Dairy Research Review™

In this issue:

FOLLOW ANIMAL HEALTH REVIEWS ON TWITTER
@animal_review

Welcome to the latest issue of Dairy Research Review.

Papers dealing with calf management dominate this issue, including why greater thought is required when quantifying mortality, deciding when and how to treat diarrhoea, an attempt to identify early predictors of diarrhoea, and a review of the effects of early separation on cow and calf health. Also featured in this issue is a paper that delves into the complexities of reducing methane in ruminants and another that investigates a method of increasing the anti-human rotavirus activity of bovine colostrum.

We hope that you enjoy this issue of **Dairy Research Review**. We value your feedback – please keep sending us your comments and suggestions.

Kind regards
Hamish Newton
hamishnewton@animalhealthreview.co.nz

Quantifying calf mortality on dairy farms: Challenges and solutions

Authors: Santman-Berends IMGA et al.

Summary: These Dutch researchers evaluated definitions of calf mortality for scientific validity, usefulness for policymakers, and comprehensibility by farmers. Based on expert consultations, 10 definitions for calf mortality were evaluated that assessed different age categories, time periods, and denominators. The researchers found that small differences in definitions appeared to have a major effect on the magnitude of mortality.

Comment: This paper looked at how to define calf mortality. On the face of it you would think it is quite easy; just count the dead calves and divide by the number of calves born. However, if using this as a measure to monitor success/failure in the calf shed, it gets less and less sensitive for detecting a change in mortality rate as the denominator (number of calves born) gets larger. This study looked at the 10 parameters used by the Dutch to monitor calf mortality. This resulted in understandable confusion amongst farmers and the press, etc. As expected, the mortality rate per day was highest during the first 14 days of life. The number of calves at risk of mortality after 14 days in the Dutch system basically halved after 14 days as the bull calves left for the veal industry. In our system, most bulls will leave at 4 days of age so the number of calves at risk declines earlier, at least on a dairy farm. The underlying aim of the Dutch reporting calf mortality was to detect trends over time at a national level. I imagine we in NZ will look at calf mortality primarily to monitor the performance of a calf-rearing system either on a dairy farm or on a dedicated calf-rearing unit. If you want to measure calf mortality, think carefully about what you use as the denominator, especially on a dairy farm where the bulls leave at four days of age. In a calf-rearing operation, it is probably easier to monitor mortality for each separate batch of calves that arrives.
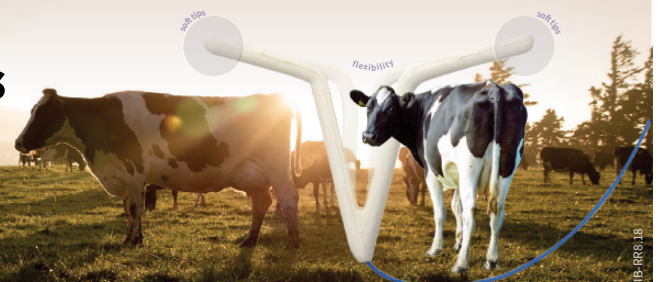
Reference: J Dairy Sci. 2019;102(7):6404–6417
Abstract

A retrospective cohort study comparing dairy calf treatment decisions by farm personnel with veterinary observations of clinical signs

Authors: Olson A et al.

Summary: This retrospective study compared clinical scoring by a veterinarian with treatment decisions made by on-farm personnel related to neonatal calf diarrhoea using data describing daily clinical scores and farm treatments collected from four farms for calves from birth to age 28 days. The results indicated the need for dairy farmers and advisors to evaluate calf treatment protocols, reasons for treatment, and training programmes for calf health and disease detection. Also indicated was the need to develop monitoring programmes for treatment protocol adherence and health outcomes following therapy.

Comment: This study compared the results of a clinical scoring system performed by veterinarians on pre-weaned calves and the decision to treat a calf made by a staff member of the farm. A farm worker's decision to treat a calf with fluids or antibiotics was not consistently associated with an abnormal clinical sign or score as defined by a veterinarian. The good news is that antibiotics were used less frequently than if they have been used if treatment was initiated upon detection of an abnormal clinical sign or abnormal score. Although this was an American study, it seems reasonable to assume that many of the treatment decisions made by our clients are, on the face of it, a bit random. This study highlights a potential need for both formalised treatment protocols and scoring systems to define ill health.

Reference: J Dairy Sci. 2019;102(7):6391–6403
Abstract

Physiological and behavioral responses as indicators for early disease detection in dairy calves

Authors: Lowe GL et al.

Summary: These NZ researchers investigated physiological and behavioural responses associated with the onset of neonatal calf diarrhoea and assessed the suitability of these responses to be used as early disease indicators. The results demonstrated that milk consumption, infrared thermography temperatures of the side and shoulder, number and duration of lying bouts, and duration of time spent at the water trough show potential as suitable early indicators of disease.

Comment: This NZ trial was set up to follow calves that were inoculated with rotavirus and compare them with negative controls. Calves were clinically examined daily and had accelerometers to record lying, temperatures measured at five sites daily with an infrared camera, feeding recorded via an automatic feeder, and drinking behaviour monitored via video. However, sh** happened! Inoculation did not result in infection and then salmonella hit. The study then morphed into seeing if all the data collected could predict disease (diarrhoea regardless of bug) before it became clinically apparent. If calf scours can be detected prior to the damage to the gut occurring, which results in diarrhoea and dehydration, this should be a good thing I am sure. This study used a variety of technologies to detect what I think a good calf rearer will consciously or subconsciously notice (I am beginning to sound like a Luddite). Milk consumption did decline prior to clinical disease but the calves fed for longer (drank slower). The temperature on the shoulders decreased before clinical disease possibly to try and conserve body temperature or possibly as a consequence of reduced feed intake resulting in less heat production. Conversely, the temperature over the side of the calf increased, perhaps reflecting inflammation? In summary, automatic calf feeders could provide an early warning system if it can provide information of total fed and time taken to feed. If using automatic calf feeders, I think the level of stockmanship needs to be higher to detect sick calves early as the feeding behaviour is not being directly visualised on a twice-daily basis.

Reference: J Dairy Sci. 2019;102(6):5389–5402
Abstract

Can bone measures of the bovine metacarpus predict humeral bone structure?

Authors: Gibson MJ et al.

Summary: The aim of this NZ study was to determine if the metacarpus could be used to predict bone mass and material properties of the humerus. The left humerus and metacarpal bones obtained from cattle aged six weeks to eight years were scanned at the mid-diaphysis, using peripheral quantitative computed tomography (pQCT), to obtain measures of bone mass and material properties (strength). The metacarpus was found to be a good predictor of bone content and material properties of the humerus across cattle of differing age and maturity.

Comment: The issue of humeral fractures in dairy heifers has not gone away but it seems that there is now a renewed effort and presumably funding to try and better understand this disease that is estimated to result in the loss of 5,000 heifers a year in NZ. We know that heifers that suffer from these fractures have a reduced cortical bone thickness. The majority of peak bone mass bone growth in heifers is achieved by puberty so perhaps the growth characteristics of heifers prior to puberty is a critical factor in predisposing heifers to fractures later in life. However, this paper also states that the metacarpus has pretty well completed its development in heifers as yearlings, but that the humerus continues to develop. Bone composition can be measured by pQTC. As it is not very practical to scan the humerus of a live heifer, this paper looked at whether the scan of the metacarpus can predict the structure of the humerus. It was found that the metacarpus scan data did predict the structure of the humerus so there is now a potential tool (for research anyway) to detect at-risk animals so hopefully in the future we can be in a position to give our clients some better advice. The Massey heifer fracture research group (look it up on Facebook) is looking for unbroken bones (humerus and metacarpus) from heifers with a fractured humerus on the other leg.

Reference: Proceedings of the New Zealand Society of Animal Production. 2019;79 8–12
Abstract

CLICK HERE
to read previous issues of Dairy Research Review

Invited review: A systematic review of the effects of prolonged cow-calf contact on behavior, welfare, and productivity

Authors: Meagher RK et al.

Summary: These researchers critically evaluated the scientific literature to assess both the acute and long-term effects of early separation versus an extended period of cow-calf contact. They found that extended cow-calf contact aggravates acute distress responses and reduces the amount of saleable milk while the calves are suckling, but it can have favourable effects on behaviours relevant to welfare in the longer term and benefit calf growth.

Comment: This is a review article on the health effects of the timing of the separation of calf from the cow. I found this article interesting for the two main reasons. Firstly, there is no consensus in the literature that early removal of the calf from the cow will reduce the incidence of Johne's disease and this paper states "MAP [*Mycobacterium avium* subspecies *paratuberculosis*] infection occurs predominantly by means of a contaminated environment, via the faecal-oral route". This obviously includes suckling from a contaminated udder but exposure to MAP from other sources is at least, if not more, important. If you are serious about controlling Johne's disease in a herd, pasteurisation of colostrum and the early removal of a calf is not likely to be enough. The second finding that made me think, was the effect of suckling on the likelihood of failure of passive transfer. Some studies showed that later removal of the calf resulted in less failure of passive transfer (FPT) and some studies showed more. As FPT is influenced by the quantity and quality of colostrum received and the timing of it, a blanket recommendation that collecting calves twice a day will reduce the incidence of FPT may not be true if the quantity of colostrum being given is in too small or of poor quality. I suppose the take-home message is the incidence of FPT will not necessarily decrease by picking calves up more frequently unless systems are in place that ensure calves get enough good quality colostrum (that has also been stored appropriately).

Reference: J Dairy Sci. 2019;102(7):5765–5783
Abstract

Use of topical local anesthetics to control pain during treatment of hoof lesions in dairy cows

Authors: Stilwell GT et al.

Summary: The aim of this Portuguese study was to evaluate the efficacy of Tri-Solfen, a combination of local anaesthetics in a topical gel form, including lidocaine, bupivacaine, adrenaline, and cetrimide, for the treatment of pain associated with the trimming of hoof lesions in Holstein-Friesian cows. The results indicated that the use of topical local anaesthesia with lidocaine and bupivacaine helps to reduce the pain associated with corrective trimming of severe hoof lesions, which should enhance animal welfare and make it safer for trimmers.

Comment: This study looked at using Tri-Solfen when treating lame cows. Most hoof horn lesions (white line disease, sole ulcer or toe ulcer) require removal of horn to level of the sensitive tissues and sometimes this removal extends (intentionally or unintentionally) into the sensitive tissues resulting in bleeding and more pain. Methods to control pain associated with treating lame cows could include nerve blocks or intravenous regional anaesthesia, etc. These techniques are not commonly done by vets or farmers for treating hoof horn lesions for a variety of reasons, such as cost, time, and technical ability, or the stoic nature of cows. I suspect I am not the only one who has treated a cow and she has walked away sorer than before I trimmed her. This seems like a relatively easy, quick, and cheap way to provide some pain relief when "traditionally" none has been used. Anything that makes doing lame cows more pleasant seems like it is worth a try.

Reference: J Dairy Sci. 2019;102(7):6383–6390
Abstract

Lameness and lying behavior in grazing dairy cows

Authors: Thompson AJ et al.

Summary: In this study, between- and within-cow changes in lying behaviour associated with consistent and changing lameness status were identified in grazing dairy cows in Southern Brazil. The results demonstrated that the between-cow effect of consistent lameness status on daily lying time and number of lying bouts was dependent on precipitation, with consistently lame cows having reduced lying time and lying bouts on days with rain compared with days without rain. There was no within-cow effect of changing lameness status on any of the lying behaviours. Precipitation was associated with decreased daily lying time, increased mean lying-bout duration, and decreased daily number of lying bouts.

Comment: This study conducted in Brazil used pedometer-type devises to measure lying times in pastured dairy cows. Cows were classified as lame, or not, by doing weekly lameness scoring. The main findings were that during rainy days cows lie down for less time regardless of lameness status but the reduction in lying time is greater in lame cows. The total lying time during rainy days is reduced as cows lay down fewer times. This research backs up what we see and what the public are getting worried about with our wintering practices – cows do not appear to want to lie down on wet surfaces and if they are also lame the reduction in lying time is greater.

Reference: J Dairy Sci. 2019;102(7):6373–6382
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.

Are dietary strategies to mitigate enteric methane emission equally effective across dairy cattle, beef cattle, and sheep?

Authors: van Gastelen S et al.

Summary: The aims of this Dutch study were to: i) provide an overview of some essential differences in rumen physiology between dairy cattle, beef cattle, and sheep that are related to methane (CH_4) emission; and (ii) to evaluate whether dietary strategies to mitigate CH_4 emission with various modes of action are equally effective in dairy cattle, beef cattle, and sheep. The investigators concluded that if the mode of action of a dietary CH_4 mitigation strategy is directly associated with methanogenesis-related fermentation pathways, the strategy is more likely to have a similar effect across different types of ruminants. However, if the mode of action is related to ruminant-specific factors, such as feed intake or rumen physiology, the effectiveness of the strategy is more likely to differ between ruminant types.

Comment: This paper looked at methods that are being investigated to reduce CH_4 in ruminants and looks at whether what works in one ruminant or class of ruminant (i.e. dairy vs beef) works in others. There is heaps in the media about technologies to reduce ruminant CH_4 production and the temptation is to assume all ruminants are equal (some of us think some ruminants are "more equal than others" though). There are two general mechanisms by which we can manipulate the CH_4 production from ruminants, manipulating the "methanogenesis-related fermentation pathways", or manipulating "ruminant-specific factors such as feed intake or rumen physiology". There are also differing methods of "accounting" for the CH_4 produced, either by animal, per kg of dry matter intake (DMI), as a percentage of gross energy intake (GEI), or per kg of product (say milk). So, increasing intake by increasing the digestibility of feed may increase CH_4 per cow but decrease CH_4 produced per kg of DMI or CH_4 as a percentage of GEI. A manipulation that reduces one of the measures of CH_4 in a cow may not reduce all of the measures. A general simplification is that methods that alter the fermentation pathways, generally work across species, but manipulations to the feed intake or rumen physiology are less consistent across species. It is also tricky to generalise as, for example, the CH_4 produced by a dairy cow in response to increasing starch in their diet is not linear but appears to be quadratic – it is how the rumen deals with the H_2 produced and how much of that can be "sunk" into propionate production. The good news is that although garlic oil appears to reduce methanogenesis *in vitro*, this has not been shown to work *in vivo* – we often return home after work pretty smelly but at least we will not reek of garlic because it was shown to reduce greenhouse gas emissions.

Reference: J Dairy Sci. 2019;102(7):6109–6130
Abstract

Colostrum from cows immunized with a veterinary vaccine against bovine rotavirus displays enhanced in vitro anti-human rotavirus activity

Authors: Civra A et al.

Summary: This Italian study demonstrated that use of a conventional bovine rotavirus vaccine in pregnant cows is sufficient to enhance the anti-human rotavirus protective efficacy of bovine colostrum, hence providing a conservative approach to the production of hyperimmune bovine colostrum (HBC) and making it viable as a functional food.

Comment: Rotavirus is no fun in the calf shed but I imagine it is even worse if your baby gets it. This paper looks at the concept of using HBC to provide passive immunity to baby humans. Although there is an oral vaccine against human rotavirus it has its problems and it is actually less immunogenic in low income countries compared to wealthy countries. This is due to a number of reasons, including transplacentally-acquired immunoglobulins, breast feeding, and malnutrition. Previous work with colostrum from cows vaccinated against human strains of rotavirus have been shown to be effective in the management of babies with rotavirus. This *in vitro* work demonstrated the antibodies produced by cows vaccinated with a conventional veterinary vaccine are cross protective against human strains of rotavirus. Perhaps in the future NZ colostrum will have its immunoglobulin G extracted and used to control rotavirus in babies.

Reference: J Dairy Sci. 2019;102(6):4857–4869
Abstract

The effect of growth rate on reproductive outcomes in replacement dairy heifers in seasonally calving, pasture-based systems

Authors: Hayes CJ et al.

Summary: This retrospective study investigated the effect of average daily weight gain (ADG) on reproductive outcomes in replacement dairy heifers reared on commercial spring-calving pasture-based farms. The results demonstrated that an increased ADG overall between birth and breeding has a favourable effect on fertility.

Comment: This Irish study followed heifers from seven herds from a first weighing within 10 days of birth to mating. This paper is pretty applicable to NZ as the calves were reared on a pastured-based system like ours. The average estimated live weight of the cows in the herds was 588kg based on a calculation taken from the Irish Breeding Index. The median age of heifers at planned start of mating (PSM) was 444 days. The average daily gain from birth to mating ranged from 400 to 900 g/day with a median of 700 g/day. It is not stated but it seems these heifers were about 350kg at PSM. So, perhaps these cows are bit bigger than we deal with but not vastly different. All heifers were mated to detected heats without any hormonal intervention and the 6-week in-calf rate was 85%. The calculated mature weights were blocked into three groups (terciles – a new word to me as well). It was found that for a heifer in the middle tercile for predicted mature weight, the median predicted days open (time for half of them to get pregnant) were 27 days, 16 days, and 11 days for heifers with an ADG of 0.40, 0.70, and 0.90 kg/day, respectively. This effect could be due to a higher ADG resulting in puberty being attained earlier (puberty likely to be more related to weight than age) and therefore more cycles before PSM. As the ADG and percentage of mature weight attained at PSM are obviously related, it is not surprising that the difference in median days open decreased with increasing ADG in all mature body weight terciles, but the heifers in the 3rd tercile at any ADG had a lower median number of days open than the two heavier terciles for mature body weight.

Reference: J Dairy Sci. 2019;102(6):5599–5611
Abstract

Using Dairy Research Review for CPD points

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.

SEE THE VCNZ WEBSITE FOR TEMPLATES TO DOWNLOAD ACTIVITY RECORDS AND REFLECTIVE RECORDS
http://www.vetcouncil.org.nz/contProfDevel.php

NEW ZEALAND VETERINARY NURSING ASSOCIATION

Animal Health Review publications are accredited for 0.5 points per publication with the NZVNA.
More information is available at NZVNA