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**Gestational Management Important for Calf Productivity**

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Proper nutrition during pregnancy is not only critical for human mothers, but it is also important for bovine mothers. Nutritional management of pregnant beef cows and heifers has long-term implications for the performance of their calves. Developmental or fetal programming is the idea that the maternal environment provided to the fetus affects fetal development and even has long-term effects on the offspring. Environmental factors like inadequate nutrition during gestation can cause an embryonic or fetal calf's genes to express themselves differently and affect the calf long after it is born.

Approximately 75% of the growth of a calf fetus occurs during the last two months of gestation. Accordingly, there is often a focus on providing good nutrition to pregnant cattle during late gestation to support rapid fetal growth and prepare for lactation. It is also tempting to let dry, pregnant cows, in particular, “rough it” on low quantities and qualities of forages and supplemental feeds to try to save on herd nutrition program expenditures. Yet providing these cows and heifers with good nutrition during each trimester of gestation is crucial. Just as an obstetrician encourages an expectant human to maintain healthy eating habits throughout pregnancy, cow-calf managers should provide good nutrition to expectant cattle throughout their gestation or risk having negative impacts on the developing embryo or fetus.

Important developmental events occur throughout gestation. Even during early embryonic development, when nutrient requirements for embryonic growth are small, changes in tissue composition can occur and affect future organ system growth. A fetal heartbeat is detectable as early as 21 days after ovulation in beef animals. As early as 25 days into a pregnancy, limb development occurs. This is followed by development in sequence of the pancreas, liver, adrenals, lungs, thyroid, spleen, brain, thymus, and kidneys. Testicles or ovaries are being developed at one and a half to two months of pregnancy. Growth timing and rate for these tissues varies, so the timing of less than optimal maternal nutrition during determines what tissues are compromised. Nutrient deficiency in early gestation cattle appears to affect placental development. Likewise, nutrient deficiency in later gestation likely affects organ system development and nutrient use by tissues important for growth and reproduction.

Beyond producing a live calf, it is desirable that each animal in the brood herd produce healthy and productive calves each year. To accomplish this, sufficient dam nutrition is needed for proper placental development, organ differentiation and growth, and muscle cell growth and proliferation of the fetus. Calves out of undernourished dams may have compromised health at birth, have poor growth and productivity, and develop significant diseases later in life. Maternal diet can influence calf death loss, intestinal function, respiratory function, reproductive function, growth rate, fat deposition, muscle fiber

diameter, and meat quality. Beyond the fetal programming affects, maternal nutrition also affects colostrum yield, in turn affecting newborn calf health.

Maternal nutrition impacts muscle fiber number and size in the developing fetus. Improving skeletal muscle growth is a common goal in beef cattle development and something that directly affects calf value. The number of skeletal muscle fibers a calf has does not increase after birth. Therefore, skeletal muscle development during gestation is critical to future muscle mass. Because skeletal muscle has a lower priority to receive nutrients than brain or heart tissues, it is especially vulnerable to nutrient restriction.

In addition, intramuscular fat cell number and collagen content are affected in the fetus by dam nutrition. This has implications for marbling and palatability of beef from the resulting calves. Providing increased late-gestation supplementation to the dam has been shown to increase marbling scores in steer offspring.

Management strategies to alleviate negative effects of poor nutrition in the gestating beef female can include supplementation to correct nutrient deficiencies, early weaning to reduce lactation demands, and selection of more ideal timings for breeding and calving to better fit cattle nutrient demands to forage resources. Close monitoring of cow and heifer body condition is always important for assessing nutritional status of the breeding herd. Avoiding sharp declines in body condition or managing for higher body condition prior to exposure to limited nutrients are some approaches to consider.

More research is needed to determine the detailed effects of specific nutrient deficiencies on the developing embryo, fetus, and later calf. However, knowing that good maternal nutrition throughout gestation is essential can help drive management decisions to produce healthier, more productive calves. For more information about beef cattle production, contact an office of the Mississippi State University Extension Service.