Welfare issues during the dry period in dairy cattle

The dry period is critically important for the welfare of dairy cows and their production in the following lactation; Eva Mainau BVSc MSc PhD Dip ECAWBM, Deborah Temple BVSc MSc PhD Dip ECAWBM, Pol Llonch BVSc MSc PhD Dip ECAWBM, Xavier Manteca BVSc MSc PhD Dip ECAWBM, Farm Animal Welfare Education Centre, Barcelona, Spain, present an overview of the risks and issues associated with animal welfare in relation to this period

The main welfare problems during the dry period are an increased risk of intramammary infections, pain and discomfort due to udder engorgement, feed and water restriction and aggressive interactions between cows.

INCREASED RISK OF INTRAMAMMARY INFECTIONS

Several studies have shown that over 60% of new intramammary infections occur during the dry period and the vast majority of them are caused by environmental pathogens. There are two phases within the dry period when susceptibility to new intramammary infections is particularly high: shortly after drying off and just before calving.

Several factors increase the risk of new intramammary infections. Once milking stops there is neither flushing of bacteria from the streak canal or teat dip protection. Udder engorgement due to the abrupt cessation of milking at drying off (see below) may cause milk leakage, delays the formation of the keratin plug and results in widening and shortening of the streak canal. In addition, milk is a perfect substrate for bacterial growth. Shortly before calving, susceptibility to infection increases because the keratin plug breaks down, leukocyte function is impaired and there is colostrum leakage in some cows.

Mastitis is a major welfare problem mainly because it causes pain. There is now behavioural and physiological evidence showing that all cases of clinical mastitis are painful. For example, it has been shown that cows with mild and moderate mastitis have significantly larger hock-to-hock distances compared with healthy cows, suggesting that they modify their stance to reduce pressure on the udder. Also, cows with mild and moderate mastitis show an increased sensitivity to pressure on the leg closest to the affected quarter, which would indicate a lower pain threshold as a result of the inflammatory process.

DISCOMFORT AND PAIN CAUSED BY UDDER ENGORGEMENT AT DRYING-OFF

Drying-off in modern dairy farming is carried out between 45 and 60 days before the expected time of parturition. 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. 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 result therefore in the accumulation of massive amounts of milk in the udder, leading to udder engorgement, which is particularly pronounced in high yielding cows and abruptly dried cows. Udder engorgement at drying-off causes discomfort and pain. In addition, 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.

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 hours after dry-off. Afterwards, there is a degeneration of secretory cells and a subsequent disruption of alveolar and lobular

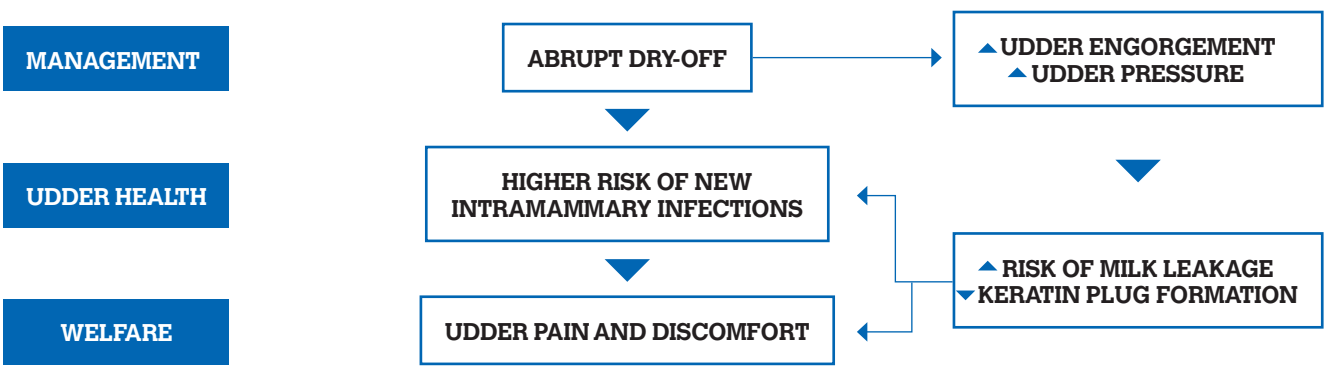

Figure 1: Some of the main welfare problems during the dry period in high-producing dairy cows.

Figure 2: Udder engorgement using a digital algometer that is modified by welding a 2cm washer at 2cm from the tip of the algometer (Bach et al, 2015). Picture courtesy of IRTA Research Institute, Spain.

structures of the udder. Around 16-18 hours 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 two days after dry-off and decreases afterwards but is still present four or six days following abrupt dry-off.

INDICATORS OF PAIN CAUSED BY DRYING-OFF

There are two lines of evidence that demonstrate that a significant proportion of cows experience udder pain after drying off: lying behaviour and behaviour in response to udder manipulation.

LYING BEHAVIOUR

Lying behaviour is a fundamental requisite for good welfare in dairy cows.

A reduction in lying time has been previously used to assess discomfort caused by udder distension due to milk accumulation. For instance, a reduction in milking frequency from twice to once a day in mid-lactation increased mammary pressure and milk leakage and reduced lying behaviour. After omitted milking, all cows showed some signs of discomfort by standing in the resting area afterwards instead of lying.

It has been demonstrated that cows reduce their lying time as a result of udder pain, probably in an attempt to relieve pressure on the udder.

One day after dry-off, when milking is abruptly stopped in cows with average milk production below 10kg/day, lying time is not reduced as udder firmness increases minimally. However, cows producing, on average, more than 16kg/day reduce lying time, increase the frequency of lying bouts and decrease their duration, which may be indicative of physical discomfort and restlessness.

For healthy, dry cows, lying time of 14 hours per day have been described in well-managed and -dimensioned housing systems. Lying time responds to simple changes in stall management. For example, dry cows allocated in stalls showed that lying time increased from nine to 14 hours/day when wet sawdust bedding was switched to dry bedding.

BEHAVIOUR IN 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 standardised way. Pain sensitivity has been quantified using mechanical (algometers) or thermal (CO_2 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 four categories (0=no udder pain; 1=light udder pain; 2=moderate udder pain and 3= severe udder pain) depending 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 and in 6% of the animals, udder pain was intense.

At farm level, 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 day following 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 vocalisations might be indicative of udder engorgement, as well as periods of distress or hunger at drying-off.

RESTRICTED ACCESS TO FEED AND WATER AT DRYING OFF

Restriction of feed and especially water intake is sometimes used as a method to quickly cease milk production. Abruptly restricting feed and water intake has been associated with an increase in cortisol, which is an indicator of stress. Furthermore, restricting access to water raises severe welfare concerns.

AGGRESSIVE INTERACTIONS AND COMPETITION BETWEEN COWS

As calving approaches, cows are likely to be moved to a new pen and mixed with other cows. Re-grouping may occur several times during the last few weeks of pregnancy. There are several studies showing that regrouping reduces time spent ruminating and increases aggression.

Individual cows respond differently to regrouping and this may have important effects on their health status after calving. It has been shown, for example, that cows that develop metritis and ketosis after calving spent less time feeding during the pre-calving period than those cows that remain healthy after calving. It has been suggested that subordinate cows may be particularly at risk as they would be driven away from the feed bunk by more dominant cows. Therefore, providing enough feeding space would be particularly important to reduce the negative effects of competition between cows.

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

Dry cows are usually allocated to pastures or dry lot to promote exercise during the dry period. Alternatively, bedded pack and a paved alley should be recommended, including a resting area equivalent to 10m2/cow. Bedding material should be removed on a regular basis (preferably

Figure 3: Dry cows allocated outside with appropriate shelter and food.

daily). In any case, dry cows should be protected from extreme drafts and provided with a dry area to rest as many hours of the day as they desire.

Minimise situations likely to cause chronic stress, such as competition for food or water. Ideally, pens should include a feeding trough long enough for all cows to feed at the same time (minimum of 0.76m 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.

Dry cows should be kept as far away as possible from the milking parlour, as the sight, sound and smell of the parlour will stimulate the milk let-down reflex, resulting in a shorter lie-down periods.

SUMMARY

Cows may face several welfare problems during the dry period, including an increased risk of intramammary infections, pain and discomfort caused by udder engorgement after drying off and stress due to regrouping and competition. These welfare problems are likely to have negative effects on health and performance. Reducing udder engorgement after drying off would be very useful to reduce pain and discomfort, as well as the risk of new intramammary infections. Good husbandry practices, such as providing cows with a clean, comfortable environment, and avoiding competition as much as possible when regrouping, are critically important strategies to improve the welfare of cows during the dry period.

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