



# Angus Stakes

► by *Shauna Rose Hermel*, editor

## Beyond the genome

*Amazing. In my late-night wind-down time, I caught an episode of “Nova” on PBS that was talking about the mapping of the human genome. Of course anything talking about DNA catches our eye these days.*

### Unexplained by genes

Scientists were explaining that in mapping the human genome, they discovered there were far fewer genes governing who we are than they had originally thought — in the neighborhood of 30,000 rather than 125,000. That means we have about the same number of genes as a rat. And, in a lot of instances, we share the same DNA as our four-legged friends.

Additionally, every cell in our body shares the same genes, so a scientist couldn't distinguish a cell from your eye from a cell from your liver just by looking at the DNA code. What makes cells, tissues and organs different is what genes are “turned on” to express themselves in our physical form, or phenotype.

Another point: One of our goals with mapping the human genome (and the bovine genome as well) is to find ways to eliminate genetic diseases. One of the

scientists discussed two diseases that were caused by the same gene deletion, but the parent the deletion was inherited from determined which disease the child displayed.

### Epigenetics

So, they hypothesized, there has to be something else, something beyond genes, that controls who we are. Enter the idea of an epigenome. According to the scientists, the epigenome includes methyl groups that attach to the DNA backbone. One scientist gave the analogy that the epigenome coils around the genome, hugging it. When it hugs too tightly, it turns genes off.

What's more, the research indicated that environment affected the epigenome. They discussed how litters of lab rats displayed differences in their genetic coding based on whether they had a nurturing mother or one they termed more “hands-off.” Those

with nurturing mothers handled stress more easily and were less likely to display genetically inherited diseases.

Their explanation was that environment has a huge effect on the epigenome, which then affects what genes are turned on and off. What's more, these environmental marks can be imprinted on our genome and affect families for generations to come.

In one country, comparing documentation of famine to cause of death in subsequent generations indicated that when a grandfather endured a famine the grandchild was more likely to have complications with diabetes. But famine affected males and females differently, and the timing of the famine also affected the outcomes.

The story went into more detail, including epigenetic treatments of diseases such as cancer.

### Does it apply to us?

The question I have is, how does this affect our genetic discussions when we are trying to characterize and predict traits in Angus cattle? We've carried stories in the *Angus Journal* indicating that to maximize marbling, calves should never experience a

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