The incidence and importance of milk leakage in the dry cow

by Ana I. De Prado Taranilla, Global Technical Manager, Ceva Sante Animale. France.

One important objective of the dry-off is to minimise the risk of intramammary infections (IMI). However there are two other aspects equally important and very much related to udder health – management and welfare.

The genetic potential for milk production has increased during recent decades and, as a result, 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 leads 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.

Risks of new IMI

The cessation of milking at drying-off implies dramatic changes in the composition of mammary gland secretion which could pose a risk of new IMI.

In addition, the flushing of bacteria from the streak canal ceases and teat dipping stops. 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. The keratin plug formation, an important defence against IMI, may vary between cows and it has been reported that 50% of the teat canal still remained open 10 days after drying off.

Milk is no longer being removed from the gland but cows continue to produce milk for some days. As a result, there is marked engorgement of the cisternal spaces, ducts and alveoli of the gland. The udder volume and pressure are increased due to milk accumulation.

Cows may suffer pain and milk leakage (ML) can occur. This facilitates bacterial penetration of the streak canal during the first days until involution is complete.

Each of the biochemical changes, the increased intramammary pressure (IMP) related to the level of milk production at the moment of dry-off and the subsequent leaking of milk are believed to contribute to susceptibility to new IMI in the early dry period.

Level of milk production

The National Mastitis Council recommends abrupt cessation of milking when the target of 15 litres per day has been achieved.

The reason why it is recommended to reduce the milk production to that level 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.

A study was conducted in Ontario to evaluate the association between milk production at dry-off and IMI. DHI records were examined during 1998 and 1999.

A new IMI was defined as a change in linear score from less than 4.0 at the last test prior to drying off to linear score greater than 4.0 at the first test in the next lactation.

Only 16% of cows producing less than 13kg of milk at dry-off developed new IMI compared to 26% of cows producing greater than 21kg.

Another study concluded that for every 5kg increase in milk production at dry-off above 12.5kg, the odds of a cow having an IMI at calving increases by 77%.

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. This equates to doubling the risk of new IMI in the dry period for every 12 litre increase in yield at drying off.

It has been hypothesised that there is also an association of milk production and teat-canal closure.

The keratin plug 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 an association between milk production and closure of the teat canal.

At the end of the first six weeks of the dry period, 47% of quarters from cows producing 21kg or more were still classified as open compared with only 19% of quarters from cows producing less than 21kg.

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. The investigators demon-

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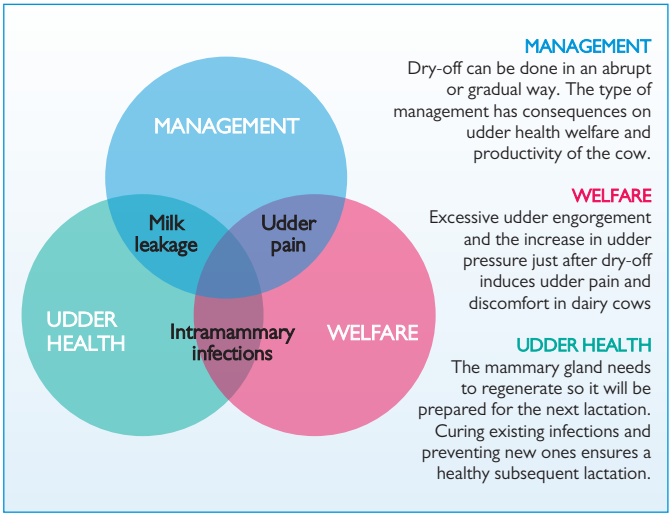
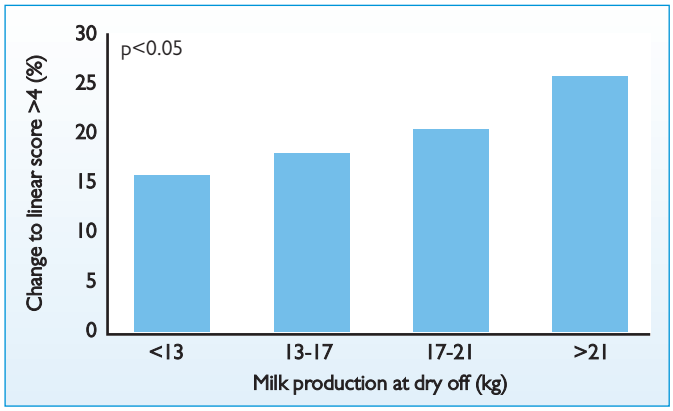


Fig. 2. The relationship between the key dry-off indicators and the three aspects at dry-off.

Fig. 1. Percentage of cows with changes in linear score by milk production at dry-off.



Dairy cow showing milk leakage.

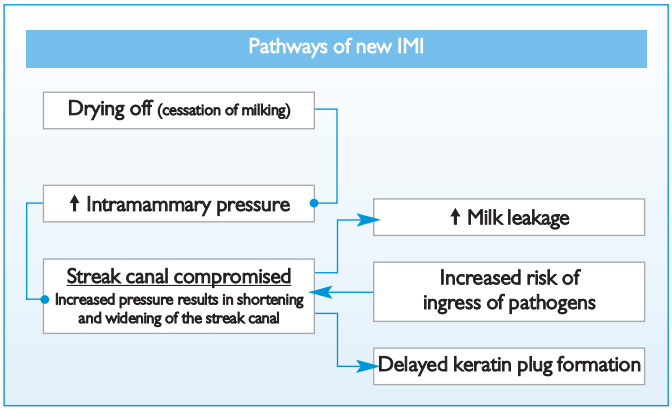


Fig. 3. A flow diagram showing the pathways of new intramammary infections (A. Bradley).

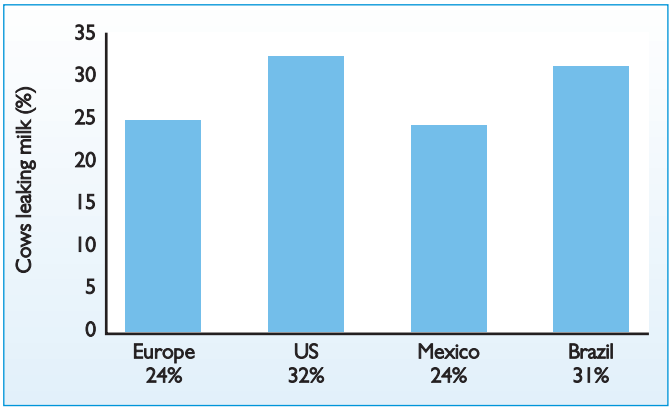


Fig. 4. Percent of cows leaking milk during three days after dry-off in different countries/areas.

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strated that 50% of teats were still open at day seven after drying off.

It appears clear that the decline in milk production has a positive effect on decreasing the rate of new IMI during the dry period. It could ameliorate new IMI incidence not only by the increased risk of mastitis associated with milk leaking from quarters but also by the association of production and teat-canal closure. Although there are more factors that may influence the presence of ML, milk production and ML seems to have a strong relationship.

Causes of milk leakage

Milk leakage 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 one or more teats, a drop of milk on the teat end or indirectly if we see milk on the ground under the udders.

Following the data from some publications, ML can occur if the closing mechanism of the teat canal is compromised, for instance if the teat end is damaged. It has also been observed that milk flow rates were higher in quarters leaking milk than in other quarters. This is not exclusively a characteristic of high-producing cows.

In a study carried out on 15 commercial farms in Germany, even lower yielding primiparous cows with greater peak milk flow rates were at risk of leakage.

In addition, short teats, inverted teat ends and cows with teat canal protrusions, that may have less sphincter muscle tone, increased the risk of milk leakage in multiparous cows.

When a huge amount of cisternal milk yield accumulated in the udder, the IMP increased and may have caused ML from the shorter canals.

The relevance of ML was demonstrated when it was observed that cows leaking milk after dry-off were four 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 leak.

The results of this trial reaffirmed the high susceptibility of cows in the early dry period even when the prevalence of IMI with major pathogens at dry-off was low.

The authors concluded that ML was strongly associated with clinical mastitis and IMI with major pathogens in the dry period.

ML allows bacteria to penetrate the teat canal and colonise the mammary gland.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). Leaking milk may also enhance the nutrient environment for micro-organism 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 in the bedding, is poor.

Strategies to reduce the quantity of milk and ML at dry-off may be important to minimise the risk for new IMI.

Incidence of milk leakage

There are very few publications where we can find data about the real incidence of ML in dry cows.

One of the first studies was carried out in Netherlands in 1993. The authors concluded that milk leaking was frequent during the dry-off period. Cows were dried off with less than 5kg per day of milk production. 30% of cows leaked milk during the week after dry-off.

In other experiments, the effects of reducing milk yield by feed restriction before the dry-off resulted in less percentage of cows leaking milk. Two days after dry-off 14% of cows with lower production leaked milk compared with 42% of cows with higher production.

In a recent study carried out in Canada, the effect of milk production at the moment of dry-off on ML was evaluated. All cows were treated with antibiotic, internal and external teat seal.

Frequency of ML was greater in cows producing as average 14.1kg compared with those producing 10.9kg before dry-off (75 vs 27%). This suggests that the reduction of milk production reduces the percentage of cows with milk leakage.

Recent milk leakage data

In order to get information about the current incidence of ML in commercial dairy farms, Ceva Sante Animale has carried out studies in Europe, USA, Brazil (unpublished data) and Mexico. All cows were carefully observed for ML detection after dry-off (DO) during three consecutive days.

In Europe, a total of 1,142 cows from 41 different farms from eight countries were investigated. The incidence of ML was on average 24, 4% at cow level with difference between farms depending on the level of the yield 24 hours before the dry-off. The highest incidence of ML was found at visit two, between 30-34 hours after DO.

In the USA, 312 animals from three farms were involved in the study. The average percentage of cows leaking milk during any of the observations was 32% and the range among farms was from 21-45%. The highest ML was observed 36 hours after dry-off.

In Brazil, 187 cows from three sites were involved in a study. 31% of cows leaked milk at any observation with a range from 26-44% among farms. In Mexico 1,611 cows belonging to nine farms located in two regions of Mexico were dried off by the abrupt cessation of milking. It was found that 24% of all cows studied showed milk leaking in at least one of the observation periods. The lowest and highest limits of the range among farms were 17% and 47%, respectively. The highest ML observation was detected during the second visit. The summary of these results is shown in Fig. 4.

The ML incidence after having checked 3,065 animals around Europe and America is higher than expected. However, awareness of this issue between veterinarians and farmers is very low. ML is a valid indirect measure of the intramammary pressure which is related to welfare and udder health.

Conclusion

Although one important objective of the dry-off is to minimise the risk of IMI, management and welfare aspects of the cow also have to be considered. Milk production and ML are related with new IMI. The results show that the incidence of ML in farms is underestimated. More attention during the first days after dry-off is needed to detect cows leaking milk that may be at risk of new IMI.

A simpler method of abruptly reducing milk production that does not require either feed restrictions or reduction in milking frequency is needed. This is essential to improve management, udder health and welfare at dry-off and therefore have a positive impact on the profitability of the farm. ■

References are available from the author on request