Fetal Programming Series

Achieving Replacement Reproductivity

Potential starts before calves are born.

by ***Grace Vehige***

Photo by Grace Vehige

Producers know cow and heifer reproductive ability is key to herd profitability and that adequate nutrition is essential to achieving reproductive efficiency in replacement heifers. They also understand proper nutrition is critical in meeting the protein, energy and trace mineral requirements necessary for the reproductive process to occur.

Until recent years, producers typically focused on the nutrition of a calf's dam or replacement candidates themselves, especially after weaning. Now, more are learning about the impact dam nutrition has on heifers' reproductive potential before they're born.

The concept of fetal programming in cows, also known as developmental programming, is that a maternal stimulus or insult at a critical period in fetal development has long term effects on the offspring.

Any stressor, including inadequate cattle nutrition can cause DNA methylation in the developing fetus, according to a Purina factsheet, "Cattle Fetal Programming 101." DNA methylation is a mechanism cells use to control gene expression. The DNA can't change but DNA methylation can cause DNA activity to change, which can change gene expression.

"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, such as reproduction," says Doug Hawkins, technical support specialist with Purina.

Attention to fetal programming, which involves the nutritional needs of both the female and the fetus, is of equal importance to herd productivity.

"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," Hawkins explains.

Hawkins emphasizes nutrition can influence how genes are expressed, both positively and negatively, which can be passed on through generations. With that in mind, producers who plan to keep or purchase replacement females should consider the nutrition supplied to the dam of the replacement female.

Identifying strengths and weaknesses

"Producers need to start with a goal in mind and then use the proper nutrition and management tools to reach those goals — goals such as optimum weight at breeding and calving," Hawkins says. "The goal is always to provide adequate nutrition year-round … There are definitely breed and environmental situations to consider, but these are goals that producers should strive to obtain."

Even when weighing cows to monitor weight gain or loss is impractical, Hawkins notes that monitoring cow body condition is an effective and viable tool. He says the optimum body condition score (BCS) is 6. Cows that are too thin or too fat can have reproductive issues.

"Maintaining a year-round BCS 6 through supplementation can lead to increased reproductive efficiency, heavier weaning weights and also increased longevity of the cow," Hawkins explains.

By the way, when choosing a supplementation program, Hawkins advises considering factors including the quality and quantity of forage used and the body condition of the female.

According to Hawkins, producers commonly overlook cows' energy requirements. Sometimes, that stems from not knowing the energy levels of the forage and feedstuffs they're using. He explains understanding the amount of energy in forages and feedstuffs can be achieved using either Total Digestible Nutrients (TDN) or the Mcal system.

Investing in a nutrition program

Utilizing a targeted nutrition approach is an effective way to set the stage for efficient herd production. If unsure where to begin, set goals for yourself and your herd, perhaps beginning with a shortened calving season.

According to Hawkins, the shorter the calving season, the more economical and efficient the herd becomes. "Decisions such as nutrition, herd health, management practices and marketing become more focused, which can lead to profitability," he says. **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*.

A review of the third trimester

"A female's nutrient requirements will increase significantly during the last trimester of pregnancy and through lactation. The first-calf heifer will have even higher nutrient demands because she is also growing," Hawkins says. "It is important to make sure that the first-calf heifer's increased nutrient demand is fulfilled to meet her requirements until her first calf is weaned."

Not only does the female's third-trimester nutrition affect her overall and reproductive health, but it is also a key time for fetal development.

"The third trimester is the time period where 75% of the fetal growth occurs," says Elizabeth Backes-Belew, nutritionist with Purina Beef Technical Solutions.

During the third trimester, the fetus undergoes the final stages of lung development; if not properly developed, the calf is at risk for asthma and other respiratory complications upon birth.

Aside from the fetus' third-trimester developments, Backes-Belew says, "Colostrum is produced in the last trimester, so keeping the cow in good shape during this time period helps produce better colostrum for the calf." **HW**