

Managing Dry Cows to Optimise Udder Health: Myths and Realities

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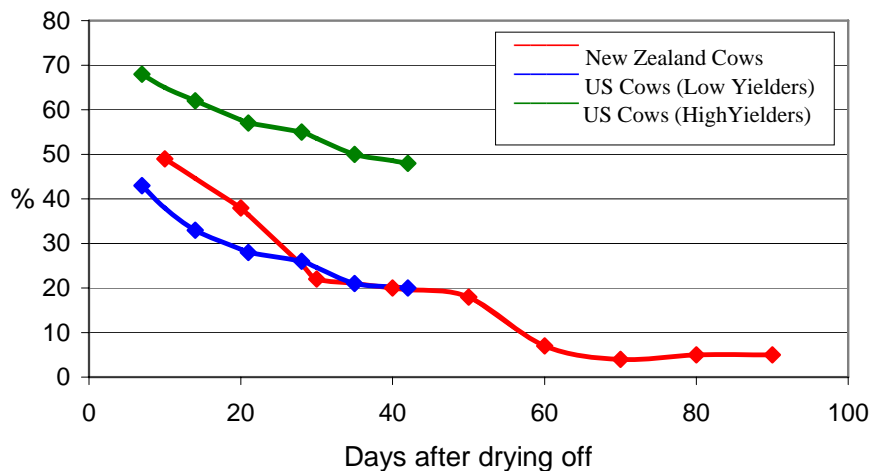
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The importance of the dry period in mastitis epidemiology has been a key area of both mastitis research and clinical interest in recent years. It is also an area, which has seen the development of new and innovative products and approaches to monitoring and managing udder health. Unfortunately as with the development of any new strategies and products, the approach often becomes ‘clouded’ by previous misconceptions and misunderstandings of the latest research. The aim of this article is to outline the latest thinking in dry period udder health management and to dispel some of those ‘persistent’ myths.

MYTH: A natural keratin plug forms in the streak canal during the dry period, forming an effective and long-lasting seal against infection

As illustrated in figure 1, research from both New Zealand and North America has adequately demonstrated that keratin plug formation is far from either rapid or complete. The original New Zealand research demonstrated that over 50% of quarters had not formed a functional keratin plug by 10 days post calving and some 5-10% of quarters never form a functional keratin plug. Similar research in North America generated similar findings but also demonstrated that high yielding cows were even worse at plug formation.

Figure 1: Proportion of quarters failing to produce a keratin plug during the dry period



REALITY: Large numbers of quarters do not form a functional keratin plug during the dry period and often therefore have an inadequate defence against new environmental intramammary infections.

MYTH: High concentrations of lactoferrin in the non-lactating mammary gland means it is not necessary to ‘target’ gram negative pathogens (eg *E. coli*) during the dry period

Lactoferrin is undoubtedly an important component of the mammary defence during the dry period. Its action is by binding iron (an essential component for bacterial growth) and making it relatively unavailable to bacteria. Following drying off, lactoferrin levels rise, but importantly so does the lactoferrin: citrate ratio - these two molecules compete for the binding of iron, with the iron bound to citrate being relatively more available than the iron bound to lactoferrin - thus the effect of lactoferrin is enhanced. However, lactoferrin levels peak within 28 days of dry off and then gradually wane towards calving. Finally, it is important to remember that lactoferrin is only bacteriostatic and although it may prevent clinical mastitis during the dry period it does not prevent colonisation of the gland.

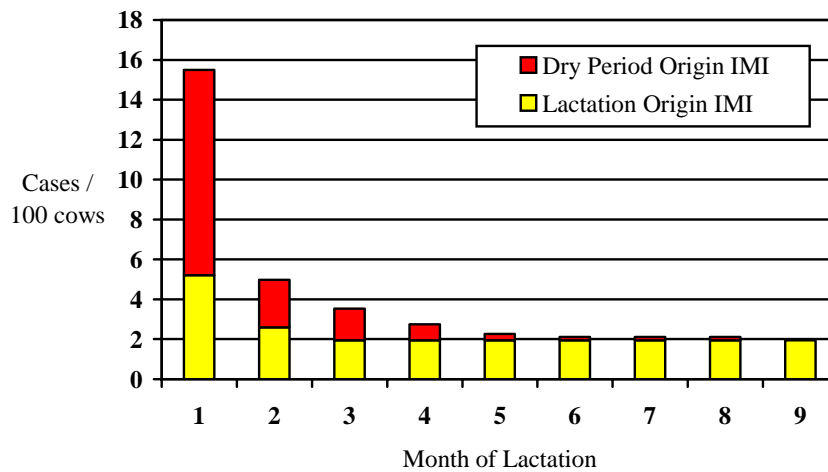
REALITY: Although lactoferrin levels do rise during the dry period, its protective effect is not absolute and new gram -ve infections do occur.

MYTH: My clients don't have a problem with dry period udder health management

Unfortunately it is difficult for farmers to perceive that there may be a problem on their units with new infection during the dry period. Fortunately, we have several tools at our disposal, which can demonstrate if there is an issue.

In all herds it is possible to look at the lactation distribution of clinical mastitis. This exercise usually reveals a classic distribution of clinical cases – with the highest incidence being evident in early lactation. However, if one looks at the origin of the intramammary infections that is resulting in these cases, as illustrated in figure 2, then it is possible to see that the peak in early lactation is driven by clinical mastitis arising from dry period infection. In fact in some cases up to 70% of clinical mastitis occurring in the first month of lactation may be of dry period origin.

Figure 2: An illustration of the distribution and origin of clinical mastitis



In herds with individual cow somatic cell count records, an insight into the importance of the dry period can be gained by looking at the movement of somatic cell counts around the 200,000 cells/ml threshold. An insight into the success of dry period management can be quickly and easily gained by calculating the proportion of cows with cell counts above 200,000 cells/ml at their first recording in lactation. The target value should be less than 5%, herds with figures above this warrant further investigation of dry period management. In herds using Interherd this can be done online using the Vet Companion program – this program utilises the 200,000 cells/ml threshold to calculate apparent cure and new infection rates during the dry period.

A final option in non-recording herds is the use of the California Mastitis Test (CMT). Used at 4 days post calving, and in the hands of a suitably trained operator, the test will detect over 80% of infected quarters (Sensitivity and Specificity is in excess of 80%) and is often a revelation to many producers.

REALITY: It is relatively straightforward to convince farmers of the need to address dry period management by review of clinical mastitis incidence and lactation distribution. In recording herds individual cow somatic cell counts can prove an invaluable tool.

MYTH: It's not possible to make cost effective rational decisions about dry cow therapy selection in commercial dairy herds

Using clinical mastitis, individual cow cell count and CMT data as illustrated above it is cheap and relatively easy to gain an insight into dry period udder health management issues. If one then targets clinical mastitis bacteriology on cases occurring in the first 30 days of lactation it is possible to gain an insight in to the aetiology of dry period infections – the reason being that upwards of 75% of these cases are likely to be of dry period origin.

Armed with this data, and with a knowledge of the aetiology of persistent infections (by culturing high cell count cows) it is then possible to make rational decisions about the most appropriate therapy(s) to be used on

a unit. The cost of this approach is minimal – the benefit is likely to be very large as in many instances a change in the type of dry cow therapy used is unlikely to result in additional cost.

REALITY: *As outlined earlier all the tools necessary to make evidence based decisions about dry cow therapy selection are already available or easily achievable at little or no additional cost. This approach is easily achieved in the ‘modern’ dairy herd and has been implemented in numerous dairy herds by the authors.*

MYTH: There’s no advantage to be gained from targeting antibiotic dry cow therapy at the cow level – it’s only ‘playing at the edges!’

Dry cow therapy has two aims – namely cure and prevention of existing and new intramammary infections respectively. As outlined above the pathogens, which need to be cured and the pathogens causing new intramammary infection can be determined by the strategic use of bacteriology. In recording herds, cows can then be easily classified as likely to be infected or uninfected, using individual cow somatic cell counts. It is then straightforward to select the product most appropriate for cure in the infected cows and prevention in uninfected cows.

As an example, research in commercial UK dairy herds has demonstrated that selecting a product with extended activity against gram-negative organisms, can result in a 50% reduction in the incidence of coliform mastitis in the first 100 days of the subsequent lactation. Not using such a product in uninfected cows would not seem logical in herds with a problem with coliform mastitis in early lactation. Similarly using a product with extended gram +ve activity in uninfected cows in herds with a predominance *Streptococcus uberis* would seem a rational approach. In appropriate herds use of an internal teat sealant would allow ‘broad spectrum’ protection to the ‘back end’ of the dry period

REALITY: *In circumstances where the aetiology of existing and new infections is different it is very unlikely that the same antibiotic will be appropriate in both cases. UK research has demonstrated that selection of dry cow therapy can reduce clinical mastitis incidence by as much as 50% in the first 3 months of the subsequent lactation.*

MYTH: The use of antibiotics at calving is the only effective way of controlling intramammary infections that have become established during the dry period

There is a dearth of UK based evidence to support the widespread use of antibiotics at calving as a way of limiting the impact of dry period intramammary infection. What data is available originates from studies overseas and the significance of such studies is most often driven by removal of coagulase -ve staphylococci (CNS). Care needs to be taken when extrapolating this evidence to the UK situation, as unlike the situation in some countries, data from UK dairy herds would suggest that the majority of CNS infections resolve spontaneously in the early post-partum period.

However, steps can be taken to reduce the impact of dry period infection – by ensuring optimum nutrition, and in particular ensuring adequate Vitamin E and selenium levels and minimising negative energy balance at and around calving may have a significant impact. Lack of Vitamin E, selenium and negative energy balance have all been shown to have an adverse effect on immune function (in particular the speed of neutrophil mobilisation) and therefore deficiency is likely to result in an increase in the proportion of sub-clinical infections becoming clinical. Maximising management to minimise concurrent disease is also likely to have positive ‘spinoffs’ on clinical mastitis incidence.

REALITY: *The widespread use of antibiotics at calving is unlikely to be a cost effective way of controlling intramammary infections acquired during the dry period. Optimising nutrition and other aspects of management to reduce concurrent disease thereby enhancing host immunity are likely to prove more rewarding.*

MYTH: The use of systemic antibiotics during the dry period or end of lactation therapy is a cost effective way of improving udder health status at calving

Bacteriological cure rates achieved with appropriately selected antibiotic dry cow therapy are typically in excess of 80%, and in recent studies conducted by the authors have often approached 90%. These cure rates are well in excess of those quoted in the historic literature and are probably a reflection of the lower prevalence of *Staphylococcus aureus*, and lower bulk milk somatic cell counts in modern day dairy herds (infected cows are more difficult to cure in high cell count herds with a high incidence of *S. aureus*).

When such high cure rates can be achieved with intramammary products alone, the cost effectiveness of additional systemic therapy is questionable. The exception may be the high cell count herd with a very high prevalence of *S. aureus*, though even then a more aggressive approach to culling may be more appropriate.

REALITY: *In the modern dairy herd cure rates are high with antibiotic dry cow therapy, there is a dearth of evidence supporting the superimposition of systemic antibiotics or demonstrating that they lead to a significant or cost effective increase in cure rate.*

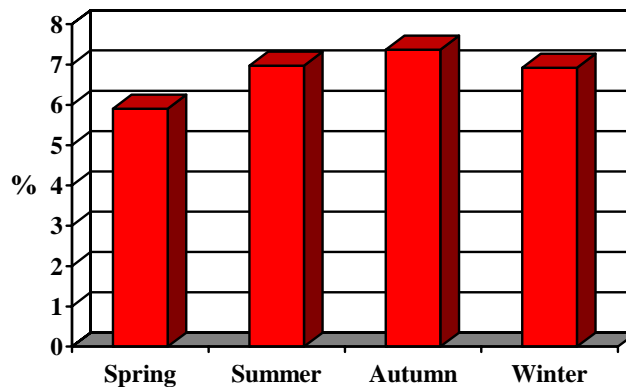
MYTH: **Economies can be made in dry period environmental management. The environment is unlikely to be a major issue in the summer months**

Dry cows and their environments are usually the most neglected on a unit (figure 3). This approach is often driven by a misconception that dry cows are resistant to infection. Another common mistake is to assume that dry cows at pasture are not at such a high risk of infection. Unfortunately, dry cows are often poorly managed at pasture, especially late in the season and large numbers of new infections may occur, as illustrated in figure 4.

Figure 3: Dry cow management at pasture is often neglected, in particular management around feeders is often very poor.



Figure 4: An illustration of the seasonal distribution of the prevalence of coliform infections immediately post calving



REALITY: *All year round management of the environment is an essential component of dry period udder health management.*

MYTH: It's not worth reducing milk yield prior to dry off - the dry cow antibiotic will protect the cow
This may have been the case in the past when milk yields were significantly lower. However, as milk yields have risen it may be increasingly important to address the yield of cows prior to drying off, rather than waiting until after drying off. The rationale being that cows with a higher yield at drying off not only take longer to form a functional keratin plug (see above) but are also significantly more likely to acquire an infection during the dry period. In a recent study each 1 litre increase in the yield at drying off resulted in a 6% increase in the chance of a cow becoming infected during the dry period - that equates to a doubling in the risk of a new infection between a cow dried off at 20 litres as opposed to 10 litres.

REALITY: *Abrupt drying off is almost certainly the most appropriate approach. However, implementing strategies (other than intermittent milking) to reduce yield prior (rather than after) drying off are likely to reduce infection rates during the dry period.*

MYTH: Somatic cell counts are unreliable and are not a sound basis for the selection of uninfected cows appropriate for the use of OrbeSeal

Somatic cell counts provide the only cost effective means of determining the infection status of a cow on a commercial dairy unit. Despite the recent controversy surrounding the accuracy of somatic cell count measurement they do remain a useful tool. As an example, there is ample research, generated from studies around the globe to demonstrate that a 'cow level' threshold of 200,000 cells/ml has a sensitivity and specificity of between 75% and 80% for detecting the presence of a major pathogen intramammary infection. The threshold used in different herds is often a philosophical rather than a science based decision and may need to vary between herds according to individual herd targets and possibly between cows; for instance according to their parity. It is important not to base treatment decisions on one individual cow cell count alone, but to base decisions by applying the threshold across at least three recordings – if this precaution is taken then the impact of measurement error can be minimised. The reality remains that many herds are using individual cell count thresholds to implement dry cow therapy selection strategies to good effect.

REALITY: *Although a proxy for infection status, individual cow somatic cell counts provide a useful and reliable tool for the identification of cows suitable for OrbeSeal use. It is appropriate to vary the threshold used to determine infection status in different herds according to herd targets and underlying infection prevalence.*

MYTH: Combination of dry cow antibiotic and OrbeSeal is the most appropriate approach to dry cow therapy in all cows

Current estimates are that over a third of OrbeSeal use is in combination with antibiotic dry cow therapy and indeed the product is licenced as a medicinal device in the US and is recommended for use in combination with antibiotic dry cow therapy – does that mean we should be using them in combination in all cows? Almost certainly not! Firstly, OrbeSeal currently still remains licenced for use in uninfected cows only in the EU so combination use remains 'off label' and subject to the 'cascade' and standard withdrawals.

There is little evidence to support the use of antibiotics and OrbeSeal in low cell count cows. US research has not been stratified to distinguish between the benefits in infected and uninfected cows, and New Zealand research failed to demonstrate any additional benefit in uninfected quarters. Although there is UK research (in one herd) to demonstrate that combination therapy outperforms antibiotic dry cow therapy alone, there is no data to support the assumption that combination therapy would outperform OrbeSeal alone.

However, there are circumstances when combination use may be justified; (1) in herds which are unable to use OrbeSeal as a 'stand alone' either as a result of lack of records or because of concerns about ability to infuse appropriately, and when dry period new infection rates have been demonstrated to be unacceptably high; (2) in the type of herd outlined in (1) in cows with extended dry periods and; (3) in high cell count cows in recording herds, especially when the dry period may be longer than the duration of efficacy of the antibiotic dry cow therapy selected.

REALITY: *Combination of dry cow antibiotic and OrbeSeal is probably appropriate in high cell count 'infected' cows and cows with extended dry periods which are in excess of the duration of efficacy of the selected antibiotic. It may also be appropriate in herds without somatic cell count data and experiencing problems with new infections during the dry period.*