



## How are EBVs calculated?

EBVs are calculated using a computational procedure known as BLUP (Best Linear Unbiased Prediction).

### Statistical analysis

Each EBV calculation involves solving a set of simultaneous equations where the unknowns are the genetic value of the animal and the environmental effects on its performance. When carried out many times, the equations are able to quantify the unknown genetic component.

Over time, as more pedigree and performance data is added, the solution to the equations becomes more accurate as the *true* breeding value of the animal is approached.

### Factors influencing an EBV

EBVs are calculated using information from several sources:

- Measurements from the animal itself
- Measurements from the animal's herd mates (known as 'contemporaries')
- Measurements from the animal's relatives and their contemporaries
- The degree to which one trait influences another (known as a 'correlation')
- The degree to which each trait is passed on to the next generation (known as 'heritability')

#### Correlation

This term describes the direction and strength of the association between two traits. For example, some traits are highly positively correlated, such as 200-Day Weight and 400-Day Weight, whilst others are negatively correlated, such as 400-Day Weight and Calving Ease.

When something is known of one trait but perhaps not another, a prediction can be made based on what is known about the correlation between them. This again enhances the accuracy of the EBV in question and helps deal with situations where records for a trait are limited or unavailable.

#### Heritability

This is a term used to describe the strength with which traits are inherited and it varies depending on the trait in question. Generally:

- Traits associated with reproduction and survival have low heritabilities
- Milk production and early body size have medium heritabilities
- Later growth and carcass traits (i.e. fat and muscle) have relatively high heritabilities.

When something is known of the performance of one or both parents, then the trait's heritability can be used to help predict how the offspring will perform and BLUP uses this 'knowledge' to enhance the accuracy of its EBV calculations.