



**Breed Improvement Article**

## **Heritability and the Management Myth**

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**Heritability is defined as:** the proportion of the differences among cattle, measured or observed, that is transmitted, on average to their offspring. Heritability of different traits may vary from zero to one. The higher the heritability of a trait, the more accurately individual performance predicts breeding value and the more rapid should be the response to selection for that trait. (BIF Guidelines – 8th Edition)

An example of a trait with high heritability is colour. If a breeder chooses to change colour in their herd, this can be achieved relatively rapidly. This is partly due to the fact that the trait is controlled by relatively few genes, and is a yes/no type of trait. Is the animal red or black. Most traits we are concerned with as animal breeders have a somewhat lower heritability. For example, in Limousin the heritability of weaning weight is about 0.23. This means that genetics explains about 23% of the variation between individual animals. These traits tend to be controlled by several genes in combination and operate along a continuum. For example, a calf may be 5 pounds heavier than his contemporaries, or 10 pounds or 50 pounds and so on.

I have often heard it said that producers/feedlots can manage for whatever purpose is desired. This concept is based on the fact that if less than 30% is due to genetics then over 70% must be due to management. This is a dangerous and incorrect supposition. While management may account for many of the differences we see between animals, we can't manage an animal past its' potential. In other words, if we were trying to win a 100 yard dash, genetics can throw a brick wall across the track at the 50 yard mark, or they can provide the potential to win the race.

### **Heritabilities and Correlations used in the Limousin Genetic Evaluation**

	<b>BW</b>	<b>WW</b>	<b>PWG</b>	<b>Milk</b>
<b>Birth Weight (BW)</b>	.42	.34	.22	0
<b>Pre-Weaning Gain (WW)</b>		.23	.28	0
<b>Post-Weaning Gain (PWG)</b>			.20	0
<b>Milk</b>				.19

Heritability describes a portion of the variation shown between animals, however genetics produce the “upper limit” that an animal under any management scenario can reach.

In other words, the variation between individuals may occur at a level that is well below the desired outcome. A good example of this could be carcass characteristics. Genetics may explain only a portion of the differences between animals for yield and marbling (two primary components of the grading system). A feedlot operator may be long feeding to try to target a high marbling, white tablecloth market with genetics that do not have the potential to marble. While the heritability of marbling is relatively low, the genetic potential to marble may have an upper limit in the AA class. There is still variation between animals due to genetics, but we have thrown a brick wall up in the path of the cattle reaching this goal.

Another good example in Limousin is that of post-weaning gain (PWG). In Limousin cattle, this is roughly 20% heritable. This means we can select for it, however it does not mean that we can feed for post-weaning performance past the level set by the animal’s genetic potential.

A good way to think about genetics is that they are 100% important up to the point of conception. Once an animal is conceived, their genetic code is “locked in” and management becomes 100% important. Matching genetic potential to our management targets through the use of selection tools is the best guarantee we have that the animal’s will have the potential to be profitable.