal quickly with new infections

Treatment with long-acting intramammary antibiotics before calving

Using intramammary antibiotics to protect in-calf heifers is similar to treatment with dry cow antibiotics to protect lactating cows at dry off. A review¹¹ of US research into the efficacy of this approach concluded that:

- A single infusion of dry cow antibiotics into infected glands prior to calving led to cure rates of 67-100% for *Staphylococcus aureus* infections but benefits were only observed in herds with a high prevalence of *Staph. aureus* among heifers.
- Use of lactating cow products 1-2 weeks before calving could lead to cure rates of pre-existing infections of 59-76%, compared to 26-31%, but did not translate into lowered SCC or higher milk yields in lactation.

No benefits have been observed for prevention of mastitis by environmental pathogens, therefore this approach is not recommended in New Zealand.

Treatment with injectable, short-acting antibiotics near calving

This approach involves the use of a parenteral or injectable antibiotic treatment with a relatively short (4 day) withholding period applied shortly before calving. If administered in the last week before calving, or even on the day of calving, the withholding period would fit within the normal withholding period for newly calved cows.

This approach was tested using 597 heifers across three commercial herds in NZ¹², comparing no treatment with treatment of individual heifers with a commercial preparation of 15 million IU micronised procaine penicillin at the first milking after calving. Treatment reduced the risk of clinical mastitis within the first 7 days by more than 50% and mastitis within the first 100 days by nearly 50%.

In another NZ study¹³ with 967 heifers across 17 commercial herds, treatment with 15 million IU micronized procaine penicillin within 7 days prior to calving resulted in a 30% reduction in risk of clinical mastitis within the first 21 days after calving. The greatest benefit was observed when the treatment was administered on the day of calving.

Note that, in New Zealand, the use of any intramammary or injectable antibiotics prior to calving in heifers represents an off-label approach. These practices are not recommended due to the high cost of treatment and risks of inhibitory substance residues in milk after calving.

Other Approaches

Supplementation with selenium was tested in a large NZ study⁶, and was found to provide no benefit in otherwise Se-replete heifers.

The benefits of oxytocin in the first few days after calving to help heifers establish a milk let-down response is unproven. No advantage to mastitis control or milk production was observed when oxytocin was administered at each milking for the first 5 days after calving, compared to the normal milking routine, across 536 heifers on three commercial farms¹⁴.

Other helpful¹⁵ strategies are based on common-sense. They include: keeping udders clean by managing pasture allocation following rain; reducing the risk of dystocia or retained foetal membranes; running separate heifer and cow mobs pre- and post-calving, to reduce bullying; and pre-calving milking as a last resort for heifers with very tight udders. However the latter should be used with caution as it may increase the risk of a negative energy balance in the pre-partum period.

Which approach is best for your system?

The best approach for your herd will depend on a number of factors, which include:

- Gap in performance between current levels of clinical mastitis among first-calving heifers and industry targets.
- Farm-specific costs, management risk and likely benefits of each approach.
- Availability of infrastructure for safe administration of internal teat sealants to heifers, 4 weeks before calving.
- Availability of labour to pick up new-born calves twice per day and bring heifers in to be milked.

- Practicality of teat spraying heifers' teats 2-3 times per week, for the last 3 weeks before they calve.

For herds with more than 15 cases of clinical mastitis within 2 weeks of calving, per 100 heifer calvings, SmartSAMM recommends steps are taken to more proactively reduce heifer mastitis.

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