

DRY YOUR
BEST

*The dry period:
where everything
starts.*

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This publication highlights the critical importance of the dry period in dairy cattle. An explanation about the different dry-off methods and their impact on the Management, Udder Health and Welfare of cows is also provided to better understand why the dry off is not the end of the current lactation but the beginning of the next one.

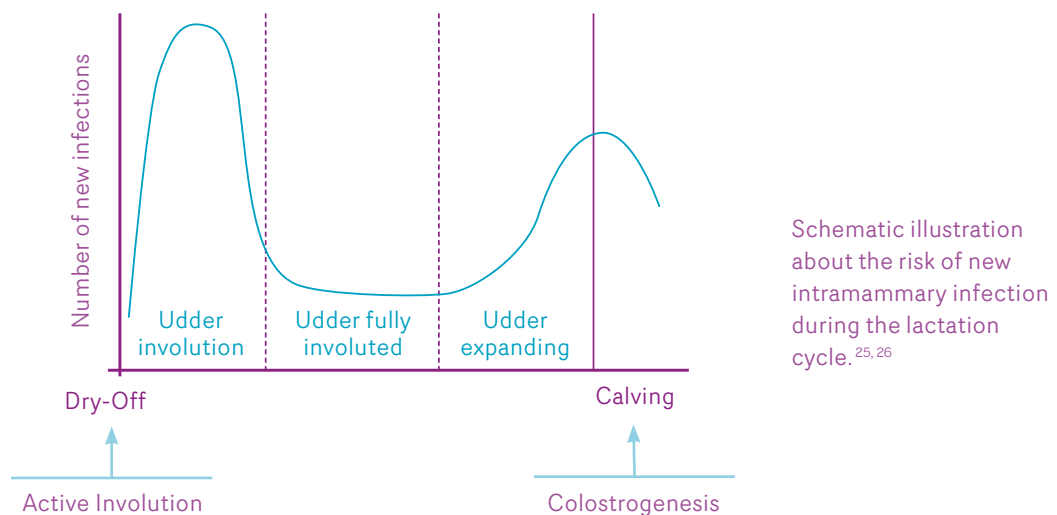
Key messages:

- 🦠 At dry-off other aspects besides udder health such as cow management and welfare should be considered as they are interrelated.
- 🦠 Reducing milk production by using a gradual dry-off method is beneficial from the udder health perspective but has a negative impact on productivity, management and welfare.
- 🦠 An abrupt dry-off is the best option from a management perspective but has a negative impact on cow welfare and udder health.
- 🦠 A simpler method of abruptly reducing milk production that doesn't require either feed restrictions or reduced milking frequency is therefore needed. This is essential to improve management, udder health and welfare. This would also have a positive impact on the profitability of the farm.

Introduction

The dry period is an important resting period for the dairy cow. The average duration of the dry-period is 45-60 days. It is crucial to maximise productivity in the following lactation¹ as the preparation of the next lactation starts here. Anatomical physiological and immunological changes happen in the mammary gland during this period, especially in the early dry period (active involution) and the time immediately prior to and after parturition (colostrogenesis)¹⁷.

In the early dry period, the mammary gland should quickly involute to maintain udder health and optimise milk production in the next lactation. Typically, this phase (udder involution phase) has a high risk of new intramammary infections (IMI) and it is thought to take 3-4 weeks to complete. In the fully involuted state (between active involution and colostrogenesis) the mammary gland is considered very resistant to new infection and the duration of this state will be determined by the overall length of the dry period allowing for the processes of involution and colostrogenesis⁴. One or two weeks before calving, the risk of new IMI is high again.



The importance of the dry period in the epidemiology of mastitis at calving has been studied for years. Some studies in the 1980's demonstrated new infection rates by environmental organisms as 10 times higher than during lactation²⁶.

UK studies also examined the role of the dry period in mastitis epidemiology. It was demonstrated that in low bulk milk somatic cell count herds (< 250,000 cells/mL) using blanket antibiotic treatment, there was a significant rise in the prevalence of IMI between drying off and postcalving^{2, 3, 5}.

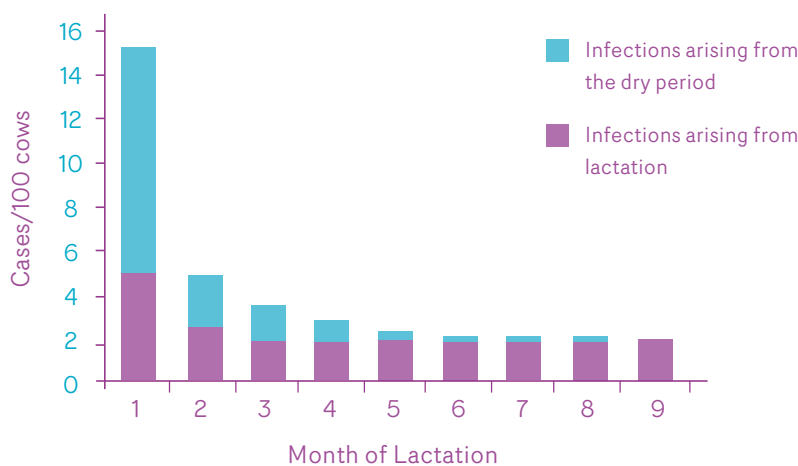
Experimental trials performed by the same authors and using the latest molecular techniques confirmed that over 50% of all environmental mastitis occurring in early lactation (first 100 days in milk) resulted from infections acquired during the dry period.



DNA fingerprinting demonstrating the persistence of infection from the dry period. (Numbers indicate days pre and postcalving that isolates were collected. All isolates postcalving were from cases of clinical mastitis)^{2,3,5}

It was also proved that infections from quarters that became infected during the dry period were significantly more likely to succumb to clinical mastitis with the same pathogen in the subsequent lactation than uninfected quarters.

The acquisition of new IMIs in the dry period can have a dramatic impact on the incidence and distribution of clinical mastitis in the subsequent lactation. In fact, much of the peak in clinical mastitis seen in early lactation can be attributed to dry period infection¹¹.



Data showing the origin of infection (dry period or lactation) in cases of clinical mastitis¹¹.

It is also important to remember that infections acquired in the late dry and transition periods are more likely to have a major influence on clinical mastitis in the subsequent lactation than those acquired shortly after drying off¹¹.

The three axes at dry-off: Management, Udder Health and Cow Welfare

One important objective of the dry-off is to minimise the risk of intramammary infections. However there are two other aspects equally important and very much related to the udder health. These aspects or axes are cow management and welfare. The genetic potential for milk production has increased during the last decades, as a result of that it has become a management challenge to stop milk production in high yielding cows at the moment of dry-off. Large amounts of milk in the udder lead to udder engorgement. Udder engorgement causes discomfort and pain and there is a reduction in total lying time and the average duration of lying bouts ^{8,10}.



A good way to evaluate the relationship between three axes is through these key dry-off indicators: the incidence of milk leakage, the incidence of new intramammary infections and udder pain.

Management at dry-off

The two most common methods used to stop milk production at the end of lactation are abrupt dry-off and gradual dry-off. Abrupt dry-off implies an abrupt cessation of milking without any intended variation in the milk production of the lactating cow prior to that moment. This means no change in the quantity and quality of feeding, water availability, or milking frequency.

Any other dry-off method that aims to reduce the level of milk production of the cows in the days before the dry-off is performed, such as reducing milking frequency or food restrictions, is referred to as a gradual dry-off method. Most farmers prefer to use the abrupt dry-off method as the management is easier. However, with the increase in genetic potential for milk production, drying off has become a challenging moment for dairy cows. High producing cows are difficult to dry-off abruptly as they produce more milk and are also more prone to milk leakage with an increased risk of new IMI. Thus, the National Mastitis Council (NMC) recommends stopping concentrate feeding of high producing cows two weeks before the anticipated drying off to reduce daily milk production to less than 15 kg per day before the dry-off.

Intermittent cessation of milking has been shown to decrease milk production by **22% to 47%** during the last week of lactation¹⁸. As this management procedure reduces milk production, it results in a reduction in economic income.

In a study, cows offered 8 kg of dry matter/day during the 7 days before drying-off, produced **34% less milk** than those offered 16 kg of dry matter/day. However, this reduction in nutrients at drying off may lead to metabolic problems, especially among high-yielding cows and may cause hunger²⁷. An increase in NEFA levels can cause a suppression in immune function and therefore the cow can be more susceptible to infection^{15,16}.

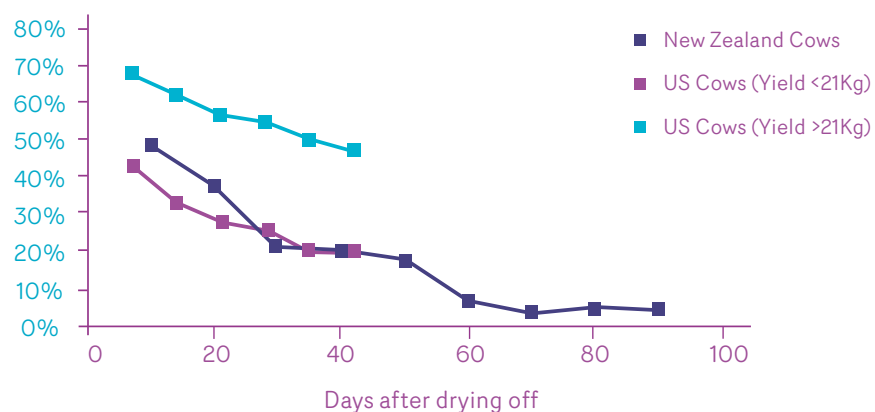
Lowering milk production before dry-off has been found to be beneficial from the udder health perspective. However there are concerns about the effects of both feed restrictions and reduced milking frequency on the welfare of dairy cattle²⁷. Furthermore, these methods involve higher labour costs than the abrupt dry-off.

Udder health at dry-off

The level of milk production before the drying off and the milk leakage incidence (ML) during the week after the last milking are known to be risk factors for new IMI during the early dry period. Upon cessation of milking there are some major changes: the flushing of bacteria from the streak canal ceases, teat dipping stops and the streak canal becomes relatively compromised by the increased intramammary pressure. The slow transition to the involuted state delays the protective effects of lactoferrin and immunoglobulins whilst fat and casein levels remain high, inhibiting leukocyte function ²⁴.

The reason why it is recommended to reduce the level of milk production at dry-off is due to the fact that the higher the milk production at the moment of dry-off, the higher the risk of new IMI. Thus, for every 5 kg increase in milk production at dry-off above 12.5 kg, the odds of a cow having an IMI at calving increases by 77% ²⁰. Other data showed that for each litre increase in yield at drying off, the odds of a quarter being infected with an Enterobacterial organism post calving increased by 1.06 ¹². This equates to doubling the risk of new IMI in the dry period for every 12 litre increase in yield at drying off.

The keratin plug is formed after dry-off in the teat canal. It is the udder's natural defence mechanism as it prevents bacteria from entering the teat canal during the dry period. In a study conducted in North America the authors found that at the end of 6 weeks, 23.4% of teats were still classified as open (i.e. had not formed a functional keratin plug) and an association between milk production and closure of the teat canal was found. At the end of the first 6 weeks of the dry period, 47% of quarters from cows producing 21 kg or more were still classified as open compared with only 19% of quarters from cows producing less than 21 kg⁸. Observations of the dynamics of the teat canal closure for a group of 756 dairy cows after dry-off were also reported in a New Zealand study ²⁹. The investigators demonstrated that 50% of teats were still open at day 7 after drying off.



Proportion of open teats observed during the dry period under natural field conditions in studies conducted in New Zealand and North America ⁵.

Reducing milk production prior to dry-off could ameliorate new IMI incidence as well due to the increased risk of mastitis associated with ML²³.

ML is a symptom of impaired teat sphincter function and it is a risk factor for increased IMI¹³. ML is defined as milk flowing from one or more teats in the absence of milking. ML is considered to be present if we observe streams of milk coming from the teat, milk drops on the teat end or indirectly if we see milk on the ground under the udder.



Dairy cow showing milk leakage (milk at the teat end and on the floor)

The relevance of ML was demonstrated when it was observed that cows leaking milk after dry-off were 4 times more likely to develop clinical mastitis and had 6.1 times more risk of developing an IMI with a major pathogen during the dry period than cows that did not leak²³. ML allows bacteria to penetrate the teat canal and colonise the mammary gland⁶. The percentage of cows leaking milk was associated with an increased incidence rate of *E.coli* and *S.aureus* clinical mastitis in herds with low somatic cell counts (SCC)^{21,22}.

ML has also been observed in low-producing cows. Thirty per cent of cows that were dried off with less than 5 kg per day of milk production leaked milk during the week after dry-off²³.

Leaking milk may also enhance the nutrient environment for microorganisms in the bedding, thereby increasing the environmental exposure. The risk of udder infections in association with ML increases when the hygiene in the cows' environment, especially the bedding, is poor.

Welfare at dry-off

The abrupt dry-off method in cows that are still producing considerable amounts of milk results in the accumulation of the milk in the udder. This leads to udder engorgement (increase of udder volume and pressure) and milk leakage^{14,28}.

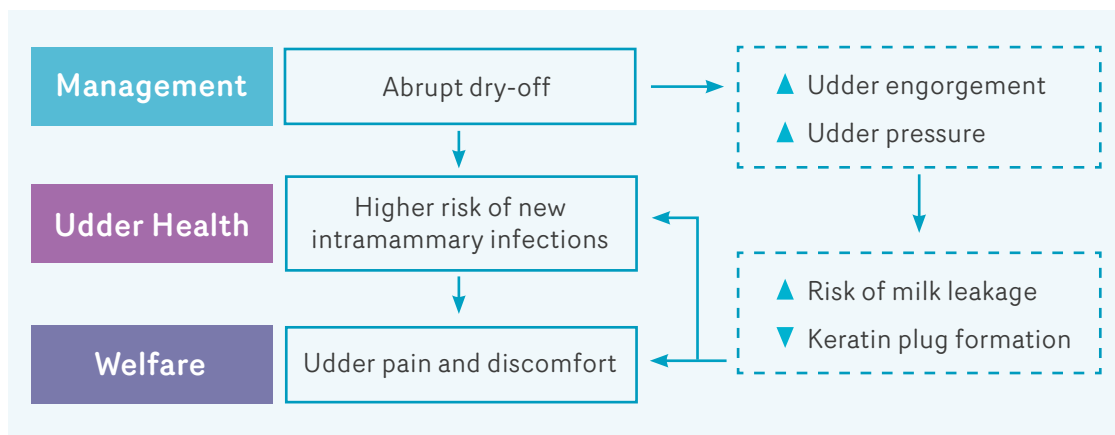


Udder engorgement
24 hours after dry off

Udder engorgement causes discomfort and pain. There is a reduction of the total lying time and the average duration of lying bouts which is an indicator of discomfort^{14,19}. This discomfort due to an increase in udder engorgement may act as an impediment to easy movements of the rear legs^{1,10}.

Welfare problems caused by drying off are more pronounced in high producing dairy cows and are therefore likely to become increasingly more important^{9,14}.

Management, Udder health and Welfare at dry-off are closely related and their interactions can be summarised by the following illustration.



From Farm Animal Welfare Education Centre. www.fawec.org. (Fact sheet #13)

Summary

The dry period is a very important resting period for the dairy cow. It starts with the election of the dry-off method that will have consequences in management, udder health and welfare. A simpler method of abruptly reducing milk production that doesn't require either feed restrictions or reduced milking frequency is needed so the management will be simplified without impacting the udder health or the cow welfare. This is essential to improve the dairy cow performance and would also have a positive impact on the profitability of the farm.

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