



UDDER PAIN AND DISCOMFORT AT DRY-OFF IN DAIRY CATTLE

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Dry-off in dairy cows implies the gradual or abrupt cessation of milking. Gradual cessation of milking is achieved by reducing energy intake or milk frequency before drying-off. Both dry-off procedures are associated with engorgement of the mammary gland resulting in **udder discomfort and pain**, which are likely to be more pronounced in **high-producing and abruptly dried cows**.

PHYSIOLOGICAL CHANGES IN THE UDDER

At dry-off, the mammary gland continues to synthesize and secrete milk, resulting in an increased intramammary pressure that may cause pain and discomfort for the cow. The milk is accumulated in alveoli and ducts of the mammary gland producing **udder distension** by 16 h after dry-off. Afterwards, there is a degeneration of secretory cells and a subsequent disruption of alveolar and lobular structures of the udder. Around 16–18 h after dry-off, intramammary pressure rises rapidly, and milk leakage and a **mild inflammatory response** occurs. Evidence of inflammation includes transient increase in blood flow, increased neutrophil numbers in milk and tight junction changes. Intramammary pressure peaks 2 days after dry-off and decreases afterwards but is still present 4 or 6 days following abrupt dry-off.

FACTORS AFFECTING PAIN CAUSED BY DRY-OFF

HIGH-PRODUCING COWS

Cows producing higher quantities of milk at dry-off (>20Kg/day) have larger volumes of mammary secretion during early involution than cows producing less milk (<15Kg/day). Currently, dry-off involves the cessation of milking in cows that are still producing significant quantities of milk yields such as 20–35kg/day and in some cases up to 50Kg/day. The risk of discomfort associated with udder engorgement at dry-off is higher in high-producing cows.

ABRUPT CESSATION OF MILKING

Abrupt cessation of milking at dry-off 40 to 55 days before the expected calving day is a common management practice. Some farms prefer to decrease milking frequency several days before drying-off to reduce milk yield. However, there are some evidences that this practice may still cause some discomfort due to udder distension.

PARITY

Primiparous cows can experience more discomfort at dry-off than multiparous ones. Besides their lack of previous experience, primiparous cows have a more persistent milk production curve and a relative immaturity of the mammary gland which may impair their tolerance to high intramammary pressure.

INDICATORS OF PAIN CAUSED BY DRYING-OFF

LYING BEHAVIOUR

Cows reduce their lying time as a result of udder pain, probably in an attempt to relieve pressure on the udder. This will be explained in more depth in an upcoming fact sheet.

BEHAVIOURAL RESPONSE TO UDDER MANIPULATION

Assessing the reaction of animals upon being manipulated is a commonly used method to assess pain and is considered to be valid and reliable as long as the reaction is scored in a standardized way. Pain sensitivity has been quantified using mechanical (algometers) or thermal (CO₂ laser) stimulation of a hind leg or the udder. Those methods measure the nociceptive threshold, defined as the minimum stimulus necessary to elicit a pain response. When a stimulus is applied to a painful site, a cow responds with avoidance behaviour such as kicking, leg lifting or tail flicking. Lower nociceptive threshold values indicate that there is increased pain. To date, those methods have been used in dairy cows mainly to assess pain associated to lameness or mastitis. Recently, an udder pain score has been described for assessing pain due to udder engorgement in dry cows. Cows are classified into 4 categories (0=no udder pain; 1=light udder pain; 2=moderate udder pain and 3= severe udder pain) de-



Udder engorgement determined using a digital algometer that is modified by welding a 2-cm washer at 2cm from the tip of the algometer (Bach et al., 2015) (picture courtesy of IRTA research institute, Spain).

pending on their reaction at udder palpation (from no behavioural response to refusal of the palpation). Available evidence indicates that the day after drying-off around 21% of the cows suffer udder pain as a result of udder engorgement.

MEASURES OF UDDER ENGORGEMENT AND UDDER PRESSURE

After milking is ceased, mammary tissue becomes engorged with milk, causing intramammary pressure. Udder engorgement after dry-off reflects the high pressure within the udder. This pressure can lead to tissue damage which in turn causes pain. Several measures of udder engorgement and/or udder pressure have been suggested as indirect measures of udder pain:

- Udder pressure can be measured using mechanical stimulus at the udder or by palpating the udder.
- The distance between teats before the last milking compared with that on the following day after dry-off is useful to assess udder engorgement.
- Leakage of milk from the mammary gland is defined as milk dropping or flowing from any teat and is a risk factor for increased intramammary infections.
- Increased vocalizations might be indicative of udder engorgement, as well as periods of distress or hunger at drying-off.

DRYING-OFF IS A STRESSFUL SITUATION

Drying-off causes physiological stress. Pain caused by high intramammary pressure after drying-off is accompanied by a stress response. After an abrupt dry-off, high-yielding cows show higher udder pressure and a greater increase in the concentration of fecal glucocorticoid metabolites, which is an indicator of chronic stress, compared with cows that are not dried-off abruptly. In addition, any novel or uncommon situation can trigger stress. Drying-off is usually associated with several management practices that could be perceived by the animal as stressors. For example, cows are usually moved to a different pen, regrouped with other cows and changed to a low-energy diet. It is worth remembering that stress is additive and that the risk to suffer intramammary infections increases with the stress response.

RECOMMENDATIONS ON HUSBANDRY AND PAIN TREATMENT

- Minimise situations likely to cause chronic stress, such as competition for food, water or lying space. Ideally, pens should include a feeding trough long enough for all cows to feed at the same time (minimum of 0.76 m of feeder/cow) and each pen should have at least two functioning water points.
- Dry cows should be monitored after drying-off. Identifying milk leakage, palpating the udder and checking for udder pain can be useful to estimate the incidence of welfare problems related to dry-off.
- It is recommended to inhibit prolactin production in high-yielded cows to reduce milk production at dry-off and promote mammary involution. For instance, the use of one single dose of cabergoline at dry-off, as a potential dry-off facilitator, effectively reduces milk leakage, discomfort and pain from udder engorgement.

SUMMARY

Drying-off is a painful and stressful period. The mammary gland continues to synthesize and secrete milk during early involution, resulting in an increased intramammary pressure that may cause discomfort. The risk is greater in high-producing cows which are dried-off abruptly. The avoidance behaviour of the cow to udder palpation should be used to identify cows suffering from udder pain. The use of prolactin inhibitor is recommended as a dry-off facilitator as it promotes mammary involution and reduces pain.

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