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Limousin Factsheet 6

Coloured and Polled Genes in Limousin Cattle

Most characteristics of cattle such as growth and fertility are controlled by many or multiple genes. Characteristics such as polledness and colour are controlled by a single pair of genes. Genetic tests are available for these genes and the outcome of particular matings can be accurately predicted once basic genetic principles are understood. This note aims to give Limousin producers an understanding of these principles...

Dominance

For most single gene traits there are dominant and recessive forms of the gene. The combination of dominant and recessive genes in the pair of genes carried by each animal determines what the animal looks like.

For example, take the polled gene in Limousins. The polled gene is dominant and the horned gene is recessive. If an animal carries two horn genes (pp) it will be horned. If it carries two polled genes (PP) it will be polled. If it carries a horn gene and a polled gene (Pp) it will be polled because the polled gene is dominant.

Homozygous and Heterozygous

Animals which carry a pair of genes which are the same are called homozygous (homo means same). For example, for polledness, the animals carrying two polled genes (PP) or two horned genes (pp) are both homozygous.

However, if the genes are different (Pp) the animal is heterozygous (hetero means different). While we can be confident that all horned animals are homozygous for the horned gene (pp) we cannot tell if a polled animal is homozygous (PP) or heterozygous (Pp) except by a genetic test.

Heterozygous animals and homozygous animals will have very different breeding outcomes in both pedigree and commercial herds. Understanding these is important when selecting breeding animals on the basis of their genetics for these characteristics...

Predicting the Outcome

Sometimes the outcome of a mating can be predicted with complete accuracy. In other cases we can only predict the probability of the outcome. For example:

A bull that is homozygous polled (PP) - All calves will be polled (since he only has polled genes to pass on and they are dominant).

A bull that is heterozygous polled (Pp) – Although he will appear polled himself he will produce some polled and some horned calves (unless the cows are all known to be homozygous polled, in which case all the calves would also be polled).

A bull that is homozygous horned (pp) – will have horns and will only pass a horned gene to his calves.

Example: Heterozygous bull mated to heterozygous cows:

| Cows | Bull | |
|------|----------|----------|
| | P | p |
| P | PP (25%) | Pp (25%) |
| p | Pp (25%) | pp (25%) |

- 25% of the calves will be homozygous polled (ie without horns and they will in turn always pass this to progeny)
- 50% of the calves will be heterozygous polled (ie will be without horns but will not always pass this on to progeny)
- 25% of the calves will be homozygous horned (with horns and will always pass this to their progeny)

Colour

The same principles as described above apply for the red and black colour with black being dominant and red being recessive.

A bull that is homozygous black (BB) - Bull will be black and all calves will be black

A bull that is heterozygous black (Br) – Bull will be black and will pass on red and black genetics to the calves. What colour they are will depend on the genes carried by the dam. See example below.

A bull that is heterozygous red (rr) - Bull will be red and only red will be passed to the calves.

For example: A heterozygous black bull mated to heterozygous black cows:

| Cows | Bull | |
|------|----------|----------|
| | B | r |
| B | BB(25%) | Br (25%) |
| r | Br (25%) | rr (25%) |

- 25% of the calves will be homozygous black (ie coloured black and they will in turn always pass this to their progeny)
- 50% of the calves will be heterozygous black (ie coloured black but will not always pass this on to progeny)
- 25% of the calves will be homozygous red (appear red and will always pass this to their progeny)