Dairy RESEARCH REVIEW™

Making Education Easy

Issue 37 – 2024

In this issue:

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Welcome to the latest issue of Dairy Research Review.

Research reported in this issue includes modelling nitrogen utilisation in pasture-grazed dairy cattle, molecular typing for improved surveillance of *Leptospira* spp., evaluating the effects of milking frequency on milk yield in seasonal-calving pasture-based systems, and investigating associations of postpartum health with oestrus detection and pregnancy outcomes. Transient post-parturient hypocalcaemia is the subject of a prospective study and an expert perspective. Calf-cow separation and minimising early embryonic losses are the topics of two other expert perspectives reported in this issue.

We hope that this issue of **Dairy Research Review** is professionally beneficial in your daily practice. Your input is important; please your comments and feedback 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.

Effect of milk flow-rate switch-point settings on milking duration and udder health throughout lactation

Authors: Upton J et al.

Summary: The multiple aims of this study included quantifying the effects of different milk flow-rate switch-point settings for automatic cluster removers (ACRs) on milking duration, somatic cell count (SCC), and teat condition over a nearly 3-month study period in a grass-based system. Overall, the results supported the hypothesis that increasing milk flow-rate switch-points can be effective in reducing milking duration while maintaining milk yield without affecting SCC.

Comment: The authors of this study acknowledge there is already a large number of papers that have shown that increasing the flow rate at which ACRs cut the vacuum reduces milking duration without affecting yields. However, they were concerned about the long-term effect of this on SCC in spring calving pasture-based herds in Ireland, where *Staphylococcus aureus* is now the predominant pathogen. Studies in NZ over an 11-week period did not find any adverse effects on SCC (Edwards et al. 2013). This study was conducted over a 31-week period. Reassuringly, this study did not find an effect on milk SCC and that increasing the milk flow-rate switch-point from 0.2 kg/min to 0.8 kg/min reduced daily milking duration by 14%. I think is important to remember that milking duration is the time from the cups going on a cow to them coming off. So, do not expect a 14% reduction in total milking time for a herd by changing the settings on the ACRs; cow flow will in many cases influence that time more.

Reference: J Dairy Sci. 2023;106(12):8861-8870
Abstract

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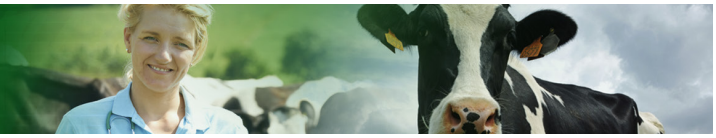

Molecular typing of *Leptospira* spp. in farmed and wild mammals reveals new host-serovar associations in New Zealand

Authors: Wilkinson DA et al.

Summary: This study involved applying molecular typing to DNA isolated from historical biological samples collected over a 10-year period to determine *Leptospira* spp. infecting domestic and wild mammals in NZ. The findings suggested that serological typing, which has traditionally been used for diagnosis of leptospirosis in NZ, is inadequate for typing all strains and that future surveillance and research will need to incorporate molecular methods to accurately type species and serovars of *Leptospira* infecting animals in NZ.

Comment: There is a fair bit of chatter about new and emerging strains of *Leptospira*. This paper describes what was found in different samples from different species that have already been collected and were re-analysed using polymerase chain reaction. After reading this paper I think I finally understand how the different *Leptospira* bugs are classified. There are two species we are primarily concerned with, *Leptospira borgpetersenii* and *L. interogans*. Within these species there are serovars that are differentiated using a microscopic agglutination test (MAT) based on surface antigens. Surveillance of leptospirosis in NZ has relied on serology but there is cross reactivity between serogroups for example, "in New Zealand, cattle are often infected with serovar Hardjo type bovis which belongs to the species *L. borgpetersenii*. This strain serologically reacts like serovar Hardjo type prajitno, which belongs to the species *L. interrogans*" and both of these serovars can cross react with serovar Balcanica. In amongst all this confusion a 2016 survey of cattle found that half of the shedding cattle were seropositive to Tarrasovi, which we have traditionally thought of as being associated with pigs as the reservoir host. Molecular typing techniques confirmed this strain as *L. borgpetersenii*; however, the sequence was unlike serovar Tarassovi, thus this "new" strain is called Pacifica, but Pacifica is currently included in serogroup Tarassovi since most animals shedding Pacifica have high titres against serovar Tarassovi. It is still unclear if the increase in human cases of serovar Tarrasovi are due to Tarrasovi or Pacifica. What this study found was that Pacifica has been around since at least 2007 (the earliest samples tested in this study); and it is also present in farmed deer, and there was no molecular evidence for serovar Tarassovi in dairy cattle samples, only Pacifica. Dairy cattle were also associated with five serovars not just the two we vaccinate for (serovars Hardjo type bovis and Pomona) such as Ballum and Copenhageni which we associate with rats and hedgehogs. I hope that molecular rather than serological typing of *Leptospira* spp. will in due course give us better idea of which strains belong in which species, but now what we thought was the truth may not be the complete picture. Once again understanding what is being tested "clears the water" or perhaps in the short term makes it a bit murkier?

Reference: N Z Vet J. 2024;72(1):1-9
Abstract

Cow-level factors associated with nitrogen utilization in grazing dairy cows using a cross-sectional analysis of a large database

Authors: Tavernier E et al.

Summary: The primary aim of this modelling study was to estimate how much of the nitrogen available to grazing dairy cows is used and whether its availability varies with certain animal-level factors. The results indicated that cow-level factors such as breed, stage of lactation, and parity contributed to the variability detected in a range of different nitrogen use efficiency (NUE) and nitrogen balance (NB) metrics. After accounting for these effects, 4.8–6.3% of the variability in four NUE and four NB metrics assessed in the study were attributable to between-cow differences.

Comment: Dairy cows use about 30% of the nitrogen they ingest; the rest they excrete in the urine and faeces. If the proportion of nitrogen that a cow ingests that is utilised can be increased there should be economic and environmental benefits. NUE is the amount of nitrogen output (milk, meat) divided by the nitrogen intake. NB is the difference between output and intake and so reflects the amount of nitrogen lost to the environment. Obviously measuring nitrogen in and out of a cow is difficult, so proxies such as milk urea nitrogen (MUN) have been proposed. This study modelled the nitrogen use of grazed Irish dairy cows using data from previous studies. The models reported in this study suggest that only about 5% of the variability in NUE and NB was attributable to inter-cow variability so it seems breeding for more nitrogen-efficient cows will be a long slow process. First parity cows excreted less nitrogen than multiparous cows but their NUE was poorer. This is likely explained by lower dry matter intake (ingested nitrogen), and the reduced NUE was due to lower milk production and growth acting as a "nitrogen sink". Cows use nitrogen less efficiently for growth of muscle than they do to produce milk protein; hence, the first calvers' NUE was worse. MUN has been widely used as a proxy for urinary nitrogen excretion, and in some studies as proxy for NUE, but "weak correlations at best existed between MUN and all of the nitrogen metrics explored in the present study". The values from this study on pasture-grazed dairy cattle show poorer nitrogen utilisation than those reported from housed cattle, but this is only one measure of the environmental footprint of pasture-based dairy farming. I suspect as long as we feed grass with crude protein content of >20% we cannot expect to efficiently utilise the nitrogen the cows ingest.

Reference: J Dairy Sci. 2023;106(12):8871-8884
Abstract

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Reading relevant veterinary articles such as those in Dairy Research Review is a valuable way to keep current and can become part of your CPD record. Simply record the activity on your activity record and create a reflective record by writing a few sentences about what you learnt and how this impacts your practice as a veterinarian.

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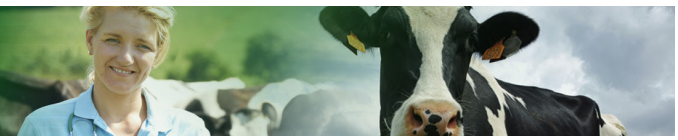


Simultaneous resistance to multiple anthelmintic classes in nematode parasites of cattle in New Zealand

Authors: Sauermann C et al.

Summary: These researchers investigated anthelmintic efficacy against nematode parasites of cattle on four commercial farms following reports of poor animal growth rates and welfare, and positive faecal egg counts, despite routine treatment with combination anthelmintics. They identified the emergence of simultaneous resistance to oxfendazole, levamisole, and macrocyclic lactone anthelmintics.

Comment: This study has received a fair amount of publicity in the rural press. It reports on four farms where anthelmintic resistance to benzimidazole, macrocyclic lactone, and levamisole was found in both *Cooperia* spp. and in *Ostertagia* spp. Four farms are reported on that had "apparent failures of anthelmintics to maintain animal performance expectations on commercial farms, i.e., the farmer initially noted poor body condition, reduced growth rates, and/or scouring in young cattle, which led to an initial investigation by the farm veterinarian". Faecal egg count reduction tests (FECRTs) were conducted on these farms with eggs being able to be counted down to a sensitivity of 15 eggs/g. I think it is worth noting that all of the farms were 100% cattle, and in two instances the majority or all of the cattle were <12 months of age, one reared until slaughter at 2 years of age. The fourth farm is not described as a rearing property but I suspect it is. It does appear that we can no longer rely on levamisole to control *Cooperia* spp. Despite the methodology used in the FECRT being sensitive enough to find 15 eggs/g on one farm, ivermectin had 95% efficacy but the combination of abamectin + oxfendazole + levamisole had an efficacy of 87%. This highlights the difficulty of interpreting a single FECRT result when we have a cut point. This paper is a timely reminder that drench resistance is out there, and the FECRTs supported the clinical suspicion that the referring veterinarians had. The good news is that the *Ostertagia* FECRTs showed less resistance at least on two of the three farms where there enough *Ostertagia* eggs recovered to be able to calculate a reliable FECRT. It seems that grass and drench will not be all that is required to rear cattle in the future and farm systems will need to incorporate other classes and/or species of stock. We might need to start thinking more like our colleagues who advise lamb finishers.

Reference: Vet Parasitol. 2024:325:110079
Abstract

A three-year comparison of once-a-day and twice-a-day milking in seasonal-calving pasture-based systems

Authors: Murphy JP et al.

Summary: This randomised study compared once-a-day milking (OAD) with twice-a-day (TAD) milking over 3 years, by determining differences in milk production and composition, body weight (BW), body condition score (BCS), dry matter intake (DMI), udder health traits, locomotion score, and milking time on a pasture-based system. Milking cows OAD for their full lactation reduced cumulative milk yield (-26%) and milk solids yield (-21%). A shorter lactation length (9.7 days) of the cows milked OAD versus TAD partially contributed to the reduced milk output but the main reason was the lower daily milk production. OAD milking did not increase mastitis incidence but did increase somatic cell score (SCS).

Comment: Yet another Irish pasture-based study. This direct quote from the paper sort of sums up OAD milking, "Lazzarini et al. (2018) stated that OAD milking is most suitable for farmers who can either afford a reduction in income to gain better and more flexible working conditions or can minimize milk yield loss and greatly reduce labour cost". The trick seems to be how to minimise the milk loss. Cows were assigned to either a OAD or a TAD herd for three years, each year 23% of the herds were heifers. Both herds were grazed side by side and were given two breaks a day for the first grazing rotation then both herds got 24-hour breaks. The cows on OAD on average had a 9.7-day shorter lactation and produced 21% less milk solids. The reduced days in milk accounted for about 14% of the reduced production. The milk fat percentage (MF%) in the OAD cows increased year on year while the MF% remained consistent across the year in the TAD herd. DMI was about 20% less in the first 7 weeks of lactation in the OAD herd. The reduced DMI remained for the rest of the lactation but was not as pronounced (or statistically significant). In this study there was no difference in the 6-week in calf rate (6WICR) between the two herds. This contrasts with the NZ study of 1,460 herds where Jayawardana et al. (2022) did find improved 6WICRs in herds on OAD. As the two herds in this study were only 32, 44, and 48 cows in each of the three years not finding a difference in the 6WICR is not surprising.

Reference: J Dairy Sci. 2023;106(12):8910-8925
Abstract

Postpartum health is associated with detection of estrus by activity monitors and reproductive performance in dairy cows

Authors: Bruinjé TC et al.

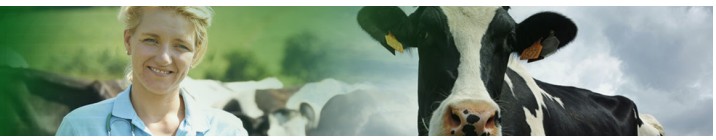
Summary: The objective of this prospective, longitudinal, observational study conducted in two commercial Holstein dairy herds was to characterise associations of post-partum health with the probability of oestrus detection (ED) by automated activity monitors (AAM) and subsequent reproductive performance. In reproductive management that prioritises artificial insemination (AI) at detected oestrus, monitoring early post-partum cows for risk factors including elevated blood beta-hydroxybutyrate (BHB), retained placenta, endometritis, purulent vaginal discharge, excessive body condition score (BCS) loss, and delayed cyclicity, can help to identify cows that are more or less likely to be detected in oestrus and to become pregnant within a reasonable timeframe.

Comment: This is a Canadian study, and it seems they rely quite heavily on timed AI after synchronisation programmes as "65% of free-stall herds surveyed in 2016 relied on ED for >50% of AI in lactating cows, though most also used synchronization protocols for timed AI" so it seems a fair bit of intervention was or is occurring. This study used data from two herds that use automatic activity monitors for ED for first AI. The herds had a voluntary wait period (VWP) of 55- and 50-days post-partum before the first AI would occur. Oestrus events during the voluntary wait period were only examined on one farm due to "a data access problem and a software backup fault". Oestrus was detected in 70% of cows between the end of the VWP and 75 days in milk (DIM; average was 64 DIM). This study showed reduced odds of having oestrus detected by 75 DIM if she suffered from retained placenta, endometritis (6% polymorphonuclear cells on a cytobrush), a purulent vaginal discharge (Metricheck positive), elevated BHB, increased BCS loss, lameness, or did not have an oestrus event during the VWP. There was no association found between blood calcium levels and oestrus detection but this study was run on commercial farms where multiparous cows were given calcium boluses as a preventative so do not assume there is not an association and disregard subclinical hypocalcaemia. Finally, cows with more than one risk factor were over 3-times less likely to be detected in oestrus.

Reference: J Dairy Sci. 2023;106(12):9451-9473
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.



Perspective: Transient postparturient hypocalcemia - a lactation-induced phenomenon of high-producing dairy cows

Authors: Hernandez LL & McArt JAA

Summary: These authors discuss milk fever in high-producing dairy cows, how postpartum dairy cows can experience different types of subclinical hypocalcaemia, that it is incorrect to assume all postpartum hypocalcaemia is detrimental and that treatment of all cases is necessary and beneficial, and that the mammary gland is a critical factor in the management of calcium homeostasis.

Comment: Just when you thought there could not be anything new about hypocalcaemia this article puts a case forward that it is when hypocalcaemia occurs that is important. Hypocalcaemia can be classified as transient, persistent, or delayed. Transient hypocalcaemic cows produce more milk than those that experience persistent or delayed hypocalcaemia as well as normo-calcaemic cows. Based on blood calcium levels at 4 days in milk (DIM), hypocalcaemic cows either have delayed or persistent hypocalcaemia (dyscalcaemia) are at increased risk of metritis, ketosis, a DA, and removal from the herd compared to cows that are normo-calcaemic or were transiently hypocalcaemic (low calcium prior to day 4 but normal by day 4). Cows with transient hypocalcaemia had a 15% greater dry matter intake (DMI) post-partum than cows with dyscalcaemia. This to me suggests that high DMI immediately post calving is important for normal resumption of calcium homeostasis by 4 DIM. What drives this increased DMI is not clear but it would seem foolish to restrict the feed offered to post parturient cows. The adage that "sometimes the easiest way to address milk fever is by feeding more" seems supported by this paper. This paper I think gives a good basis for deciding when to monitor blood calcium levels (at 4 DIM) and makes me think about the blanket use of calcium supplements to all cows at calving if the herd does not have an issue with clinical milk fever. Remember this paper is not about clinical milk fever and is referring to "high producing dairy cows", what high producing means is not defined so may not be applicable to our production levels.

Reference: J Dairy Sci. 2023;106(12):8177-8180
Abstract

Influence of prepartum dietary cation-anion difference and the magnitude of calcium decline at the onset of lactation on mineral metabolism and physiological responses

Authors: Connelly MK et al.

Summary: These researchers evaluated how the prevention of a transient hypocalcaemia at parturition in combination with prepartum dietary cation-anion difference (DCAD) would affect blood calcium homeostasis and influence mineral metabolism. They determined that reducing prepartum DCAD reduces the magnitude of calcium decline at the onset of lactation and duration of transient hypocalcaemia and that interruptions via extended calcium (Ca) infusion in transient hypocalcaemia markedly disrupts blood Ca and phosphorus (P) dynamics.

Comment: The authors hypothesised that preventing Ca decline in the immediate 24 hours after parturition would disrupt mineral metabolism and that this would be more robust in cows fed a positive DCAD diet prepartum. Cows were either on a negative (N) or positive (P) DCAD diet pre-calve. Once they calved cows received an infusion of Ca gluconate to maintain the blood calcium at a rate to maintain blood ionised (iCa) concentrations at approximately 1.2mM for 24 hours or else an infusion of dextrose for 24 hours (Dex). As expected, the calcium levels dropped in the 24 hours prior to parturition with the P DCAD cows starting to drop earlier and also fell further than N DCAD cows, as N DCAD diets should result in a greater "readily exchangeable Ca pool". This effect of N DCAD was also evident as in the Ca gluconate-infused cows, less was required to maintain normo-calcaemia in the N DCAD cows than the P DCAD cows. After the infusion of Ca gluconate stopped the calcium levels dropped to below the nadir level the Dex-infused cows fell to. The time to Ca nadir for the Dex-infused cows was around 6 hours post calving, the time to nadir for the Ca gluconate-infused cows was 12 to 16 hours after the infusion stopped. N DCAD Ca gluconate-infused cows had the lowest iCa concentrations at 90 hours postpartum relative to all other treatments. Once again, this paper has made me question whether blanket treatment of all cows with calcium at calving is wise, are we somehow upsetting a homeostatic mechanism for calcium that requires a transient reduction in calcium.

Reference: J Dairy Sci. 2024;107(2):1228-1243
Abstract

Perspective: Can early embryonic losses be reduced in lactating dairy cows?

Authors: Hansen PJ

Summary: In the context of emerging novel approaches to improve pregnancy outcomes, the main focus of this article is current research helping to enrich understanding of early embryonic loss in lactating dairy cows.

Comment: This paper gives a summary of what is known and what is likely to contribute to early embryonic loss. Some of the topics discussed are what is likely to be beyond our influence as clinical veterinarians at present though. In a NZ study (Berg et al. 2022) found that "29% of recovered ova were not morula or blastocyst stage embryos at day 7 and 41% were not at the appropriate stage of development at day 15 of gestation; there was little evidence for additional pregnancy failure through day 70" so if these losses can be reduced repro performance will improve. Two causes of reduced oocyte competence are follicular growth in a low progesterone environment and the ovulation of aged follicles. We have the ability to address aged follicles and low progesterone with synchronisation programmes, but compared to overseas we rely on these far less – the low progesterone level also reinforces the importance of calving spread and the importance of a cow having pre-mate heats. Cows with clinical disease (uterine or non-uterine) regardless of whether it occurred during preantral follicle growth (>42 days before breeding), antral follicle growth (day -42 to -1 relative to breeding), or the early post breeding period (day 0 to 42 relative to breeding) have reduced probability of being pregnant after a breeding. As a word of warning because the outcomes we measure are binary (e.g. conceived or not) to detect an improvement from 40% to 50% you require 387 cows per group (power 0.8 at p=0.05). So if you do get changes implemented on farm or reduce the incidence of disease you may not have the numbers to detect a "statistically significant" effect in conception rate, but often you can "see an effect". Have a look at the in-calf-rate by diagnosis or calving pattern in MINDA live – it might not be statistically significant, but it looks very real to me.

Reference: J Dairy Sci. 2023;106(10):6593-6596
Abstract

Perspective: Prolonged cow-calf contact – a dilemma or simply another step in the evolution of the dairy industry?

Authors: Cook NB & von Keyserlingk MAG

Summary: These authors address research questions that require answers to better inform dairy producers and facilitate their decision-making and evolution of the dairy industry with respect to the controversial issue of cow-calf separation at birth being incongruent with societal views on acceptable farming practices. Not resolving the issue of cow-calf separation carries the risk of eroding public trust in the dairy industry.

Comment: The authors say there is a "disconnect between industry practice and societal values on the issue of immediate separation at birth" of dairy calves. The authors believe this needs to be addressed. Although personally I do not feel that science often changes a belief, especially one held about something as emotive as separating a newborn from its mum, and in this case "the available scientific evidence indicates that early cow-calf separation will not be supported by science", and there is evidence cited in this paper that shows early separation is detrimental to the calf (e.g. we still struggle with failure of passive transfer) and the cow (e.g. mastitis). If in the future, society will not tolerate the early separation of the calf and the industry will have to change. Some questions that were asked in the paper include: is partial rather than full-time contact sufficient, how long post calving should contact continue for, should weaning from milk and separation from its dam be simultaneous, are "nurse cows" an acceptable alternative? Perhaps some of the issues will be resolved if we transition away from bobby calves. If this comes to pass, I think managing prolonged cow-calf contact in a pasture-based system will easier than in a housed system but will be extremely disruptive.

Reference: J Dairy Sci. 2024;107(1):4-8
Abstract