

# Sorting Gate

## Unraveling performance: Is it genetics or management?

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Genetics and nutrition need to work together for cattle to reach their full performance

potential.

When developing genetic tools such as expected progeny differences (EPDs) or dollar value indexes (\$Values) to select seedstock, the first step is to unravel which part of an animal's performance is due to genetics and which part is due to how the animal was managed.

To separate the two, we must break animals into different contemporary groups. A contemporary group is a group of cattle from the same herd and of the same sex that have been managed together and thus have been given the same opportunity to perform, including access to feed resources.

Assigning contemporary groups is the best way to account for environment and

management differences so the remaining performance can be correctly attributed to genetics. That information can then be used to rank animals on only their genetic merit. This is important, because we know management can have a large effect on overall calf performance.

### Contemporaries

Take creep-feeding — the practice of providing supplemental nutrition to beef calves while they are still nursing. North Dakota State University reported that, on average, calves will wean 30-60 pounds heavier when creep-fed.

So, if you are not creep-feeding, but your neighbor down the road is, your neighbor's calves may weigh more simply due to that operation's management strategy.

Because these two groups of calves are separated into their own respective contemporary group, we can still evaluate both

herds appropriately and rank the calves for weaning weight genetic merit. Though the actual weights wouldn't provide an accurate comparison of the genetic potential across the two herds, the EPDs and \$Values calculated on those calves would.

Ensuring producers submit good contemporary group information alongside performance data like birth and weaning weights or carcass ultrasound data is crucial in creating predictable genetic selection tools.

### Heritability

The proportion of a trait, or performance measure, attributed to genetics is called its heritability. Trait heritability can range from 0.0 to 1.0. A heritability of 1.0 would mean

100% of the difference in performance is due to genetics. For currently predicted traits, you will not see a reported heritability of 1.0. In fact, the highest heritability estimate in the Angus suite of genetic traits is 0.59.

Heritability estimates are

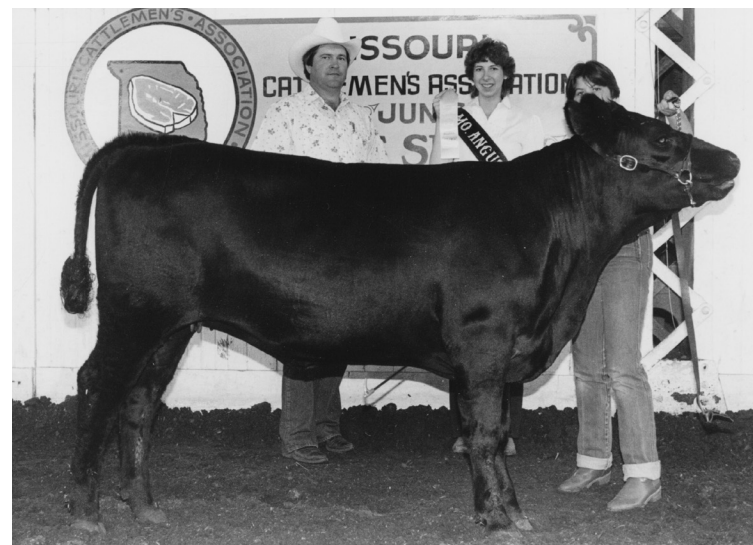
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**Table 1: Heritability of select traits within the Angus breed**

Trait	Heritability
Calving ease direct (CED)	0.19
Birth weight (BW)	0.46
Weaning weight (WW)	0.28
Yearling weight (YW)	0.42
Maternal milk (Milk)	0.12
Mature Height (MH)	0.59
Fat thickness (FAT)	0.33
Marbling (MARB)	0.48
Ribeye area (RE)	0.32
Carcass weight (CW)	0.44



Aberan Elba Erica 5th was exhibited at the 1962 National Western Stock Show.



Harmony Hills Queen Cara 032 exemplifies the change in height made by the 1980s.

broken down into three categories — low, moderate and high. Traits related to fertility and reproductive performance commonly fall into the lowly heritable category. Weaning weight, postweaning gain and yearling weight are considered moderately heritable, while mature height and marbling in most cases fall into the highly heritable category. Table 1 (see page 36) lists the heritability of some of the most selected traits in the Angus breed.

Remember, not all heritability estimates across different breeds are created equal. The better and larger the database of phenotypic performance measures, the better and the more exact these estimates will be. Users of Angus genetics can sleep well knowing the American Angus Association has hundreds of thousands (in

some cases, millions) of records available to them to estimate these types of figures.

### **Selection response**

Heritability also provides a gauge of how well a trait will respond to selection. The higher the heritability of the trait, the more responsive the trait is to selection pressure and the faster genetic change will take place.

Take a trait like mature height. Over time the industry has seen the belt-buckle cattle and cattle that towered well above my head, and I'm 5'8" (see pictures on page 36). How could we make such dramatic changes in height so quickly? It happened because a trait like height is highly heritable, not being very affected by the environment. Thus, with selection pressure, a change could be quickly made.

A trait like heifer pregnancy (the probability a heifer will get pregnant in her first breeding year) is lowly heritable, as many factors can contribute to an individual female becoming pregnant. For this reason, genetic change for a trait like heifer pregnancy will be slow.

Oftentimes, producers trying to tackle fertility will place more pressure on management strategies, such as changes in nutrition, to get females bred.

Low heritability estimates do not mean no progress can be made with the use of genetic selection. It does mean producers need to have added discipline and patience to see that selection pressure take hold.

Heritability is one of the most important concepts in animal breeding and selection. The magnitude of heritability can help

us determine how we would like to tackle an issue, whether that be to increase quality grade and end carcass merit or heifer fertility and cow longevity.

Traits with higher heritability can be more easily tackled with selective mating, while lower heritability traits will need to be harmonized with good management strategies. Altogether, the most successful operations will be those who enlist both the advancement we are making in the science, as well as good management logic. **ABB**

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Editor's note: Authored by AGI staff, "Sorting Gate" is a regular *Angus Beef Bulletin* column featuring herd improvement topics for commercial producers using Angus genetics. Kelli Retallick-Riley is president of AGI. For additional information on performance programs available through the American Angus Association and AGI, visit [www.angus.org](http://www.angus.org) and select topics under the "Management" tab.