



How do teat sealants protect cows during the dry period?

Teatseal (Bimeda (NZ) Ltd) is a commercial product that is infused into each quarter at drying-off to physically block the teat canal and prevent infections entering the udder. It is a non-antibiotic approach to protecting uninfected quarters during the dry period.

The product is registered in New Zealand and may become available on the Australian market in future.

The concept of using a physical barrier at the teat end originated from observations that the teat canal 'closed' at drying-off through the formation of a keratin plug. The initial research for a suitable artificial teat sealant began in Ireland in the 1970s and was modified in New Zealand in the 1990s. The substances used commercially are inert, have the consistency of plasticine, and do not harden or set. After infusion, teat sealants remain in the teat sinus and canal until they are removed by suckling calves or by manually stripping the quarter.

Teatseal is composed largely of bismuth subnitrate in a liquid paraffin base (Woolford et al 1998). It is infused into the udder from individual dose plastets using a similar mode of administration as for Dry Cow Treatments. The compound remains lodged in the lower teat for at least 3-4 weeks after drying-off, and some dispersion eventually occurs in dry cow secretions in the udder. Residual levels of bismuth in bulk milk have been reported to be 10 parts per million at the first milking, declining to less than 1 parts per million within five days.

Confidence – Low

Teat sealants may be useful tools but there is no local experience of their application in Australian dairy herds.

Research priority – Moderate

Information about the use of teat sealants on commercial farms in Ireland (where the formulation contains antibiotic) and in New Zealand (no antibiotic) would be useful.

Intramammary infections in 528 cows treated with Teatseal (adapted from Woolford *et al* 1998)

Time of infection	Quarters with new mastitis infections (%)			
	Teatseal	Teatseal + Dry Cow Treatment	Dry Cow Treatment	Untreated
During the dry period ^a	0.2	0.4	0.4	3.4
At calving ^b	2.3	1.5	2.3	12.7
Total	2.5	1.9	2.7	16.1 ^c

a. Quarters that developed clinical mastitis.

b. Quarters that were milk culture positive (of which 56% of infections were *Strep uberis*).

c. Untreated quarters had significantly more new infections than other treatments ($P < 0.01$).

Only uninfected cows should be treated with Teatseal.

In contrast to the parent product developed in Ireland in 1977 (Osmonds TeatSeal, Cross-Vetpharm Group), the formulation evaluated in New Zealand is more viscous and does not contain antibiotics.

Studies in New Zealand found that Teatseal performed similarly to Dry Cow Treatments and that there was no advantage in including antibiotics with the Teatseal treatment (Woolford et al 1998).

Only cows without mastitis should be treated with Teatseal, as Teatseal contains no antibiotic and will not cure infected quarters. The absence of antibiotic in the formulation also means that special care should be taken to ensure sterile administration of Teatseal. Introduction of bacteria into the mammary gland at the time of the infusion due to poor technique can have severe consequences.

Key papers

Woolford MW, Williamson JH, Day AM, Copeman PJA. The prophylactic effect of a teat sealer on bovine mastitis during the dry period and the following lactation. NZ Vet J 1998;46:12-19.



What do teat warts look like and how are they treated?

Bovine papilloma viruses cause teat warts. Six separate virus strains have been identified that differ in appearance and cause warts in different anatomical areas (Radostits et al 1994). On teats, different strains cause 'rice grain' flat white warts (BVP-5), frond-like papillomas that protrude in a ragged fringe of up to one centimetre in length (BVP-6) and fibropapillomas that protrude from the teat surface (BVP-1).

In general, young animals are very susceptible to papilloma viruses, and usually build up immunity (from apparent or inapparent infection) before they enter the milking herd. In older cattle, papillomas are usually confined to the udder and teat and tend to increase in frequency with age.

Spread is from one animal to another, with virus usually entering through skin abrasions. Teatcup inflations and milkers' hands help transfer the virus from one cow to the next. The live virus is relatively robust, and will remain fully viable at room temperature for over three weeks.

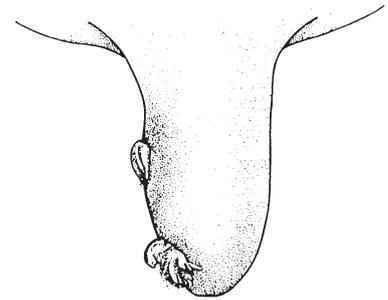
Warts can interfere with the function of the inflations and can, in some cases, block the teat canal. If they become damaged, they can serve as home for a number of mastitis pathogens (particularly *Staph aureus* and *Strep dysgalactiae*). They can also make it difficult to keep the teat clean.

Most warts are self-limiting and disappear within 5-6 months. The frond type can be physically removed. If there is a major problem in a herd, an autogenous vaccine can be made from wart tissue from cows in the herd. Type-specificity is high, so vaccines must include all serotypes and tissue types responsible for the outbreak. The response of the low, flat warts to vaccination is relatively poor.

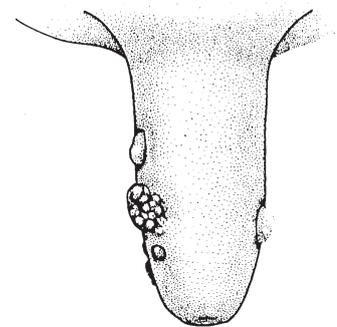
Iodine teat disinfectants with emollients are recommended to keep teat skin healthy and keep damaged warts clean.

Key papers

Radostits OM, Blood DC, Gay CC. Viral diseases characterized by skin lesions. In: Veterinary Medicine, Chapter 22, 8th edition. Bailliere Tindall, London, 1994:1127-1137.



Frond-like warts



Nodular warts



What tests, apart from bulk milk cell counts, are useful in assessing milk quality?

A number of tests are conducted on milk samples from farm vats. Vat tests that relate specifically to mastitis are bulk milk cell counts and bulk-tank milk cultures. Other tests, such as a total plate count or Bactoscan, are primarily related to milk quality issues.

Bulk-tank milk cultures

Bulk-tank milk cultures may help identify organisms present in the vat and provide information on the cleanliness of milk harvesting techniques and equipment, and the adequacy of milk cooling. Dairy advisers sometimes submit vat samples to laboratories as part of mastitis investigations.

To obtain samples that are representative, the vat must be well mixed by turning on the agitator 10 minutes before sampling and samples taken from both the top and bottom of the tank (Mackie 1997). The methods used to collect and store samples are critical to prevent overgrowth with micro-organisms, and appropriate arrangements must be made to ensure samples are maintained at refrigeration temperatures. It is not advisable to make diagnostic decisions based on a single test – a series of at least three is recommended.

The procedures for culture of vat samples for bacteria originating from within the udder has been developed and refined in the United States over the past 15-20 years (Guterbock and Blackmer 1984), but few formal analyses of its usefulness as a diagnostic test for mastitis have been conducted. Vat culture is reported to have a low sensitivity for the major mastitis pathogens. Although herds infected with *Strep agalactiae* are expected to have high numbers of bacteria in milk, Godkin and Leslie (1990) found they were only detected reliably by repeated cultures. This experience has also been observed in the field in Australia.

Further studies are required to identify methods to increase the sensitivity of this screening test, including establishing appropriate sampling regimens on farm, and selective media and inocula sizes in laboratories. Although it is tempting to use bulk-tank milk to identify potential pathogens, isolated organisms do not necessarily originate from mastitic cows. For example *Strep uberis* is ubiquitous in the environment and able to multiply in raw milk cooled below 10°C, so isolation from the vat does not necessarily indicate infected quarters. More direct links between the bacteria isolated from vat milk samples and the cause of mastitis can be established by sampling individual cows.

[Technote 4.3 discusses milk cultures from individual cows.](#)

Total plate count

Total plate counts provide accurate counts of bacteria in vat milk. The presence of bacteria is established by incubating a diluted sample of vat milk on agar plates (with special growth media) for 72 hours at 30°C. The bacterial that grow are counted and the total number in the original sample is estimated according to the dilution factor used.

Counts may be high if:

- there are problems with washing equipment or refrigeration of the milk; and
- wet or dirty cows are milked, with bacteria from the cows' skin and hair washing into the milk.

Although mastitis can cause an increase in total plate counts, this situation is not common. High total plate counts are occasionally seen in herds with *Strep agalactiae* infections.

Bactoscan

The Bactoscan has largely replaced total plate counts because the number of living bacteria in a milk sample can be estimated in five minutes (rather than the three days required for cultures). The Bactoscan machine counts bacteria with the aid of a fluorescent dye. These machines are subject to regular documented calibrations to ensure their accuracy.

Thermoduric count

Thermoduric counts are the number of bacteria per millilitre of milk that survive laboratory heat treatment. High thermoduric counts indicate poor equipment cleaning and sanitation problems.

Milk samples are held at 62.8°C for 30 minutes, cooled for 10 minutes, then incubated for 72 hours at 30°C. The equivalent diagnostic test in the United States is the Laboratory Pasteurised Count (LPC), where samples are incubated for 48 hours at slightly higher temperature (32°C).

Using multiple tests to troubleshoot milk quality problems with high bacterial counts

High bacterial counts can arise from organisms passed in the milk or from bacteria contaminating equipment. Problems of milk quality due to high bacterial counts can be investigated using a combination of tests such as total plate counts, thermoduric counts and coliform counts (where coliforms specifically are estimated). The approach is to take milk samples from the bulk tank at different times during milking and from different locations in the milking plant. This helps to differentiate high bacterial counts arising from problems of pre-milking hygiene, equipment cleaning and sanitation, and incubation of bacteria in the milk handling system from mastitis pathogens (Reinemann et al 1997).

Guide to troubleshooting milk quality (Mein 1999)

Test	Examples of milk quality categories			Interpretation
	Excellent	Adequate	Warning or penalty	
BMCC (cells/mL)	<200,000	200,000 – 400,000	>400,000	Mastitis may be a cause of high bacteria counts if both the BMCC and Bactoscan readings/ total plate counts are high.
Bactoscan band (estimated bacteria/mL)	<80,000	–	≥80,000	
Total plate count (colony forming units/mL)	<10,000	10,000 – 20,000	>20,000	
Thermoduric (count/mL)	<1,500	1,500 – 3,000	>3,000	Elevated thermoduric counts generally result from equipment cleaning and sanitation problems.
Coliform (count/mL)	<100 (low)	100 – 500 (medium)	>1,000 (high)	Medium elevations in coliform counts generally result from inadequate milking hygiene (cups on wet teats, manure on cups, etc). High elevations often result from incubation in the milking system during long milking shifts (e.g. bacterial growth on milk filters).

Key papers

- Godkin MA, Leslie KE. Culture of bulk tank milk as a mastitis screening test: a brief review. *Can Vet J* 1993;34:601-605.
- Guterbock WM, Blackmer PE. Veterinary interpretation of bulk-tank milk. In: *Veterinary Clinics of North America Large Animal Practice* 1984;6:257-268.
- Mackie J. Bulk tank milk analysis: its role in troubleshooting mastitis and bacterial contamination of milk. In: *Proceedings of the Australian Association of Cattle Veterinarians* 1997:49-56.
- Mein GA. Trouble-shooting high bacteria counts in farm milk: Part 1a Routine milk quality analysis. In: *Post Graduate Foundation in Veterinary Science Proceedings 321, Machine milking, mastitis and milk quality course notes, University of Sydney* 1999:356.
- Reinemann DJ, Mein GA, Bray DR, Reid D, Britt JS. Troubleshooting high bacteria counts in farm milk. In: *Proceedings of the 36th National Mastitis Council Annual Meeting, Albuquerque, New Mexico, 1997:65-79.*



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An Index to the contents of the
Countdown Downunder Technotes and
associated FAQs can be found
between the Introduction section
and Technote 1.