



Fetal Programming and the Recipient

Nutrition is essential to getting the most from future genetic potential.

by *Grace Vehige*

“Producers must understand that an animal’s productivity begins at its conception and that every day is important, and a producer’s goal is for that animal to have more good days than bad days. That is why nutrition, herd health and management are so critical every day,” says Doug Hawkins, technical support specialist with Purina.

Production potential as the fetus develops has to do with fetal programming, which is still a relatively new consideration when it comes to cow-calf production.

Briefly, fetal programming is the maternal environment’s impact on a calf both before and after birth. It applies to all pregnant cows, including donors and recipients.

“For the most part, I would argue that we should just be treating our recip herd as well or better, in terms of nutrition, than we do our base cow herd because, theoretically, they’re carrying what could be the most valuable animal on the farm or the ranch,” says Patrick Gunn, beef technical sales consultant for Purina.

Positively affecting fetal programming revolves around establishing and maintaining a nourishing maternal environment for the growing fetus. That requires providing the dam with adequate, balanced nutrition.

Nutrition is key to creating value

“If a replacement female has inadequate nutrition while in utero, then that can alter key nutrients that could be vital to gene expression of key traits that producers are selecting for, such as reproduction,” Hawkins explains.

Reproduction is unquestionably the single most important factor in the profitability of a cow-calf operation, including the reproductive longevity of producing females.

“The recip cow doesn’t put forth any chromosomes into the equation, but nutritional status, ultimately, can impact how the genetics are expressed in that calf,” Gunn explains. “So, plane of nutrition, quality of nutrition, all those management factors will potentially change how that calf expresses its genetic potential.”

To illustrate the point, Gunn points out clones often do not have identical phenotypes. “A lot of that has to do with the donor cow in the situation and her nutritional management and the aspect of fetal programming,” he says.

Hawkins emphasizes successful beef female reproduction requires optimum nutrition that meets the needs of protein, energy and trace minerals.

“The goal is always to provide adequate supplementation year-round...There are definitely breed and environmental situations to consider, but these are goals that producers should strive to obtain,” Hawkins says.

Learning as we go

“For as much as we know about fetal programming, there’s far more that we don’t know,” says Gunn. But, he adds, “At this point, what we do know is that if we don’t give a dam what she needs, it can have a negative impact on that calf, long term, once it’s born.”

Moreover, Gunn points out some traits, like fertility, are economically important but lowly

away. So, I think from both a commercial and seedstock producer’s perspective, there is a huge financial implication associated with [fetal programming].”

Future fetal programming study

Current research surrounding fetal programming provides producers plenty of detail and incentive to consider implications of this phenomenon when assessing their management program. As Gunn alluded to earlier, however, there is much more to learn.

While he thinks the future of fetal programming will continue to examine things like phenotype, growth potential, and reproductive potential, Gunn believes there will likely be more emphasis on other areas such as cattle health.

“A lot of times, research on the impact of fetal programming has been focused on those earlier phases of nutrition, whereas health and immune function tend to be developed more toward the end of gestation,” Gunn says. “So, I think we’re going to see a lot more research surrounding health in particular, as it relates to feedlot health and pre-weaning health.” He believes more emphasis will be placed on how management can be manipulated so that fetuses can be programmed to be healthier, more reproductively fit and ultimately more profitable.

Potentially, increasing knowledge about fetal programming could also add accuracy to the expected progeny differences (EPDs) that predict genetic merit for specific traits.

Gunn believes the impact of fetal programming is one reason some producers are reluctant to fully embrace genomic-enhanced EPDs (GE-EPDs).

“Just because an animal has a certain genetic profile does not necessarily mean it is

capable of being expressed. That is the whole premise of fetal programming,” Gunn explains. “Currently, GE-EPDs assess the genes that the animal possesses, but not necessarily the ability to express those genes. As we learn more about fetal programming and how gene expression is manipulated; as a result, I believe GE-EPDs have the potential to become more accurate.” **HW**

Editor’s note: Additional information regarding fetal programming in the first, second and third trimesters of gestation can be found in the August 2020, October 2020, January 2021 and February 2021 issues of *Hereford World*.

Photo by Taylor Belle Matheny



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heritable. Genetic improvement is even slower when mating decisions are made to improve fertility but may not be realized because the offspring are unable to express their potential.

“By giving a recipient female, or just the herd in general, better nutrition, we can obviously improve the bottom line,” Gunn says. “I think first and foremost, we may not consciously notice it, but when we come out of a year with a drought or extreme weather conditions, the fetuses resulting from that period are not as thrifty, on average. A lot of times we fight more health issues and things that really impact the bottom line right