

Dairy RESEARCH REVIEW™

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Issue 24 – 2020

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Welcome to the latest issue of Dairy Research Review.

This issue features studies investigating bone morphology and strength in dairy calves prior to weaning and the association of lameness with production and reproductive performance in pasture-based dairy cows. On the technology front, a pasture-based automatic milking system is compared with a conventional system from an economics perspective and a Smarttag sensor for recording cow grazing time undergoes validation on a Taranaki dairy farm. Also of local interest is an analysis of the relationship between farm debt and productivity and profitability on NZ dairy farms.

We hope that you learn something new from this issue of **Dairy Research Review**. Please keep 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.

Short communication: the beef merit of the sire mated to a dairy female affects her subsequent performance

Authors: Berry DP & Ring SC

Summary: This cross-sectional study used up to 346,765 calving events from 230,255 Holstein-Friesian cows in 3,604 herds to quantify the association of sire beef merit with the milk and reproductive performance of his mate in the ensuing lactation in the absence of calving difficulty. Statistically significant associations between sire beef merit and both milk and reproductive performance of the mate were identified. In biological terms, however, the size of the associations was small.

Comment: This study from Ireland looked at whether the sire used on a cow affects her subsequent lactation and subsequent fertility. Data was only collected from cows that calved without assistance to avoid the confounding effect of dystocia. The models created took into account that low yielding cows are more likely to be mated to beef sires. Using a beef breed sire compared to a Holstein-Friesian resulted in a 1.5% reduction in 305-day milk yield. The milk production traits were mainly attributable to the dam — not the sire that resulted in the pregnancy, which makes sense. The predicted probability of pregnancy rate after 42 days of mating (equivalent of the 6-week in-calf rate) was 0.66 for cows that had a Holstein Friesian calf and 0.57 for cows that had given birth to an Angus or Hereford calf. However, the average days from calving to first service was 81.7, 65, and 64 days for cows that gave birth to either a Holstein Friesian, Angus, or Hereford calf, respectively. In summary, the reduction in yield is small as a percentage but might be significant if you have massively yielding cows. The apparent reduction in “6-week in-calf rate” is likely due to reduced days in milk at the planned start of mating.

Reference: *J Dairy Sci.* 2020;103(9):8241–8250

[Abstract](#)

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Bone morphology and strength in the mid-diaphysis of the humerus and metacarpus in dairy calves prior to weaning

Authors: Gibson M et al.

Summary: These researchers investigated the relationship of computed tomography-derived measures of bone strength and morphology with gross measurements of size and growth in pre-weaning dairy calves. Differences in growth patterns were observed between the metacarpus and humerus over time. Calf weight was the best predictor for measures of periosteal circumference and stress strain index ($R^2=0.49-0.58$) in the metacarpus. Calf weight was also the best predictor for measures of stress strain index at all ages in the humerus ($R^2=0.94$).

Comment: Once again this spring I saw multiple heifers with a fractured humerus. This is another paper looking at what might be contributing to this problem. This study looked at the preweaning period and scanned the metacarpus of calves at 1, 6, and 12 weeks of age. At each scanning time point some of the calves were euthanised and the humerus was removed to allow scanning of that bone. What I took away from this paper is that the humerus up until 12 weeks of age is undergoing far more changes and development than the metacarpus. There was a strong relationship between weight and the measures of bone strength so maintaining preweaning (birth to 12 weeks or 100kg) growth rates could be important for future strength of the humerus.

Reference: *Animals (Basel)*. 2020;10(8):1422

[Abstract](#)

Short communication: evaluation of an eating time sensor for use in pasture-based dairy systems

Authors: Dela Rue B et al.

Summary: Commercially available Smarttag “eating time” sensors were mounted on the neck collars of multiparous Holstein-Friesian cows in a Taranaki herd to investigate whether Smarttag sensors were suitable for recording the grazing time of cows. Observations of 37 cows were recorded in 14 sessions over 8 days, providing a total of 55.5 hours of observations. Sensor-identified percentage “eating time” and observed percentage active grazing time were shown to be both well correlated and in agreement.

Comment: This study, which was conducted in the Taranaki, looked to validate, in a NZ grazing system, a Smarttag “eating time” sensor. There seems to be a proliferation of these sensor technologies and it is good to see them validated for the way we manage cows in NZ. It is possibly not correct to assume because one particular sensor works, they all will, but I think this paper does support the idea that the “mechanics” (3-dimensional accelerometers) in the sensors will work in our systems. I suspect the real technology is in the algorithms and this is where different technologies are likely to differ.

Reference *J Dairy Sci*. 2020;103(10):9488–9492

[Abstract](#)

Using Dairy Research Review for CPD points

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See the VCNZ website for templates to download activity records and reflective records <http://www.vetcouncil.org.nz/contProfDevel.php>

Short communication: the relationship between farm debt and dairy productivity and profitability in New Zealand

Authors: Ma W et al.

Summary: To determine whether increased debt benefits or damages the economic performance of dairy farms these researchers explored the effects of farm debt measured by debt-to-asset ratio on dairy productivity and profitability, using the New Zealand DairyBase data of 2,637 dairy farms for a 10-year period. The data indicated that dairy productivity is positively determined by production intensification, irrigation intensity, milking frequency, cattle breeds, and stocking rate. Dairy profitability is positively affected by milk price, business type, milking frequency, and stocking rate. High dairy farm debt was associated with lower levels of farm performance, which is concerning because of the high debt levels on a substantial proportion of NZ dairy farms

Comment: This paper looked at the effect of dairy farm debt (debt-to-asset ratio) on both productivity (MS/Ha) and profitability (\$/Ha) of NZ dairy farms. Data was extracted from the DairyBase database from 2005 to 2014. Dairy farm debt was estimated to account for 64% of NZ’s agricultural debts and 6.3% of the NZ’s debts in November 2019. Higher production systems are associated with a higher debt ratio. When the effect that debt has on profitability and production was looked at for farms that had 5 years of data only profitability was affected, but when only farms that had 10 years of data were analysed farm debt had no effect on productivity or profitability. Factors that can change relatively quickly were found to affect profitability, namely milk price, milking frequency, business type, and stocking rate.

Reference: *J Dairy Sci*. 2020;103(9):8251–8256

[Abstract](#)

Associating mobility scores with production and reproductive performance in pasture-based dairy cows

Authors: O’Connor AH et al.

Summary: These investigators collected mobility scores, body condition scores, and production data for 11,116 cows from 68 herds to determine the associations of various production and reproductive performance measurements with mobility scores in spring-calving, pasture-based dairy cows. The data demonstrated that suboptimal mobility has negative associations with production (milk, fat and protein yield, and somatic cell count [SCC]) and reproductive performance (calving interval length), as well as being associated with a higher risk for premature culling.

Comment: This paper looked at Irish cows managed seasonally like we do. Cows were lameness scored twice (average days in milk 40 days and again at an average of 160 days in milk). Lameness was scored as 0 (optimal mobility) progressing to scores of 1, 2, and 3. Scores greater than 0 were deemed to have suboptimal mobility. Just over 11,000 cows were in the study. At both scoring time points just under 7,000 cows had a lameness score of zero (optimal mobility) so the balance had “sub optimal mobility” most of which, about 3,000, had a score of 1. Cows with suboptimal mobility at either scoring period were more likely to have an elevated SCC, possibly due lying down more? Cows with a score of 2 at the early scoring period had a longer inter-calving interval (but oddly not the score 3 cows but there were very few of those). Cows with suboptimal mobility were also more likely to be culled. The reason for this is unclear but was likely due to a mixture of reproduction, reduced production, and increased SCC. This study shows the effects of sub-optimal mobility in seasonally calving pasture-fed cows are what we probably all expect, based on what we see in cows that have been treated for lameness prior to mating not getting pregnant rapidly.

Reference: *J Dairy Sci*. 2020;103(10):9238–9249

[Abstract](#)

The association of cow-related factors assessed at metritis diagnosis with metritis cure risk, reproductive performance, milk yield, and culling for untreated and ceftiofur-treated dairy cows

Authors: Machado VS et al.

Summary: In this prospective cohort study, which was nested inside a randomised clinical trial that investigated the efficacy of an alternative therapy for metritis, cows diagnosed with metritis were randomised to receive subcutaneous ceftiofur 6.6 mg/kg at enrolment and 72 hours later (n=168) or to remain untreated (n=147). A random subset of 150 non-metritic cows was also included to compare milk production, reproductive performance, and culling responses. Plasma levels of non-esterified fatty acids, β -hydroxybutyrate, and haptoglobin (Hp); parity; rectal temperature; days in milk (DIM) at metritis diagnosis; vulvovaginal laceration (VL); body condition score; dystocia; twins; and retained placenta were measured to assess the association of cow-related factors with metritis cure risk and economically-important outcomes. Hp levels and DIM at metritis diagnosis were associated with risk of cure for metritis in the untreated cows while plasma Hp, DIM at metritis diagnosis, VL, and dystocia influenced the risk of cure for ceftiofur-treated cows. Because the accuracy of those variables to predict metritis cure was only moderate, the identification of more accurate predictors of metritis spontaneous cure and treatment failure is needed for the development of a selective therapy strategy for metritis.

Comment: Metritis was defined as a fetid, watery, reddish-brownish discharge with or without fever. Cure was no fetid discharge in a metricheck device 12 days after diagnosis. What surprised me was the cure rate (could still have pus though) in the non-treated cows of 64.6% (vs 81.5% for ceftiofur-treated cows). This means that six cows need to be treated to cure one extra cow. Oddly in this study, the number of DIM when a diagnosis of metritis was made was positively associated with the chances of a cure as were cows that had a dystocia compared with a normal birth. This study does not give us an easy way to decide if to treat or not (or ideas on what to treat with). What it did do that was useful, was measure the degree of inflammation a cow was exhibiting (haptoglobin), which was negatively associated with chances of pregnancy or staying in the herd. Perhaps if you find a fetid discharge at metrichecking and you think the cow is a “bit off” something in addition to an intrauterine antibiotic is warranted.

Reference: *J Dairy Sci.* 2020;103(10):9261–9276

[Abstract](#)

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Relationship between milk constituents from milk testing and health, feeding, and metabolic data of dairy cows

Authors: Glatz-Hoppe JG et al.

Summary: The objective of this study was to validate a new evaluation scheme to assess the nutritional status of dairy cows based on milk constituents. Two data sets with fertility and health information (set A: 72,982 records of 43,863 German Holstein cows) and with measured energy and nutrient intake and metabolic characteristics (set B: 49,275 records of 1,650 German Holstein, Simmental, and Brown Swiss cows) were analysed. The data indicated that the informative value of milk constituents with respect to the nutritional status of dairy cows with feed energy and crude protein (CP) was only conditionally high and that frequently used limit values should no longer be used. The new feeding evaluation had higher agreement with measured feed energy and feed CP intake in relation to demand, blood and urine values, and changes in body reserves. The study investigators proposed new ranges for milk constituents.

Comment: This study took individual herd test records (five consecutive tests per lactation) from German cows (not pastured based) and examined the milk constituents to look for relationships with reproductive performance and health such as ketosis, sub-acute ruminal acidosis (SARA), hypocalcaemia, and retained placenta. The level of milk urea nitrogen (MUN) in a cow's milk was not negatively associated with reproductive performance in these German cows. In this paper, cows with “low” MUN had poorer reproductive performance — probably because they were insufficiently fed (a CP and energy deficit as all were total mixed ration (TMR) fed). Extrapolate these findings to bulk milk MUN levels on our pasture-fed cows at your discretion. The milk fat-to-protein ratio (FPR) of ≤ 1.4 was defined as optimal (not for the Jerseys though), this is a protein-to-fat ratio of 0.71. There was an almost linear relationship between energy balance and the FPR (negative) and the higher the FPR the greater loss of weight and body condition score. A word of caution, these results are individual cow results from TMR-fed cows — how you take this to bulk milk tank results is up to you.

Reference: *J Dairy Sci.* 2020;103(11):10175–10194

[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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Incidence of milk leakage after dry-off in European dairy herds, related risk factors, and its role in new intramammary infections

Authors: De Prado-Taranilla AI et al.

Summary: The aim of this study was to investigate the milk leakage incidence from dry off to 52 hours later in commercial European dairy herds, related risk factors, and the association between milk leakage and new intramammary infection (IMI) and the presence of clinical mastitis (CM) across the dry period and in the first 30 days after calving. Based on the study results the investigators concluded that reduction of milk leakage (and consequently lower new IMI during the dry period and at calving) may contribute to a reduction of antimicrobial usage and hence less antibiotic resistance.

Comment: A total of 1,142 cows from 41 herds in eight European countries were dried off and the incidence of milk leakage post dry off was recorded. No internal (or external) teat sealants were used. The results showed that 25% of cows leaked milk after dry off. Quarters (but not cows) that leaked milk in the first 52 hours after dry off had 2-fold higher odds of mastitis up to the first 30 days of lactation. The cows that did not have their milking frequency reduced prior to dry off had a higher risk of leaking milk. The highest risk group was cows that were milked three times a day or were milked through an automatic system. This result is not consistent with what was found by [Tucker et al.](#) in a 2009 NZ study that found once-a-day milking for the final week reduced their milk output by 20% but had no reduction in the incidence of milk leakage compared with cows dried off abruptly. This paper has a large discussion section comparing the findings of studies examining milk leakage and the findings vary. In this paper, higher yield at dry off was associated with milk leakage but also is not a consistent finding in the literature. The risk of milk leakage may be associated more with peak milk flow rates. In this study, most farmers altered the feeding prior to dry off to reduce yields but the results of these changes on milk leakage were not reported. It seems that there is no clear consensus apart from milk leakage is bad, but how to reduce it, on a particular farm, is trickier to answer.

Reference: *J Dairy Sci.* 2020;103(10):9224–9237

[Abstract](#)

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Physical and economic comparison of pasture-based automatic and conventional milking systems

Authors: Gargiulo JI et al.

Summary: This study compared the physical and economic performance of pasture-based automatic milking systems (AMS) with conventional milking systems (CMS) and also aimed to identify gaps for improving AMS productivity and profitability. Data from 14 AMS and 100 CMS located in the main dairy regions of Australia were collected over 3 years. Results showed that all the main physical performance indicators evaluated, such as milk production per cow, milk production per hectare, pasture grazed per hectare, or milk solids per full-time equivalent employee (FTE), were similar between systems. Although the AMS farms had higher overhead costs, there were no differences in total labour costs between the two systems. Profitability was not significantly different between AMS and CMS.

Comment: This study looked at the actual performance of 14 Australian farms using AMS (robots) and 100 comparable farms that milked conventionally. Herd size ranged from 130 to 360 odd cows and the robot farms had an average of four robots. There were no significant differences in the “physical indicators” between conventional and robot farms for the three seasons analyzed (milk solids, pastured harvested, purchased feeds, and on and on) apart from the robot farms having a lower protein percentage and a trend for the robot farms to have more cows per full time-equivalent worker (2.3/100 cows vs 2.7/100 cows; $p=0.087$). The economic indicators were also remarkably similar between the two systems apart from greater shed costs, depreciation, and interest. Studies done in confinement systems have shown increased milk production of 2 to 10% but these systems likely allow a higher dry matter intake, and the ability for cows to be milked more frequently by robots is more beneficial. In common with NZ, one of the biggest drivers of profitability was tonnes of dry matter harvested per hectare and surprisingly this was not significantly different between robot farms and conventional farms (but were both low compared with what we are used to at 6 and 7 tonnes) so pasture utilization did not seem to adversely affected. The authors referred to a survey of farms in NZ, Australia, and Ireland that have robots, which indicated that they invested in robots to increase the flexibility of time management. This study backs that statement up as number of cows per FTE worker did not differ between robot and conventional farms.

Reference: *J Dairy Sci.* 2020;103(9):8231–8240

[Abstract](#)

Udder health of early-lactation primiparous dairy cows based on somatic cell count categories

Authors: Persson Waller K et al.

Summary: This study investigated the prevalence of intramammary infection in early-lactation primiparous dairy cows using milk recording cow composite somatic cell count (SCC) categories that were based on classification of SCC at the first two milk recordings after calving as low or high using cut-offs indicating intramammary infection. A total of 1,597 dairy herds were included in the study. Only 50% of cows had a low SCC at both milk recordings after calving indicating a substantial need for prevention of subclinical mastitis in early-lactation primiparous cows. The study investigators proposed that SCC categories may be a useful tool for identifying successful and problem herds.

Comment: This study looked Swedish first calvers for three years (approx. 50,000 first calvers each year). The first two herd tests were analysed if they occurred between 5- and 35-days post calving and 20- to 40-days post calving. Heifers were classified as having a “low” SCC if the result was $\leq 75,000$ and “high” if $> 100,000$. SCCs between these values were called “in conclusive”. So, across the first two herd tests a heifer could be low:low or high:high or other combinations. Approximately 50% of heifers were low:low and only 5% low:high supporting the idea most infections occur early in the lactation. If a heifer was a Jersey, she was less likely to be low:low compared with the other breeds examined (and more likely to be high:high). Within a breed if there were sires that had $> 1,000$ heifers in the study, there were sires that were more likely to produce heifers that were classified as low:low. Heifers that came from farms that had higher production were also more likely to be low:low; possibly for a farm to be high producing udder health has to be good? Heifers that were milked on farms with AMS were less likely to be low:low; could heifers “struggle” to learn to use the robots happily? The most interesting part is that that there is a breed effect (at least between the breeds in Sweden) and a sire effect, so hopefully the breeding worth for SCC used in NZ predicts this.

Reference: *J Dairy Sci.* 2020;103(10):9430–9445

[Abstract](#)

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