Fetal Programming Series

Fetal Programming in the Second Trimester

Research shows carcass merit and other performance traits are affected in the second trimester of pregnancy.

by ***Grace Vehige***

When caring for a livestock herd, there are many nutritional factors to consider. Nutrient requirements vary and are often dependent on breed, environmental factors and physiological factors. While the term itself may not be new, an up-and-coming phenomenon has caught the cattle industry by storm: fetal programming. This concept describes the maternal environment's role in calf development before and after birth. As a fetus develops throughout the three trimesters of pregnancy, the conditions it is exposed to affects the animal for the rest of its life.

What develops in the second trimester?

The first and second trimesters of pregnancy are very similar in terms of fetal development stages. The embryo and fetus are very small but have large demands for nutrients.

"Several key factors are developed during the second trimester. These include muscle tissue development and further development of vital organs, such as the liver, kidneys, heart and brain. Also, the gastro intestinal tract is being developed, as well as further development of the reproductive tract," says Elizabeth Backes-Belew, Ph.D., nutritionist with Purina Beef Technical Solutions.

According to Backes-Belew, a calf hits the ground with every muscle cell it will ever have in its life. When considering future profit and performance, this means the second trimester is critical in influencing positive growth. Providing the right resources and supplements during the second trimester opens the door to achieve higher weaning weights, more gain at finishing, improved marbling and improved tenderness.

"Producers must understand that an animal's productivity begins at its conception and that every day is important. 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, Ph.D., technical support specialist with Purina.

Why does the second trimester matter?

It is most common for producers to focus on the third trimester of fetal development, as 75% of fetal growth occurs at that time. However, continued research provides evidence that the first and second trimesters of fetal development are just as important as any other point in gestation.

Many studies regarding fetal programming demonstrate a relationship between maternal nutrition and the future performance of the offspring. For example, a study which focused on the influence of mid-gestation nutrition found improved nutrition during the second trimester led to heavier weaning weights and heavier finishing weights. The improved nutrition during the second trimester also led to improved marbling and tenderness on the rail[1].

"By not feeding mom to meet her nutrient requirements, you are giving up pounds at weaning and finishing, and leaving positive attributes in terms of carcass quality on the table," shares Backes-Belew.

What can I do?

At the end of the day, good animal husbandry and attention to nutrition requirements are what keep a herd productive and profitable. Although most of fetal growth occurs in the third trimester, a fetus' ability to reach the third trimester is dependent on the previous trimesters. Backes-Belew points out that a fetus' ability to perform once it is born is a direct result of fetal programming in the beginning stages of development.

Producers are able to actively utilize fetal programming strategies in many ways, but it all comes back to the basics. Backes-Belew says producers can ensure proper maintenance of calf development by keeping an eye on the cow's body condition score throughout pregnancy.

"It is important to provide the right kinds of nutrients and the right amount of supplements, such as vitamins, minerals and protein," she says. "There are many products and resources to help you develop a nutrition program that fits your herd."

Further supporting this statement, Hawkins confirms, "Nutritionally, a producer can better utilize their forage resource and supplement according to the stage of production of that female instead of using the shotgun approach of feeding cows that are in different stages of production. A targeted nutrition approach to stage of herd production is much more advantageous."

What you need to know

The future performance of the fetus, as well as the cow's future reproductive ability, relies on a quality nutrition program. "Lack of nutrition as a fetus develops can impact growth, fertility, carcass merit and organ development once a calf hits the ground," Backes-Belew says.

It is apparent through fetal programming research that producers must provide adequate protein, energy and mineral supplements to their herds. While there are many unanswered questions regarding fetal programming, the common denominator in most studies is this: Managing nutritional resources and being considerate of maternal environment during gestation can help improve a calf's future performance and overall health.

More information about fetal programming and the first trimester of gestation can be found in the August and October issues of *Hereford World*. In future issues of *Hereford World*, learn about the effects of fetal programming in the third trimester of pregnancy. HW

Series Recap: Fetal Programming in the first trimester

Previous articles in the *Hereford World* discussed fetal programming and why the first trimester of pregnancy is important, with the October 2020 article offering insight as to how fetal programming in the first trimester affects genes.

The first trimester of pregnancy is essential for fetal development because the placenta forms and develops. While the embryo and fetus are very small in the first trimester, they still require a large amount of nutrients for placental development. As the placenta develops, the fetus attaches to it and forms blood vessels. The fetus feeds from and receives nutrients for growth from these blood vessels.

In addition to placental development in the first trimester, limbs and organs begin to form and grow. If these tissues do not develop properly, the calf's health at birth could be compromised. However, maintaining cows properly and keeping an eye on body condition score ensures a healthy maternal environment, thus leading to the healthy development of the fetus. HW