



# Dairy Research Review™

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Issue 5 – 2016

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### Independent commentary by Hamish Newton.



Hamish Newton graduated from Massey University with a BVSc in 1998 and started working in mixed practice at the Veterinary Centre – Oamaru. He then worked in mixed practice in the UK before starting a PhD at Bristol University examining factors that influence the cure of intramammary infections in the involuting mammary gland. Upon completing his PhD in 2007 he returned to the Veterinary Centre – Oamaru and became a partner in 2008. He now spends most of his working time dealing with dairy cows.

## Welcome to the fifth issue of Dairy Research Review.

The first two papers covered in this issue focus on NSAIDs and how they can improve performance in dairy cows. Subsequent selections include cloxacillin as an alternative to ceftiofur for dry cow mastitis and reports on how adding water to starter diets improves calf performance during the hot months of summer, chicory as an alternative to perennial ryegrass, and the performance of calves on different milk replacer feeding levels.

We hope that the knowledge and insight imparted in this issue of Dairy Research Review are useful in your practice. As ever, we look forward to receiving your feedback and comments.

Kind regards

**Hamish Newton**

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## Hot topic: Early postpartum treatment of commercial dairy cows with nonsteroidal anti-inflammatory drugs increases whole-lactation milk yield

**Authors:** Carpenter AJ et al.

**Summary:** The objective of this study was to demonstrate that postpartum nonsteroidal anti-inflammatory drug (NSAID) treatment can increase milk yield on a commercial dairy farm. Dairy cattle in their second lactation and greater (n=51/treatment) were alternately assigned to one of three treatments at parturition, with treatments beginning 12–36 hours after parturition and lasting for three days. The treatments were: one placebo bolus on the first day and three consecutive daily drenches of sodium salicylate (125 g/cow per day; SAL); one bolus of meloxicam (675 mg/cow) and three drenches of an equal volume of water (MEL); or one placebo bolus and three drenches of water (CON). All groups were monitored for 365 days post-treatment. Whole-lactation milk and protein yields were greater in NSAID-treated cows, although fat production at day 305 was not affected. A significant interaction of treatment and parity for plasma glucose concentration was observed; MEL increased plasma glucose concentrations versus CON and SAL in older cows. SAL decreased plasma  $\beta$ -hydroxybutyrate concentration versus MEL at 7 days post-treatment. Haptoglobin concentrations were elevated in SAL cows versus CON. CON cows tended to be removed from the herd more quickly than MEL cows (42 vs 26% at 365 days post-treatment). Treatment did not affect body condition score, concentrations of plasma free fatty acids and paraoxonase, or time to pregnancy.

**Comment:** Research suggests that inflammation following parturition is associated with reduced production. This study examined cows orally dosed with meloxicam, sodium salicylate (another NSAID), or a negative control. Treatment was started 12–36 hours after calving. The amount of protein and milk produced was increased in cows that received either of the NSAIDs. In a similar finding to that of McDougal et al. (2009) there was tendency for meloxicam treated-cows to survive longer in the herd (42% of control cows vs 26% of meloxicam-treated cows were removed from the herd by day 365). No differences were found in time to pregnancy or first service conception rate. The findings in this paper are different to what has previously been reported where no milk response or even a reduction in milk yield (at least temporarily) has been observed with NSAID treatment. However, in this study, milk production was measured for a longer duration than in previous studies and significant differences were not noticed until 7 weeks in milk. Although this study used oral meloxicam, it could give practitioners more confidence to use meloxicam for cows examined peri-calving as it is likely there could be long-term benefit.

**Reference:** *J Dairy Sci.* 2016;99(1):672–9

[Abstract](#)

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### Addition of meloxicam to the treatment of clinical mastitis improves subsequent reproductive performance

Authors: McDougall S et al.

**Summary:** This randomised, blinded, negative-controlled intervention study tested the hypothesis that addition of meloxicam to antimicrobial treatment of mild-to-moderate clinical mastitis would improve fertility and reduce the risk of removal from the herd. Cows (n=509) from 61 herds in eight regions (sites) in six European countries were randomly assigned within each site to be treated either with meloxicam or a placebo (control) in addition to one to four intra-mammary infusions of cephalexin and kanamycin at 24-hour intervals. Milk samples were collected for bacteriology and somatic cell count (SCC) prior to treatment and at 14 and 21 days post-treatment. There was no difference in SCC between groups pre- or post-treatment. Cows treated with meloxicam had a higher bacteriological cure proportion than those treated with the placebo [0.66 (SE=0.04) vs 0.50 (SE=0.06)]. Treatment with meloxicam was associated with a higher proportion of cows conceiving to their first artificial insemination (0.31 vs 0.21), and a higher proportion of meloxicam-treated cows were pregnant by 120 days after calving (0.40 vs 0.31). The number of artificial inseminations required to achieve conception was lower in the meloxicam versus control cows (2.43 vs 2.92).

**Comment:** Most practicing dairy vets will be aware of the results of this study, which has recently been published. The study conducted in Europe took cows with mastitis and in addition to a standard antibiotic treatment half got meloxicam. Cows that received meloxicam had a greater chance of a bacteriological cure, and greater chance of conceiving to first service, required fewer matings to get pregnant, and had more pregnancies within 120 days. For those interested in the proposed mechanisms of the effects reported I recommend you read the paper. For the rest of us this paper supports the findings of Scott McDougal (2009) and support the prescribing of meloxicam for mastitis prior to PSM if the welfare benefits are not sufficient alone.

Reference: *J Dairy Sci.* 2016 Jan 6 [Epub ahead of print]

[Abstract](#)

### Associations between the degree of early lactation inflammation and performance, metabolism, and immune function in dairy cows

Authors: McCarthy MM et al.

**Summary:** This study determined associations between the severity of systemic inflammation during the early post-partum period and performance, energy metabolism, and immune function in dairy cows. Cows were assigned to categorical quartiles based on the highest plasma haptoglobin (Hp) concentration measured during week 1 post-partum (Q1=0.18–0.59, Q2=0.60–1.14, Q3=1.15–2.05, and Q4=2.06–2.50 g/L). Although cows were assigned to different categories of inflammation during the post-partum period, a quadratic relationship of inflammation on pre-partum dry matter intake (DMI) and body weight (BW) was detected such that cows in Q2 had lower pre-partum DMI and cows in Q2 and Q3 had lower pre-partum BW compared with cows in the other quartiles. Also detected was a quadratic association of inflammation with post-partum DMI and BW such that cows in Q2 and Q3 also had generally lower post-partum DMI and BW versus cows in Q1. There was a tendency for a Q × time interaction for milk yield and Q × time interactions for 3.5% fat-corrected milk and energy-corrected milk yields; quadratic relationships suggested a decrease in milk yield for Q2 and Q3 cows.

**Comment:** In this trial, cows had their haptoglobin levels measured regularly (3-times weekly for the first 21 days of lactation). Each cow's highest haptoglobin level measured in the first week post calving was used to place her into one of four quartile groups that was used as a categorical value in the analysis. Haptoglobin is a non-specific marker of inflammation and the reason for the raised values measured in cows in quartiles 2, 3, and 4 cannot be speculated on. Cows that had haptoglobin levels in the 2<sup>nd</sup> and 3<sup>rd</sup> quartiles had the greatest decrease in dry matter intake and the greatest weight loss out to 9 weeks of lactation. It was suggested the losses experienced by the quartile 2 and 3 cows may have been due to an insufficient immune response to eliminate the pathogen insult that was dealt with effectively by the cows in quartile four. This paper does pose more questions than answers for me but is interesting in light of the two previous articles on NSAIDs in the peri-parturient period.

Reference: *J Dairy Sci.* 2016;99(1):680–700

[Abstract](#)

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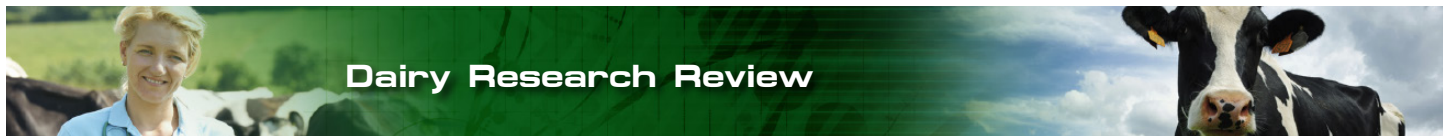


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## Randomized noninferiority study evaluating the efficacy of 2 commercial dry cow mastitis formulations

Authors: Johnson AP et al.

**Summary:** These US researchers compared the efficacy of two commercial dry cow mastitis formulations. A total of 799 cows from four dairy herds were enrolled at dry off and randomised to receive cloxacillin benzathine (DC; n=401) or ceftiofur hydrochloride (SM; n=398). Aseptic quarter milk samples were collected for routine bacteriological culture before dry cow therapy at dry off and again at 0 to 10 days in milk (DIM). Data describing clinical mastitis cases and Dairy Herd Improvement Association (DHIA) test-day results were retrieved from on-farm electronic records. The overall crude quarter-level prevalence of intra-mammary infection (IMI) at dry off was 34.7% and did not differ between treatment groups. There was no difference between treatments as to the risk for presence of IMI at 0 to 10 DIM (DC=22.4%, SM=19.9%) or on the risk for acquiring a new IMI between dry off and 0 to 10 DIM (DC=16.6%, SM=14.1%). Also, there was no difference between treatments in DHIA test-day somatic cell count linear score (DC=2.19, SM=2.22), butterfat test (DC=3.84%, SM=3.86%), protein test (DC=3.02%, SM=3.02%), or 305-day mature-equivalent milk production (DC=11,817kg, SM=11,932kg) between calving and 100 DIM.

**Comment:** This trial, which was conducted on four Wisconsin farms, compared two dry cow formulations, one containing cloxacillin (500mg) and the other ceftiofur (500mg). Both of these products have no milk withhold period post calving and have a label requirement of a 30-day dry period. After infusion of the selected antibiotic product all teats had Orbesal (same as Teatseal) inserted. The cows and systems the cows were managed under are different from what we normally encounter. For example, all cows were routinely being vaccinated with a coliform mastitis vaccine. The average dry period length was 58 days and the previous lactation length was 320 days and the cows were housed on variety of materials during the dry period. The authors also acknowledged that the cows and the herds that the cows came from are not representative of the herds in the Midwest. Trial herds were larger (1663 cows vs 185) had a lower BTMSCC (172,000 vs 213,000) and were producing more per day (40.3 L/cow/day vs 33). Despite this the two products were found to be equivalent for this population of cows.

Reference: *J Dairy Sci.* 2016;99(1):593-607

[Abstract](#)

## Does adding water to dry calf starter improve performance during summer?

Authors: Beiranvand H et al.

**Summary:** These investigators determined whether addition of water to starter would improve performance, rumen fermentation parameters, blood metabolites, and behaviour in dairy calves. Thirty Holstein male calves (3 days of age; 42.0±4.2 kg of body weight) were randomly assigned to one of the following three starter diets differing in moisture content: 90% dry matter (DM); 75% DM; and 50% DM. Weaning and final body weight values were found to increase linearly with increasing dietary water. Starter intake also increased linearly during the pre-weaning and overall periods. In addition, average daily gain increased linearly in calves receiving the 75% and 50% DM diets versus those receiving the 90% DM diet. However, the treatments had no effects on gain-to-feed ratio. Adding water to a starter with 50% DM led to linear increases in both total volatile fatty acids and molar proportions of acetate and propionate in the rumen. It had no effect on the molar proportions of butyrate, isovalerate, or valerate, and nor did it have any effect on acetate-to-propionate ratio.

**Comment:** This study was done in Iran at daily temperatures not normally experienced here but the results might be applicable to some of the warmer and more humid places in the North Island especially if there is heat stress experienced by the cows. Growth pre-weaning was greater in the calves that had water added to the starter ration. This result was attributed to the greater feed intake found with decreasing dry matter of the feed. Whether these results are repeatable in the temperatures and humidity experienced in NZ or if the results found are attributable to the calves not being able to sort the TMR they were offered as it got wetter when we tend to feed feeds where sorting is less likely to occur is open to debate. Wetting feed and not removing the uneaten portion daily would be a risk for mould growth.

Reference: *J Dairy Sci.* 2016 Jan 6. [Epub ahead of print]

[Abstract](#)

## Lactation traits associated with short- and long-term once-daily milking performance in New Zealand crossbred dairy cattle

Authors: Davis SR et al.

**Summary:** The aim of this study was to establish the relative value of milk yields under twice-daily milking (TDM) as a predictor of yield and yield loss under once-daily milking (ODM), and to understand the role of residual milk and udder storage capacity-related traits in regulating yield and yield loss during ODM. A Holstein-Friesian × Jersey crossbred herd was established over two seasons, as two individual cohorts on the same farm, managed on a pasture-based system over four lactations. Short-term (1 week) studies showed that milk yield under ODM was well predicted ( $R^2=0.7-0.8$  in 5 of 6 studies) by the daily yield under TDM in the week before ODM. Yield loss (kg/d) increased with increasing milk yield and with increasing somatic cell count (SCC), although predictions were relatively poor ( $R^2=0.09-0.30$ ). Yield loss (%) decreased with increasing TDM yield in 3 of the 6 studies and was positively correlated with SCC during ODM, but in absolute or percentage terms ODM yield loss was a poorly repeatable trait in grazing cows. Part of the variation in yield loss percentage (30%) was positively associated with residual milk (%), measured pre-trial, during measurement of functional udder capacity in lactation 3. Total production (kg of milk) over the full-lactation ODM study in lactation 4 was correlated with total production in a 10-week study in lactation 3 ( $r=0.72$  and  $0.63$  for cohorts 1 and 2, respectively). Poor production was associated with high yields of residual milk (measured in lactation 3) and high production was associated with low yields of residual milk, relative to the other 80% of animals.

**Comment:** This study examined how the yields of cows milked twice a day predict the performance of cows milked once a day. It also examined the role that residual milk (alveolar milk that could be removed after milking with oxytocin) has on the yield of cows when milked once a day. Cows that were the higher producers under TAD milking were higher producers under OAD milking regimens. The percentage loss in yield when cows are milked OAD was poorly predicted by the cow's TAD milk yield. It was found that there was a negative correlation between the residual milk yield and milk yield in cows milked both TAD and OAD. The authors concluded high residual milk yield prior to going to OAD plays a significant negative role when going to OAD. The residual milk yield is likely to be a more important trait for cows on OAD milking routine than cows on a TAD milking routine.

Reference: *J Dairy Sci.* 2015;98(9):6094-107

[Abstract](#)



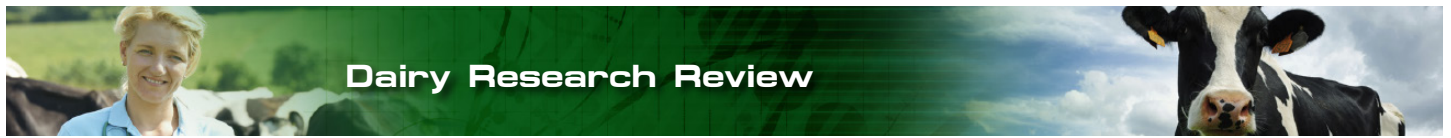
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### Repeatability of metabolic responses to a nutrient deficiency in early and mid lactation and implications for robustness of dairy cows

**Authors:** Gross JJ & Bruckmaier RM

**Summary:** This study investigated if individual cows respond in a consistent manner to a negative energy balance (NEB) in early lactation and mid-lactation. Twenty-five dairy cows experienced the usual NEB after parturition and were subjected to a second 3-week NEB induced by feed restriction in mid-lactation. Animals were retrospectively ranked according to their highest plasma non-esterified fatty acid (NEFA) concentration in weeks 1–4 postpartum. The animals with the 33% highest and 33% lowest values were selected and classified either as the high response (HR) or low response (LR) group. After parturition, milk yield and energy-corrected milk yield was higher for HR compared with LR in weeks 2–14 and weeks 1–6, respectively. During feed restriction in weeks 15–17 post-partum, no differences in energy-corrected milk between LR and HR were found. Energy balance was more negative in HR during the NEB in early lactation, but not different from LR during feed restriction in mid-lactation.

**Comment:** This study examined whether cows that responded strongly to the normal negative energy balance in early lactation (week 1 to 4 of lactation) also responded strongly to a feed restriction later in lactation (50% of requirements during weeks 15 to 17 of lactation). Cows were ranked according their highest NEFA concentration in weeks 1 to 4 of lactation; the 33% of cows with the highest NEFA were coded as high responders (HR) and the lowest 33% as low responders (LR). HR cows were in greater negative energy balance for longer post calving due to increased production of milk and decreased dry matter intake. NEFAs were higher in the HR cows during the feed restriction during weeks 15 to 17. These results suggest that some cows are better able to respond to a feed restriction and rapidly provide a supply of "mobilization-derived nutrients" to the mammary gland and prioritise nutrient supply to the udder. This may have some implication for breeding programmes and some cows going through a "feed pinch" might better handle the stress and maintain milk production but what effect this could have on reproduction was not covered in this paper. A feed restriction at 15 weeks post-partum in the NZ system roughly coincides with the second round of artificial insemination.

**Reference:** *J Dairy Sci.* 2015;98(12):8634–43

[Abstract](#)

### Herbage intake and milk production of late-lactation dairy cows offered a second-year chicory crop during summer

**Authors:** Muir SK et al.

**Summary:** These researchers measured the dry matter (DM) intake, nutrient intake, milk yield, and yield of milk fat and protein of predominantly Holstein-Friesian dairy cows in late lactation consuming three herbage-based diets (four replicates per treatment). The three grazed herbage were second-year chicory (CHIC), perennial ryegrass (*Lolium perenne* L.; PRG) monocultures, and a mixed sward (50:50) of chicory and perennial ryegrass (MIX). All diets were supplemented with alfalfa (*Medicago sativa* L.) hay (5.5kg of DM/cow per day) and an energy-based concentrate pellet (4.0kg of DM/cow per day). No significant differences in milk yield (12.0 to 12.6 kg/day across the treatments) or the yield of milk fat (539 to 585 g/day) and milk protein (433 to 447 g/day) between the three herbage-based diets were observed. In addition, no differences in DMI (17.9 to 19.2 kg/day) or estimated metabolizable energy intake (173 to 185 MJ/day) were noted between treatments.

**Comment:** This paper examined the use of second year chicory fed in the autumn in Victoria, Australia. There were three treatment groups: i) Perennial ryegrass, alfalfa hay and a pellet in the shed; ii) chicory, alfalfa hay and a pellet in the shed; and iii) 50:50 perennial ryegrass and chicory with the alfalfa hay and pellets as above. All groups ate the same amount of alfalfa hay (5.5kg DM/cow/day) and pellets (4kg DM/cow/day). It was found that the DMI of the forages was statistically the same (around 9kg). This was different to previous findings cited in this paper where DMI of chicory was higher than other forages. The reason for similar intakes in this study was attributed to the supplementary feeding and the nutritive characteristics of the chicory sward, which was second year chicory fed in the autumn. The chicory in this study was in a reproductive state (increased stem, lowered ME, and increased NDF) and had a ME less than that of the ryegrass (9.1 vs 9.2 MJME/kg DM). This paper highlights the importance of knowing what is being fed and not just using standard figures for the crops being fed have not been seen if doing a feed budget or investigating poor performance. DairyNZ's Facts and figures booklet has Chicory's ME at 12.5 to 13 MJME/kg DM.

**Reference:** *J Dairy Sci.* 2015;98(12):8825–35

[Abstract](#)

### Effects of human visitation on calf growth and performance of calves fed different milk replacer feeding levels

**Authors:** Guindon NE et al.

**Summary:** In this study, 28 newborn Holstein heifer calves from a university herd and eight newborn Holstein heifer calves from a commercial herd were blocked by birth and herd into one of four treatments: conventional [20% crude protein (CP), 20% fat] milk replacer (MR; treatment C) with (1) or without (0) human visitation, or a higher plane of MR nutrition (28% CP, 20% fat) regimen (treatment A) with (1) or (0) without human visitation. Calves were fed their MR treatment until day 43 (pre-weaning), after which all calves received half of their allotment of MR until day 49 (weaning). Calves were tracked for the next week until day 56 (post-weaning). During the pre-weaning and weaning phases, calves on A0 and A1 treatments consumed more MR, less starter, and weighed more than the C0 and C1 calves. Calves on A0 and A1 had greater average daily gain (ADG), hip and withers gain, were taller at the hip, and had larger girths during the pre-weaning phase. Overall, body weight, withers and hip heights, and heart girths were greater in A0 and A1 calves during the weaning week. Cortisol levels tended to be higher in visited calves during weaning. Post-weaning, calves formerly fed A0 and A1 treatments had lower blood glucose and tended to have higher urea and cortisol concentrations than C0 and C1 treatments. The higher plane of nutrition-fed calves tended to have higher cortisol concentrations indicating that they experienced more stress due to the removal of MR more than calves fed conventionally.

**Comment:** This study examined feeding calves up to weaning (at 49 days old) that were fed either a conventional milk replacer (21% CP) at 227g twice a day, or a high protein milk replacer (28.6% CP) at 408g b.i.d rising to 567g b.i.d. Within each of these two treatments, half the calves had human interaction for approximately 30 seconds twice a day encouraging eating of starter meal. Calves were weaned off milk replacer from day 42 to 49. As expected, the calves fed the high protein milk replacer consumed more milk replacer, energy, and grew faster and bigger but only ate about 50% as much starter meal as the calves fed conventional MR up to the start of weaning. Calves on the high protein milk replacer were more efficient when measured as ADG/DMI (g/gDMI); however, when average daily gain per energy unit (g/Mcal) was examined, there was no difference between the two feeding regimens due to the energy dense milk replacer. The human interaction did not result in any differences in the growth of the calves and most calves in NZ systems would likely get as much interaction with humans as the calves in this study anyway. This study suggests that, if you want bigger calves at a fixed weaning date, increased milk replacer will achieve that goal but it might not be the most cost efficient way of growing "kilos of calf" if the cost of energy in milk replacer exceeds that in calf starter meal.

**Reference:** *J Dairy Sci.* 2015;98(12):8952–61

[Abstract](#)

### *Theileria orientalis*: a review

**Authors:** Watts JG et al.

**Summary:** This paper is a review of the tick-borne protozoan parasite *Theileria orientalis*, which is responsible for benign or non-transforming theileriosis and which exerts its major effect through erythrocyte destruction. The review describes the experiences of three countries that have been significantly affected by theileriosis, New Zealand, Australia and Japan, including how the parasite behaves in each country and the management strategies that have been applied.

**Comment:** Many of you will be well up to speed with *Theileria*, but those of us who have not seen it but who potentially could see it due to transported animals or spread of vectors this paper reminds us to consider *Theileria* as a differential. For those of you more interested in the clinical management and treatment of cows and herds then there have been numerous articles in the VetScript and there are the two *Theileria* Veterinary Handbooks available at <http://bit.ly/1XYHrcF> and <http://bit.ly/1NouBli>.

**Reference:** *N Z Vet J.* 2016;64(1):3–9

[Abstract](#)

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