HERD’19
DELIVERING CHANGE

PROGRAM

A wonderful line up of experts across all disciplines of the herd improvement industry is in store.

19 & 20 March 2019
Bendigo All Seasons
171 McIvor Road, Bendigo
Victoria, Australia 3550

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Herd’19 is a proud, joint initiative of Dairy Australia, NHIA, DataGene and Holstein Australia that features a tailored and innovative program that is aimed at Herd Improvement industry personnel (from field and technical staff through to management) and dairy farmers with a specific interest in using genetics to achieve the next paradigm of farm business productivity gains.

Significant investment in this event from the four hosting entities has kept registration fees to a minimum, on the back of a policy of encouraging as many people as possible to attend – enabling you to invest in your own and your staff’s education and professional development.

We trust that you enjoy the program of events.

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Day 1 - Arrival / Registration – Tuesday 19 March 2019
9.30am-10.30am Arrival and registration to the Herd’19 Conference
Enjoy a refreshment and morning tea upon arrival.

Day 1 - Welcome – Tuesday 19 March 2019
10.30am-10.40am Official Welcome
Conference Master of Ceremonies and communications consultant to the herd improvement industry
Esther Jones sets up the days ahead, leading us through the official welcome.

Day 1 - Tuesday 19 March 2019
Session 1 – Craig Lister – Why are we here?
10.40am-10.55am As a dairy farmer and leading breeder of high genetic merit bulls, Craig understands what change is needed to succeed – on farm. As a director of DataGene he is part of the decision-making team that is making change happen. But will the farm sector embrace those changes fast enough to keep pace with the global expectations of dairy? We have asked Craig to explore how the herd improvement industry can motivate the necessary rate of change in our farmer base.

Session 2 – Matt Shaffer – Leading change
10.55am -11.20am Since the Herd series commenced in 2009, Matt Shaffer has been at the centre of a decade of change through leadership positions at Holstein Australia, Dairy Australia and now as the CEO of DataGene. Matt will provide an insight into the change that has occurred in both the Australian and global herd improvement industries since 2009 and consider what’s to come.

Session 3 – David Nation – The Australian Dairy Plan
11.20am-11.55am The Australian Dairy Plan aims to rally the industry to set a clear vision and purpose for the next five years and beyond. David will talk about the opportunity for the broader dairy community to have their say and the role our herd improvement industry has to play.

Session 4 – Ross Anderson – Impact of innovation on our people
11.55am-12.20pm What is the impact of new technology, new client demands and new organisational demands on a herd recording organisation’s people? How do you create an environment that enables change and inspires both staff and customers?

Session 5 – Tim Jelbart – A story of change
12.20pm-12.40pm Tim was a participant in the ImProving Herds project and through this was introduced to a new world of genomics and BPIs. But with a strong grounding in the economics of managing a successful dairy farm, how did Tim reconcile the project’s research findings with what he sees on the ground?

12.40pm-12.45pm An introduction from Zoetis followed by a lunch in the hospitality area

Day 1 - Luncheon – Tuesday 19 March 2019
12.45pm-1.45pm Lunch is proudly sponsored by Zoetis

Session 6 – Sijne van der Beek – Unintended consequences
1.45pm-2.10pm Sijne van der Beek, Manager Innovation CRV will share some insight into the unintended consequences in adoption of genomic selection strategies and what we need to do to support our staff and customers.

Session 7 – Jennie Pryce – Opener followed by on the couch with change makers
2.10pm-2.45pm DairyBio as a change leader. What innovations should we expect in 1 year, 5 years and 10 years?
On the couch with:
• Mary Abdelsayed  • Caeli Richardson  • Evans Cheruiyot
Our panel members will discuss their research and its impact on farmers and the industry.
Session 8 – Nancy Charlton – So you’ve bought the box, now what?
2.45pm-3.15pm  Nancy Charlton’s experience in the supervision of robotic installations across North America has revealed some surprising observations in how farmers and the service industry adapt (or not) to change. How can we provide better support to our customers to enable, not disable change?

Day 1 - Afternoon Tea Break – Tuesday 19 March 2019
3.15pm-3.45pm  Afternoon tea is proudly sponsored by Bentley Instruments Inc USA.

Session 9 – Jennie Pryce – The vision for MiR at DairyBio/Sam Simpson – The vision for MiR
3.45pm-4.05pm  After just a few short years of MiR development we are getting a glimpse of a technology that holds tremendous potential. We ask Jennie Pryce to look ahead to give us some insight about what’s to come with MiR technology. What secrets are being revealed by this technology and how these could be applied on farm?
As a dairy farmer on the cutting edge of technology, Sam Simpson has seen her fair share of innovation successes and nightmares. So what are the do’s and don’ts of new technology application on farm?

Session 10 – Chris Murphy – What’s next?
4.05pm-4.20pm  Five years ago, the Herd Improvement Industry Strategic Steering Group established a vision and a plan for a vibrant Australian herd improvement industry knowing that its success was dependent on leadership and partnerships. Chris Murphy has recently reviewed our industry’s progress against the plan and can help us answer ‘are we on track’?

Session 11 – Lucinda Corrigan & Paul Stammers – Next-gen go-getters
4.20pm-5.00pm  DataGene director Lucinda Corrigan is a go-getter from way back. It takes one to recognise one - and so we ask Lucinda together with Katunga dairy farmer Paul Stammers to meet three of our next-gen go-getters - and ask them how they intend to go about go-getting their careers in the Australian dairy herd improvement industry:
• Ebony King  • Amabel Grinter  • Vaughn Johnston

Day 1 - Pre-Dinner Drinks – Tuesday 19 March 2019
6.00pm-7.00pm  Pre-dinner drinks are proudly sponsored by Nat-Tech (Bentley Instruments Inc USA).
7.00pm-10.30pm  The Herd’19 Conference Dinner
Paul Stammers “Life after FeedBuddy and becoming a social media sensation”.

Day 2 - Arrival / Registration – Wednesday 20 March 2019
8.00am-8.30am  Arrival and registration to the Herd’19 Conference
Mingle with other delegates in preparation for the commencement of Day 2 sessions.

8.30am-8.40am  Welcome to Day 2
Conference Master of Ceremonies, Esther Jones oversees the morning recovery plans following the celebratory Herd’19 conference dinner and introduces Day 2.

Session 1 – Ben Hayes – What was the change you thought genomics could make?
8.40am-9.10am  How does this compare to the change it has made? What’s to come that we haven’t even dreamed of yet?

Session 2 – Pauline Brightling – The rewards of farm-based research
9.10am-9.45am  Pauline Brightling from Harris Park will share her wealth of knowledge about how farm based research impacts on technology adoption on farm.
Panel discussion: What drives you to participate in farm-based research? What do you see as the rewards/drawbacks? What makes the interaction work well? What do you need to be prepared for if you undertake research on your farm?
• Lucinda Corrigan  • Anthea Day  • Trevor Henry  • Bill Wales
Session 3 – Brian Albertoni – Global change in a traditional industry

9.45am-10.10am  Brian Albertoni from World Wide Sires draws on his many years of global experience to highlight some of the critical changes of our dairy genetics and where this is leading the industry in the future.

Day 2 - Morning Tea Break – Wednesday 20 March 2019

10.10am-10.40am  Morning Tea is proudly sponsored by Foss Pacific.

Session 4 – On Farm Service Improvement Speakers

10.40am-11.00am  Daniel Schwarz - Daniel is a cattle disease specialist with Foss who is a world leader in analytical solutions (e.g. FTIR based technologies) and applications in the dairy industry. Daniel will present the latest innovations and how they could be applied on dairy farms for improved dairy herd management.

11.00am-11.10am  Scott Rathbone - CRC Agrisolutions - Animal monitoring technology, the move from skeptic to believer, the how and why of my technology journey.

Session 5 – John Penry – What does a farm look like without blanket dry cow treatment?

11.10am-11.40am  Internationally, animal agriculture is challenged to do their fair share in reducing anti-microbial resistance. John Penry will shed some light on the whys, the ifs and the buts of the elimination of prophylactic antibiotic use.

Session 6 – Tim Humphris & Ee Cheng Ooi – Herd fertility

11.40am-12.10pm  Since the Herd series began, fertility has featured prominently in every program. So what’s changed and what hasn’t? What are some strategies that farmers, service professionals and industry can adopt to make a step change in the fertility of Australian dairy cattle?

Session 7 – Daniel Abernethy – Turning data into decisions

12.10pm-12.20pm  Genomic testing has moved from scientific journals to being used by bull breeding organisations and now by farmers looking to drive genetic improvement of their herd. Daniel Abernethy from Zoetis Genetics will present on the on-going development of genomic testing and the approach taken to turn data into decision.

Day 2 - Luncheon – Wednesday 20 March 2019

12.25pm-1.25pm  Lunch is proudly sponsored by Allflex Australia.

Session 8 – Farmer Tim – The guts and glory of social media

1.25pm-1.55pm  Skype Session. How has social media changed the way farmers interact with consumers? Do we (farmers and service sector) need to change to make the most of this channel? How?

Session 9 – Lee-Ann Monks – Why on earth would you do it?

1.55pm-2.25pm  DataGene’s marketing and communications manager, Lee-Ann Monks, digs into the minds of our social media champions to understand what it takes to thrive in new media. Panel discussion:

• Di Bowles  • Greg Tiller  • Adam Sawell  • Aimee Snowden  • Owen Daley  • Farmer Tim

2.25pm-2.45pm  Conference Close; Conference Master of Ceremonies, Esther Jones will officially close the Herd'19 conference, followed by afternoon tea.
With genomic selection the very best animals are related. First because family information is still important. Second, because we do not know exactly what are the best DNA variants. We have to estimate the effect of DNA variants, and there is little information available to estimate the DNA variants present in outcross families. Consequently, the chance of an outcross animal to get a high genomic breeding value is very low and thus they are not selected. This has consequences. Dominant families, dominant breeding programs and dominant breeds get more dominant.

To avoid this requires effort. Targeted data collection on outcross animals. More focus on smaller breeds. A willingness to work with lower ranking animals. Research into new methods to estimate the effects of rare DNA variants.

What does this mean for farmers? On the short term not so much. Farmers, especially in the open Australian market, can pick and choose. Use bulls from various breeding organizations. Use crossbreeding. And thus manage genetic progress and genetic diversity on their farm.

For the long term, farmers should continue to elect their representatives that govern breeding organizations, herd books and levy boards wisely.

Unintended consequences

With Genomic selection, Winner Takes All. Is this the best long term solution?

Genomic selection has revolutionized dairy cattle breeding. It started with an idea: Take a DNA sample of a (young) animal. Analyze for that animal (on many places on the genome) which DNA variants the animal did inherit from its parents. Based on this predict the genomic value of the animal. Select the animals with the highest genomic value.

In the last decade, the idea has been proven very powerful. Breeding organizations have changed their approach to breeding. They sample DNA and predict genomic values for many animals. Focus shifted from progeny testing to embryo production: generate many offspring from your elite cows and genomically select the best offspring. Genetic progress has doubled and generation intervals did shrink.

The main promise of genomic selection: increased genetic gain, has come true. But people also predicted that inbreeding would go down because selection would be less based on family information. And people predicted that breeding costs would significantly go down since genotyping is much cheaper than progeny testing.

In reality, inbreeding has gone up and costs have not gone down. The two are related. Especially for the Holstein breed, the competition between the large global players has intensified. They pay a lot to get access to the very best females and invest large sums of money in embryo production and recipient management. Generation intervals are ultra-short and only the very best males and females, all related, are used.
Together with our industry partners, we must unite to support the farmer in what they need to improve or change in their management style. Dairy farms in the U.S. and Canada differ on some levels ... herd sizes, and fluctuating milk prices versus milk quotas ... but regardless of their unique challenges, all farms have learning curves when purchasing new technology. I had a customer once tell me, “I don’t want anyone taking up my time unless they have a solution to a problem on my farm.”

The farms that have more vision, more strategy and more equity are more likely to sustain and grow their operations, which also explains the trend of larger herd averages. You truly “get what you plan for.” For producers planning for change, it’s important to think about:

1. What questions will I ask and to whom?
2. Why am I adding the technology?
3. How will I work with the technology?

I used to think that we needed to qualify people for technology. Now I believe if we ensure the expectations are in line with the desired result, then qualifying is not necessary. The dairy producer’s team must be onboard, too. Meetings must happen and major influencers on the dairy farm should be involved at different times, otherwise misunderstandings and expectations evolve that lead to disappointment.

If you know where you are today and where you need to be then you focus on finding the right people to help get you there. In the end, it is all about your vision and the people you find. Ask hard questions, take responsibility, work with good people and you will enjoy the journey.
The vision for MIR at DairyBio

Jennie Pryce1,2 Tim Luke1,2, Simone Rochfort1,2, Valentina Bonfatti3 and Phuong Ho1

1Agriculture Victoria, Bundoora, Australia
2La Trobe University, Bundoora, Australia
3University of Padova, Italy

Key points

• The use of mid-infra-red spectroscopy to predict traits of importance is an area of growing research globally. In Australia, we have had research projects in this area since 2015.
• The vision of DairyBio scientists is to develop accurate predictions of traits of importance that can be used for meaningful management and breeding purposes.
• The process includes collection of data, analysis of data and validation in independent data. consultation.
• Traits that are measurable directly in milk (e.g. fat, protein etc) are generally straightforward to predict using MIR, while, characteristics associated with health and fertility are much more difficult to predict consistently well.

It has been just a few years since we started research into the application of mid-infrared (MIR) spectroscopy of milk (i.e., the same technique routinely used worldwide to predict milk composition during herd testing) to predict novel traits.

Traits that are measurable directly in milk are generally straightforward to predict using MIR (e.g. protein, fat etc). However, characteristics that are part of the cows physiology e.g. health and fertility, are much more difficult to predict consistently well across Australia’s diverse feeding systems. This issue presents a considerable challenge in assembling the size of dataset required to generate robust results across these feeding systems. The DairyBio team in partnership with DataGene remains committed to collecting more phenotype data and using it for research purposes. We are optimistic that the obstacles will eventually be overcome.

In addition, there are opportunities to use MIR predictions of traits that are high value, for genomic selection. The vision here is that very large populations of genotyped cows with mid-infrared spectral data could lead to an increase in genomic prediction accuracy for traits that are only measurable in small populations, due to either expense or difficulty in obtaining measurements (or both), for example metabolites measured in blood serum that are indicative of early lactation health status. Even though we currently have only small populations of cows with MIR and genomic data we are generally seeing a benefit of MIR predictions on top of having measurements on the trait itself. It is anticipated the modest gains so far seen would be enhanced by larger data sets.

MIR technology

Modern herd test equipment has the capacity for MIR analysis.

MIR stands for mid-infrared spectroscopy, which involves passing a beam of light through a milk sample to provide data in the form of spectra (absorbance at specific wavelengths). The absorbance spectra are unique to the sample and tell us about milk composition in addition to the health of the cow. Farmers currently receive regular reports from their herd test centres with information on milk volume and fat and protein content.

The MIR for Profit project set out to explore opportunities for the Australian dairy industry. It ran from 2015-18 with funding by the Rural R&D for Profit Programme. Since then DairyBio projects have been established to continue MIR research.
MIR for Profit

Our journey into the application of MIR data to predict traits of importance started in July 2015, through a project known as MIR for Profit, funded by the Rural R&D for Profit Programme. Agriculture Victoria’s interest in the application of MIR to predict phenotypes of importance in dairy cattle came from overseas research that suggested MIR could also be used to predict some traits associated with the health and fertility status of the cow. The aim of the project was to investigate whether MIR prediction of traits of importance in Australian production systems is possible.

Since the MIR for Profit project started, DairyBio (a co-investment of Agriculture Victoria, Dairy Australia and the Gardiner Dairy Foundation) has expanded the scope of MIR prediction. Firstly, through the use of MIR and genomics to provide initial predictions of blood metabolites indicative of animal health in early lactation cows. The intention is development of management and breeding solutions.

In 2018, a new DairyBio project started that has extended the traits we measure (such as fertility and lameness).

Application to the Australian dairy industry

To be useful for the industry, the MIR predictions have to satisfy a number of requirements:

1. They must be able to accurately predict the status of animals that are not present in the dataset used to generate the prediction equations. This is very important, as erratic results, or failure to work in some production systems could very quickly erode confidence in the technology.

2. Working with experts (nutritionists, epidemiologists, veterinarians) to understand whether a MIR prediction could be useful for management strategies. This is important, because incorrect or inconsistent advice will also reduce confidence.

3. Determining acceptable levels of prediction accuracy needed to be used for prediction of individuals or groups of cows. This is the last step in the process of prediction equation development and involves engagement with industry stakeholders and experts.

Once these three points meet industry and stakeholders’ expectations, there needs to be development of user-friendly management tools to allow farmers and their advisers to identify and take early action for at risk animals (or groups of animals) for issues such as fertility or ketosis/acidosis.

Findings so far

To date, we have published four peer-reviewed scientific papers (with more currently under consideration and preparation). Our team of scientists have shown that:

• Traits that are measurable directly in milk (e.g. milk fatty acids) can be predicted with high accuracy.

• Traits that are associated with animal health and measured directly on the animal (e.g. lameness and fertility), or in blood (metabolites), are much more difficult to predict with consistently high accuracy.

• MIR predictions generated in Victoria for predictors of ketosis/energy balance initially showed promising accuracies based on a relatively small dataset. However, the validation has been somewhat erratic, especially for herds that have different feeding systems from the reference data. This tells us that roll out of the technology for these traits is too early and that more samples need to be added to increase model robustness.
• We have tested MIR predictions that are in-built into Bentley machines and they are excellent for predicting fatty acids measured in milk. While for traits that are often measured in blood, rather than milk, such as beta-hydroxy-butyrate (an indicator of ketosis) the in-built equations are not as accurate. Our hypothesis, and results so far, show that MIR predictions of animal health traits are likely to better when based on Australian data.

• We have developed a MIR prediction equation for conception to first service using early lactation herd-test data. Currently, we can identify cows that are less likely to get in-calf using an early lactation milk-test with reasonable accuracy. We still have more work to do to refine and validate this prediction.

• MIR can be used to complement gene discovery methods for traits associated with production.

• When we have used MIR to enhance genomic prediction accuracies the results are in line with expectation for the size of reference population available. We see a lot of merit in expanding the reference population of genotyped cows with either (or all) of MIR data, genomic data and high value phenotypes.
What’s next?

Five years ago, the Herd Improvement Strategic Steering Group established a vision and a plan for a vibrant Australian herd improvement industry knowing that its success was dependent on leadership and partnerships. Chris Murphy has recently reviewed our industry’s progress against the plan and can help us answer ‘are we on track’?

Some history...

In June 2013, a broad cross-section of the herd improvement industry came together and recognised that an industry strategy and a blueprint to drive significant change were critically needed. This group acknowledged the many issues that had troubled the herd improvement sector for a decade or more, and decided that a whole of industry approach was needed. Key issues identified included:

- An evaluation system that was half-heartedly supported by companies and farmers
- Genetic improvement was accepted as important but not linked clearly to profit
- Silos existing between research, genetic evaluation, development, implementation and maintenance
- Data existing in silos and not moving easily between on-farm packages, service providers and industry
- A divisive culture inhibiting innovation and co-operation

At the time, many people were really questioning the value of herd improvement – and work was done exploring the importance and impact of genetic gain on the Australian industry. The Lacey and Coats paper in 2013 estimated that the potential benefits of addressing issues of market failure in herd improvement could be worth $25 million per annum in gross farm margin due to genetic gain, a figure which could well rise with continuing innovation in genomic technology.

From this gathering, the Herd Improvement Industry Strategic Steering Group (HIISSG) was established in January 2014 and the first Herd Improvement Strategy was launched in June 2014.

The key aspects of the strategy were:

- Increasing the ability of herd improvement to deliver farm profit
- Reviewing, and potentially redesigning, oversight of pre-competitive activities that support the herd improvement industry
- Establishing an ongoing and collaborative research program to clearly demonstrate herd improvement’s impact on farm profit and to monitor genetic and phenotypic trends
- Improving service provision at farm level
- Resetting genetic evaluation to changed conditions
- Refocusing industry on the importance of people in herd improvement

Given there had been many significant changes in the herd improvement industry and it was over four years since the launch of the first strategy in June 2014, in late 2018 it was timely to assess the industry’s performance in relation to the Herd Improvement strategy and refresh the strategy for the next five years – with a vision out to 2024.
SPEAKER PAPERS  CHRIS MURPHY

Increasing the ability of herd improvement to deliver farm profit

- Develop key industry messages, including clear value statements for genetic improvement, herd test, use and collection of data and AI usage ✓
- Develop an engagement plan to deliver agreed messages to other industry service providers ✓
- Develop a campaign aimed at dairy farmers around the benefits of genetics, genomics, data, use of AI and herd test ✓
- A working group of industry, design experts and farmer representatives should design reports that are valuable, clear and user friendly ✓
- A working group of industry experts and farmers should collaborate to develop and scope new tools that can take advantage of genomic technology ✓
- Dairy Australia should develop a step-wise move towards a central data repository, where data can move easily across the industry and be used to deliver decision-making tools to farmers ✓

Redesign oversight of pre-competitive activities that support the herd improvement industry

- A group should continue to provide strategic guidance in the herd improvement industry and ensure that farmer representation and advocacy is embedded to help drive outcomes ✓
- Review the oversight needs of the genetic improvement sector to ensure that there is clear alignment and line-of-sight from research through to delivery ✓

Demonstrate value from herd improvement

- Establishment of an ongoing research program to clearly demonstrate herd improvement's impact on farm profit and to monitor genetic and phenotypic trends ✓✓✓

Improve service provision at farm level

- Herd test centres to explore further efficiency gains, such as labs, logistics, response to new equipment and technology involved in delivering herd test ✗
- Support discussions on improving the efficiency of service delivery for breed societies, which is vital to their ability to improve farmers’ services and maintain access to technology ✓
- HIISSG (or equivalent) works with organisations and agencies to build investment coalitions to address key issues in the strategy ✓

Reset genetic evaluations to changed conditions

- ADHIS/Datagene to communicate regularly and work with key stakeholders to establish market needs in the medium-term and then establish clear priorities to ensure market connectivity between genetic evaluation and the broader dairy industry ✓✓✓
- Establish an industry-led working group to develop a plan for future data collection ✓
- The industry implements, as a matter of urgency, the key recommendations from the Genomic Pipeline Working Group to ensure improved delivery of genomic breeding values ✓

Refocus industry on the importance of people in herd improvement

- Develop a program of industry-endorsed training for herd improvement personnel ✗
- The herd improvement industry embeds the development, training and support of scarce personnel into industry discussions around genetic improvement ✗
- Training providers and service providers invest in education and training programs to improve herd practices of farmers and their staff ✗
Are we on track?

The consultation process for the strategy refresh began with a survey of 30 key stakeholders who were involved in HISSG and its Task Forces, to assess which recommendations in the initial strategy had been achieved (and could therefore be removed), which recommendations had been partly achieved but were ongoing, and which recommendations had not been achieved.

Feedback from stakeholders indicated a mix of perceptions on levels of achievement, with most responses indicating recommendations had been “partly achieved” since the strategy commenced in 2014. There was broad consensus that the industry is better placed and that a lot of good progress had been made in many of the areas to achieve 2020 outcomes.

Performance in each area of the strategy is summarise below:

A summary of the complete Herd Improvement Strategy 2019-2024 is below:

<table>
<thead>
<tr>
<th>Industry Vision</th>
<th>Focus Areas</th>
<th>Strategic Objectives</th>
<th>Activity Areas</th>
</tr>
</thead>
<tbody>
<tr>
<td>Dairy farmers maximise their profit through a vibrant herd improvement industry offering effective and highly valued services</td>
<td>Improved decision-making from data</td>
<td>Supporting data-driven decisions</td>
<td>• Centralised data repository</td>
</tr>
<tr>
<td></td>
<td>Increased farm profitability through herd improvement</td>
<td>Increasing genetic gain</td>
<td>• Coordinated data management</td>
</tr>
<tr>
<td></td>
<td>Improved animal performance from research and development</td>
<td>Maintaining R&amp;D capability</td>
<td>• Increased cow performance measurement</td>
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<td></td>
<td>Improved and diversified service offerings</td>
<td>Stimulating pre-competitive innovation</td>
<td>• Clear value proposition</td>
</tr>
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<td></td>
<td>Strengthened capabilities</td>
<td>Facilitating training and support</td>
<td>• Improved trait reliability</td>
</tr>
</tbody>
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HERD’19 PROGRAM & PROCEEDINGS

CHRIS MURPHY
What’s next?
The feedback from stakeholders on achievement of the recommendations above is factored into the refreshed herd improvement strategy. A summary of a refreshed strategy incorporating stakeholder feedback was circulated broadly amongst the industry in late 2018, with additional input integrated into a final draft in February 2019. The review of the previous strategy and collation of new ideas contributed to identification of five refreshed focus areas within the 2019-2024 strategy:
1. Improved decision-making from data
2. Increased farm profitability through herd improvement
3. Improved animal performance from research and development
4. Improved and diversified service offerings
5. Strengthened capabilities

Key areas of focus and increased areas of priority from the original strategy are:
• Support and enhance the DataVat infrastructure, acquire herd improvement and other data from a range of industry participants, and support industry partners to develop tools, resources and analysis that leverage the data for the benefit of farmers
• Increase the measurement of individual cow performance through an increased number of cows participating in herd testing and increased data accessed from farms with in-line meters.
• Close the gap between potential and actual genetic gain, by increasing the number of farmers using Australian profitability metrics to drive elite sire selection
• Increase the number of farmers and service providers that recognise the value of herd improvement, its contribution to farm profitability, and that have confidence in Australian breeding values.
• Ensure phenotypic data is sufficiently available to underpin the calculation of both traditional and genomic breeding values
• The priorities for research and development in this strategy are to improve the reliability of existing traits, develop breeding values for new traits and the development of new herd management tools that use genomic data
• Sustain collaboration and cooperation to improve advice, data and services at the farm level
• Drive an industry-wide approach to innovation in herd testing
• Fully scope out what is required in order to develop a program of industry training for herd improvement personnel
• Integration of herd improvement messages into broader Dairy Australia and other extension programs
By the late 1990s, following a lot of research (and a lot of research funding), two problems were becoming apparent with the marker assisted selection concept. The first was that for the most economically important traits, like protein kg, no genes of large effect were being discovered. Rather, the evidence pointed towards variants in lots of genes, spread across the genome, causing differences between cows in their production. The second problem was cost – the DNA markers in use at that time were expensive to genotype, particularly in the large numbers that would be required to capture enough of the genetic variation (e.g., at enough genes) to make using the DNA marker information worthwhile.

Two breakthroughs made the application of genomics (DNA marker information) practical in dairy cattle. The first breakthrough addressed the first problem described above – how to use the genomic information if differences in traits between animals was made up of the effect of many genes of small effects, rather than just a few large genes? Meuwissen, Hayes and Goddard (2001) realised that to deal with this type of trait architecture, thousands of DNA markers across the genome were required to capture the effect of all the genes of small effect contributing to trait variation. They developed new statistical methods that estimated the breeding value of animals from the information from these thousands of genome-wide markers. These estimated breeding values were termed genomic estimated breeding values (GEBV), and the approach was called genomic selection. They further demonstrated that provided the reference set (consisting of bulls and cows with both DNA marker genotypes and traits recorded) used to estimate the marker effects was large, these breeding values could have high reliabilities.
The promise compared to the reality?

Genomic selection was ready for implementation – the statistical algorithms to predict GEBV from the marker information had been developed, and animals could be genotyped at low cost. In 2010 the technology was commercialised by ADHIS (the predecessor to DataGene), and GEBV for young genomic bulls have been published ever since. How has this impacted dairy cattle breeding in Australia? The major promise of genomic selection was that if reliable genomic estimated breeding values could be predicted from the genomic information, bulls could be used at a much younger age for breeding, than was possible under progeny test schemes. Current reliabilities for young genomic bulls for Balanced Performance Index average 63% (December 10th 2018 Good bulls guide, Holstein), progeny tested bulls are higher (80%), but these bulls are up to five years older. The average age of AI bulls used to breed cows by year is given in Figure 1a.

In both Holsteins and Jerseys, the average age of AI bulls used by dairy farmers to breed their cows has dropped significantly since 2010, from 7.5 years to 4.5 years. Even more dramatic though is the drop in the age of sires used to breed the next generation of AI bulls Figure 1b), from 7.5 years to approximately 2 years in Holsteins, and 3-4 years in Jerseys. This suggests AI companies are intensively selecting sires of sons using GEBV.

Because these DNA markers could be genotyped at birth, the opportunity was then to select young bulls for breeding much earlier than was possible under progeny test schemes (prior to genomics, progeny testing was the only way to get highly reliable breeding values for bulls). To understand this, the formula for genetic gain is:

$$\Delta G = \frac{i \sqrt{R} \sigma_g}{L}$$

Where $\Delta G$ is the amount of genetic gain made each year, $i$ is the intensity of selection (eg how many bulls for breeding are selected out of the total pool of bulls), $\sqrt{R}$ is the square root of the reliability, $\sigma_g$ is the genetic standard deviation (eg the amount of genetic variability), and $L$ is the generation interval (eg. The age of the bulls when they are used for breeding). With progeny testing, $L$ is roughly 7 years. With genomics, bulls can be used as soon as they are able to produce viable semen (roughly 2 years, depending on the bull). The promise of genomics was therefore to reduce generation intervals by half or more, which the above formula demonstrates could lead to a doubling of the rate of genetic gain.

The second challenge, the high cost of acquiring genomic information, was overcome in 2008, when a new technology for genotyping DNA markers across the genome was developed, called SNP arrays. This technology genotyped DNA markers (Single nucleotide polymorphisms, SNPs) in the tens of thousands at reasonable cost per animal ($100s in 2008, around $50-$60 now, compared with $2000 for a full microsatellite profile!).
Nevertheless, the trend looks promising. Only released in 2015, and selection directly on these indices would of course increase the gain in these indices. The increase in rate of gain would partially reflect the fact that the new indices (BPI, HWI, TWI), were only released in 2015, their daughters would only be born in 2011 or 2012. Additionally, the increase in rate of gain would of course increase the gain in these indices. Nevertheless, the trend looks promising.

So the promise of genomic selection to reduce generation intervals has been realised. Has this translated into increases in genetic gain? The trend in rate of gain for Balanced Performance Index certainly appears to increase after 2010, Figure 2a (cow genetic trend by year of birth). However this should be interpreted with a lot of caution for a number of reasons. If the first genomic bulls were available in 2010, their daughters would only be born in 2011 or 2012. Additionally, the increase in rate of gain would partially reflect the fact that the new indices (BPI, HWI, TWI), were only released in 2015, and selection directly on these indices would of course increase the gain in these indices. Nevertheless, the trend looks promising.

For some traits, genomics is expected to have more of an impact than for other traits. A case in point is fertility. Fertility traits have a low heritability, which meant even with a progeny test scheme reliabilities of estimated breeding values were modest, and gains were slow. With genomics, provided the reference population used to calculate the GEBV is very large, reliabilities of GEBV for fertility can actually be higher than from a first proof. The genetic trend for daughter fertility (cow genetic trend by year of birth) is shown in Figure 2b.

Figure 1. 1A. Average age of AI bulls used by dairy farmers to breed cows by year, and 1B. Average age of sires to breed the next generation of AI bulls (sires of sons) by year.

Figure 2. Genetic trend for Balanced Performance Index (2A) and Daughter fertility (2B) by birth year, in Holstein and Jersey cows.
Although these numbers seem impressive, it must be remembered that the reference set has to be continually updated to enable the reliable prediction of the next crop of young bulls. If the reference set is not updated, reliability of the GEBVs erodes quite rapidly over time. With the (gradual) demise of formal progeny testing, cows with good trait records become the only avenue for updating the reference set. Interestingly Australia was the first country to recognise the value of including cows with good trait records in the reference set (as opposed to just progeny tested bulls), (Pryce and Daetwyler 2012). Other countries have since followed suite. In Australia, the challenge of updating the reference set is being met by the Ginfo project.

New reproductive technologies to further reduce the generation interval.
The genetic gain equation demonstrates the shorter the generation interval, the greater the rate of genetic gain. In vitro fertilisation (IVF) is actively being used in many dairy breeding programs worldwide, both to reduce generation intervals on the female side (pick up of oocytes is possible at 8 months), and increase the number of progeny per elite mating. Increasing the number of progeny per elite mating increases the chances that one of the embryos will carry a “stack” of the best chromosomes from each parent.

What’s next?
Maintaining and building the reference set.
A critical task for the future is ensuring continual flow of new genotypes and trait records into the reference set use to calculate GEBV. The current Australian reference set for calculating GEBV for Holstein and Jersey cattle is given in Table 1.

<table>
<thead>
<tr>
<th>Breed</th>
<th>sex</th>
<th>total</th>
<th>Protein kg</th>
<th>Overall type</th>
<th>Fertility</th>
</tr>
</thead>
<tbody>
<tr>
<td>Holstein</td>
<td>Bull</td>
<td>5184</td>
<td>4895</td>
<td>2882</td>
<td>4457</td>
</tr>
<tr>
<td>Jersey</td>
<td>Bull</td>
<td>1286</td>
<td>1222</td>
<td>650</td>
<td>1090</td>
</tr>
<tr>
<td>Holstein</td>
<td>Cow</td>
<td>30721</td>
<td>30721</td>
<td>11808</td>
<td>26171</td>
</tr>
<tr>
<td>Jersey</td>
<td>Cow</td>
<td>8066</td>
<td>8066</td>
<td>3225</td>
<td>7065</td>
</tr>
</tbody>
</table>

Table 1. Australian dairy reference set (cows and bulls that are both genotypes and have trait records, or in the case of bulls daughter trait deviations) used to calculated genomic estimated breeding values (GEBV).
New reproductive technologies which offer the potential to further reduce genetic gains are on the (near) horizon, however successful implementation of these technologies is critically dependant on continual collection of cow trait records spanning health, fertility, type and production.

**References**


Traditionally R and E were separate, sequential activities. The scientists beavered away creating the new widget and then handed it over to another team to ‘extend’ it. In this model the farmer is not really in view until the discussion group at the very end. Progress is achieved but there is often an element of despair that farmers don’t adopt (or adapt) many of the technologies on offer.

Over the last 20 years a different way of approaching research and extension has emerged that has real benefits. This approach puts farmers, and the other key players in whichever priority area is the focus, right at the centre of exercise from the beginning.

The key is to hinge all the effort – research and extension – around a plan for a ‘route to change’ that aligns all activities with the intentions and worldview of farmers. For complex industry level problems it is essential to get the questions and design right, from the farmers’ perspective. This is well beyond the practice of having one or two farmers on a steering group or reference panel. It is an active dialogue around the practical aspects of applying innovation in the complex commercial world. It often involves substantial parts of the effort on farm. Successful programs of RD&E to benefit farmers are moving increasingly in this direction.

So what types of RD&E activities happen on farm, and what does it involve for the farmers who participate? The RIRG group have described the ways in which farms are involved in farming system research and an adaption of their model is helpful to explore this question.

Farms may be part of the effort to produce new technology (knowledge, products or services), or part of the effort to disseminate them. Their contribution may be largely in providing data or demonstration around the physical aspects of the farm, or in learning to better understand the role of people in making innovation happen. All of these are important contributions to the overall success of the RD&E investment.
How are they approaching the decisions where the technology may have a role? How should the technology be best adapted for use? Farmers involved in this part of the RD&E effort may be interacting with advisers, other farmers and social research teams in articulating their thought processes and key questions. Perhaps the ImProving Herds farms have been contributing in this way.

‘Partner farms’ drive the research process and take a role as commercial innovators across the technical and people dimensions. They embody characteristics of all three of the other farm roles. Some of the FutureDairy farms, and farms like Macalister have taken this role.

These are not rigid categories – some individual farms take on many of these aspects of the RD&E effort – and change their roles over time. What it does show is that working dairy businesses are an essential part of successful collective RD&E, and the experience for farmers involved can be rich and varied.

References


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Key points

• Raw milk samples hold a wealth of information in terms of milk quality and dairy herd management and form the basis for economical production of milk of high quality
• Analysis of individual cow milk samples provide an invaluable source of information on the cow’s health, performance, and overall status. New parameters are needed to further refine and improve dairy herd management through milk analysis.
• Differential Somatic Cell Count as a new supplementary parameter for improved mastitis management
• Ketosis screening through dairy herd improvement helps to manage an otherwise undetected problem on dairy farms
• Milk fatty acid analysis for optimisation of the nutritional aspect of dairy products as well as optimising dairy cow feeding and management

Mastitis and DSCC

Despite of extensive mastitis management programmes being in place since decades, the disease is still causing tremendous losses of approximately €32 billion to the dairy industry worldwide and thus the most costly disease in milk production. It further adversely affects dairy cow welfare and is the major reason for usage of antimicrobials on dairy farms. In particular the subclinical form of the disease is challenging given that it triggers spread and persistence of mastitis with dairy herds.

New milk indicators for animal health and nutrition

Differential Somatic Cell Count (DSCC)

The traditional and well-established Somatic Cell Count (SCC) parameter is the key parameter/indicator in mastitis management programmes (e.g. in the frame of dairy herd improvement (DHI) testing) and used broadly around the globe. However, SCC reflects the total number of cells in milk but does not differentiate between them. The new Differential somatic cell count (DSCC) parameter indicates the combined proportion of the immune cells polymorphonuclear neutrophils and lymphocytes in milk in percent. Proportions of macrophages can be calculated by 100-DSCC. This, in turn, provides a more detailed picture of the actual inflammatory status of the mammary gland (e.g. compared to SCC only) making DSCC a supplementary indicator for mastitis.

Beta-hydroxybutyrate (BHB) and acetone

Both are so called ketone bodies, which accumulate excessively in blood, milk, and urine as a results of body fat mobilization in connection with a negative energy balance. Hence, elevated concentrations of BHB and/or acetone serve as indicators for the presence of ketosis.

Milk fatty acids

Milk fat consists of fatty acids connected through glycerol. More than 400 different fatty acids are known. The total fat content as well as the fatty acid composition are mainly associated with the feeding (e.g. grain and protein intake), herd and feeding management (e.g. stocking density, feeding frequency) as well as animal related factors (e.g. breed, stage of lactation).
Milk fatty acid analysis

The milk fatty acid profile has been of interest to the dairy industry for many years for optimising the nutritional aspect of dairy products. However, milk fatty acids are closely related to the feeding of dairy cows and thus provide a lot of information on the nutritional status of dairy cows. Hence, there has been more focus on utilising milk fatty acid information for optimising feeding and management of dairy cows in recent years. Specifically, fatty acids can be grouped according to their origin into de novo, mixed, and preformed fatty acids. The fatty acid results do then allow to evaluate feeding and ruminal processes in detail. Besides utilising the fatty acid information of bulk tank samples for herd level evaluations, doing such analyses on the level of individual cows offers the possibility to further fine-tune feeding and potentially to screen for feeding disorders.

Ketosis screening

Ketosis, a metabolic disorder in high yielding dairy cows, where energy demands exceed energy intake, is another issue causing significant economic losses on dairy farms nowadays.

Ketosis screening based on the prediction of ketone bodies (i.e. BHB, acetone) in DHI samples using FTIR technology has been used in practise for several years. It is well-know that ketosis negatively affects dairy cow performance. Briefly, milk yield as well as milk protein were significantly lower in cows with high milk BHB results compared to those with low results. Milk fat as well as SCC were significantly higher in high milk BHB cows as opposed to low BHB cows. The prevalence of associated diseases such as displaced abomasum was also significantly higher in high BHB compared to low BHB cows. Overall, ketosis screening in the frame of DHI testing is a valuable tool that can be offered to dairy farmers. It clearly elevates awareness and allows to manage an otherwise undetected problem on dairy farms.
At an industry wide level, legislative changes in The Netherlands in 2012 were viewed as a major shift by a national dairy industry. In this country, antibiotic use was reduced, relative to 2009 levels, by 20% in 2011, 50% in 2013 and 70% in 2015 (Lam, 2013). These targets have been achieved across all animal production sectors in this country.

While the title of this paper focuses on prophylactic antibiotic use, the discussion will be wider than just treatments administered where no disease is suspected. Rather, we will focus on practices available to dairy farmers to reduce the overall antibiotic use for the treatment of mastitis, both during lactation and at the end of lactation. This focus is relevant as it is likely that the majority of antibiotics used on a dairy farm are for mastitis. While good Australian data is currently hard to source, a recent NZ study described 85% of the antibiotic drug use rate, at a herd level, attributed to mastitis treatments (Compton and McDougall, 2014).

Teat sealant use in pre-calving heifers

In the early 2000’s, the use of teat-sealants (bismuth subnitrate) in pre-calving heifers was trialled extensively in NZ. Since that time, the application of this treatment to the NZ heifer population has increased, and it is estimated that approximately 45% of heifers may receive this treatment around 1 month prior to calving (based on a large Waikato veterinary service database). The rationale behind this treatment is that the presence of the teat-sealant compound, in the developing teat cistern, prevents the establishment of new mastitis infections in the weeks immediately prior to first calving. The majority of heifer new clinical infections in pasture-based systems, such as NZ, occur in the first 30 days in milk.
In a study conducted in NZ in 2006, the use of teat-sealants (ITS) in pre-calving heifers was found to reduce both the incidence of clinical mastitis in early lactation by 70% and the rate of new intramammary infection due to Strep uberis by 70% (Parker et al. 2007, Parker et al. 2008). It is important to highlight that the majority of ITS administration in pre-calving heifers is performed by trained animal technicians where diligent application of disinfection is paramount. This is certainly not a task to be undertaken in facilities with poor restraint, or where teat end cleaning and disinfection can be easily compromised.

**On-farm milk culture systems**

Over the past 15 years, on-farm milk culture systems (OFC) have become more prevalent, particularly in Nth American and European dairying countries. Here the rationale is that, prior to clinical mastitis intramammary/intramuscular treatment, the herd manager has information on the likely cause of infection and can use this information to guide the treatment process. In an extensive 2011 survey, 23% of clinical mastitis milk samples recorded a “no growth” culture result (Charman et al. 2012) with this generally aligning with overseas studies which average approximately 30-35% prevalence of no growth in equivalent milk samples. With no growth sample results, one assumption is that the cows immune system has successfully mounted a response such that, while the inflammatory effects of the infection remain present, the bacteria responsible have been cleared.

One of the more extensive studies involving OFC was reported by Lago et al. (2011, I and II). In this study design, half the cows with mild or moderate clinical mastitis were not treated for the first 24 hours after detection pending the results of a milk culture (sample obtained at first detection).

Where the post-24 hr culture result was either no growth, or gram negative bacteria, no antibiotic treatment was administered. Only gram positive culture results resulted in an intramammary treatment according to manufacturer’s recommended dosage regime. The remaining half of the cows in the study acted as positive controls (they received clinical mastitis treatment regardless of culture outcome). The OFC based treatment cows had a tendency to reduced withhold days (because of abnormal appearing milk) compared to the control cows (5.2 vs 5.9 days). There was no statistical difference in days to clinical cure (2.7 d – control vs 3.2 d – OFC) nor percentage of bacteriological cure within 21 days of initial detection. There was also no statistical difference between the study groups in risk of recurrence of clinical mastitis, linear somatic cell count (log transformed ICCC), daily milk production or risk of culling. In this study, OFC assigned cows received 56% less intramammary treatments compared to the control group.

Farmers are advised to assess carefully, with their veterinarian, the performance of any OFC system relative to a gold standard (eg: culture results on the same sample from an accredited commercial laboratory). This is a cautious approach given the rapid increase in OFC systems being advertised to Australasian farmers where testing methodology differs.

**The use of ITS in selective (part-herd) dry cow treatment**

Internal teat-sealants were first introduced around 2002 to Australia and have been widely used as a stand-alone treatment or as a “combo” treatment with DCT. Teat-sealant should only be used as a sole therapy where test information is available on an individual animal basis and that test data indicates that the treated quarters are likely to be free of sub-clinical infection (eg: ICCC).
A new approach to selecting cows for DCT in selective (part herd) treatment

Selective, or part-herd, DCT relies on information to indicate the subclinical mastitis infection status of the individual cow. In most countries, the test used for this determination is an ICCC derived from regular herd testing. However, in Australasia, there is a continuing trend towards a reduction in the percentage of herds using herd testing services – the reasons for this are numerous. As a result of this trend, a recent study was conducted in NZ (McDougall et al. 2018) to examine alternative approaches to regular, within season, herd testing.

Prior to describing this study, a brief explanation of test performance is relevant. All tests applied to a biological system have test performance which should be described as test sensitivity (Se) and specificity (Sp). Consider the example herd described in table 1 where there are 1000 cows on a nominated day. Based on the data in Table 1, the test Se is 71/100 or 0.71 (71%) – this describes the accuracy of the test in describing only the animals that are truly infected, or in this case, have a subclinical mastitis infection based on some other gold standard test (e.g. milk culture). The test Sp is 739/900 or 0.82 (82%) - this describes the accuracy of the test in describing only the animals that are truly non-infected, or in this case, do not have a subclinical

<table>
<thead>
<tr>
<th>Test result or true disease status</th>
<th>Subclinical mastitis true positive (diseased)</th>
<th>Subclinical mastitis true negative (no disease)</th>
</tr>
</thead>
<tbody>
<tr>
<td>ICCC test positive based on cut-off</td>
<td>71 (correct test result - true status)</td>
<td>162</td>
</tr>
<tr>
<td>ICCC test negative based on cut-off</td>
<td>29</td>
<td>738</td>
</tr>
<tr>
<td></td>
<td>100 total true subclinical mastitis</td>
<td>900 true non-infected</td>
</tr>
<tr>
<td></td>
<td>1000 animals total</td>
<td>1000 animals total</td>
</tr>
</tbody>
</table>

Table 1: Example “2x2” table describing test performance with an ICCC where the cut-off is set at 250,000 cells/ml

While differences exist between dairying countries as to the prevalence of use (e.g. the US has a low usage of ITS), there is now a large body of research describing the effects of using ITS at the end of lactation.

A large meta-analysis was conducted by Rabiee and Lean (2013) into the benefits of ITS. A meta-analysis is a way of combining many different studies into a unified, interpretable set of results. They reported that the use of ITS, either alone or in the presence of DCT, reduced the risk of new intramammary infection after calving by 25% when compared with cows treated with DCT alone. When cows treated with ITS only were compared with those who received no treatment, the use of ITS reduced new intramammary infection by 73%.

Based on this meta-analysis study, it is difficult to argue against the use of ITS as part or a part-herd DCT strategy. It is also a compelling argument for the use of combination ITS/DCT treatment. Where ITS is used alone, as with pre-calving heifers, the diligent application of pre-insertion hygiene is an absolute must.

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mastitis. Understanding test Se and Sp is important as it also describes the number of animals in a herd where the incorrect treatment decision is made – for example, where a truly infected animal is not given DCT as part of a selective DCT strategy.

The NZ study of McDougall et al. (2018), in brief, set out to describe test performance where only a single herd test data source was available. Their finding was that a single herd test, within 80 days of the herd drying off date, had an equivalent test performance compared to either the maximum ICCC recorded for a cow over 4 herd tests (in a season), or where it was compared to multiple ICCC test periods in combination with age and clinical mastitis information. The use of the Rapid Mastitis Test, as an alternative to ICCC, was also found to be an reasonable way to identify cows for DCT although this test performance was not as good as ICCC. This finding is likely to have far-reaching implications on the applicability of a single, late-lactation herd test, where ICCC data for selective DCT is the primary aim.

Conclusions

There are multiple pathways open to any dairy herd to reduce antibiotic use that have been briefly outlined in this paper. In all of the described approaches, animal health and wellbeing is not compromised while overall, herd level antibiotic use for the control of mastitis is minimised.

References


What's next?

Since the Herd conference series began, fertility has featured prominently in every program. So, what’s changed and what hasn’t? What are some strategies that farmers, service professionals and industry can adopt to make a step change in the fertility of Australian dairy cattle?

Dairy Australia and its predecessor, the Dairy Research and Development Corporation has been involved in extension and research in reproduction in dairy cattle since the mid-1990s. The National Dairy Herd Fertility Project was a major research project undertaken in the 1990s involving many thousands of cows across all dairying areas in Australia. An additional study was conducted in 2011 to assess how reproductive performance had changed over the previous 15 years. This report found that although rates of fertility had declined (Figure 1), the factors affecting reproductive performance were still the same as they were in the late nineties.

In some of these herds, reproductive performance did not decline over the 12-year study period. One of the significant findings was a large variation in reproductive performance between farms. This shows that on-farm management practices can have a big impact on fertility. It is very important that the key drivers of reproductive performance on dairy farms are not forgotten:

- Calf and Heifer Management
- Body Condition and Nutrition
- Heat Detection
- AI technique and semen handling
- Bull management
- Cow health
- Calving Pattern
- Genetic selection

A challenge for all farmers would be to look at their score card on reproductive management. How well do they perform in the key areas? Advisors assisting farmers with reproductive management must encourage them to get the basics right, before looking for a “silver bullet”.

However, equally importantly, farmers need to assess their marginal rate of return. If a farm currently has a 3-week submission rate of 90%, with a 6-week in-calf rate of 60%, is it worth spending money on whole herd synchrony programs to achieve a 100% submission rate on the first day of joining? Is it worth spending an extra $40 per cow, to get an additional 3% 6-week in-calf rate? Or will a better return on investment be achieved by spending an extra $40 per cow on canola supplementation in early lactation?

Figure 1. Median 6-week in-calf rates for mating periods in seasonal and split calving herds (pooled) from 1997 to 2016 (National Herd Reproduction Performance Report 1997 – 2016, John Morton)
What has changed?
Currently, for farmers wishing to create step change with their reproductive performance, it is imperative that they consider selecting for high daughter fertility ABV when selecting bulls. Farmers should select high BPI bulls from the Good Bulls Guide and then ensure daughter fertility ideally above 110 for Holsteins and positive for the other breeds.

Jennie Pryce and her team at DairyBio should be congratulated for the development and continued improvement of the daughter fertility ABV. Ee Cheng Ooi’s paper, also presented at Herd’19 outlines her research on the comparison between daughter fertility ABV and reproductive performance in a very large dataset spanning a 40-year period. The is a growing body of evidence which demonstrates the benefits of crossbreeding on reproductive performance (Pyman, 2007; Hazel et al., 2014; Coombe et al. unpublished report). The scientific use of crossbreeding provides one of the biggest step changes seen in reproductive performance in dairy herds.

Farmers in the dairy industry who want to use reproductive performance to drive profit on their farms should consider crossbreeding. Crossbreeding is not just using the neighbour’s Jersey bull. To achieve the maximum benefit from cross breeding, a three-way breeding program should be used, to maintain high levels of heterosis.

The best bulls from all three breeds should be used. The messages are still the same, use the Good Bulls Guide, select high BPI sires, select bulls within each breed with the highest daughter fertility from the top of the BPI list.

Many dairy farmers implement a cross breeding program without attention to detail, or without an ongoing commitment. In these cases they fall well short of achieving the potential gains. Breeding goals take years to come to fruition, therefore once initiated best results will be achieved with long term adherence to the program.

Sire selection becomes very important in a three-way cross breeding program, it can be become confusing at joining time. A very successful method is to use different coloured ear tags (or ear tag backs) to identify cows. Breed A have white tags, Breed B have green tags, Breed C have red tags. Breed A (White Tags) cows are always joined to bulls from Breed B. Breed B (Green Tags) are always joined to bulls from Breed C. Breed C (Red Tags) are always joined to bulls from breed A.

Significant increases can be made in 6-week in calf rate, submission rates, conception rates and as well as decreases in not in calf rate by using cross breeding.

Conclusion
Dairy Farmers wishing to improve their herds reproductive performance should ensure they are addressing all key areas

- Calf and Heifer Management
- Body Condition and Nutrition
- Heat Detection
- Genetics, sires and mating strategies and artificial insemination
- Bull management
- Cow health
- Calving Pattern
- Genetic selection

Step change will come from a strong focus on selecting high daughter fertility ABV sires. Step change will also come, if a farmer is willing to use cross breeding, particularly a three-way cross, utilising high BPI, high daughter fertility ABV sires for all three breeds.
References

Dairy Australia (2011) InCalf Fertility Data Project 2011
Validating the Daughter Fertility ABV

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Introduction

Reproductive performance in the Australian dairy industry has declined over the last fifty years, and is likely to be an unintended consequence of the single-trait selection for milk yield. In order to give herd managers the ability to select sires that produce daughters with high genetic merit for fertility, the multi-trait daughter fertility Australian Breeding Value (ABV) was released in 2013 (Pryce et al., 2013).

Using high daughter fertility ABV sires provides an opportunity for herd managers to permanently and cumulatively improve the reproductive performance of their herds, providing lasting benefits above and beyond the improvements brought about through synchronisation protocols and changes in herd management.

However, the release of new technologies is not automatically accompanied by uptake. The first aim of this study was to better understand the reasons why herd managers choose or do not choose to select high daughter fertility ABV sires, using the Theory of Planned Behaviour (TPB) as a social research framework (Ajzen, 1991).

Social research: materials and methods

Thirty-five dairy herd managers were recruited from the client base of Rochester Veterinary Practice, in Northern Victoria. A wide range of herd manager types were represented, with a variety of different breeds and farming systems. Each manager was interviewed using a series of questions according to the TPB framework, similar to that used by Alarcon et al (2014). Interviews were recorded and transcribed for thematic analysis, with a total of 7 hours and 47 minutes of audio collected.

Social research: results

Twenty-seven out of the 35 herd managers included ‘fertility’ in their list of breeding objectives, although only 16 of these specified ‘daughter’ fertility. A wide variation in results was consistent with previous studies that have demonstrated marked heterogeneity in herd manager attitudes to bull selection (Byrne et al., 2015).

Farmer-perceived barriers for selecting high daughter fertility ABV sires included a lack of high daughter fertility bulls with other desirable traits, a lack of trust in the fertility ABV or ABV system, difficulty in interpreting international proofs, information overload, semen price, low bull reliability, and difficulty in understanding bull catalogues. Not all herd managers found the process problematic, however, particularly if a breeding consultant was employed to select all or most of the sires.

Farmer-perceived barriers for choosing daughter fertility as a breeding objective included a lack of awareness of the ABV, a lack of interest in genetics in general, low confidence in the impact of genetic selection for fertility, and a feeling that fertility was not important for their production system.
The analyses were performed separately for the Holstein-Friesian and Jersey breeds. A three-level hierarchical structure was implemented to account for the nested effect of lactation within cow within herd, similar to that described in Dohoo et al (2001). Piecewise, spline and quadratic transformations were performed as necessary to more accurately represent relationships between fixed effects and the outcome. The models were adjusted for age, season, birth year, milk yield, heat stress risk, protein percentage and days calved at mating start date/insemination date as deemed appropriate after testing.

Statistical analysis: results
For the Holstein-Friesian breed, each point of daughter fertility ABV was associated with a 5% increased odds of conception to the first service (adj OR 1.05, 95% CI: 1.04 – 1.06), a 3% increased daily chance of submission in the first 42 days after mating start date (MSD; adj HR 1.03, 95% CI: 1.02 – 1.04), and a 6% increased daily chance of calving in the first 42 days after CSD (adj HR 1.06, 95% CI: 1.05 – 1.07).

For the Jersey breed, each point of daughter fertility ABV was associated with a 6% increased odds of conception to the first service (adj OR 1.06, 95% CI: 1.02 – 1.11), a 5% increased daily chance of submission in the first 42 days after MSD (adj HR 1.05, 95% CI: 1.03 – 1.07), and a 5% increased daily chance of calving in the first 42 days after CSD (adj HR 1.05, 95% CI: 1.03 – 1.08).

These percentage increases are relative, not absolute. Therefore, if a Holstein-Friesian cow with an ABV of 100 has a 50% chance of conceiving to the first service in a mating period, the same cow with an ABV of 101 has a 50 x 1.05 = 52.5% chance of conceiving.
This doesn’t seem like a huge increase compared to some of the other fixed effects. For example, a Jersey calved greater than 65 days before MSD has a 71% increased daily chance of submission in the first 3 weeks of joining (adj HR 1.71, 95% CI: 1.62 – 1.81). Therefore, assuming that a late-calving Jersey has a 40% chance of being inseminated in the first 3 weeks, the same early-calving Jersey would have had a 0.4 x 1.71 = 68% chance of insemination.

However, the positive association between the ABV and outcomes is consistent and significant, and occurred for both breeds for all reproductive metrics. It is also multiplicative, meaning that while one ABV point for a Holstein-Friesian is associated with a 5% increased odds of first service conception, a five ABV point difference is associated with a 20% increased odds of conception.

In conclusion, the daughter fertility ABV has a clear statistically significant association with improved fertility. Management effects such as calving pattern, however, are still important considerations for farmers looking to improve reproductive performance.

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References


Adversity is often great in building connections

April 27th 2016 - this was the day that Murray Goulburn (who we supplied at the time) informed suppliers that the income wasn’t matching the expenses and that we had been overpaid for our milk. This money had to be recovered somehow and that somehow was from suppliers.

At the time I felt like the bottom had fallen out of our world. We had just bought the neighbouring farm, had started to grow our herd numbers and had taken on a huge amount of debt. Everything that the dairy industry was telling us to do. We had also employed staff to help us.

The day after the price drops – which Fonterra also did with their clawback I was looking through my Facebook feed and seeing and reading all the anger, shock and dismay. I’d also had friends and family ringing and messaging me asking what they could do to help me.

My answer was – “Just buy dairy and if you can afford it and its available to you buy Devondale”.

After saying this a few times I realised that I still loved being a dairy farmer and involved in the dairy industry.

I realised times were going to be tough (AGAIN!) but we would get through it – but how?

I must confess at this point that I had drunk most of a bottle of wine.

I also remembered a quote from Henry Ford – “Don’t find a fault, find a remedy” and that is what I did.

I was texting a friend and we were discussing what to do and I said maybe I should start a facebook group and show people the really good things about dairy farming – the positive things and encourage them to buy dairy.

And so show some #dairylove was born.

I started off by adding a few friends, who added a few friends and overnight we had 500 plus members.

Today I’m very proud to say there are almost 19000 members of the group – it’s not a group it’s a community. A connected community.

The membership is worldwide – all ages, genders and walks of life with both dairy farmers, retired dairy farmers, people that buy dairy and even vegans and animal activists.

To me it is the BEST thing to come out of the dairy crisis and something I’m incredibly proud of. Its saved lives – through peer support around mental health and there are several people I personally know of who wouldn’t be around if not for #dairylove.

It’s a safe place which has no rules as its self-policing. Many, many people have told me it’s their favourite place on Facebook – no negativity no nastiness. People feel connected as it’s a place to come and look at great farm and cow pictures and a place where you can get advice and support. I have the help of 4 other admins to help monitor the group as it’s a lot of work.

Facebook tells me that in the last 28 days there have been 75,700 posts, comments and reactions. That’s 75,700 connections!

This group was started due to a tough time. I thought it would only be something that would last a couple of weeks but near two years later it continues to grow daily.

I think this is because of the way people feel connected to the group. If someone is having trouble with a dairy issue then can ask and others will comment and help out. They know if they aren’t having a good day they can post in the group and others will reach out to them.
Sadly a lot of the opportunities we used to have to connect with others are now gone – we no longer go down the road to sell calves and spent 5 minutes selling the calves and an hour or two chatting to the neighbours. Gone too are the small schools and churches in the area.

But you know what – the people are still here. Yes there might be a few less and they might be more spread out but they are still here. Still wanting to be a part of a community and wanting to feel connected -social media provides this.

Yes, its different but its still connection and its still community.

#dairylove
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