

Dry-off and dairy cow udder health and welfare: Effects of different milk cessation methods – a review

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Why is this important?

Over the past few decades, average milk production per cow has increased substantially. This makes the transition from lactating to non-lactating more challenging for high-yielding cows. However, to optimize milk production and udder health in the next lactation, the dry period is essential. Cows are particularly susceptible to intramammary infections (IMI) at the beginning of the dry period, which is why many producers treat all cows with a blanket antibiotic dry cow therapy at dry-off. Recent concerns about antimicrobial resistance have increased and animal welfare has become a major consumer interest, making management practices for producers an interesting balancing act between animal health, welfare, and sustainability of production. Optimal drying-off practices should consider all of these aspects. Drying-off practices typically include different milk cessation methods, administration of antibiotics / internal teat sealants, and housing changes. The researchers reviewed 54 research studies and suggest evidence-based drying-off protocols that may be implemented by producers on-farm.

What do we know?

There are two methods to stop milking cows:

- 1) Abrupt – milking is suddenly halted on a set day, based on expected calving date and desired dry period length; easy to implement
- 2) Gradual – reduced over a period of time (often moving to 1x milking/day for 5 to 7 days) up to the final milking at dry-off.

Methods may or may not be combined with changes in feeding that reduce energy or nutrient intake, such as feeding cows only hay or straw, restricting dry matter intake, or feeding lower nutrient-density diets.

Mammary gland involution

Involution is a complex process during which the udder transitions from a lactating to a non-lactating state. During involution, concentration of natural protective factors in the milk increases, providing immune defence in the udder against infection. Factors such as pregnancy status, systemic hormones, and drying-off practices influence the involution process. Research has shown that involution is faster in cows with low milk yield at dry-off (such as <15 kg/d), allowing for more efficient elimination of existing infections and the prevention of new infections. Gradual drying off accelerates the involution process and combining this with feeding of a reduced-energy ration also results in higher concentrations of immune factors.



Methods to reduce milk yield at dry-off

Many dairy cows are still producing large volumes of milk at the end of lactation, making dry-off more challenging and even painful for the cow when dry-off is abrupt. Reducing milk yield prior to dry-off is key to minimizing negative effects on health and welfare. During the last week of lactation, milk yield was dramatically decreased in cows milked 1x/d (from 24 kg/d to 14 kg/d) compared to abruptly dried off cows (25 kg/d to 23 kg/d). Further, when cows were milked 1x/d for 3 days, and then milking was skipped for 1 day before the final milking, milk yield dropped from 24 kg/d to 11 kg at dry-off. Combining intermittent milking with the feeding of a reduced-energy ration during the final week of lactation further decreases milk yield before dry-off.

Effects of methods on udder health

Because most IMIs result from bacteria entering the udder through the teat canal, one of the most important natural defence mechanisms against new IMI after dry-off is the formation of a keratin plug in each teat canal, which physically prevents entry of bacteria. Higher-yielding cows tend to leak more milk at dry-off, thus preventing plug formation and allowing entry of bacteria. There are fewer IMIs in gradually dried-off cows, likely due to accelerated mammary involution and higher concentrations of protective factors. Milk yields of 15 kg/d or less are generally associated with improved udder health compared to higher milk yield; thus, this is the target yield at dry-off. Reducing milking frequency or restricting energy and nutrient intake before dry-off, or both, reduces milk yield and accelerates involution, reduces the probability of milk leakage, and favours rapid formation of the keratin plug. Lowered milk yield prior to dry-off therefore aids in the prevention and control of new IMI during the dry period and subsequent lactation. Also note, the physical location of cows after dry-off may also affect milk leakage; if cows in the dry pen can hear the milking machine, this may stimulate let-down.

Effects of methods on cow welfare

The hormone cortisol increases as a result of pain, discomfort or stressful experiences. Higher milk yield at the time of dry-off results in increased cortisol after abrupt dry-off, suggesting that there may be discomfort or pain, which may last several days. Low-yielding cows (5-11 kg/d) did not show elevated cortisol. Although feeding changes are an excellent method to employ prior to dry-off, the specific diet should be carefully considered. While more drastic nutrient restriction (such as feeding an all-straw diet) decreases milk yield more quickly, it also induces hunger and discomfort in the animal and may also increase cortisol, indicating a greater amount of stress on the cow.

What does it mean?

The time immediately after dry-off is a high-risk period for new IMIs; milk still accumulates in the udder, the keratin plug has not yet completely formed, and the natural protective factors in the mammary gland are still low. Although there is not necessarily one method that will work for all producers, there are some general drying-off recommendations that can be made to improve health and welfare of the cow and maintain sustainable production.

Best Practices

- Gradual dry-off is preferable, as it more effectively reduces milk yield, hastens udder involution, elevates natural protective factors in the milk, and results in overall less stress on the cow.
- A 5- to 7-day intermittent milking (1x/d) protocol, with or without feeding changes, is ideal.
- The optimal milk yield should be at or below 15 kg/d.
- Ensure dry cow housing is clean, dry and comfortable; ideally house cows away from the milking parlour or equipment.
- Producers should also consider reducing energy intake prior to dry-off, perhaps by implementing a less nutrient-dense ration during late lactation.
- Maintain good records and plan for drying off well in advance.