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Dear Red Breed Enthusiasts,

Let me begin with a question: Do we place enough breeding emphasis on feet and leg conformation? Foot maintenance is a cost for us all, both for the effort to maintain a healthy foot and the production losses from subclinical foot problems.

The classifier assesses feet and legs using five evaluations:

1. Foot Angle
2. Heel Depth
3. Bone Quality
4. Rear legs Side View
5. Rear Legs Rear View

I would add one further trait – thurl placement. Although it really belongs to the rump category, it has an enormous effect on locomotion.

Locomotion is a measure on how freely and confidently a cow moves, it is actually the end effect that herd's people deal with in the everyday routine. Many nutrition advisors score herd locomotion and vary the inclusion of feed additives like Zinc. They also may recommend the use and frequency of foot baths to harden cow's hooves.

Good herd managers recognise the value of good feet and locomotion and have instituted regular hoof trimming into the management regime. In many herds uncalved heifers are inspected by the trimmers for minor modifications to their hoof shape. This presents us with a dilemma- good hoof trimming has a positive economic benefit, but it alters the expression of hoof shape which is so important to accurate classification and hence bull proofs. Breeding should be our primary hoof management strategy (however slow it is) and trimming should only be fixing problems, but we cannot make accurate assessment because of our trimming practices!

Another factor is the colour of the hoof. Should we select for hard dark coloured hooves, rather than softer white ones? If dark hooves are more durable and require less trimming, should red breeds be seeking to proliferate this trait more? Does this make economic sense? How much do the feet of your cows cost you per year? Is the importance of feet and leg conformation emphasised heavily enough in our composite breeding value systems? Are feet and legs more, or less important in grazing systems compared to housed cow systems? Alternatively, are different styles of feet and leg structure required for different cow environments?

I will leave you to evaluate these questions and provide me with your learnings from past experiences.

In Australia, the issue of recessive genes has been discussed in recent months. The topic has arisen because breeders are receiving results of genomic testing containing columns for recessive traits which are populated when an individual tests positive. Thankfully most columns remain blank, but every now and then there is a positive.

There are up to 34 columns for various gene markers in some reports and they vary from the type of proteins contained in milk, to hernias and the slick gene, just to name a few. Many of the columns refer to

markers which have been found in other breeds, as the system has been set up specifically for red breeds and while I am sure that researchers would have a very good idea about which markers are more common in which breeds, as each breed enters the era of genomic testing a few unknowns will be discovered.

We must ask ourselves how important are the effects which are being highlighted by the results? What is the magnitude of the problem, how widely is it distributed and what action if any should be implemented? Or, as in the case of the type of proteins contained in the milk, how can we capitalise on its benefits? Can we proliferate the gene, or genes?

There are some important points to remember in this discussion:

1. These traits have been around forever, they are not new. The difference is we know about them now.
2. The tests identify individuals who will express the trait, as well as carriers where the trait is dormant.
3. There will be animals with very valuable genetics which will test positive to a negative trait one day and we must be ready to use them for their positive aspects while minimising their negative ones. In this way it is no different to what breeders have always done when practicing corrective mating.
4. No breed will be completely free of negative recessive traits, although research may not have highlighted them all yet.
5. In some traits, other breeds have managed these problems for decades now without the entire breed falling victim to the effects of negative recessives.
6. We should be much wiser with our mating choices now we are armed with this new knowledge.
7. The danger of proliferating the negative recessives will be greatest when extremely popular strains of genetics are used randomly.

One trait which arises in Australia is “Fishy Off Flavoured Milk”. Recently a breeder commented to me that traditionally you would only know about the trait if you had just one house cow which expressed the trait fully. It is estimated that only about three percent of the Australian Red population are carriers, the majority of which do not express the trait in their milk and thus does not present a significant problem. If all these carriers were bred to carrier bulls, then the resulting progeny may express the trait.

Other breeds have developed a system of codes or acronyms which are added to the end of an animal’s name indicating a gene’s presence in their DNA. This allows breeders to avoid some unwise matings, or utilise it for other positive traits which the animal might pass to their progeny, or perhaps use it in risky situations and retain only those which do not carry the negative trait.

It seems that we should not panic about these recessives and we should be thankful for the new information which modern research has made available.

In this newsletter, Dr. Gary Rogers from the USA has kindly provided some insight into his view of the Red Cow of the future. Gary is employed by Geno Global based in Norway and chiefly deals with commercial American dairyfarmers. In that role he advises breeders how to optimise cow productivity and maintenance, with the help of Red Dairy genetics. He can firsthand the emerging trends in dairy herd management and the commercial pressures which farm managers and cows must overcome to remain profitable, over a variety of herd sizes. Gary also contributes to the Geno Research and Development Team and provides technical support for other international Geno partners. His presentation highlights many performance attributes which he believes are necessary for the prosperity of Red Dairy Breeds in the future. Read on:

Red Dairy Cattle (RDC) breeders should be optimistic about the future because RDC offer excellent milk solids production, outstanding health, exceptional fertility and RDC are easy to manage. In addition, RDC are very robust and adaptable, have moderate cow size and, perhaps most important, are excellent for crossing on Holsteins and other breeds in commercial herds.
Breeding programs will need to pursue the right vision for the future with a focus on future needs of commercial dairy herds and they must invest in genomics and new technologies. The Norwegian Red breeding program has committed to the needs of commercial dairy herds and other RDC breeding programs will need to do this as well.

Current challenges
Red Dairy Cattle breeding programs are currently challenged by global breeding company business models (mainly focused on Holsteins), marketing constraints, lack of familiarity with RDC in some key dairy countries and historical breed popularity. However, commercial herds are already helping to break down some barriers by using RDC in crossbreeding programs thus creating more demand for genetics from RDC.

Dairy herd trends and herd management in the future
The trend for increasing herd size in most countries will continue in the coming years. Regulatory efforts could intervene but this seems unlikely in most top dairy countries. Large herds will continue to get larger probably at an accelerated pace and most moderate size herds will increase in size as well. Key dairy herd management inputs can be scaled up and this will allow for much larger and more integrated herds to continue to flourish in US, Asia (especially China) and Eastern Europe where land and natural resources are available to support large herds. Development of these large herds resembles what we have seen in the past decades in poultry and pig production and this large herd model will be a major part of commercial dairy production in the future.
Herd size will also continue to increase in many traditional dairy areas like Western Europe but perhaps at a slower pace compared to locations with different natural resource and population density constraints. Traditional dairy herds will continue to be important because of societal demands but over time the large integrated herds will secure more of the global market for dairy products. Some traditional herds will find niche opportunities and non-traditional approaches to maintain economic viability. In the US and some other countries, a large number of smaller dairy farms will continue because of their core belief system and work ethic that trumps the need for high profit. However, herd sizes are likely to increase modestly even in these unique situations.

Breeding for the Future

Genetic decisions today should be based on expected needs many years in the future. Red Dairy Cattle will thrive if they can supply genetics that meet the needs of large herds in the future. Fortunately, the genetic needs of traditional herds may not differ very much from the large herds. The grazing herd segment is the exception but differences in needs for grazing herds are due more to management and environment than herd size. Large herds will demand specific genetic profiles (and performance) and these demands will drive much of the decision making in the breeding industry.

From a broad perspective, all herds in the future will require cows that are easy to manage. More cows will need to be managed with less labor and lower management input. Cows that slow down any part of the routine dairy operation or require any type of special care or attention will not be suitable for future dairy operations. Cows will need to be healthy, fertile and robust to meet the needs of future herds as sick cows will have huge costs for the system. Breeds, genetic lines and families that are not easy to manage will not contribute genes to commercial herds in the future.

Cows that are easy to manage will need to have consistent udder conformation that minimizes labor needed, provides excellent udder health and milk quality and that works well in automated systems. Most cows today can be milked with modern equipment but that does not necessarily make them suitable for highly efficient systems in the future. Herds will need (and demand) udder conformation that does not hinder efficient and streamlined milking or create disruptions in cow flow.

Efficient cows in the future will need to have an adaptable temperament that allows for ease of handling as well as rapid throughput in milking systems. Future cows will need to be agile with limited lameness and foot related problems including the need for frequent routine trimming.

Some herds will benefit more from the liquid component of milk while other herds may want lower liquid volume and increased density of fat and protein (to reduce handling costs and improve processing efficiency). Some herds will have specific protein and fat needs based on their milk market (cheese enterprise for example). Protein drives most dairy product manufacturing (except for butter of course) and the trend in many developed countries is toward more dairy consumption from manufactured products. Both fat and protein are likely to be important from a genetics perspective in the future.

Feed efficiency and greenhouse gas emissions will continue to be high on the agenda for future breeding programs. Current traits related to feed efficiency and methane emissions are largely driven by body weight or predicted body weight (this is the low hanging fruit) but we will have better measures in the future for these traits. Future cows may be smaller than today with lower body weight maintenance requirements, but they will have high feed intake capacity. Mating programs involving sexed semen (both male and female) as well as embryos will likely grow and perhaps create an increased incentive for smaller dairy cows since dairy females will have less influence on the beef supply chain compared to the past. It is likely that the cow size increases we have seen in most breeds in the past will stop and perhaps reverse a bit. Consistency in body weight and stature will likely become more important because consistency increases ease of management.

Future cows will need to meet the expectations of consumers who purchase dairy products. Consumer demands will drive genetic needs either through regulation or economic incentives. Traits related to animal welfare and product quality (in addition to environmental impact) will be more important in the future. Dehorning will most likely become unacceptable within the next decade in some (perhaps many) countries.

Fortunately, from a genetics perspective, the genetic profiles needed by herds that vary in size from 20 cows to more than 100,000 cows are generally very similar. The milk market, local economic conditions and herd management circumstances (especially full grazing herds with block calving versus full confinement herds) are more important in defining genetic needs than herd size.

Tools for making the genetic improvement

Genomic selection has revolutionized dairy cattle genetic improvement over the past decade. However, some RDC populations have not been able to capture the full benefit of genomic selection to date. For smaller populations, increasing the number of genotyped animals with phenotypic data, improvements in methods and models used to calculate genomic proofs and higher density genotyping will all likely help to improve reliabilities (or accuracies) of genomic proofs. Inclusion of crossbreds in genetic predictions could also improve reliabilities for smaller populations in the future. Breeding programs for RDC should consider stronger collaboration as increased cooperation could improve future opportunities as well.

Many dairy populations have been successful in developing ways to select for improved health, fertility and robustness. However, more work needs to be done in these areas for optimum progress. Data from current and future herd management systems including automated milking systems will further enhance selection for these traits so breeders need to embrace new technologies.

Role and impact of inbreeding

Many purebred dairy populations are rapidly becoming more inbred. This is a huge concern in a general sense but may come with a silver lining. Genetic testing will allow inbred populations to manage important individual genes but it is unlikely that the full impact of inbreeding depression on key traits can be managed and mitigated within highly inbred populations.

Inbreeding in purebreds and other industry changes will likely result in a dramatic increase in crossbreeding. Development of specific lines or families for important segments of the commercial dairy industry will likely happen very soon. Replacements generated from specific lines or families (via embryos and sexed semen) are very likely to dominate commercial production in the future. Although current pig and poultry production models may not be exactly what we see in future dairy production, it is important to consider than virtually all commercial pig and poultry stocks are crosses from specifically selected lines.

Take home messages

- Many future commercial herds will be very large and these herds will demand profitable cows that are easy to manage. Breeds and families that require any type of special care or management will not contribute to these herds in the future.
- Breeding objectives will need to consider herd needs as well as consumer and environmental needs.
- Red Dairy Cattle will need to fit into key crossbreeding programs to have long term success so breeders should select for animals that fit into major crossbreeding programs.
- New technologies must be utilized effectively to ensure that Red Dairy Cattle will have an important role to play in future herds.

Thankyou Gary for your insights and if any opinions expressed in this newsletter have triggered an opinion you may have about Red cow breeding, I welcome your feedback.

Happy breeding,
Graeme Hamilton