



Dairy Research Review™

Making Education Easy

Issue 14 - 2018

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Welcome to the fourteenth issue of Dairy Research Review.

Leading this issue are two papers respectively dealing with how farm-level management practices and colostrum quality affect calf serum protein levels and how cow-level factors affect colostrum quality in individual cows. Also included is a two-for-one study assessing the effects of internal teat sealant on culling rates and the incidence of clinical mastitis in dairy cows. The remaining papers in this issue also deal with dairy cows, including the effects of calcium supplementation on reproductive performance and milk production and the manipulation of dietary calcium and anions to alter the dietary cation-anion difference (DCAD) and calcium status of cows.

We hope that you find the research featured in this issue of **Dairy Research Review** useful in your everyday practice. We value your feedback so please keep sending us your comments and suggestions.

Kind regards

Hamish Newton

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Research Review thanks AgriHealth for their sponsorship of this publication, and their support for ongoing education for animal health professionals.

Calf and colostrum management practices on New Zealand dairy farms and their associations with concentrations of total protein in calf serum

Authors: Cuttance EL et al.

Summary: To analyse concentrations of total protein (TP) in calf serum, blood samples were collected from calves aged between 24 hours and 7 days, from 105 dairy farms in nine areas in NZ, on three occasions throughout the calving period. After the last sampling visit, a questionnaire describing calf and colostrum management practices on the farm was completed by the calf rearer or farm manager. The mean concentration of TP of calves across all farms was 59.8 g/L and was associated with region and herd size. Concentrations of TP were lower in calves from farms in Otago (56.2 g/L) and Southland (56.9 g/L) versus calves on farms in the Far North (62.6 g/L) and were lower in calves from farms with a herd size >600 (58.3 g/L) than ≤600 cows (61.3 g/L). Farm accounted for only 8.4% of the unexplained variation and there was no association between any of the measures of colostrum quality and TP concentrations.

Comment: This paper reports on the farm-level management practices from Emma Cuttance's work on colostrum and calf survival. The farm level data was collected by a survey. The paper looked for associations between the farm-level factors surveyed and the serum TP in calves aged 1 to 8 days. Only two significant variables were found, the region the farm was in and the farm size. Interestingly, there was no association between the measures of colostrum quality and the serum TP of the calves. This may be explained by the colostrum that was sampled not being the colostrum that the calves sampled had received. It seems strange that variables that we would have expected to have associations with serum TP, and have been found to be associated in other studies, were not found here. Whether this suggests our systems are more different than we think from other management systems or highlights the difficulty of using survey data I don't know. Or maybe it suggests that calves might drink from their dams more than we suspect.

Reference: *N Z Vet J.* 2018;66(3):126-131

[Abstract](#)

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Factors associated with colostrum quality in individual cows from dairy herds in the Waikato region of New Zealand

Authors: Denholm KS et al.

Summary: These researchers examined associations between cow-level factors and quality of first-milking colostrum (using a digital Brix refractometer) in 29 Waikato dairy herds (20 cows from each) and evaluated herd-level associations between vaccination against calf diarrhoea and colostrum quality. Colostrum quality was associated with the total volume of first-milking colostrum, interval from calving to colostrum collection, and cow age. Vaccination was associated with a higher proportion of colostrum samples with adequate Brix.

Comment: This next paper examines cow-level factors and their associations with first milking colostrum quality and the association between herd-level vaccination against calf scours and colostrum quality. The measure of colostrum quality used was the Brix percentage. It was found that the colostrum collected from cows that calved the day prior to collection had a lower Brix measurement than colostrum collected on the day of calving, this may have implications for farmers who are electing to only milk the colostrum cows once a day, but in light of the previous study maybe not? It was also found the cows that produced >8L of colostrum had a lower Brix level than cows that produced less than 8L. There was also no association between body condition score at calving and whether blood was present in the colostrum and the Brix score. These results further support the use of the Brix measurement in evaluating colostrum quality as it seems there is no obvious cow-level predictor of colostrum quality apart from cows older than 5 years having better quality colostrum than 2-year-olds. In this study, breed was not associated with colostrum quality. The herd effect of vaccinating was that a greater percentage of cows in the vaccinated herds had a Brix reading >22% than herds that were not vaccinating (30.8% vs 22.4%; p=0.12). This result further supports the need to select colostrum with the Brix test even if vaccinating the herd against calf scours – you will find more good colostrum but why dilute it when you have invested time and money to make it better?

Reference: *N Z Vet J.* 2018;66(3):115–120

[Abstract](#)

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.

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Estrous detection intensity and accuracy and optimal timing of insemination with automated activity monitors for dairy cows

Authors: LeRoy CNS et al.

Summary: In this Canadian observational study, the ability of automated activity monitoring (AAM) to detect oestrus for first artificial insemination (AI), the accuracy of detection, and the optimum interval from the oestrus alert from the AAM system to AI were assessed. Four commercial farms using one of two commercial AAM systems were studied over one year. The results showed that AAM can detect oestrus for first AI in just over the duration of one oestrous cycle for >80% of cows. The remainder would likely require intervention for timely insemination. In multiparous cows, performing AI based on AAM once per day would not affect pregnancy per AI. However, in primiparous cows, AI within eight hours of the onset of oestrus may be advantageous.

Comment: This study was done on four farms that had “automatic activity monitoring” to detect oestrus (either AfiAct leg-mounted or SCR neck-mounted monitors). Heats were detected and mated to between 55 and 80 days in milk (DIM). After 80 DIM, both oestrus detection and timed AI was used. Blood samples were taken at weeks 5, 7, and 9 and within a week of being identified as in oestrus for P4 concentration. One of the main outcomes examined was the optimal timing of AI relative to the onset of oestrus. Of the 1593 eligible inseminations, 139 occurred before the onset of oestrus defined by the activity meters (probably showed visual signs of oestrus and were mated before the data from the monitor was exported to the computer and the data signals processed at a milking), and 55 inseminations occurred >24 hours after onset of oestrus. The pregnancy rate for mixed-age cows mated prior to “onset of oestrus” was 25% and 29% for cows mated after 24 hours. The pregnancy rate for inseminations between 0 and 24 hours for mixed age cows was 31.3% and did not vary between the 8 hourly intervals within the 24-hour period (0-8, 8-16, and 16-24 hours). For primiparous cows though the pregnancy rate was 49%, 36%, and 32% for the three periods in the 24 hours post-oestrus alert (0-8, 8-16, and 16-24 hours). This paper, at least for the herds studied, does not seem to support twice-a-day insemination for mixed-age cows but if using an AAM system it could be worthwhile for your heifers. If you have clients using these systems, this paper also gives a good description of how the algorithms work to define a cow as in oestrus based on changes in activity.

Reference: *J Dairy Sci.* 2018;101(2):1638–1647

[Abstract](#)

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Comparison of 0.46% calcium diets with and without added anions with a 0.7% calcium anionic diet as a means to reduce periparturient hypocalcemia

Authors: Goff JP & Koszewski NJ

Summary: These US researchers attempted to: i) determine whether there is any benefit to periparturient plasma calcium (Ca) concentration if diet anion addition results in a lesser degree of acidification in dairy cows and urine pH does not go below 7.0; ii) determine whether a 0.46% Ca diet would be sufficiently low in Ca to stimulate parathyroid hormone (PTH) secretion before calving; and iii) compare periparturient plasma Ca in dairy cows fed 0.46 or 0.72% Ca diets with a similar dietary cation-anion difference (DCAD).

Comments: This paper examined manipulating dietary Ca concentrations and the anions to alter the DCAD on the Ca status of cows. By feeding a diet high in anions (low DCAD) the cow gets put into a state of compensated metabolic acidosis and the sensitivity of the bones and kidney to PTH increases. Traditionally in NZ, we have placed the cow on a restricted Ca diet prior to calving to increase the amount of PTH secreted. The experiments were designed to see if a Ca concentration in the diet of 0.46% would stimulate Ca homeostatic mechanisms and also if anion supplementation would still provide a benefit even if the urine pH (a measure of the acidification of the cow) remains above the recommended value of 6.5. There were three treatment groups: a low Ca diet (DCAD 167); a low Ca diet with added anions (DCAD -13); and a high Ca diet (0.72% Ca) and added anions (DCAD -17). There was a second experiment with essentially the same treatment groups, but all had added potassium (K) so the DCADs were more typical of we would expect on pasture (+327, +146, and +140).

In the first experiment, the addition of the anionic salts did reduce the urine pH (8.27 for the un-supplemented vs 7.07 and 7.41 for the groups that got anionic salts). The anionic salt supplemented groups also had higher serum Ca at calving. Clinical milk fever was diagnosed in 3/20 of the low Ca diet cows, 1/19 of the high Ca and anionic salt cows, and 0/21 cows that got low Ca and anionic salts. In the second experiment with added K, all treatment groups had higher urine pH than their corresponding treatment group without the added K (all >pH 8). There were no significant differences between the K supplemented groups in the blood Ca concentrations pre or post calving. In both experiments, the low Ca diets were according to NRC modelling providing 8g more Ca than needed. In conclusion, cows fed 0.46% Ca without anionic salts had the lowest peri calving plasma Ca concentration thus this level of Ca restriction was not enough to up-regulate Ca homeostasis. Cows that were fed anionic salts that resulted in reduced urine pH had similar peri calving plasma Ca concentrations regardless of Ca concentration in the diet. It seems that if you have clients adding anionic salts to their transition cows it will be effective if a urine pH <7.5 is achieved – this might mean that the DCAD has to be calculated to be <140.

Reference: *J Dairy Sci.* 2018;101(6):5033–5045

[Abstract](#)

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Effect of oral calcium bolus administration on milk production, concentrations of minerals and metabolites in serum, early-lactation health status, and reproductive performance of Holstein dairy cows

Authors: Jahani-Moghadam M et al.

Summary: In this study, multiparous dry cows (n=66) were fed a diet with a positive dietary cation-anion difference (DCAD) prior to calving and randomly assigned to receive two oral 45g calcium (Ca) boluses (n=33; one administered immediately after calving and the second 24 hours later) or no treatment (n=33). Oral Ca supplementation had no effect on milk yields or composition, increased serum Ca concentrations on day 2 post-partum, and increased first-service conception rates in cows fed a positive DCAD diet prior to calving compared with cows that received no Ca supplementation.

Comment: This is an Iranian study that examined giving cows a Ca bolus immediately after calving and then again 24 hours later. Blood samples were taken on day 0, 2, and 7. Hypocalcaemia was defined as the blood concentration of Ca in serum at day 2. Ketosis was defined by the blood concentration of non-esterified fatty acids and β -hydroxybutyric acid at day 7. Supplementation did result in higher serum Ca concentrations, so the supplement did work. The proportion of cows diagnosed with "severe hypocalcaemia" (<1.5mmol/L) was significantly lower in the supplemented cows (2/33 vs 12/33). The only other variable that was found to differ between treatment and the control group was the first-service conception rate: 41% vs 65% for the control versus treatment groups. Despite hypocalcaemic cows having reduced days in milk and phagocytic activity, this study like others cited did not find a difference in production, evidence of ketosis, or disease. This study was also in agreement with other studies that report cows with hypocalcaemia have delayed resumption of cycling and reduced conception rates. If you are seeing poor conception rates, this paper serves a reminder to look back at the calving bloods or the incidence of milk fever as a possible explanation.

Reference: *N Z Vet J.* 2018;66(3):132–137

[Abstract](#)

A clinical and histopathological comparison of the effectiveness of salicylic acid to a compound of inorganic acids for the treatment of digital dermatitis in cattle

Authors: Capion N et al.

Summary: This Danish study assessed the efficacy of three topical non-antibiotic treatments for the treatment of digital dermatitis (DD) in a commercial dairy herd. Thirty-three cows (42 lesions in total) were randomly assigned to receive one of three treatments: salicylic acid, a compound of inorganic acids in a 20% solution, or the same compound of inorganic acids in a dry form. Lesions were biopsied pre- and post-treatment and were clinically evaluated five times. During the 30-day study, all lesions improved irrespective of the treatment used, with no difference between the treatments being observed. The odds ratio of a healed lesion having spirochetes in the epidermis was 0.58 versus 26.5 for an active DD lesion.

Comment: I personally do not see a great deal of DD, and I am unsure if it is a significant issue for many of you, but this paper discusses some non-antibiotic treatments for DD. Concern around development of antibiotic resistance, as well as potential residue issues, has led to increased interest in non-antibiotic treatment regimens. I assume most DD lesions in NZ are being treated with a tetracycline spray, but with the push to reduce antibiotic usage we might need to consider a non-antibiotic option. What I found more interesting in the paper were the facts relating to *Treponema* spp., e.g., they account for 90% of the bacteria found in DD lesions and are not found on the adjacent skin and they produce ammonia and hydrogen sulphide, which damage skin. In addition to *Treponema* spp., poor hygiene is also required for DD lesions and that cattle slurry has a pH of 8.4 (vs 6.4 for skin). The non-antibiotic treatments have acids in them that lower the pH on the skin, which explains some of their efficacy. Perhaps why we don't see great outbreaks of DD is because most of the day our cows are on "clean" grass or get their feet cleaned by the grass.

Reference: *J Dairy Sci.* 2018;101(2):1325–1333

[Abstract](#)



Describing temporal variation in reticuloruminal pH using continuous monitoring data

Authors: Denwood MJ et al.

Summary: These European researchers fitted a series of statistical models to continuously monitored reticuloruminal pH data obtained from 93 animals on 13 farms to characterize normal variation within and between animals and farms. They then used a subset of the data to relate deviations from the normal pattern to the productivity of 24 dairy cows from a single herd. A substantial variation in pH characteristics was observed between animals, although animals on the same farm tended to show more consistent patterns. There was strong evidence for a predictable diurnal variation in all animals. For the animals with production information, there was a strong association between productivity and deviations from the expected diurnal pattern of pH two days before the productivity observation. Contrastingly, no association between productivity and the occurrence of observations was apparent below a threshold pH.

Comment: Acidosis is at the forefront of many vets' minds at the moment with thousands of cows going off to be wintered on fodder beet. In this paper, the changes in rumen pH were constantly monitored via boluses in 93 cows on 13 farms. Twenty-four of these animals were further examined for deviation from the normal pattern of change in pH to look at how that related to productivity. There was "substantial" variation in pH between animals but animals on the same farm were more consistent. Seventy percent of the variation was explained by diurnal variation. For the subset of 24 cows that were evaluated for production (days in milk and milk yield), there was a strong association with change in the diurnal pattern of pH change two days prior to a change in production being noted. There was no association between productivity and observations of pH below a threshold. The dataset came from milking cows that did not show signs of disease, so this pattern probably represents normal pH changes in cows milking. What happens in cows during the dry period on fodder beet when fed once a day could be quite different.

Reference: *J Dairy Sci.* 2018;101(1):233–254

[Abstract](#)

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Effect of treatment with an internal teat sealant at drying-off in cows wintered on forage crops in New Zealand on clinical mastitis and somatic cell counts

Authors: Bates AJ & Saldias B

Summary: This was a prospective cohort study in which cows from four North Otago dairy herds that were wintered on forage crops and had no history of clinical mastitis or elevated somatic cell counts (SCC) were randomly assigned to treatment with internal teat sealant in each quarter at drying-off or no treatment. The use of teat sealant halved the incidence of clinical mastitis between drying-off and 84 days after calving, and reduced by 33% the prevalence of cows with SCC $\geq 200,000$ cells/mL approximately 70 days after calving, compared with untreated cows.

Reference: *N Z Vet J.* 2018;66(2):64–71

[Abstract](#)

Effect of using an internal teat sealant at drying-off in cows wintered on forage crops in New Zealand on culling in the dry period and early lactation

Authors: Bates AJ & Saldias B

Summary: The effect of treatment with internal teat sealant compared with no treatment at drying-off on culling during the dry period and 90 days after calving was assessed in the same cohort of North Otago dairy cows. Culling was defined as an unplanned exit from the herd, including cows sold for slaughter, cows slaughtered for salvage value, and cows that died on farm. The use of teat sealant at drying-off reduced the risk of culling over the dry period and for the first 90 days of lactation.

Reference: *N Z Vet J.* 2018;66(2):72–78

[Abstract](#)

Comment: We are now expected to reduce the amount of antibiotics used in the dairy industry. Reducing the use of prophylactic antibiotics during the dry period is the logical place to start now we know that teat sealants work and how to select cows to receive teat sealants. The first paper examines the effect of not giving a teat sealant to uninfected cows and looking at the outcome of clinical mastitis out to day 84 post calving compared with cows that did receive a teat sealant. Cows with SCCs $< 100,000$ and no mastitis history from four farms and either got a teat sealant or no treatment at dry off. The second of these papers uses the same cows but examines effect of teat sealant on the chance of being culled between dry off and 90 days in milk (an unplanned exit from the herd). Infusion of a teat sealant roughly halved the risk of mastitis in the first 30 days of the dry period and the period from 30 days before to 84 days post calving. In this study, cows with dry periods longer than 80 days were at increased risk of mastitis and the protective effect of teat sealant was larger (5% vs 21%) presumably because the time at risk for acquiring an infection was longer. At the first herd test, the cows that were teat sealed were roughly half as likely to have a SCC $> 200,000$ (13% vs 20%). Of the 964 cows in the analysis for culling, 69 were culled and only 14 of these had a diagnosis of clinical mastitis made. A cow that had a diagnosis of mastitis was twice as likely to be culled than a cow without a mastitis diagnosis. Once again, the cows that received a teat sealant had half the risk of being culled between dry off and 90 days in milk. These two papers are great to have when a client asks: "What if I do nothing?"

Invited review: Mineral absorption mechanisms, mineral interactions that affect acid–base and antioxidant status, and diet considerations to improve mineral status

Authors: Goff JP

Summary: This review article mainly discusses the paracellular and transcellular mechanisms used by the gastrointestinal tract to absorb the microminerals and macrominerals needed by dairy cows. Another focus is the effect that macrominerals have on the acid-base and antioxidant status of an animal. Also discussed is how complex interactions between minerals can compromise the effectiveness of a diet in promoting the health and productivity of a cow.

Comment: This is not a quick read. If you really want to get your head around the absorption of minerals in the dairy cow, relive your chemistry and physiology lectures, or if you secretly want to be a chemist rather than a vet then get a copy of this review. What is good about this paper is that it is very easy to navigate as it is laid out mineral by mineral so you can pick and choose what you want to get up to speed with. Phosphorous is becoming a bit of a hot topic especially with fodder beet feeding for many of us, and this was a useful paper to remind me (learn for the first time?) about the mechanisms of absorption and the importance of vitamin D and hence calcium levels. This is a good paper to have a PDF copy of in a folder somewhere on your computer as a go to "text book" or perhaps print out a copy and keep it inside the clinic's copy of Neville Grace's Managing Trace Element Deficiencies.

Reference: *J Dairy Sci.* 2018;101(4):2763–2813

[Abstract](#)