

Dairy RESEARCH REVIEW™

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Issue 35 – 2023

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Welcome to the latest issue of Dairy Research Review.

Two papers in this issue look at reproductive performance, specifically how it is affected by ketosis during early lactation and by supplementary trace minerals in pre- and postpartum diets. Clinical mastitis is the focus of two other papers, one of which deals with cow- and herd-level factors in lactational treatment while the other discusses an evidence-based protocol for selective treatment decisions. Also included in this issue are papers informing the transfer of passive immunity, scoring of ear tag wounds, and treatment of claw horn lameness.

We hope that you find the research selected for this issue of **Dairy Research Review** professionally beneficial. Please keep your comments and suggestions coming!

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.

Effects of source of supplementary trace minerals in pre- and postpartum diets on reproductive biology and performance in dairy cows

Authors: Mion B et al.

Summary: These researchers evaluated the effects of complete replacement of inorganic salts of trace minerals (STM) with organic trace minerals (OTM) in both pre- and postpartum diets on ovarian dynamics, oestrous behaviour measured by sensors, preimplantation conceptus development, and reproductive performance in dairy cows. The results show that replacing STM with OTM led to modest improvements to resumption of ovarian cyclicity and important changes in preimplantation conceptus development but it did not alter conception risk and pregnancy rate.

Comment: This study looked at whether supplemented trace elements were in the form of inorganic salts or as an organic form, a chelate between the mineral and an organic molecule. The idea is that OTMs have greater bioavailability. What made this article interesting is that reproductive outcomes were reported as well as measures that might help explain the mechanisms or biology of what the trace elements do or where they end up. No differences were found in the days to conception, risk of pregnancy, or pregnancy loss. There were, however, some differences found in the uterine fluid (lipids and metabolites related to galactose metabolism), the transcript of the conceptus and follicular fluid (increased copper level). I suppose what we don't know is that with a higher-powered study would of the changes found be translated into measurable reproductive outcomes, or were the cows in his study not under enough oxidative stress or was management such that differences were not evident (too good or too bad)? There is a very long discussion section though that discusses many studies that have not found a difference in the reproductive performance between different forms of trace elements.

Reference: *J Dairy Sci.* 2023;106(7):5074-5095

[Abstract](#)

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Consensus recommendations on calf- and herd-level passive immunity in dairy calves in the United States

Authors: Lombard J et al.

Summary: A group of calf experts was assembled to evaluate different threshold values for transfer of passive immunity (TPI) and their relationship to mortality and morbidity using available data and to come to consensus on a calf- and herd-level TPI standard. They proposed that the TPI standard include four serum IgG categories, excellent (≥ 25.0 g/L), good (18.0–24.9), fair (10.0–17.9), and poor (< 10.0), and at the herd level > 40 , 30, 20, and $< 10\%$ of calves are in the excellent, good, fair, and poor TPI categories, respectively.

Comment: Unfortunately, by the time you read this most calves will be out of the sheds but following on from an article summarised last time ([Crannell et al. 2023](#)) I thought this reinforces some messages about evaluating TPI. For years we have described TPI as either failure or success based on a cut of value, e.g., serum IgG level ≥ 10 and < 10 g/L, which was based on data that showed higher pre-weaning calf mortality in calves with failure of passive transfer (FPT). In the US, the data suggests that most calves are now receiving enough colostrum to not be classified as FPT and indeed the pre-weaning mortality rates are declining, but the morbidity rates are not. Data from 2,360 calves from 103 farms was analysed to find some cut points that had some relevance to reducing both mortality and morbidity. For context the reported mortality and morbidity rates were 3.2% and 34.3%, respectively. The authors looked at different options for cut points and settled on the following IgG levels, “excellent” (≥ 25 g/L), “good” (18–24.9), “fair” (10–17.9), and “poor” (< 10). Comparable categories of serum total protein and serum Brix were calculated. The actual data and the model created showed that as the serum IgG levels increased morbidity decreased. I think this paper reinforces a message that in this scenario “more is better”. In the data set used, 35% of calves achieved “excellent” IgG levels and only 12% were “poor” so having two outcomes (success or failure) at a cut point of 10g/L really does not explain what might happen for the almost 90% of calves that we traditionally would have said, have adequate TPI. How to monitor TPI with sampling and reporting/interpreting four categories/proportions is going to be tricky though – please read Richard Laven’s article in the June issue of Hoofprint. The authors also kindly remind us that TPI is not the only driver of calf mortality and morbidity. Adequate nutrition, lack of stress, adequate housing, limited exposure to potential pathogens, and the subjective issue of the skills and management intensity of the calf rearer(s) are all important. Laboratory results will help with an investigation, but we still need to get our “eyes on the problem” to identify the weakest link to correct.

Reference: *J Dairy Sci.* 2020;103(8):7611-7624

[Abstract](#)



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Development and application of a novel approach to scoring ear tag wounds in dairy calves

Authors: Harmon ML et al.

Summary: Because little is known about the duration and process of wound healing associated with ear tag application, the objective of this study was to develop a detailed scoring system and use it to quantify wound healing in dairy calves that had plastic identification tags applied at two days of age. It was found that impressions, crust, tissue growth, and desquamation were still seen in many calves by 12 weeks of age, suggesting that extrinsic factors, e.g., mechanical disturbance and irritation, may have contributed to prolonged wound healing.

Comment: The placement of ear tags is the reality for all calves that get reared and even those that go on the bobby calf truck. While the need for tagging is unlikely to change, I read this paper as it made me stop and think about what is done as routine and normal, may not be 100% fine and acts as a reminder to do the normal practices as well as possible. This US paper describes the healing of the wounds created by applying the Allflex tags we are all used to. The only thing that seemed different to what we do routinely was that the ears were disinfected with chlorhexidine prior to tag application. The prevalence of “tissue growth and exudate” peaked at 91% of calves at the front of the ear four weeks after tagging. The back of the ear interestingly had its peak prevalence (67%) later, at week six. A similar pattern was observed with exudate, a higher prevalence, and earlier, on the front of the ear, compared with back of the ear. Does the hair on the back of the ear create a barrier between the tag and the wound/skin? Surprising (but perhaps because I have never looked) was only 10% of calves at 12 weeks post tagging had a “piercing only” at both the front and back of the ear. This sort of study provides some context about what is realistic to expect in all the calves, that I don’t properly look at, when I get asked to look at a calf with “a tag infection”. Although this paper looked at one type of tag there are references to other papers that have looked at other tags (plastic, metal, radio-frequency identification, and accelerometer) and what was reported here is probably not abnormal.

Reference: *J Dairy Sci.* 2023;106(7):5043-5053

[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. 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.

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Invited review: selective treatment of clinical mastitis in dairy cattle

Authors: de Jong E et al.

Summary: Not all cases of clinical mastitis (CM) benefit from antimicrobial treatment according to scientific evidence; therefore, correctly identifying CM cases that benefit from antimicrobial treatment is key to supporting judicious antimicrobial use (AMU) and reducing selection pressure for antimicrobial resistance (AMR) in the dairy industry. This review informed an evidence-based protocol for selective CM treatment decisions based on a combination of rapid diagnostic test results, review of somatic cell count and CM records, and elucidated consequences in terms of udder health, AMU, and farm economics. Rapid identification of the causative agent is the most important factor in selective CM treatment protocols and selective CM treatment of non-severe cases can be a practical tool to facilitate AMU reduction on dairy farms.

Comment: We are being steered towards selective dry cow therapy to reduce AMU with the intention or assumption that this will reduce the risk of AMR developing or being further selected for. The next obvious way to reduce selection pressure for AMR in a dairy farm is to reduce the amount of mastitis being treated, firstly through prevention but once a case is identified through selective treatment of the clinical cases. A proposed protocol is discussed in the paper and the first step is to assess the severity of the mastitis case. Severity was defined as mild (visible changes limited to the milk), moderate (also inflammatory signs of the infected quarter), or severe (also signs of systemic illness). For the mild and moderate cases, a diagnostic test to inform the treatment decision is advised if a result can be obtained in 24 hours. What was found in the systemic review was that the bacterial cure rate of clinical cases was not inferior if a selective protocol was used compared to blanket treatment of clinical cases. The reduction in antimicrobial usage if a farm switches to selective treatment was influenced by two things. Firstly, the amount of CM the herd suffers from. A herd with a high incidence of CM will have a greater absolute reduction in AMU than a farm with low incidence of CM even if the relative reduction stays the same. This reinforces the need for improved udder health at a farm level to reduce AMU – not having a need to treat keeps the antibiotics in the bottle. The second is the proportion of cases that are Gram negative or no growth. For every 10% increase in the proportion of cases that are Gram negative or no growth there was on average a 9.1% reduction in AMU. On-farm diagnostics to enable selective treatment of CM will reduce AMU especially if there is a high incidence of mastitis on the farm (there is still the need to address underlying issue though) and if there is a relatively high incidence of Gram-negative mastitis or no growths.

Reference: *J Dairy Sci.* 2023;106(6):3761-3778

[Abstract](#)



Healthy Hoof: workshop

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The Healthy Hoof Programme is provided by DairyNZ and delivered by NZVA

Lameness recovery rates following treatment of dairy cattle with claw horn lameness in the Waikato region of New Zealand

Authors: Mason W et al.

Summary: The objective of this investigation was to describe the time in days for lame dairy cows to recover after diagnosis and treatment of claw horn lameness and to determine whether cure rates differ between farms. A total of 241 lame cattle with claw horn lesions were enrolled across the five farms. This descriptive study provides evidence that rapid times to non-lameness and soundness are possible on NZ dairy farms by following industry-standard guidelines for treatment of claw horn lameness, and that cure rates can differ between farms.

Comment: I suspect we are all guilty of driving on to a farm and seeing the lame mob and deciding whether it is “big” or “small” but forget that the prevalence of lameness (the size of the lame herd) is influenced by both the incidence of lameness (e.g., number of cases this week) and the duration that they are lame for. This paper reports the lameness recovery rates rather than the proportion of lame cows recovered by set time points. The cows in this study had a median time to being non-lame (lameness score of ≤ 1) of only seven days and 90% were non-lame by 21 days. The median time to being sound (lameness score = 0) was 18 days and by 35 days 90% were sound. This gives us some idea of how long a cow should be remaining in the lame mob if they have been treated appropriately. The big caveat though is that the lame cows were examined and treated by a veterinarian within 24 to 48 hours of the farmer identifying a cow as lame. It is acknowledged in this paper that “there is a consensus that time to lameness diagnosis and lameness treatment protocols are strongly associated with lameness cure risk”. I don’t know but suspect the cure rates reported here are better than what happens on most farms. If this is the case, then I think we need to discuss both appropriate treatment, and ways to identify and treat lame cows earlier.

Reference: *N Z Vet J.* 2023;71(5):226-235

[Abstract](#)

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Reproductive performance of lactating dairy cows with elevated milk β -hydroxybutyrate levels during first 6 weeks of lactation

Authors: Alemu TW et al.

Summary: Using the dairy herd information data of 30,413 cows, these researchers evaluated the association between time and amplitude of elevated milk β -hydroxybutyrate levels (BHB) occurring within 42 days in milk (DIM) and the subsequent reproductive performance of lactating Holstein cows. The overall findings of the study suggest that monitoring and prevention of ketosis during the first 6 weeks of lactation is necessary to avoid the negative effects of the transition period on the reproductive performance of lactating dairy cows.

Comment: This study looked at the effect that elevated milk BHB had on reproductive measures in American cows. While we don't have access to milk BHB levels this paper does add to the body of knowledge of what effects subclinical ketosis might have on subsequent reproductive performance. This paper not only looked at if there were elevated milk BHB levels but when the elevation occurred relative to calving. Cows needed to have at least two measures of milk BHB. As measures were done at monthly herd testing "early" results were from the first 14 days in lactation and late results were from 14 to 42 DIM but due to the monthly sampling regimen there were very few test results between 3 and 4 weeks in milk. What I did learn was the mechanisms behind ketosis can vary with when it occurs. Type II ketosis generally occurs in the first 14 DIM and is caused by an insulin resistance resulting in hyperinsulinemia, hyperglycaemia, and lower gluconeogenesis, which promote excessive body fat mobilization resulting in increased ketogenesis and fat accumulation in the liver. Type I ketosis tends to occur later and is a result of reduced feed intake leading to hypoglycaemia. Having EMB either early or late did result in poorer measures of reproductive performance but the effect of this was way less than the effect of parity – but as we cannot control parity (apart from managing the age structure of the herd) paying attention to ketosis right out to 6 weeks in milk seems prudent. Whether the magnitude of effects seen in this paper with cows managed completely different to our cows holds true for us I don't know. While we don't have access to milk BHB levels we can do body condition score measurements and look at bulk milk constituents as very rough proxies.

Reference: *J Dairy Sci.* 2023;106(7):5165-5181

[Abstract](#)



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Lactational treatment of bovine mastitis: development over time and factors influencing cytological cure

Authors: Wilm J et al.

Summary: This large database-based retrospective observational study combined electronic health records and routinely measured somatic cell counts (SCC) from individual cows to create an overview of lactational mastitis antibiotic treatment in Danish dairy herds. Over the 10-year study period, lactational mastitis treatments in Denmark shifted toward fewer treatments in total while treatment for acute cases and treatment duration both increased. Statistical analysis confirmed the importance of cow-related factors for the probability of cytological cure following lactational treatment of mastitis but also revealed the importance of managing the herd-level new infection risk, as well as analysis of causative pathogens to improve outcomes and prevent unnecessary use of antibiotics.

Comment: This Danish paper extracted health records from cows over the years from 2010 to 2019. Treatment success used an individual cow somatic cell count (ISCC) of $\leq 100,000$ cells/mL 21 to 60 days after treatment. In Denmark, it is a requirement to "document the consumption of prescribed antibiotics for different indications". The two common mastitis diagnosis coded are "common mastitis", which usually results in the case being treated with a penicillin-based protocol, and "acute mastitis", which is used to describe more severe cases suspected to be caused by Gram-negative bugs. The acute cases tend to get treated systemically and with intramammary tubes containing either a lincomycin/neomycin or first-generation cephalosporin. Over the time period analysed, there was a decline in the number of mastitis cases but the distribution of cases moved towards proportionately more "acute cases". The treatment duration had also increased. There was also a decrease over time in the proportion of mastitis cases that had a bacterial diagnosis made (33% down to 20%) but of the cases with a diagnosis the proportion diagnosed with a Gram-negative bug has increased with a decrease in *Staphylococcus aureus* cases. When the risk of cure (ISCC $\leq 100,000$ cells/mL) was examined, it remained pretty consistent between years (0.42 to 0.45). The risk of cure decreased with age, stage of lactation (days in milk), and whether the cow had an elevated SCC or a previous mastitis history, all what we would expect. The most interesting thing from this paper was in the introduction where it references studies that "indicate that the economic success of treatment strategies is dependent on the herd-level transmission dynamics" – cows in a herd with many infected cows appear less likely to cure as they might well get reinfected. So when dealing with "the drugs aren't strong enough" comments, this reminds us to think about both cow factors (age, mastitis history, duration of high SCC, etc) and the herd that the cases are coming from. Cure rates appear better in better herds.

Reference: *J Dairy Sci.* 2023;106(8):5740-5752

[Abstract](#)

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Communicating without words: measuring nonverbal communication between veterinarians and farmers during routine herd health consultations

Authors: MacGillivray F et al.

Summary: Veterinarian-farmer non-verbal communication (NVC) can influence interactions and their outcomes. In this study, the researchers considered which aspects of NVC should be measured, and how, to better understand the significance of NVC for veterinarians working in dairy practice. Based on video recordings of routine consultations analysed for farmer and veterinarian NVC, the researchers concluded that it is practical to measure non-verbal attributes and that veterinarians becoming more skilled non-verbal communicators may result in more effective conversations during routine consultations, leading to an increased sense of satisfaction for both veterinarian and farmer.

Comment: This paper examined the NVC between veterinarians and farmers at a visit where at least one cow was examined on farm, during a routine planned visit. While the type of visit described in the paper was not routine in NZ the paper does describe what NVC occurred during an introduction (arriving on farm) and during a discussion (a sit-down consult). Static NVC includes what is worn (branded clothing, etc) and the usage of paper documents or computers. Dynamic NVC includes things like interpersonal distance, head orientation, use of gestures, and use of object- and self-adapters. While this was a descriptive study, and did not measure outcomes associated with different NVCs, it is worthwhile to think about what you can control. Static NVC is controllable, what you wear and how you position a computer or the paper you are discussing can be altered to improve the chances of good communication (to allow eye contact or perhaps in a small animal consult have the computer so you don't turn your back on a client). There are some dynamic NVCs that are also able to be controlled relatively easily, such as being conscious of your use of object-adapters (fiddling with pens or glasses, etc) and self-adapters (such as touching your hair or face). In summary, this is a paper that reminds us communication is not just what you say and how you say it but includes NVC as well. What you wear, how you position your computer or paper, and how much you fiddle with stuff are things we can control or at least be aware of.

Reference: *J Dairy Sci.* 2023;106(8):5452-5467
[Abstract](#)

Animal- and herd-level factors associated with onset of puberty in grazing dairy heifers

Authors: Steele NM et al.

Summary: To better understand the importance of the animal- and herd-level factors that influence the onset of puberty in commercial dairy herds, these investigators measured puberty and fertility traits in a population of 5,010 Holstein-Friesian and Holstein-Friesian x Jersey dairy heifers across 54 commercial herds. They found that that heavier animals at a greater percentage of mature liveweight (PMLWT) or with a greater Jersey breed proportion reach puberty earlier than their lighter or greater Holstein breed proportion herd mates.

Comment: This NZ paper looked at what influenced heifers reaching puberty and when. Onset of puberty was defined by a raised blood progesterone level. Heifers were examined at three time points at monthly intervals when the mean age in each herd was 10, 11, and 12 months (visit V1, V2 and V3, respectively). At both the herd and the animal level the most important factors for having attained puberty at any of the visits were liveweight, PMLWT, and percentage Jersey genetics. One of the measures in this study was the ano-genital distance (AGD). It was found that a 10mm greater AGD resulted in a 9% greater chance of reaching puberty by V3. This result appears contradictory to other papers that found a shorter AGD at >28 months of age was associated with better reproductive performance. This may be due to "an isometric growth pattern of animals when the AGD increases in proportion to body size in immature animals". There was also some findings regarding height and weight that did not seem intuitive, probably because "heifers grown in a non-linear fashion may have grown proportionately more in height at the expense of liveweight". Frequency of weighing was negatively associated with proportion of heifers attaining puberty in this study. Does increased weighing occur in response to a history of poor heifer rearing? In summary, well grown heifers reach puberty earlier than poorly grown heifers as do heifers with more Jersey genetics.

Reference: *N Z Vet J.* 2023;71(5):213-225
[Abstract](#)

Graduate Student Literature Review: reducing mortality and morbidity in transported preweaning dairy calves: colostrum management and pretransport nonsteroidal anti-inflammatory drug administration

Authors: Elmore KK & Chibisa GE

Summary: The authors of this review provide background on preweaning mortality and morbidity, colostrum management, transport-related stress, and use of nonsteroidal anti-inflammatory drugs (NSAIDs) in transported calves and highlight some current knowledge gaps. They conclude that good colostrum management and proper hygiene and nutrition are important factors in limiting the negative outcomes in preweaning calves but that further research is needed to develop other effective strategies to reduce digestive and respiratory disorders, need for antibiotic treatment, and mortality and morbidity rates. They are equivocal about pre-transport NSAID administration, merely stating that it could have health and production performance implications.

Comment: This paper is very US centric, for example it states that one in ten heifers and almost all bulls are transported to a calf-rearing farm within two days of birth and some of the distances travelled are huge (e.g., 482km in one example). This paper neither supports nor discourages the use of NSAID (it mainly discusses flunixin and meloxicam) when transporting calves and suggests "more research is required". There were some take-home points though that are worth considering that I imagine might hold true for NZ calves, but perhaps not, as don't think we have 30% morbidity rates in pre-weaned calves that the US papers talk about:

- "Young calves are more susceptible to transport-related stress because they are less efficient at thermo- and osmo-regulation."
- "The risk of death for bobby calves >4 days of age increased 1.45 times for every additional hour of transportation between 0.1 and 10 hours."
- There are reported "negative associations between the serum concentration of inflammatory markers (e.g., haptoglobin, interleukin-6, and tumour necrosis factor) during the first 3 weeks of life in dairy calves and average daily weight gain up to 9 months of age".

Reference: *J Dairy Sci.* 2023;106(8):5753-5762
[Abstract](#)

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