Technote 16

Drying off abruptly, taking steps to reduce yield

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The dry off strategy used can significantly influence the risk of new udder infections establishing during the dry period. Higher milk yield at dry off (Newman *et al* 2010) and milk leakage following dry off (De Prado-Taranilla *et al* 2020) have both been associated with an increased risk of infections detected at calving.

The primary objectives at dry off are to rapidly suppress milk secretion and achieve timely teat canal closure, which typically takes around 2-4 weeks. Most new infections occur in quarters where the teat canal has not yet sealed.

➜ **Technote 14** describes closure of the teat canal during the dry period.

① Dry off cows producing less than 5 L/day

Cows producing less than 5 L/day, or 0.4 kg MS/day, should be dried off because:

- They can significantly increase bulk milk SCC even without mastitis, as somatic cells become more concentrated in the reduced milk volume
- Udder involution accelerates as production falls, increasing SCC even in uninfected quarters.

A study of 94 uninfected identical twin cows approaching dry off found that over 60% showed a rapid SCC rise (>50,000 cells/mL per week) in the final month of lactation, and the majority (>60%) were producing less than 5 L/day (Lacy-Hulbert *et al* 1995).

NMAC (National Milk Quality Advisory Committee) therefore recommends drying off cows when their milk yield falls below 5 L/day (0.4 kg MS/day), to protect milk quality for processing.

② Reduce milk production during dry off

Advisers should stress the need for advance planning so that farmers can:

1. Implement management changes for high producing cows at least one week before dry off, and
2. Organise grazing so that cows go to clean paddocks immediately after dry off.

Cows producing 5 to 10 L/d (0.4 to 0.9 kg MS/d) usually tolerate abrupt drying off, provided management changes after the last milking encourage involution.

Cows producing more than 10 L/d require more active management of milk production, with nutrition restriction more effective than switching to less frequent milking (Holmes *et al* 1996, Lacy-Hulbert *et al* 1999, Tucker *et al* 2009) under NZ conditions.

Reducing feed allowance can rapidly suppress milk yields, by up to 30%, but may compromise cow welfare if not managed carefully. In a behavioural study, reducing dry matter intakes (DMI) to 8 kg DM/d for the final week of lactation and first 14 d of the dry period reduced milk yield from 9.3 L/d to 4-6 L/d by dry off, compared with cows eating 16 kg DM/d (Tucker *et al* 2009). This reduction was associated with less udder firmness, reduced udder leakage, and lower mastitis risk after dry off. But cows on low DMI showed clear behavioural signs of hunger, with 2-3 times more vocalisations than higher fed cows before and after dry off.

More moderate restrictions in DMI (e.g. 10-12 kg DM/d) may reduce hunger but it is unclear if this approach achieves the same rate of udder involution, and less mastitis risk. In this study, cows received no antibiotic DCT; provision of internal teat sealants (ITS) would be expected to reduce mastitis risk.

NMAC recommends that the DMI for high-producing cows (>1.0 kg MS/day) be reduced by 30-50% during the last 1-2 weeks before dry off, and after dry off, to assist the drying off process. This aligns with NMC guidelines (National Mastitis Council 2006) which advise cessation of concentrate feeding two weeks before dry off.

Rations must still meet the energy demands of a cow that is 6-8 months pregnant. As a guide, a 500 kg cow requires about 59 MJ/day of metabolisable energy for maintenance, excluding the energy demands of pregnancy and activity. Table 1 provides a guide to energy requirements and dry matter intakes (DMI) for transitioning cows from lactating to dry, based on **Facts and Figures** (DairyNZ 2021).

To comply with animal welfare codes, water must not be restricted at any stage.

Table 1 Daily metabolisable energy requirements and recommended daily dry matter intakes for a 500 kg cow transitioning from lactating to dry, for an 8-week dry period. Values derived from DairyNZ Facts and Figures (DairyNZ 2021).

Days before / after dry off:	-7 to -14	-1 to -6	Dry off	1 to 7	8 to 14
Weeks before PSC:	**10**	**9**		**8**	**7**
Energy Requirements for:	**Metabolisable energy requirements (MJ/cow/day)**				
Maintenance	59	59		59	59
Walking on flat (3 km x 2 MJ ME/km)	6	6		1	1
Pregnancy (35 kg calf birth weight)	21	23		27.5	32
Milk (0.9 kg MS/day)	72	-		-	-
Milk (0.4 kg MS/day)	-	32		-	-
Gaining condition[1]	6	-		-	39
Total Requirements (MJ/day) =	**186**	**120**		**88**	**131**
Dry matter intake for different feeds after dry off:	**Dry matter intake 'down the throat' (kg DM/day)**				
A. Autumn Pasture & Silage (e.g. 11 MJ ME/kg DM)	14.9	10.9		8.0	11.9
B. Pasture + low ME crop (e.g. 10.5 MJ ME/kg DM)[2]	-	-		8.6	12.8
C. Pasture + Hay (e.g. 9.5 MJ ME/kg DM)[2]	-	-		10.0	14.8

[1] *BCS gain estimated at 0.1 score per 30d in lactation, and 0.5 score per 30 d when dry. Note that 1 score equals 33 kg or 1.1 kg Lwt/day, and a milking cow requires 50 MJME/kg Lwt gain and a dry cow, 72 MJEM/kg Lwt gain. No gain planned for 1 week before and 1 week after dry off.*

[2] *Energy requirements increased by 2.5% or 7.5% to accommodate the lower DM, as per DairyNZ Facts and Figures (@ 5% per 1 MJ ME/kg DM different from 11)*

Note that the dry matter intakes make no allowance for wastage. If cows were grazing pasture, with a utilisation of 90%, they would need to be offered approximately an extra kg DM each day.

3 Dry off abruptly without reducing milking frequency

Dry off should be abrupt, with no reduction in milking frequency prior to the final milking. Maintaining the same milking schedule prevents unnecessary rises in BMSCC. Reducing milking frequency, particularly for cows with a higher SCC, will increase the bulk milk SCC (Holmes *et al* 1996).

Intermittent milking (i.e. milking every second day) should be avoided as this significantly increases the risk of mastitis (Zecconi *et al* 1995; Lacy-Hulbert & Woolford, 1999).

4 Put cows in clean areas after giving DCT or ITS

After administering antibiotic dry cow treatment (DCT) or internal teat seal (ITS), it is essential to minimise teat contamination with bacteria by:

- Thoroughly spraying teats manually after treatment, and
- Not allowing cows to lie down for at least 2 hours after treatment, avoiding bare soil, mud and manure-soiled areas.

Cows should be moved to clean, dry paddocks for 7-14 days after dry off (low manure load, no exposure to dairy effluent). High environmental levels of coliform and streptococcal bacteria markedly increase new infection risk. Severe outbreaks of *Pseudomonas* mastitis have occurred where cows lay in wet conditions in the first few days after dry off. These bacteria are usually associated with contaminated water supplies; infections can be severe, often fatal, and virtually impossible to treat.

Although formation of the keratin plug makes the teat canal more resistant to penetration in the dry period (as measured by water pressure needed to open the canal), O'Brien (1989) reported that the canal was not well closed until four days after dry off and that cows are particularly susceptible to infection during this time.

Full closure of teat canals, measured using a manual stripping technique, can take up to 40 days after dry off (Williamson *et al* 1995), despite administration of antibiotic DCT at dry off. Rapid closure of the teat canal helps prevent new infections (Capuco *et al* 1992, Williamson *et al* 1995).

Keeping cows in a clean paddock well away from the milking herd reduces the chance of triggering milk let-down, which supports plug formation. It also prevents accidental re-attachment of milking cups to dry cows.

5 Feed a maintenance diet for 7-14 days after dry off

Restricting feed intake after dry off helps accelerate udder involution by reducing milk secretion:

- Most cows in moderate body condition (i.e. greater than body condition score 4.5) can tolerate 7 days on maintenance before gross involution starts to occur, after which feed intakes can be increased (see Table 1).
- Cows producing more than 10 L/day at dry off may require up to 14 days on maintenance before udder swelling subsides, and involution becomes evident (i.e. reduction in udder swelling and firmness).

For cows treated with antibiotic DCT and/or ITS, the requirement to restrict feed to maintenance levels may be less critical than for cows receiving no protection, as these treatments provide protection against new intramammary infections.

During the transition, increasing the proportion of non-digestible fibre while reducing the dietary metabolizable energy content is likely to support rumination, satiety and cow comfort as cows adapt to dry off (Jensen *et al* 2022).

Greater use of rumination sensors has increased the focus on maintaining rumination rates during this period. But the rumination rates expected for typical NZ drying off approaches, involving different feed types, has yet to be determined.

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