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DRYING OFF

TECHNOTE 14

Decide dry cow management strategy

At the end of lactation, dairy cows require a dry period that is sufficiently long to allow the udder tissue to repair and rejuvenate.

Alveolar cells, the cells that synthesise milk, collapse and the number of active alveolar cells declines to a minimum during the early dry period (Capuco *et al* 1997; Wilde *et al* 1997). New secretory tissue is laid down when cows start to 'freshen' ready for calving, so that the total amount of secretory tissue increases from one lactation to the next.

A minimum of six weeks (and preferably eight weeks) is recommended between dry off and calving for regeneration of udder tissue. A significant reduction in production has been observed when the dry period is less than 20 days (Sawa *et al* 2012, Kok *et al* 2017).

Another physiological change, which occurs at the start of the dry off period and is critical for preventing new infections over the remainder of the dry period, is closure of the teat canal with a keratin plug made from the cells lining the teat canal (Williamson *et al* 1995; Dingwell *et al* 2004). More than 20% of quarters do not have a teat plug by six weeks after dry off.

Factors such as the presence of teat end cracks or lesions, the level of milk production before dry off (Dingwell *et al* 2004) or milk flow rate before dry off (Summers *et al* 2004) have been associated with delayed closure of the teat canal after dry off.

Antimicrobial resistance

Increasing antimicrobial resistance (AMR) is an issue in human and animal health. The New Zealand dairy sector needs to demonstrate leadership in managing antimicrobial use and resistance, to protect market access, while maintaining standards of animal welfare and using antibiotics appropriately.

Antimicrobial stewardship is one of the five key objectives of the New Zealand AMR action plan, and in support of this plan, the New Zealand Veterinary Association (NZVA) produced an AMR Strategy in July 2015. One component of this plan is to work towards the use of selective DCT on dairy farms in New Zealand. To support this, the NZVA and the Dairy Cattle

Confidence – High

World-wide experience supports the recommendation of a 6-8 week dry period.

Research priority – Low

Terms used in Technote:
Whole Herd DCT = Blanket DCT = use of an antibiotic dry cow treatment across all cows in the herd at dry off.

Targeted or Part Herd DCT = Selective DCT = use of an antibiotic dry cow treatment across selected cows in the herd at dry off.

The New Zealand antimicrobial resistance action plan was released in August 2017 by the Ministry of Health and Ministry for Primary Industries. Available at: **https://www.health.govt.nz/publication/new-zealand-antimicrobial-resistance-action-plan**

Veterinarians (DCV) of the NZVA published a position statement, stating that

> "*the use of dry cow therapy (DCT) in non-infected cows is no longer appropriate in an era of effective alternatives such as internal teat sealants (ITS) and improved management practices. By 2020, DCT will only be used in the treatment of existing intramammary infections*".

Antimicrobial use for treatment and control of mastitis is the major indication for antibiotic use in New Zealand dairy cows. For herds with a low bulk milk somatic cell count, low incidence rate of clinical mastitis and low culling percentage for mastitis-related problems, it is likely that few cows are truly infected at drying off. For these herds, routine use of antimicrobials in every quarter of every cow at the end of lactation is not justified. Internal teat sealants should be used in preference to antibiotic dry cow therapy to prevent new infections over the non-lactating period, in those cows unlikely to be infected at drying off.

14.1

Calculate dry off dates to ensure that all cows get at least a six-week (preferably eight-week) dry period.

Confidence – High

In seasonal calving herds, cows with high cell counts in late lactation can contribute significantly to a high bulk milk SCC.

Research priority – Moderate

It is unknown if a longer dry period benefits cows with a high SCC by allowing more time for resolution of infections by antibiotic DCT or self-cure.

Accurate expected calving dates are obtained through the combination of artificial breeding and/or natural submission information and early-aged pregnancy testing (cows tested at 6-16 weeks pregnant). These provide the best estimate of optimal drying-off dates.

The optimal dry period length is 6 to 8 weeks. This allows cure of existing intramammary infections and replacement of secretory cells within the mammary gland. Observational studies from North America (Kuhn et al 2006a, Kuhn *et al* 2006b) and Europe (Sawa *et al* 2012, Kok *et al* 2017) have found that milk production is maximised with dry period lengths of approximately 40 to 60 days.

A systematic review by van Knegsel *et al* (2013) reported that shorter dry periods were associated with a 4.5% decline in milk production in the subsequent lactation, an improved postpartum negative energy balance and a better body condition score, but no effect on incidence of mastitis, metritis, retained placenta, or displaced abomasum, and variable effects on subsequent reproductive performance.

In herds that operate split calving, keeping track of individual cow dry periods can be difficult. Care should be taken to ensure that all cows experience a dry period of at least 6-8 weeks (42-56 days).

In New Zealand, most cows will have a dry period that is longer than 60 d, with many having a dry period longer than 100 days. For cows treated with DCT alone, an increased risk of a new IMI with increasing length of dry period was reported in observational studies (McDougall 2010, Bryan *et al* 2011). Use of an internal teat sealant may provide extended protection in the dry period (Berry & Hillerton, 2007, Laven et al 2014) for cows that are likely to have an extended dry period.

Such cows can include young or low body condition cows that are being dried off early to maintain body condition, high SCC cows that are being

dried off early to manage milk quality in the bulk tank, or mobs of cows that are being dried off early to manage feed supply in times of drought.

It is also important to know the length of the dry period to ensure selection of the most appropriate antibiotic DCT, to minimise the risk of antibiotics in the milk in the next lactation.

14.2

Dry off high SCC cows early to help lower bulk milk SCC.

Technote 12 describes how to use individual cow SCC for management decisions.

14.3

Collect data to assess herd level risk of mastitis.

The following should be assessed when making culling and dry off decisions:

- Level of intramammary infection approaching drying off,
- Risk of acquiring new infections over the non-lactating period and in subsequent early lactation,

Herds with a low prevalence of infection at drying off, and a low risk of new intramammary infection over the dry period, should not use antibiotic DCT in every quarter of every cow.

A targeted or selective approach to antibiotic DCT involves identifying those cows that are likely to be infected and treating only these with antimicrobial treatment at dry off.

The data typically required to establish prevalence of intramammary infection before drying off, and likely risk of new infections in the dry period, include:

- bulk milk somatic cell count,
- individual cow somatic cell count,
- clinical mastitis treatment records and
- bacteriological culture results.

When individual cow SCC records are available, the DairyNZ Mastitis Focus Report can be used to assess the spread of infection relative to industry best-practice trigger levels. Analysis presented within the Mastitis Focus Report is enhanced when clinical case information is available and incorporated.

14.4

Plan to use appropriate treatment and prevention for all cows in the herd.

Confidence – Moderate

The guidelines described in SmartSAMM Guideline14 and this Technote are based on field experience and experimental observations of DCT in NZ.

Research priority – Moderate

The long-term (multi-year) consequences of Part Herd (Selective) antibiotic DCT have not been determined.

Antibiotic DCT is used to:

- Treat existing infections

  Formulation of antibiotic DCT is designed to ensure that antibiotic concentrations remain above the minimum inhibitory concentration for a determined number of weeks, maximising the chance of cure. Bacteriological cure rates of existing infections under New Zealand circumstances are between 80 and 90% (McDougall 2010; Bryan *et al.* 2011). However, quarters infected with *Staphylococcus aureus* have cure rates of only 60 to 70% (McDougall 2010).

Internal teat sealants (ITS) are used to:

- Protect uninfected quarters from becoming infected during the dry period

  This helps reduce the prevalence of mastitis at calving, which can lead to a lower incidence of clinical mastitis and lower cow SCC in the next lactation (Woolford *et al* 1998; Berry and Hillerton 2002). The use of ITS alone reduced the risk of a new intramammary infection by 73%, relative to no treatment, and 25%, relative to antimicrobial treatment (Rabiee and Lean 2013).

- Extend the period of protection when used in combination with antibiotic DCT.

  This is achieved by maintaining an effective teat seal in cows with a dry period longer than the period of protection offered by DCT alone. This might be appropriate for cows with extended dry periods (i.e. beyond eight weeks). Use of a combination of DCT and ITS reduced the risk of new infection, relative to DCT alone, in cows with a high somatic cell count in the preceding lactation (Berry and Hillerton, 2007, Bradley *et al* 2010).

  Under New Zealand conditions a combination of ITS with DCT in high SCC cows resulted in approximately 40% decline in risk of clinical mastitis, relative to DCT alone (Bates et al. 2016).

Most internal teat sealants contain the non-antibiotic product, bismuth subnitrate, and several ITS products are now available in NZ.

Selecting a herd approach

The most appropriate strategy must be planned with a veterinarian. **The SmartSAMM recommendation is to ensure that all cows are protected by some form of treatment during the dry period.**

In most herds it is appropriate to use a targeted or selective approach, whereby a proportion of the herd that are considered "at risk" of being infected are treated with antibiotic DCT. All cows then also receive an ITS.

In some herds with a high proportion, or prevalence, of infected cows at dry off, vets may choose to prescribe whole herd DCT (Table 1). This should be part of a comprehensive mastitis management plan towards more selective use of DCT.

Table 1. Indicators of a high herd prevalence of infected cows at dry off and high incidence of new infections over the dry period.

Measure of infection	Criteria indicative of herds with a high risk of mastitis*
Bulk milk SCC	Seasonal average is equal to or above 250,000 cells/mL
Clinical mastitis in dry period	2 or more cases/100 cows over the dry period
Clinical mastitis in early lactation	10 or more cases per 100 cows in the first month of lactation
Individual cow SCC in early lactation	More than 25% of herd with cow SCC over 150,000 cells/mL at herd tests in first six months of lactation
Dry period new infection rate	15% or more of cows have an increase in SCC from below 150,000 cells/mL, to above 150,000 cells/mL, over dry period

* For herds to be considered eligible for whole herd antibiotic DCT, it is recommended that all five criteria are met, or three criteria if no individual cow SCC data is available.

Treatment for infected cows

Antimicrobial therapy is appropriate for those cows likely to be infected (that is, having a high individual SCC), and will likely result in a bacterial cure rate of about 80% of infected quarters (McDougall 2010, Bryan *et al* 2011).

A combination of both DCT and ITS in cows likely to be infected has been shown to reduce the new infection rate, reduce the clinical mastitis incidence rate and reduce the herd test SCC in the subsequent lactation, compared with dry cow antimicrobials alone (Runciman *et al* 2010, Bradley *et al* 2011).

Predicting if a cow or quarter is likely to be infected at drying off

Microbiological culture of milk samples, collected aseptically from each gland towards the end of lactation, provides the strongest evidence that a quarter or cow is infected in late lactation. However, the logistics of collecting large numbers of milk samples, with aseptic teat preparation, and undertaking laboratory work with associated costs, means that culture-based decision-making is not yet practical for the majority of New Zealand herds.

Decisions at dry off therefore, are typically based on indirect markers of infection status, such as somatic cell count (SCC), rapid mastitis testing (RMT), conductivity testing, or herd management software.

A single herd test SCC, determined in the last 80 days prior to drying off, has been shown to be as predictive as having up to four herd tests across lactation, as a basis to define if a cow is infected with a major pathogen, or otherwise at drying off.

In a study involving 36 herds across New Zealand (McDougall *et al* 2017), in which all four quarters from an average of 72 cows per herd were sampled at dry off, 8.6% of quarters cultured bacteria, but only 2.4% of quarters (7.2% of cows) were infected with a major pathogen (i.e. *Staphylococcus aureus*, *Streptococcus* species or *Escherichia coli*).

For detection of quarters infected with a major pathogen, the sensitivity (Se, i.e. the proportion of truly infected quarters detected) and specificity (Sp, i.e. the proportion of quarters defined as uninfected that truly were uninfected), were 0.85 and 0.72, respectively, when using a maximum cow SCC of >150,000 cells/mL as the cut-point, and when the last herd test was within 80 days before drying off (Table 2).

Putting that in context, if a herd of 500 cows were to be dried off, and there was a 7.5% cow-level prevalence of major pathogens, then:

- 6 cows with a major pathogen infection would be false negatives, i.e. defined as uninfected due to a SCC ≤150,000 cells/mL, and
- 159 cows with no major pathogen infection would be false positive, i.e. defined as infected due to a SCC >150,000 cells/mL (Table 2).

So, assuming all cows with a maximum SCC above150,000 cells/mL would be treated with antibiotics and those below the cut-point would be infused with a non-antibiotic alternative such as ITS, this would mean that 128 cows, free from a major pathogen infection, would be treated with antibiotics, and conversely, 6 cows, infected with a major pathogen, would be treated with ITS.

Table 2. Classification of cows (number of cows) using various maximum cow somatic cell count (SCC x1,000 cells/mL) to define cows as likely to be infected with a major pathogen compared with actual, quarter-level culture results, where a cow was defined as infected with a major pathogen if one or more glands were culture-positive for a major pathogen. This table models a cow-level prevalence of a major pathogen infection in one or more glands at dry off, of 7.5% in a group of 500 cows.

Cut-point	Max SCC	N cows infected	N cows uninfected or minor pathogen	Se[1]	Sp[2]	PPV[3]	NPV[4]	N tubes DCT[5]
125	Above	33	154	0.88	0.67	0.17	0.99	**748**
	At or below	4	308					
150	Above	31	**128**	0.85	0.72	0.19	0.98	**636**
	At or below	**6**	333					
175	Above	30	107	0.80	0.77	0.21	0.98	**548**
	At or below	7	354					
200	Above	29	94	0.78	0.79	0.23	0.98	**492**
	At or below	8	367					
225	Above	26	82	0.71	0.82	0.24	0.97	**432**
	At or below	11	380					

[1] Sensitivity

[2] Specificity

[3] Positive predictive value

[4] Negative predictive value

[5] Assuming that only cows with one or more SCC above the SCC cut-point would be treated with antibiotic DCT (1 tube/gland).

For example, using a SCC cut-point of 150,000 cells/mL would mean that:

- 85% (31/37) of cows would be correctly identified as infected, of all cows identified as infected (**Se**),
- 72% (333/461) of cows would be correctly identified as uninfected, of all cows identified as uninfected (**Sp**),
- 19% (31/159) of cows over the threshold would be truly infected (**PPV**),
- 98% (333/339) of cows under the threshold would be truly uninfected (**NPV**) and therefore, could be treated with ITS.

Alternatives to herd test SCC

Where herds do not undertake herd testing, alternatives such as a hand-held rapid mastitis test (RMT), or automated conductivity or somatic cell measures via the milking management system, may be used to define intramammary infection status.

A benefit of the RMT is its flexibility with regard to time, in that it can be carried out close to dry off and requires no laboratory or third-party coordination. Conductivity measured at a cow-composite level, or at quarter-level, is less predictive than RMT, and use of a combination of conductivity and RMT appears to add little value, above using RMT alone (Gohary and McDougall, 2018).

When an RMT cut-point of Trace or above for any quarter in a cow is used, the Se, Sp, PPV, and NPV were found to be 0.80, 0.50, 0.11, and 0.97, respectively. At quarter level, the Se, Sp, PPV, and NPV were found to be 0.93, 0.58, 0.05 and 0.99, respectively, in the same dataset. Thus, in the absence of any herd test data, RMT score, particularly at quarter level, provides a reasonable alternative to SCC.

Using the same 500 cow herd example as above, when the true cow-level prevalence of major pathogen infection was 7.5% (or 2.5% at quarter level), use of an RMT score of Trace or above, for one or more quarters within a cow, categorised 259 cows as infected. If all quarters of these cows were treated, a total of 1,036 tubes of DCT would be used (Table 3).

If decision-making occurred at the quarter-level, that is, only quarters with an RMT score of Trace or above were treated, then a total of 644 tubes of DCT would be used (Table 2). Use of this approach could reduce antimicrobial use by 49% (cow-level) or by 68% (quarter-level), when compared with the 2,000 tubes required if whole herd DCT was used.

Table 3. Number of cows or quarters classified as rapid mastitis test (RMT) positive (Trace or above) and the presence or absence of a major pathogen infection at the time of drying off. This table assumes a cow-level prevalence of a major pathogen infection in one or more glands at dry off, of 7.5% for 500 cows.

		Major pathogen infection		Total number of tubes of antibiotics used
		Yes	No	
Cow-level	RMT +	29	230	(29+230) x 4 = **1036**
	RMT-	7	233	
Quarter-level	RMT+	31	613	31 + 613 = **644**
	RMT-	13	1341	

Important reminders for farmers and advisers

1) The appropriate dry cow strategy for a herd is dependent on the prevalence and incidence of intramammary infection within the herd.

Confidence – Moderate

Because no antibiotic product is 100% effective, choices for a specific farm must be made on pathogens known to be present, and on the herd's previous response to antibiotic therapy.

This in turn, is dependent on mastitis management strategies employed within the herd. When there is a high prevalence of infection in the herd, it may be appropriate to use whole herd DCT in the short term while other mastitis control measures such as effective teat disinfection, machine maintenance, staff training, culling etc. are implemented. However, whole herd, or blanket, DCT should not be used as a substitute for other mastitis control measures.

Other factors need to be considered when prescribing DCT and ITS, such as the capability of the on-farm team to implement mastitis control programmes, including diagnosing and treating clinical mastitis cases, applying teat disinfectant effectively, infusing intramammary products with good aseptic technique, and manage the risks associated with antimicrobial and bismuth (i.e. teat sealant) residues in milk.

Chronically infected cows are less likely to respond to DCT than more recently infected cows.

Where ICSCC are available, cows that a) had high SCCs in the previous lactation, b) were treated with an appropriate DCT at dry off and c) continue to have a high SCC the following lactation, could be considered as chronically infected and culled.

2) Numerous studies have demonstrated the efficacy of ITS in reducing new intramammary infections over the dry period.

A meta-analysis found that ITS-alone is more effective than DCT-alone in reducing new intramammary infection rate over the dry period (Rabiee and Lean 2013). For low SCC cows, there is also clear benefit of ITS-alone, over no treatment, under New Zealand management systems. This is in terms of reducing the incidence of new intramammary infection, and hence prevalence of infection at calving in both heifers and cows (Woolford *et al* 1998, Compton *et al* 2014), and for reducing incidence of clinical mastitis and a high individual cow SCC in early lactation (Laven and Lawrence, 2008, Compton *et al* 2014, Bates and Saldias 2018).

3) NZ studies have demonstrated that the majority of infections present at drying off undergo spontaneous cure, when ITS is applied.

It was assumed that no bacteriological cure would occur if ITS was infused in a gland with an existing infection at drying off (Berry et al. 2004). A retrospective analysis of three studies, involving 4,655 quarters from cows with a somatic cell count <200,000 cells/mL and infused with ITS-alone, found that 1.5% of the supposedly uninfected quarters that received ITS-alone were actually infected with a major pathogen (*Staphylococcus aureus* or *Streptococcus* species) at dry off. Over the dry period, 3% of these infected quarters were diagnosed with clinical mastitis, but 92% of these major pathogen infections cured (McDougall and Compton 2015).

Similarly, a study in Southland found a 72% cure rate of existing infections following ITS alone infusion (Lacy Hulbert *et al* 2016). In that same study, 100% of low SCC cows treated with DCT cured. It should be noted in this study that the great majority of infections were associated with CNS and *Corynebacterium* species, with less than a quarter of the infections being associated with major pathogens.

Finally, in a study where quarters were allocated to DCT treatment, based on a positive RMT test (i.e. Trace or greater), with quarters with a low RMT score being treated with ITS alone, the bacteriological cure rate of existing

infections was 85% versus 95% for quarters treated with ITS-alone versus DCT and ITS (McDougall et al. unpublished). Hence, it can be concluded that, although treatment of infected quarters with ITS-alone results in a lower bacteriological cure rate than when DCT, or DCT and ITS are infused, the difference in cure rate is less than 25%. Putting that in context, if all low SCC cows in a herd were treated with DCT, and only a small percentage of these cows were actually infected, the reduction in prevalence of IMI at calving in the herd would be very small, despite potentially a 2 to 3-fold increase in antibiotic use.

4) **When ITS-alone is prescribed, support for herd owners and staff is required to ensure hygienic application of product.**

Factors such as handling facilities, number of animals to be dried off, training and skill level (and patience) of the farm team, feeding and paddock selection before and after dry off, all need to be considered.

For farms that have not yet used ITS-alone, formal training and monitoring of the infusion technique is highly recommended. A useful training technique is to ask the farm team to collect milk samples after carrying out aseptic teat end preparation. Any contaminated samples should be regarded as evidence that ineffective teat preparation had been achieved, and that retraining is required. It should be noted that, although fewer post infusion problems appear to arise from DCT-infused animals, problems still do occur, due in part to the predominantly Gram-positive spectrum of DCT products. Hence, poor hygiene at infusion can result in introduction of Gram-negative bacteria, and infections, clinical mastitis and even death of the cow.

5) **Residues of teat sealants may be found in the colostrum and milk for a number of days after calving.**

Care should be taken to ensure cows are fully stripped out at each milking in the colostrum period to minimise the risk of ITS being present in bulk tank milk.

A Canadian study found that ITS was present at the first milking after calving in 83% of quarters. Interestingly, there was no effect of absence of ITS at first milking, and increased risk of new intramammary infection over the dry period (Kabera *et al* 2018).

Historically, decisions about whether the cow receives DCT or not is generally made at the cow level, due to the availability of cow-level SCC data. In the future, use of quarter level culture or RMT testing may allow decisions to be made at a quarter level, potentially reducing antimicrobial use. However, such approaches need to be offset against increased complexity of the drying off process and the risk of mistakes.

In summary, when selecting an appropriate dry cow strategy for an individual herd, consider:

1. History of DCT and/or ITS usage over the past 12 months.
2. Incidence of clinical mastitis in previous dry period and at calving.
3. Incidence of clinical mastitis through the current lactation.
4. Average bulk milk SCC during the current lactation.
5. Individual cow SCC, including number and timing of tests.

When selecting the most appropriate antibiotic DCT product, the veterinarian should consider these factors, in consultation with the herd manager:

- Predicted length of the dry period and withholding period of the product.
- Likely pathogens, and their antibiotic sensitivity, that cause mastitis in the herd.
- Likely risk of new infections occurring in the dry period and at calving.
- Management of the risk of residue violations in meat and milk.

When ITS-alone is being considered, these factors should also be considered:

- Capability of farm team to infuse products using effective aseptic teat preparation techniques
- Opportunity to use trained technicians to support or undertake ITS infusions, where an appropriately trained farm team is not available.
- Ability of milking team to remove teat sealant after calving.

14.5

Consult with your veterinarian to select the most appropriate antibiotic DCT for your herd.

The SmartSAMM Mastitis Focus report will assist interpretation of ICSCC and clinical mastitis records.

Choosing the most appropriate antibiotic DCT for a herd depends on such factors as:

- spectrum of activity,
- likely cure rates,
- type of mastitis pathogen predominating in the herd,
- period of protection provided by different products,
- expected duration of the dry period for cows to be treated.

Confidence – High

Antibiotic DCT and ITS are effective tools for preventing new infections by *Strep. uberis* in the dry period.

Research priority – Medium

The biological and economic risk and benefits of a part herd antibiotic approach repeated year on year is unknown.

Technote 1 summarises characteristics of *Strep. uberis*.

Cure rates following antibiotic DCT are influenced by the bacteria causing the mastitis and how long the cow has been infected, and these vary between herds. Generally, cure rates will be higher for *Strep. uberis*, *Strep. dysgalactiae* and *Strep. agalactiae*, and lower and more variable for *Staph. aureus*. Cure rates of 92% to 100% were reported following treatment of *Strep. agalactiae* infections with cloxacillin or cephalonium (Sol and Sampimon 1995). Cure rates for *Staph. aureus* ranged from 41% to 84% and tended to be lower in older cows (Ziv *et al* 1981).

A meta-analysis found that the relative risk (RR) of bacteriological cure following antibiotic DCT, compared with no treatment, was 1.78 (95% CI 1.51-2.10) for all pathogens, 1.65 (95% CI 1.38-1.96) for *Staphylococcus* spp. and 1.86 (95% CI 1.48-2.35) for *Streptococcus* spp. (Halasa *et al* 2009). In the same study no difference was found between cloxacillin compared with non-cloxacillin dry cow antibiotics (RR = 1.00 (95% CI = 0.96-1.06).

Under New Zealand circumstances, cure rates of 79% for *Staph. aureus*, 78% for *Strep. uberis* and 88% of minor pathogens were reported (Williamson *et al* 1995). In studies using cephalonium products (McDougall 2010; Bryan *et al* 2011), the cure rate for all pathogens was between 78% to 90% but cure rates were lower and varied across herds (60-75%) for *Staph. aureus* infections. Cure rates also varied with:

- Cow age, with cure rates of 95%, 90%, 91% and 85% observed for ≤4, 5, 6 and 7, and ≥8-year-olds, respectively.
- Increasing length of the dry period, with cure rates declining at 0.6%/week (McDougall *et al* 2010).

There are few reports on the cure rates for shorter versus longer acting products (Halasa 2009). Bradley *et al* (2010) hypothesised that broad spectrum products, such as cefquinome (a 4th generation cephalosporin) may provide superior protection against new infections, compared with a narrow spectrum, cloxacillin product. But when used in combination with a teat sealant, the effect of a cloxacillin product was found to be similar to a broad-spectrum product (Newton *et al* 2008).

When tested in a later study (Bradley *et al* 2011), cure rates for major pathogen infections were found to be similar across treatment groups, but protection against new infections by *Strep. uberis* and other environmental bacteria was superior for groups treated with a broad-spectrum product, or combination of cloxacillin DCT and ITS, compared with cows receiving cloxacillin DCT only. However, the availability of cephalosporin-based dry cow products is becoming more restrictive, with the move to more prudent stewardship of antibiotics.

14.6

Purchase and store the antibiotic DCT and ITS you will need at dry off.

Hygienic preparation of the teat is critical before infusing intramamary treatments, especially ITS. See SmartSAMM Healthy Udder for a practical guide.

Farmers planning to administer DCT and ITS are advised to obtain their supplies (intramammary tubes, materials for teat sanitising etc.) well ahead of the dry off date. Advisers should emphasise the importance of correctly storing antibiotics, as specified on the label, for efficacy and safety reasons in accordance with the Dairy Producing Code 2 (DPC2; NZFSA 2008)

Technote 4.11 describes typical antibiotic residue violations associated with DCT products.

It is important to discourage storage of antibiotic DCT near tubes of Lactating Cow antibiotic tubes. This reduces the risk of accidentally administering antibiotic DCT to lactating cows – which can be a very expensive mistake in terms of antibiotic violations and costs associated with withholding milk from the vat.

Use fresh supplies of teat wipes when administering dry cow products. Containers of wipes, once opened, dry out quickly over a few days and are then ineffective.

It is important that only new and previously unopened packages of teat wipes are used for sanitising teats prior to administering intramammary products, to ensure their efficacy. Teat wipes are only effective if they retain a high alcohol content, which can evaporate if wipes are stored incorrectly.

Note that a number of veterinary practices prefer to use cotton wool balls, soaked in 70% methanol or ethanol, as an alternative to teat wipes.

Under no circumstances should teat sealant or DCT tubes be made **wet or dirty** before use, as this greatly increases the risk of highly pathogenic bacteria being inserted into the udder.

Failure to properly sanitise the teat ends before intramammary infusions may result in severe or fatal cases of clinical mastitis, due

to introduction of pathogenic bacteria from the teat end or from contaminated teat wipes.

Under cold conditions, warming of intramammary products prior to use may reduce their viscosity and improve their usability. This is best done by using a 'water-bath' technique, where the product is kept in its original plastic container and floated in a larger bucket filled with hot water for a period of time to warm the product through. **NEVER place the tubes directly in warm water.** An alternative approach is to place a hot water bottle in the midst of the tubes or store the tubes overnight in a hot water cupboard.

It is vital that individual treatment tubes are kept dry at all times and should never be placed directly in water. Failure to keep the tubes dry can lead to catastrophic outbreaks of clinical mastitis within a few days of treatment.

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