Dairy Research Review™

Making Education Easy

Issue 13 – 2018

In this issue:

Welcome to the latest issue of Dairy Research Review.

Highlights in this issue, which is entirely devoted to dairy cow production, include the physiological consequences of hypocalcaemia, testing for Mycoplasma, the economics of blanket versus selective dry cow therapy, and a NZ study on kale feeding pregnant dairy cows. Also featured is a study of teat sealant and amoxicillin, alone and in combination, for mastitis.

We hope that you enjoy the first issue of **Dairy Research Review** for 2018. We value your input, so please keep sending us your comments and suggestions.

Kind regards

Hamish Newton
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Determinants of antimicrobial treatment for udder health in Danish dairy cattle herds

Authors: Gussmann M et al.

Summary: These researchers investigated whether data from the Danish national cattle database could be used to predict antimicrobial treatment in relation to udder health management on different farms and identified differences between farms and which factors were most important for treatment.

Comment: This paper seems to be written in response to the increasing "societal pressure to limit the use of antibiotics in livestock production systems". Logistic regression models were created using milk yield, somatic cell count (SCC), registrations of clinical mastitis, polymerase chain reaction (PCR) results, days in milk (DIM), and parity from 518 herds to predict antibiotic use. This then allowed "influential factors" for each farm to be created that help explain the decisions farmers make about whether to treat or not. Once these factors are known then advice about prudent use of antibiotics can be tailored to an individual farm. The Danish database has about 90% of mastitis cases recorded into it. As blanket (dry cow therapy) DCT is not permitted in Denmark this paper tries to understand what factors farmers used to select cows to get DCT. There seemed to be three "clusters" of farm that made antibiotic treatment decisions based on: health indicators (SCC, PCR results, clinical case registrations); production factors (average milk yield, DIM); or, for DCT decisions alone, parity and cows last lactation (either cull or treat decisions). The authors note that treatment decisions could well be influenced by the herd's veterinarian – this variable was not included in any of the models. This paper shows us that farmers make decisions to treat or not (at least in Denmark, which has a very regulated approach to the administration of antibiotics) based on different factors. I suppose this paper serves to remind us that a "one size fits all" approach to creating treatment protocols is unlikely to be as effective as a more tailored protocol based on what the farmer believes or wants to achieve especially if antibiotics become a more limited resource.

Reference: J Dairy Sci. 2018;101(1):505–517
Abstract

Effect of induced subclinical hypocalcemia on physiological responses and neutrophil function in dairy cows

Authors: Martinez N et al.

Summary: These US researchers studied the effects of induced subclinical hypocalcaemia (SCH; blood ionized calcium <1.0mM, without recumbency) on physiological responses and immune cell function in dairy cows.

Comment: This paper reports on a randomised crossover trial where non-lactating and non-pregnant Holstein cows were given an IV infusion to either maintain a normal serum calcium level or to result in SCH. After a period of washout, the cows received the infusion they did not get first. It is stated in the paper that on the first day of lactation the synthesis and secretion of colostrum causes losses of calcium equivalent to 7- to 10-times the amount of calcium present in the blood. So, if all you get from this paper is that fact to pull out in the spring rather than discussing the rugby your time is not wasted. This study differed from observational studies of parturient cows as it avoids the possibility of endocrine changes influencing the immune system. The neutrophils recovered from SCH cows had reduced phagocytic activity and reduced oxidative burst activity. The cows with induced SCH showed reduced dry matter intake (DMI) and rumen contractions, increased lipolysis, and increased non-esterified fatty acid (NEFA) levels. The blood glucose levels also increased during the period of SCH due to the pancreas having impaired insulin secretion. One consequence of reduced insulin secretion is the decreased inhibition of lipase so increased lipolysis. This helps explain why hypocalcaemia is linked to an increased risk of ketosis. After reading this paper I will now interpret NEFA and β-hydroxybutyrate levels alongside the calcium levels.

Reference: J Dairy Sc. 2014;97(2):874–87
Abstract

Shedding of *Mycoplasma bovis* and antibody responses in cows recently diagnosed with clinical infection

Authors: Hazelton MS et al.

Summary: In this Short Communication, Australian investigators report the results of a study in which the mucosal surfaces of cows with recent clinical mastitis caused by *Mycoplasma bovis* were examined for the presence of *M. bovis* shedding.

Comment: *M. bovis* is no longer an exotic disease and I hope it will become an eradicated disease in NZ soon. This paper is timely and helps explain the difficulty our colleagues working for M.P.I. are facing in actually finding the bug. When, or if, *M. bovis* arrives in your area it is likely you will get plenty of queries from clients about testing to make sure they don't have the bug. Most of your clients won't understand the difference between "antibody" and "antigen" and be concerned that you can't test an animal and call it free of Mycoplasma. This paper describes 16 cows that had mastitis caused by *M. bovis* 13 to 7 days prior to the sampling that this paper reports on. Fifteen of the 16 cows were seropositive post the mastitis event. Vaginal, conjunctival, and nasal swabs were taken to detect antigen. Only three cows had *M. bovis* detected (all from the vagina). This highlights the difficulty in identifying infected cattle (especially non-lactating cattle). Reasons for the low detection rate of the bug could be intermittent shedding, levels below the detection threshold, or cure. It is worth noting that shedding is also intermittent into milk if lactating. Seroconversion is thought to take 2-3 weeks, but it is not clear how long antibodies remain elevated for. This is one of many papers about Mycoplasma but as you will get heaps of queries about testing this is a particularly relevant one.

Reference: J Dairy Sci. 2018;101(1):584–589
Abstract

Comparison of online, hands-on, and a combined approach for teaching cautery disbudding technique to dairy producers

Authors: Winder CB et al.

Summary: This study compared the efficacy of online training, hands-on training, and a combined approach for teaching producers to successfully administer a cornual nerve block (CNB) and then debud a calf.

Comment: With the new rules coming into effect around pain relief and calf debudding, this paper on teaching the procedure of a CNB is of interest. This study examined the teaching of how to do a CNB by being shown, online training, or a combination of both. There was an equal likelihood of a successful CNB if teaching was online or demonstrated. However, participants that only received online tuition reported being less confident before evaluation and were slower and less skilled in administering the CNB. This paper would suggest that online learning of the CNB is possible but actually being shown how to do it results in more confident operators. Showing a client how to do a CNB and then observing the outcome will allow a dispensing veterinarian to satisfy themselves that the anaesthetic is likely to be used effectively in the future.

Reference: J Dairy Sci. 2018;101(1):840–849
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.

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Economic optimization of selective dry cow treatment

Authors: Scherpenzeel CGM et al.

Summary: The aim of this Dutch study was to create a mathematical model to minimise economic costs while restricting the percentage of cows to be dried off with dry cow therapy (DCT), accounting for the effects of clinical mastitis, subclinical mastitis (SCM), and antimicrobial use (AMU).

Comment: It seems that the days of blanket DCT (BDCT) are numbered and society will require us to be more selective in the use of antibiotics and selective dry cow therapy (SDCT) will become the norm. The effect of SDCT on total antibiotics used, udder health, and the economics will depend on the selection criteria used to decide who gets what treatment. Meta-analysis has shown SDCT does result in more clinical mastitis and higher somatic cell count (SCC) but does reduce total AMU. Although the relationship between AMU and antimicrobial resistance (AMR) is unclear, there is potential benefit in reduced selection pressure for AMR when using SDCT. This paper describes a model to minimise the cost associated with DCT while restricting the proportion of cows getting DCT and taking into consideration the effects on the amount of both clinical and subclinical mastitis and total AMU. In the Netherlands, not being able to treat cows with DCT if they had a low SCC prior to dry off resulted in more clinical mastitis and higher SCC post calving.

Cows in the models fell into nine groups based on their dry period (first, second, or greater dry period) and the SCC prior to drying off. There were then three types of herds created (low-, average-, and high-bulk milk SCC [BMSCC]) using different proportions of the nine groups of cows. The cows in each group had the incidence of clinical and subclinical mastitis estimated if they received antimicrobials or not. The models were then run at varying percentages of the herds receiving DCT (100% to 0% in 5% increments) and the economic cost of those decisions quantified (costs of DCT and drugs). Across all three herd types (based on BMSCC) the economic cost increased with decreasing use of DCT (but not linearly). The economic cost was consistent from 100% of cows in each herd getting DCT to 70%, 75%, and 85% for low-, average-, and high-BMSCC herds, respectively. Each of the three herds was then classified as being high-, medium-, or low-clinical mastitis incidence herds. The herd level of incidence of clinical mastitis was the biggest driver of the economic cost. Herds with a high incidence of clinical mastitis irrespective of the BMSCC required more of the herd to get SDCT to match the economic cost of BDCT. The take-home message is SDCT is marginally less costly than BDCT but the percentage of the herd that needs to be treated increases with BMSCC and more significantly the herd's incidence of clinical mastitis for SDCT to be less costly than BDCT. Perhaps the message really is, if the incidence rate of mastitis is high in a herd, SDCT is not going to be a great option and effort needs to be directed to preventing the spread of infection and not just to the dry period.

Reference: J Dairy Sci. 2018;101(2):1530–1539
Abstract

Using Dairy Research Review for CPD points

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Quantifying fecal shedding of *Mycobacterium avium ssp. paratuberculosis* from calves after experimental infection and exposure

Authors: Corbett CS et al.

Summary: These Canadian researchers studied faecal shedding of *Mycobacterium avium* ssp. *paratuberculosis* (MAP) from calves with Johne's disease in an experimental setting.

Comment: Johne's disease is becoming a bigger part of routine dairy practice with the availability of the milk ELISA (enzyme-linked immune sorbent assay) test at herd testing. This paper gives some insights into the shedding of MAP by calves. I suspect I was not alone in thinking that the shedding of MAP mainly occurs from adult cows as they get towards the clinical stage of the disease. In the first experiment, there were seven experimental pens of four newborn calves. Two of the calves in each pen were inoculated with MAP at two weeks of age then two weeks later the two pen mates were added to the pen. They were then housed together for 3 months. Faecal samples were collected from the calves three times a week. Most (78%) of the faecal samples taken from the inoculated calves were positive and 22% of the samples taken from the in-contact calves were positive during the three months. Every calf had two positive cultures during the study period. The proportion of calves shedding MAP in their faeces peaked 3–6 weeks post housing together and then declined. With our group housing of calves, this paper explains to me why removing the Milk test-positive cows prior to calving does reduce the apparent herd prevalence of Johne's disease so dramatically on most farms. It also makes me think we should try and get our calves out of the sheds as soon as practical or sensible.

Reference: J Dairy Sci. 2018;101(2):1478–1487
Abstract

Dry matter intake, body condition score, and grazing behaviour of nonlactating, pregnant dairy cows fed kale or grass once versus twice daily during winter

Authors: Rugoho I & Edwards GR

Summary: The objective of this NZ study was to assess the effect of wintering pregnant, non-lactating dairy cows outdoors on either kale or grass, fed once or twice daily.

Comment: This study examined offering 11kg dry matter kale and 3kg of straw as either one feed or split over two feeds a day to pregnant dry cows. It was possible that feeding twice a day would result in improved performance as there could be reduced variation in rumen pH and ammonia, there could also be increased crop utilisation (less trampling), and it has also been reported that infrequent feeding can result in reduced rates of digestion and lowered utilization of nutrients. It is a relief to read that the frequency of offering Kale had no effect on the body condition score or weight change over the 47 days of the trial so no need at this stage to talk to graziers about moving break fences twice a day in the wet and cold.

Reference: J Dairy Sci. 2018;101(1):257–267
Abstract

The contribution of previous lameness events and body condition score to the occurrence of lameness in dairy herds: A study of 2 herds

Authors: Randall LV et al.

Summary: These UK researchers used longitudinal data to evaluate the proportion of lameness that could be avoided in two separate dairy cow populations by: (i) reducing recurrence of previous lameness events; and (ii) shifting body condition score (BCS) into more optimal ranges.

Comment: It has been shown that low BCS is associated with the first lameness event for a cow and heifers that had a lameness-causing claw horn lesion were at increased risk of lameness in following lactations, possibly due to bony changes in the pedal bone. This study used historical records of previous lameness scores and events and BCS on two farms UK farms. This study used a measure called a population attributable fraction (PAF), which is an estimate of the contribution that a risk factor makes to the total disease burden in a population. The study estimated that around 80% of lameness was attributable to a previous lameness event. Possible reasons for this are changes to the structures of the foot that predispose to further damage or an effect called allodynia (pain associated with non-noxious stimuli) or hyperalgesia (noxious stimuli causing pain of longer duration and higher intensity than normalynia). The effect of BCS loss was much less dramatic, with a loss of 0.5 BCS units (0–5 scale) across a herd contributing to 6% of the herd's lameness. This study, although conducted on cows housed and managed very differently to ours, highlights the importance of prevention rather than cure and raises the possibility that cure may not be that realistic.

Reference: J Dairy Sci. 2018;101(2):1311–1324
Abstract

Practical feeding management recommendations to mitigate the risk of subacute ruminal acidosis in dairy cattle

Authors: Hummer E et al.

Summary: In this Invited Review, the authors discuss subacute ruminal acidosis (SARA) in dairy cows, including the role of several feeding management factors that influence rumen health and should be considered in the control of SARA.

Comment: This review paper is about what happens during SARA and what can be done to reduce the incidence of it in cows fed mixed rations. Although this will not be directly relevant to most of us, the paper does explain what happens to cause the rumen pH to drop and what mechanisms the cow has to remove the excess acid from the rumen and how long these adaptations take to occur. I don't know if I don't see SARA or don't recognise it, but I definitely see Rumen acidosis and this paper explains the physiology behind the practical recommendations we all give around the feeding of fodder beet. This forum is too short to cover the physiology and chemistry of SARA, so if you want the details read the paper. The changes that occur when transitioning from a forage diet to a concentrate diet requires the rumen papillae to elongate and the rumen microbiota to change from one that is mainly made up of cellulolytic bacteria to one that deals with simpler sugars. The change in the rumen wall to cope with the increased rates of short-chain fatty acid production is believed to take 4–6 weeks and the change in the rumen bacteria is reported as taking three weeks. Perhaps more importantly, the paper discusses the behavioural factors that lead to SARA such as infrequent feeding, not enough physically-effective fibre, and not enough space for cows to eat. A good paper to read, if only to remind you of the reasons behind your advice.

Reference: J Dairy Sci. 2018;101(2):872–888
Abstract

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Prepartum application of internal teat sealant or intramammary amoxicillin on dairy heifers: Effect on udder health, survival, and performance

Authors: Machado VS & Bicalho RC

Summary: The aim of this randomised controlled study was to investigate the effects of pre-partum application of internal teat sealant (ITS) or intramammary infusion of amoxicillin (IA) on udder health in dairy heifers.

Comment: There is probably no need to convince anyone in NZ about the benefit of internal teat sealants given pre-partum to heifers, but these Americans wanted to examine the effect on their heifers who are housed differently and, to be fair, are higher producing. There were four treatment groups: a control group (no treatment), a group that received ITS, a group that received IA (a lactating cow formulation), and a final group that received both the amoxicillin and teat sealant (IA+ITS). The average time between enrolment/treatment and calving was 30 days. The authors hypothesised that the amoxicillin would treat existing infections and the internal teat sealant would prevent new intramammary infections and these treatments would improve udder health compared with the control heifers. This study reported on the incidence of clinical mastitis in the first 9 months of lactation. Heifers that received IA+ITS had a reduced incidence of mastitis compared with the control group. Heifers that received only IA or ITS did not have a reduced incidence of mastitis. There was a similar result for the outcome of subclinical mastitis (defined as no clinical mastitis and a somatic cell count >200,000 at a herd test in the first 9 months of lactation). This study was conducted on one herd so the results that are not what we would expect might reflect a herd effect or truly reflect what could be expected in the environment studied. This study has not changed my opinion of the utility of pre-partum ITS in heifers in NZ. There is some interesting discussion on pre-partum antibiotics but hopefully we never go there with the drive to reduce the amount of antibiotics used.

Reference: J Dairy Sci. 2018;101(2):1388–1402
Abstract