# Healthy Respect for Genetics

***Experience and research are showing a bankable advantage for Angus when it comes to feedlot health.***

*Story by*
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Seasoned cattlemen have long suspected a tie between calf genetics and health. Coffee shop chatter has hinted at it for decades.

The joke goes, "If you get [that breed], you have to shoot the first one off the truck to figure out what's wrong with him so you can start treating the others."

Now there's feedlot data, a bit less dramatic, but certainly supporting the idea. Meanwhile, scientists are earnestly searching for genes that might predict disease resistance.

With the annual cost of respiratory illness alone estimated at $750 million, this combination of new knowledge and technology could make a big difference.

The good news for Angus producers is that early indications show the breed may excel in the health arena. An analysis of data on more than 30,000 cattle fed through Iowa's Tri-County Steer Carcass Futurity (TCSCF) documents a decrease in health problems as percentage of Angus breeding increases.

Records from cattle placed on feed from 2002 to 2009 were sorted into four groups based on sire and dam information: low-percentage Angus, half, three-quarters and straightbred. Morbidity, or sickness, was 16% for straightbred Angus cattle, but increased to 21.7% for those with the lowest amount of Angus genetics. That compares to an average of 17% to 18% pulls across all cattle in the program, says Darrell Busby, TCSCF manager.

"At the lower percentage, you would notice the difference in your bottom line," he says. "That's because you'd have less drug cost, higher-gaining cattle and higher quality grade." That's not even counting the labor savings.

**The difference in morbidity among straightbred Angus and the average across all cattle in the lot is noticeable on your bottom line, says Darrell Busby, TCSCF manager. "That's because you'd have less drug cost, higher-gaining cattle and higher quality grade," not to mention reduced labor savings.**

The group with the least Angus influence racked up $7.72 per head in treatment cost, an extra $2.12 compared to the $5.60 price tag for the Angus straightbreds in the nine-feedlot system.

Decatur County Feed Yard, a Certified Angus Beef LLC (CAB) licensee near Oberlin, Kan., tracked health on more than 56,000 cattle fed there from 2003 to 2009. Analysis results parallel those in the TCSCF report.

Pens with solely Angus genetics averaged $2.88 in treatment costs, compared to $3.77 for predominately Angus crossbreds and $4.44 for other cattle.

Of course the drug costs are just part of the equation; there's also a value reduction in sick cattle.

"Any time you get some health problems, it definitely affects performance and carcass," says Dan Dorn, the feedyard's supply development manager. "It sets them back when they get sick."

The Kansas analysis shows average daily gain (ADG) dropped from 3.37 pounds (lb.) to 3.06 lb. as calves were treated, requiring 25 more days on feed.

Carcass traits also saw a marked effect. *Certified Angus Beef*® (CAB®) brand acceptance was more than cut in half from nearly 12% to 5.7% on the treated cattle. Carcasses from the solely Angus group were worth $1.94 per hundredweight (cwt.) more than their contemporaries.

"That's $15 per head," Dorn says, "and that's our profit margin most of the time."

Both data sets show high-percentage Angus cattle outperform, out-grade and stay healthier than those with less Angus influence.

Frank Brazle, retired Kansas State University (K-State) Extension specialist, says that just proves what experienced feeders and backgrounders have believed for years.

"If you're buying unweaned calves in the fall — and that's when we see the most health problems — we're more comfortable with the predominantly Angus calf," says Brazle, who backgrounds a couple thousand calves each year at his Chanute, Kan., yard.

Starting in the mid-1980s, the animal scientist documented health and breed on calves coming into research pens. His initial study looked at highly stressed cattle that were characterized by hide color.

"Back then, those we called 'blacks' would have been a high-percentage Angus," he says. Those black-hided cattle had less than a 2.8% death loss, compared to 18.4% for whitefaces, 12.9% for black whitefaces and 6.3% on mixed colors.

"It surprised some people that the Angus cattle had the least health problems, but it really surprised them that the black baldies, which have hybrid vigor, fell right in the middle," Brazle says. After that, breed and health became standard data points in his research at KSU.

"People didn't even think there could be a difference in breeds," he says. "It's still not something we can look at within a breeding program and fix, but we're getting there."

**Table 1: Effect of percentage Angus on health, performance and carcass characteristics**

| | Low | Half | Three-quarter | Straight |
|---|---|---|---|---|
| Percentage | 9.2[a] | 48.6[b] | 74.2[c] | 99.4[d] |
| Days on feed | 175.2[a] | 169.1[b] | 167.4[c] | 163.9[d] |
| ADG, lb./day | 3.1[a] | 3.2[b] | 3.2[b] | 3.3[c] |
| Health: | | | | |
| No. of times treated | 0.34[a] | 0.23[b,c] | 0.26[b] | 0.23[c] |
| Ind. treatment cost | 7.72[a] | 5.54[b] | 6.72[c] | 5.6[b] |
| Morbidity rate, % | 21.7[a] | 15.5[b] | 17.2[c] | 16.0[b] |
| Mortality rate, % | 1.7[a] | 1.1[a] | 1.5[a] | 1.7[a] |
| Carcass data: | | | | |
| Avg. yield grade | 2.56[a] | 2.78[b] | 2.93[c] | 3.03[d] |
| CAB® acceptance, % | 8.9[a] | 15.8[b] | 16.7[b] | 27.3[c] |

**Source:** Tri-County Steer Carcass Futurity data from 30,000 head on feed, 2002-2009.

[a,b,c,d]Means within a row with unlike superscripts differ (P<0.05).

**"A calf has the most genetic potential the day it's conceived," says Dan Dorn, Decatur County Feed Yard's supply development manager. "Then it's up to us as managers to make it work."**

Heritability of resistance to BRD falls in the 0.18 range, ranking it as a lowly heritable, similar to fertility. That's partly due to the categorical nature of the trait, says MARC research geneticist Larry Kuehn, and nature and time have already worked on the challenge.

## Genetic component documented

Fast-forward a few decades to a 2006 USDA Meat Animal Research Center (MARC) study that uncovered the link between genetics and bovine respiratory disease (BRD). More than 18,000 records, encompassing 12 breed types across 15 years, showed varying levels of disease occurrence among breeds.

The average for Angus cattle was lowest at 10.2%. Crossbreeds were in the middle and the highest rates, 32% to 35%, were seen in straightbred Pinzgauer, Braunvieh, Simmental and Limousin.

Researchers estimated the heritability at 0.18 out of a theoretical 1.00, putting it in the lowly heritable range. By comparison, carcass traits are usually deemed moderately heritable.

"These would be more along the lines of fertility traits," says Larry Kuehn, MARC research geneticist. "Part of the reason for low heritability is the categorical nature of the trait."

Plus, nature and time have already worked together on the challenge.

"Conceptually, these diseases aren't new. They've been here for centuries and so have the cattle, so natural selection

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**Table 2: Characterization of performance and carcass trait by sire breed**

| | Sire breed | | | |
|---|---|---|---|---|
| **Item** | **Solely Angus** | **Predominantly Angus** | **Other breeds** | **Unknown** |
| Treatment cost, $/head | 2.88 | 3.77 | 4.44 | 3.81 |
| Est. final wt., lb. | 1,213.5 | 1,178.2 | 1,189.4 | 1,178.2 |
| ADG, lb./day | 3.53 | 3.32 | 3.21 | 3.27 |
| Carcass price, $/cwt. | 133.84 | 132.99 | 131.90 | 132.23 |
| Lot CAB® acceptance rate, % | 19.19 | 11.93 | 5.84 | 9.19 |

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has already played a big role," says Larry Cundiff, MARC emeritus geneticist. "Carcass traits wouldn't have been so heritable either if anybody had cared about them for centuries before the last one. The reason they're so heritable is because they are more or less independent of fitness."

Although health has long been looked at as an environmental problem, an Iowa State University (ISU) study says that because of the high costs, "even modest estimates for heritability of BRD resistance should be considered for incorporation into beef cattle breeding programs."

The study found a heritability of 0.10 to 0.11 for Angus cattle, compared to 0.02 to 0.06 for Simmentals. That indicates selection within the Angus breed could yield still more progress.

Both of those numbers could be slightly understated because of the analysis method.

"It's a binomial trait: You either have it or you don't," says J.R. Tait, ISU animal scientist, explaining they typically look at traits such as weaning weight or marbling that have a distribution. "It's entirely possible if we were to use a program designed for categorical-based data, the heritability could go up and would be more powerful."

**"[BRD resistance] could be included in a performance index where traits are weighted by their economic effect," says J.R. Tait, ISU animal scientist. "It has a large enough impact that it would get some selection pressure."**

The ISU work also indicated several helpful correlations between BRD resistance and other traits, such as a negative relationship with birth weight and a positive association with marbling.

"It could be included in a performance index where traits are weighted by their economic effect," Tait says. "It has a large enough impact that it would get some selection pressure."

All the scientists admit there are obstacles to studying this topic.

Determining health is a somewhat subjective measure, says Jason Osterstock, a genetic epidemiologist with Pfizer Animal Genetics.

"Many of the important diseases are somewhat rare," he says. "In feedyards, we expect respiratory disease to affect just a relatively small proportion. If you start to talk about other diseases, like Johne's disease in beef cattle, you're talking about probably less than 0.5% of the population that would be affected. So that makes it difficult to study."

Another consideration, Osterstock says, is the real goal isn't necessarily to find animals that never get sick.

"Perhaps the most important thing is identifying the animal whose immune response is such that it can handle the infection and doesn't require aggressive intervention from the producer to treat the infection, so it suffers fewer negative consequences," he says.

Then there's the challenge of documentation.

"Most of your Angus bull producers aren't going to expose a number of cattle to respiratory diseases and then report it on their registration forms," Kuehn says. "Understandably, they're trying to keep calves from getting sick."

DNA predictors for health are on the horizon and could offer some help.

"It's probably going to be the most efficient way to study this," he says. "We're trying to identify which genes would tell us that they're more likely to be resistant or susceptible to respiratory disease."

MARC researchers, who were collecting lung tissue samples in packing

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plants during 2010, predict the greatest initial success will come from identifying genes within specific breeds. As newer sequencing technologies come along, they might do a better job comparing breed to breed, Kuehn says.

Pfizer is one of a handful of companies focusing on research and development in this area.

"Work is under way, so we're hopeful in a couple of years or so we'll have something that producers can apply," says Kent Andersen, associate director of technical services with Pfizer Animal Genetics. He says every segment of the industry will be able to use the technology, starting with seedstock producers.

"Even though progress would be slow, avoiding bulls that are the biggest potential troublemakers at least moves us in the right direction and minimizes the propagation of animals that are particularly susceptible," he says. "For cow-calf producers, there's probably an opportunity for value differentiation when you're selling calves if you can demonstrate that they have a lower disease risk."

DNA tools could also help producers who have limited access to feedlot health information right now.

"It may be the first opportunity for many cattlemen to select for improved health and the effects would impact the entire supply chain," Osterstock says. "Unless the producers are retaining ownership and collecting information from the feedlot, they may have limited disease data with which to make health-based breeding decisions."

Osterstock says feedlots might become more strategic in how they use animal health products.

"Judicious use of antimicrobials is an important part of what the entire livestock industry is striving for," he says. "There's potential to move towards what in the human side they've referred to as 'individualized medicine.' The decisions regarding how we prevent or treat disease in a specific animal will be made differently for different animals that have unique genotypes."

Brazle suggests a less sophisticated version of that already occurs today.

"If I go out and see an Angus calf is kind of borderline, I might let him go and not pull him," he says. "If it's another breed and there's any indication that calf is getting sick, I get him pulled. I'm afraid if I don't and he gets any start of sickness, he won't bounce back. That's pretty real for those people who start a lot of calves."

Cattlemen are already doing some basic breed selection based on health, too, Kuehn says.

"People have selected against Hereford, for example, because of pink eye, but people who really have foresight are going to keep going on a sire-selection basis rather than breed specific," he says.

Dorn says he looks forward to additional information, so that cattlemen can use it to refine genetic selection.

"We seek out the producers who want to use the data and make a difference," he says. "A calf has the most genetic potential the day it's conceived. Then it's up to us as managers to make it work."

**Table 3: Incidence of BRD in calves before feedlot, avg. age and days on feed when BRD was diagnosed, incidence rate of BRD, mortality among calves with BRD, and total death loss due to BRD among all calves by breed type and overall[1]**

| Breed | BRD before feedlot, % | Age, d | Days on feed | Incidence, % | Mortality, % | Total death, % |
|---|---|---|---|---|---|---|
| Angus | 12.9 | 205 | 35 | 10.2 | 1.9 | 0.5 |
| Hereford | 8.6 | 206 | 43 | 18.5 | 4.5 | 0.9 |
| Charolais | 11.9 | 213 | 46 | 13.7 | 5.8 | 1.4 |
| Gelbvieh | 11.5 | 211 | 41 | 14.8 | 3.4 | 0.9 |
| Red Poll | 17.6 | 201 | 50 | 22.2 | 8.9 | 2.1 |
| Simmental | 14.7 | 190 | 48 | 33.2 | 4.4 | 1.7 |
| Pinzgauer | 13.0 | 200 | 49 | 35.0 | 3.4 | 1.2 |
| Braunvieh | 25.5 | 198 | 56 | 34.0 | 0.1 | 1.1 |
| Limousin | 13.3 | 190 | 52 | 32.3 | 3.7 | 1.4 |
| MARC I | 16.5 | 201 | 41 | 15.9 | 5.1 | 1.1 |
| MARC II | 9.6 | 196 | 39 | 18.8 | 3.1 | 0.9 |
| MARC III | 13.3 | 202 | 42 | 14.6 | 3.6 | 0.8 |
| Overall | 12.8 | 202 | 43 | 17.0 | 3.9 | 1.0 |

[1]Mortality included calves that died or were culled for reasons associated with BRD.