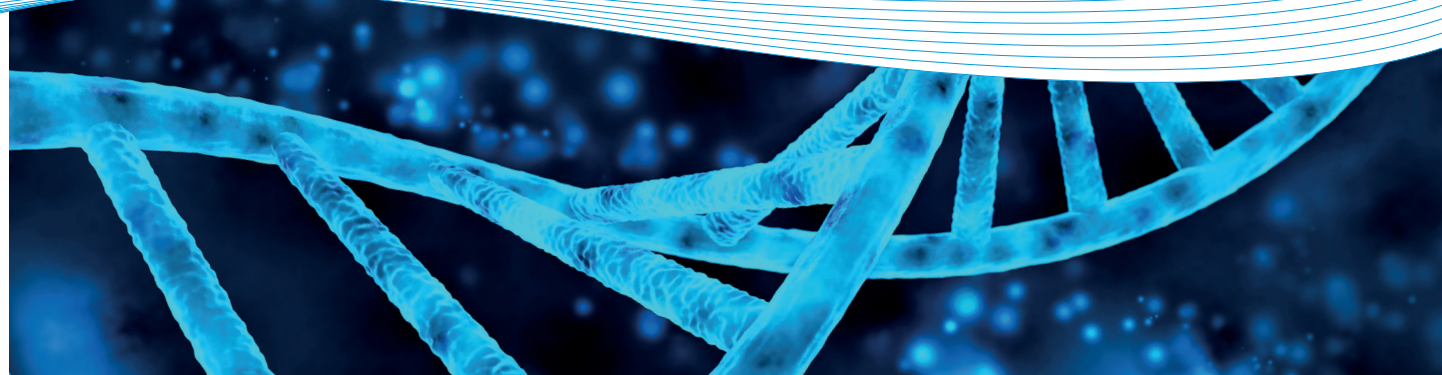


Genomics in the dairy industry



The genomic process

Genomic evaluation is the process of producing estimates of genetic merit based on an animal's DNA information.

They are available for the following breeds:

Holstein, Friesian, Guernsey, Ayrshire, Jersey

Creating genomic evaluations

The first step is to build up a reference population for a breed. A reference population contains the DNA information of bulls with a high reliability daughter-based proof.

Any animal with a high reliability proof can be used, whether they have poor or excellent genetics. This wide spectrum of genetics allows geneticists to identify markers (SNPs) in the DNA that are related to poor or favourable traits shown in the animal's genetic proof. These associations are then used to create a so-called 'SNP-key', which can then be used to evaluate young animals without daughter or production information based only on the DNA present in a tissue or hair sample.

To achieve a large enough reference population, genotype sharing agreements may need to be created between countries with similar genetics for breeds with a small population size. Holstein, Guernsey, Jersey and Ayrshire genotypes are shared between the UK, Canada, US and Italy.

Genomic proofs and their reliability

Genomic proofs produced by AHDB Dairy are identical in layout to production and daughter-proven proofs, but are flagged with **G** to indicate that the proof uses DNA and parent average information to estimate the animal's genetic potential.

Genomic proofs have a higher reliability than traditional pedigree index calculations, illustrated in Figure 1. Genomically tested young bulls retain this gain in reliability over traditionally tested bulls, even when first crop daughter production information is available.

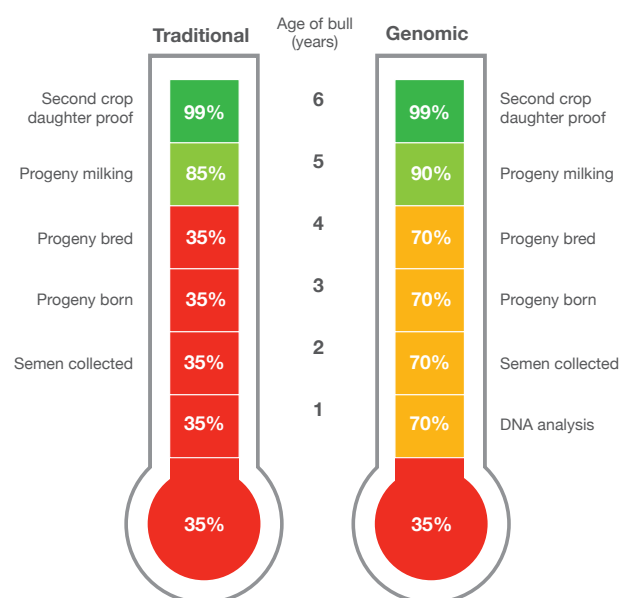


Figure 1: Reliabilities over time for traditional and genomic evaluations for Holstein and Friesian bulls*

*Note: other breeds will have around 55 per cent reliability in genomic stages 1–4

It is only when second crop daughter production information is available that traditionally proven proofs close this gap in reliability.

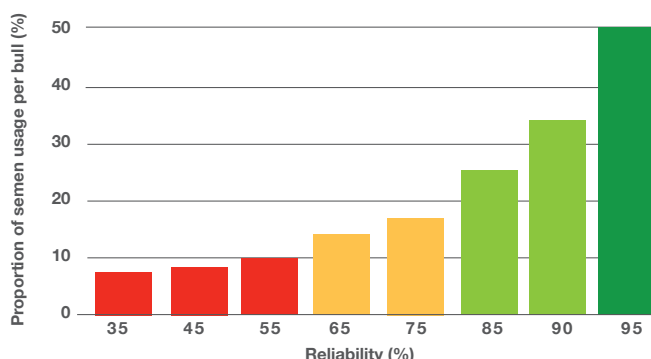
Although genomic young bulls have a higher reliability than their traditional counterparts, the same caution should be taken when using them across the herd.

The reliability indicates how likely the bull's proof will change as more information contributes towards his proof. Therefore, a genomic proof with reliability of 65–70 per cent could still drop or improve when daughter information becomes available.

Using a team of around five or six genomic young bulls across your herd is advised to ensure that if one bull changes significantly, his genetics will not contribute to a large proportion of your replacement heifers.

Figure 2 shows a traditional young bull should be used on no more than eight per cent of your herd. This proportion increases to around 15 per cent for Holstein genomic young bulls and further for first crop daughter proven bulls. Second crop daughter-proven bulls should be used on no more than half the herd.

Figure 2: Guide to proportion of semen usage for a single bull at different levels of reliability



Reliabilities for non-Holstein breeds will be somewhat lower because of the smaller size of the breed and informative bulls in the reference population.

What genomics can do for your herd

- Provide young bulls with higher reliability proofs compared to pedigree index proofs
- Receive a higher reliability genomic proof compared to the traditional pedigree index calculation for female youngstock
- Greater confidence in selecting youngstock from which to breed your next batch of replacement heifers, serving the genetically superior with sexed semen and putting the rest to beef to increase your calf value or, in the case of excess replacement heifers, the less superior genetics can then be sold. Genomically testing youngstock has an advantage over pedigree index calculations by evaluating the mixture of genes that have been passed down from both parents

Example: Non-identical twins or full siblings. Through traditional pedigree index calculations, both animals would have the same proof; however, genomics can identify the superior of the two or a poor trait that you would not wish to continue through your herd.

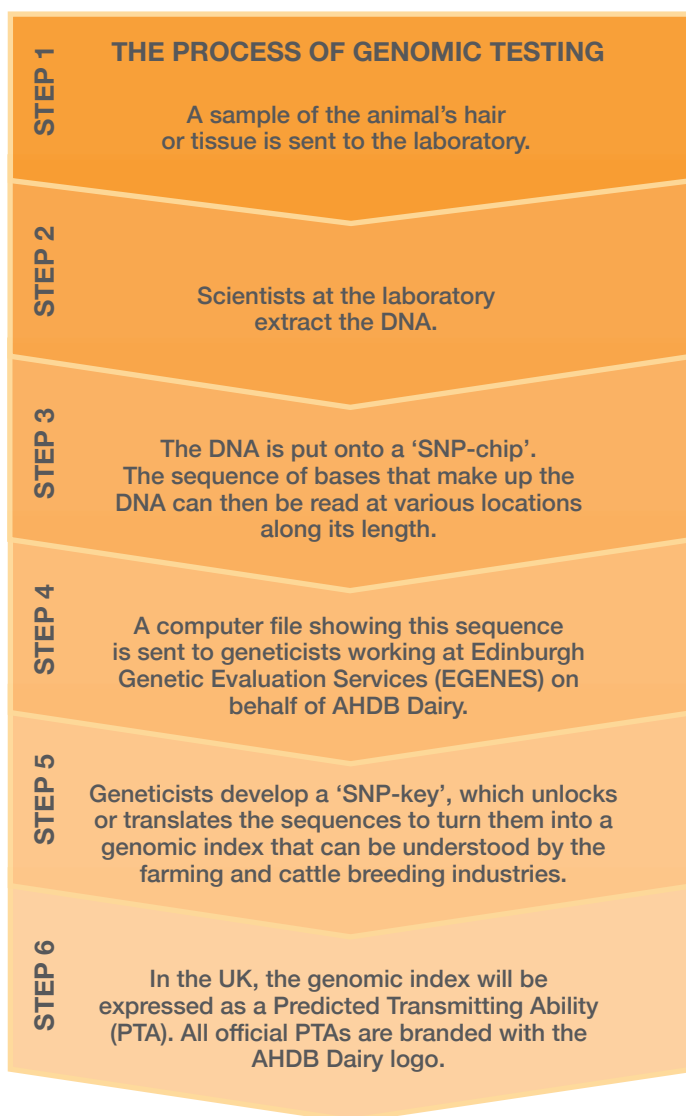
The cost

The setup of genomic evaluations by AHDB Dairy is covered by the levy; however, collection of genotypes to create a reference population is the responsibility of the breeding companies and breed society. Fees for this fall to users of the service. Numerous companies now provide genomic testing in the UK for those breeds with established genomic evaluations.

Genomic evaluations for females are free, after the initial lab test fee. However, bulls will incur a small charge to make their genomic proofs official.

Further information

For more information on AHDB Dairy breeding and genetics, visit: dairy.ahdb.org.uk/breeding or email breeding.evaluations@ahdb.org.uk



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