



by John Goeser

Early life experiences matter to cows

EPIGENETIC research studies explore the interesting interaction between the environment and genetics. In graduate school, during plant breeding studies, I was introduced to the concept and became interested. At the same time, I was studying animal nutrition and had discussions with my dairy professors on the topic.

Fast forward a decade or so, and we learned that dry cow heat abatement has a substantial impact on the subsequent lactation. Zoom forward another five years and we continue uncovering how a dairy cow's environment or plane of nutrition may have effects far beyond what we realize.

This topic was a recurring theme during the Cornell University PRO-DAIRY Herd Health and Nutrition Conference this spring. Kansas State University's Billy Bean kicked off the meeting detailing how improving the dam's plane of nutrition can enhance marbling within dairy-beef offspring. Later, the University of Wisconsin's Jimena LaPorta showcased how dry cow heat abatement not only impacts the subsequent lactation but also changes gene expression and performance of calves for multiple generations to follow.

Impacts that last

These newfound epigenetic research observations between a cow and its calf are jaw dropping to me, but we won't stop here. I'll weave in another thought leader and scientist's work to expand the concept to nutritional stressors, referencing Michigan State University's Adam Moeser.

Moeser is a world renowned and accomplished scientist who I've been able to learn from the past two years. He's also an accomplished baseball player! He's not a familiar name within our dairy industry, though he probably should be, because his work centers upon pigs.

At a meeting earlier this year, Moeser introduced the adverse childhood experience (ACE) concept. Moeser taught us how stressful events endured early in one's life can have profound impacts later in life.

In Moeser's lab, the team is researching ACE impacts in piglets. Their research compares early weaned to later weaned pigs as a model and then evaluates health responses later in the pig's life.

Moeser's finding that ACE equates to leaky gut, inflammation, and substandard disease responses later in life are real. This is another fascinating epigenetic research finding. The previously stressed piglets appear to be predisposed for issues later in life.

Feed-related stressors

Making the connection between piglets and the dairy farm, let's transition to thinking about adverse calthood events as a dairy-specific ACE. What kind of impact are adverse events having on the heifer or cow later in life?

While weaning in calves may or may not be a stressful event, scours certainly continues to be a plaguing issue. This clinical outcome is generally attributable to some environmental or nutritional stressors. What impact is this ACE

having on gut health and leaky gut or disease responsiveness and inflammation later in life? Based upon Moeser's work, this connection is worth considering.

Further linking Moeser's work to Bean and Laporta's research referenced above, I openly ponder what long-term health issues across the whole herd might be introduced by other feed-related stressors. We know leaky gut is an issue in transition cows, but there are likely far greater connections between stress and health than what we know about today. Let's connect one more dot to feed hygiene as a nutritional stressor.

Unfortunately, the 2023 corn silage and grain crop came into storage with hygiene issues in the Eastern U.S. and part of the Midwest. The 2023 season was one for the record books in different ways, but unfortunately, some corn silage and grain are afflicted with fungal or bacterial contamination. Both of these feed quality and hygiene issues could be considered a stressor in my mind.

Fungal, mycotoxin, or undesirable bacterial contamination is easy to relate to health and performance issues. We know these negative attributes in feed can disrupt rumen metabolism, irritate digestive tract tissues, or suppress the immune system.

Stretching beyond acute or visible symptoms, I'll weave in Moeser, LaPorta, and Bean's work to speculate that nutritional and feed related stress points may have lasting ramifications. Whether a pregnant cow or a weaning calf, it's not outlandish to

speculate there have to be long-term leaky gut, disease response, and production or efficiency opportunities rooted in eliminating stressors the entire herd experiences.

We often manage based upon what the cows or calves are telling us in the moment. However, the stressors I'm speaking to here may not always result in a clinical outcome such as gastroenteritis, mycotic abortions, hemorrhagic bowel disease, or digestive upset and variable manure. There are low-level, subclinical contaminants present on many dairy farms. The rumen and cows are incredibly resilient, but I believe the concepts covered here give added incentive to seek not only healthy cows, but healthier plants in the field and healthier forage in the silo.

Strive for the best

Coming out of grad school, I would not have taken the leap in connecting newfound research to speculative concepts and put it in writing. However, I've grown increasingly bold with age and desire to help your dairy continue making strides in health and performance beyond what we understand today.

There is a growing amount of research with epigenetics in dairy cows. Let's continue to alleviate stressors that calves, heifers, or cows experience for long-term gains. 🐮

Goeser is the director of nutritional research and innovation with Rock River Lab Inc., Watertown, Wis., and an adjunct assistant professor in the dairy science department at the University of Wisconsin-Madison.

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