

GENOMICS

AND YOUR DAIRY HERD



*Practical application of genomics
for dairy herds.*

Genomics uses DNA information to predict the genetic merit of bulls and cows. Available in Australia since 2011, genomic information is routinely used to calculate genomic Australian Breeding Values – ABV(g)s for dairy sires and also for females. The analysis is primarily done from a hair sample, allowing animals to be tested from a very young age.

Genomics provides unprecedented levels of reliability in predicting the breeding potential of young animals. It is particularly useful for traits such as fertility and longevity, which previously took years before enough performance data was available to calculate a reliable breeding value.

The average reliability of genomic breeding values for young animals is the equivalent of 25-30 milking daughters for a bull (production traits) or to seven lactations for a female*. Compared with breeding values based on pedigree alone, this is more than double the reliability.

ABV(g)s are backed by data from more than 20,000 genotyped animals, 30 years of progeny testing, herd recording, type classification and genetic evaluation programs. These programs continue to be a fundamental part of the genetic evaluation of Australian dairy animals.

Average reliability of ABVs and ABV(g)s for animals with and without genomic testing*

Trait	Bull reliability				Cow reliability			
	Young bull Parent average ABV	Genotyped young bull ABV(g)	First crop bull Publishable ABV	First crop bull with genomics Publishable ABV with genomics	Young heifer Parent average ABV	Genotyped young heifer ABV(g)	7 th lactation cow ABV	7 th lactation cow with genomics ABV(g)
Protein kg	22	66	86	86	25	66	55	75
Overall type	21	48	75	76	18	46	30	51
Survival (longevity)	20	46	58	66	21	46	33	51
Fertility	22	45	71	75	20	44	37	53

* The reliabilities, equivalent daughter numbers and lactations presented in this brochure are averages only, Individual animal reliabilities will vary. Source: DataGene 2015.



Genomic results provide the equivalent reliability of seven lactations of performance records.

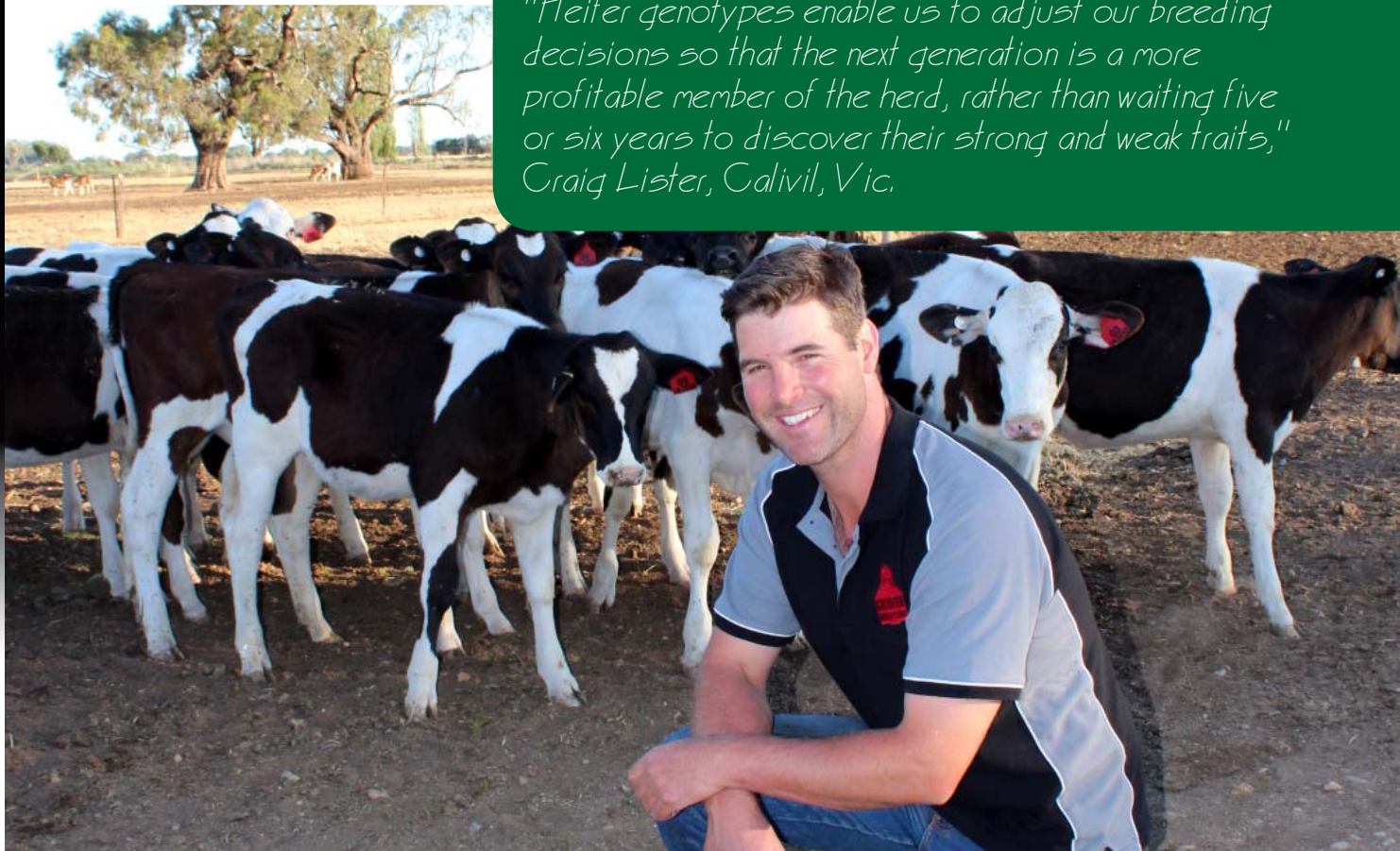
What genomics can tell us

When you send hair samples off for testing, you will receive a report on the genotype (genomic results) of each animal. The results include Australian Breeding Values – ABV(g)s – for a range of traits and breeding indices, as well as parentage* details and genetic characteristics*.

Breeding index	Production	Management	Type	Parentage*	Genetic characteristics*
• BPI Balanced Performance Index	• Protein (kg & %)	• Milking speed	• Overall type	• Sire	• A1/A2 milk
• HWI Health Weighted Index	• Milk (L)	• Cell count	• Mammary system	• Dam	• Polled
• TWI Type Weighted Index	• Fat (kg & %)	• Temperament	• Stature		• Red carrier
	• Feed Saved (Kg)	• Fertility	• Udder/teat placement		• Black red or red variant
		• Survival	• And many more...		• Genetic defects
		• Likeability			• Haplotypes associated with fertility

* By request

"Heifer genotypes enable us to adjust our breeding decisions so that the next generation is a more profitable member of the herd, rather than waiting five or six years to discover their strong and weak traits,"
Craig Lister, Calivil, Vic.



Genomics in practice

Most AI sires available in Australia are genomically tested, resulting in more reliable ABVs for both proven and young bulls, compared with parent average. The widespread use of young bulls with ABV(g)s is contributing to faster genetic gain across the Australian dairy herd.

Genomics can also help you identify genetically superior herd bulls which may be suitable as mop up bulls.

Increasing numbers of female dairy animals are being genomically tested to guide management decisions. Bull breeders and bull companies use genomics to identify young elite heifers to enter embryo transfer programs as potential dams of sires.

Now, the value of genomics for commercial herds is being realised.

Commercial Heifers

Commercial farmers are moving towards having each year's heifers genotyped to identify the top and bottom genetic groups in their herd.

This knowledge can be used to guide breeding and management decisions. For example, the genetically superior females can be mated to sexed semen or higher indexed sires while the genetically inferior heifers can be either joined to cheaper straws, used as recipients for embryo transfer programs, culled or mated to a clean up bull or beef sire. This approach increases the number of higher genetic merit replacement heifers.

Alternatively you can use the genomic results of individual animals to fine tune sire selection to improve specific traits of interest such as mastitis resistance or fertility.





Parentage confirmation

Genomic results can be used to confirm parentage, particularly in herds experiencing many calvings each day where parentage is not always clear. It also means heifers will be 'export ready' for sale into the Chinese market with minimal extra effort. Parentage verification is also useful for stud owners when registering animals.

Other benefits include the ability to manage breeding for certain gene characteristics; for example identifying carriers of genes such as A1/A2 milk, polled, red coat colour or a genetic defect. If a cow is a carrier of a defect, the information can be used to select a sire that is known to be free of the same defect.

Genomic testing can provide a significant economic benefit by reducing heifer rearing costs. If heifers are genotyped as young calves, the bottom one can be culled early, saving their rearing costs. DEDJTR scientists estimate that the rearing costs saved through identifying and culling the bottom 8% of heifers represents about one and a half times the cost of genomic testing of the entire group.

"Genomics enables me to identify the top 50% of heifers which are synchronised and inseminated with sexed semen; the bottom 25% are sold as young as four months of age and the rest are joined to a beef bull," Rob Cooper, Manilla NSW.

Getting started

What do I need?

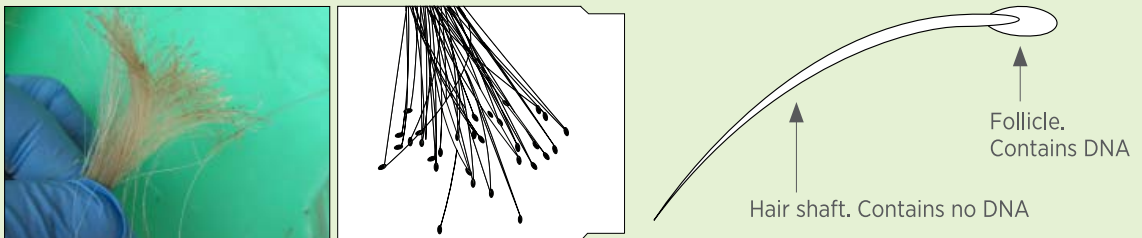
Genomic testing can be done for any Holstein or Jersey (or Holstein/Jersey cross) animal whose sire has an ABV (you can check this on the DataGene website, with your herd test centre or breed society). You don't need to herd record but the results will be more reliable if you do. If herd recording data is available, the performance information of the dam and family members can be added to the genomic results.

It's as simple as taking a hair sample

Any heifer, cow or bull can be genomically tested, provided its sire has an ABV. Holstein Australia and Zoetis (Clarifide) offer genotyping services and Jersey Australia offers genotyping services to members. The steps involved are outlined below.

1. Collect sample

- Order a hair collection kit from Holstein Australia or Zoetis (they are free).
- Write the animal's tag number on the collector.
- Collect at least 50 clean, thick hairs from the animal's tail switch or brush (the end of the tail). DNA is contained in the hair root (follicle) not in the shaft so pluck the hairs from the tail by wrapping the hairs around a pencil and pulling. The hairs can be plucked easily when pulled 'up and away' from the tail (against the direction of hair growth). Don't cut the hairs with scissors as the hair root will be missing. Short, fine body hairs are not suitable for testing.
- Place the hairs (root ends first) into the labelled collector and seal. Trim excess hair that sticks out of the collector.



Hair samples should have at least 40 clean hairs, with the hair roots attached.

2. Send your sample to a genotyping service

Download and complete the genomic testing application form from Holstein Australia or Zoetis (Clarifide). Fill in the details for each animal.

If you are actively herd testing, make sure you've recorded the animals (birth dates, sire and dam details) with your herd test centre before sending your samples off).

3. Receive results

The test will take a few weeks so make sure you allow enough time to make breeding or culling decisions. The results and an invoice will be sent to you via email.

To download instructions and forms visit:

www.holstein.com.au or

https://genetics.zoetis.com/australia/testing_and_results.aspx





Genomics solves the problem of mis-identifying calves with the wrong sire when lots of cows are calving.

Your levy at work

Genomic technology in the Australian dairy industry involves a significant investment of government funds and your dairy service levy. Partners in this program include Dairy Australia, DataGene, Dairy Futures CRC, Jersey Australia, Zoetis, Holstein Australia and the Victorian Government.

In addition to widespread commercial use, genomics are also used in R&D projects such as ImProving Herds, MIR for Profit, Ginfo, Health Data, Healthy Herds and the development of new breeding values such as the Feed Saved and heat tolerance.

To see the latest ABV(g) results go to www.datagene.com.au

Follow on Twitter [@ADHIS_Dairy](https://twitter.com/ADHIS_Dairy)

To download a Genomics Testing Application go to www.holstein.com.au or https://genetics.zoetis.com/australia/testing_and_results.aspx

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