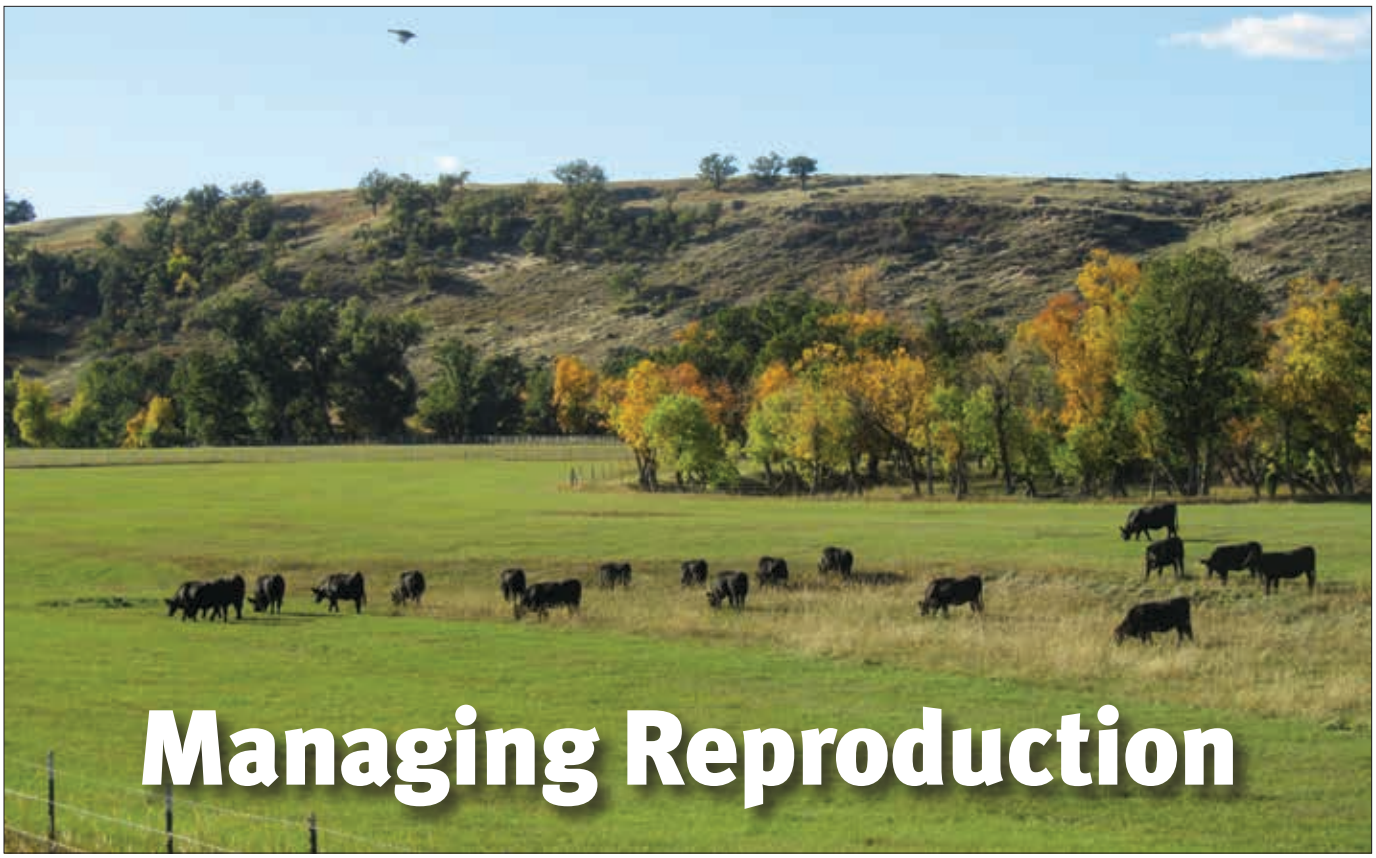

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Managing Reproduction

Nutrition and stress impact reproductive success.

by ***Katy Holdener,*** *American Angus Association, &* ***Troy Smith,*** *field editor*

Cattle need and want salt. A cow brute will seek and consume the salt needed to satisfy her craving. However, she does not possess the same "nutritional wisdom" regarding other minerals she needs in her diet, according to University of Florida animal scientist John Arthington. A researcher who studies the interactions between nutrition and physiology of cattle, Arthington talked about mineral supplementation during the Applied Reproductive Strategies in Beef Cattle (ARSBC) symposium Aug. 29-30, in Manhattan, Kan.

Focusing on cattle consuming diets consisting of grazed forages, Arthington said trace minerals are often lacking in forages, especially warm-season grasses, in various parts of the country. Minerals also may not be present in balance, such that an excess of one mineral presents an antagonism that inhibits absorption or utilization of a different mineral.

Arthington said that, in most situations, the effects of mineral nutrition on reproduction are secondary to impacts on other physiological functions. Deficiencies in macrominerals (calcium, phosphorus, potassium, magnesium and sulfur) most often present themselves as depressed growth, diminished nerve function and disruption of the body's acid/base balance. However, three microminerals, or trace elements (zinc, selenium and copper), are commonly associated with reproductive function in beef cattle.

"Of the macrominerals, phosphorus has received the most attention when considering reproductive responses of grazed beef cattle," said Arthington, noting that phosphorus has more biological functions than any other mineral and typically contributes most to the total cost of mineral supplements.

"Among microminerals, zinc, selenium and copper are most important to reproduction, but also for any process that requires rapid cell division and development," stated Arthington.

PHOTOS BY TROY SMITH

►**"Among microminerals, zinc, selenium and copper are most important to reproduction, but also for any process that requires rapid cell division and development," stated University of Florida researcher John Arthington.**

Supplementing the diets of young, developing bulls with relatively high levels of zinc is common, added Arthington, because the micromineral is essential to testicular development and spermatogenesis. Adequate

dietary zinc also is important to maintaining hoof integrity.

Arthington explained that copper and selenium are essential to the production of multiple enzymes linked to reproduction, immune function and growth. They are often the most limited trace minerals in forages, and both are antagonized by sulfur. He emphasized that the most common type of mineral deficiency is a secondary deficiency where, despite adequate mineral intake, the deficiency results from the antagonistic influence of another element.

Explaining how mineral antagonisms have fooled people in the past, Arthington said, "It has been said that copper deficiency leads to reproductive failure, but it's typically molybdenum and sulfur that are causing the problem, but we supplement copper to overcome it."

The selenium content of forages is low in many parts of the United States, and Arthington says many well-managed herds wean calves that are marginally deficient. Selenium deficiency in calves is linked with white-muscle disease, and Arthington also believes that a deficiency in gestating cows may be connected with "weak calf" syndrome.

Arthington said the debate continues regarding whether "organic" or chelated mineral supplements are superior to inorganic minerals. He said research has not necessarily supported claims that chelated minerals enhance reproductive performance among mature cows. However, Arthington says, young, stressed cattle may exhibit a positive response to chelated minerals.

— by Troy Smith

Minimize three main types of stress

The definition of stress is the sum of reactions that influence an animal's homeostasis, explained Reinaldo Cooke, associate professor at Oregon State University. Cooke detailed the implications stress may have on female reproductive systems.

Cooke began by defining homeostasis as any action that takes you outside your comfort zone. Anything that takes you away from a comfort zone is a type of stressor. He described three main types of stress:

- Physiologic stress is when an animal gets sick or catches a disease.
- Physical stress is applied if an animal receives an injury.
- Psychological stress happens when an animal senses fear.

When the body encounters stress, two systems are engaged, he said. Sympathetic nervous system and hypothalamic-pituitary-adrenal (HPA) responses are engaged to bring the body back into homeostasis.

As soon as an animal is faced with stress, the body begins to produce cortisol at a higher rate than it produces epinephrine.

"Cortisol goes up and stays up much longer than levels of epinephrine," said Cooke. "It is the main link between stress and productivity in livestock."

While the body is producing high levels of cortisol during stress, it is also releasing key elements like creatine and sugars, which can be detrimental to the animal's productivity, specifically the reproductive system's productivity. With increased levels of cortisol, there is decreased follicle growth and estrogen levels, which can lead to a change in ovulation success, he said.

"There is a direct connection between cortisol levels and pregnancy/conception rates," said Cooke. "We must understand and recognize the three stressors and find an alternative to alleviate the stressors."

Cooke said that nutrition could be considered a physiological stressor. If heifers are born on pasture and are moved to drylot systems after weaning, they experience a stressful change of environment. The pasture was considered their comfort zone, and they left homeostasis when they were moved to a crowded drylot pen.

"You must give their bodies a chance to adapt to the changes before breeding," said Cooke.

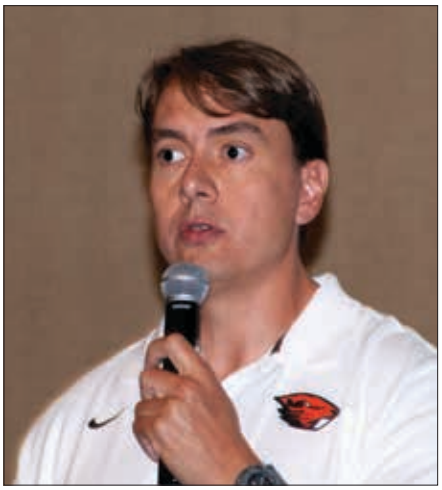
Pregnancy rates fell after the heifers were bred in a drylot facility and turned out to pasture two weeks later.

"The animals didn't know how to graze, and their average daily gain dropped significantly," said Cooke.

Relocating cattle between Day 7 and Day 21 can be detrimental to their pregnancy, he continued. Producers should consider avoiding major changes in diet and environment directly after breeding.

Cooke suggested utilizing trace minerals, sugars, amino acids and progesterone to alleviate nutritional stressors. Aim to keep body conditions healthy, not overly conditioned or too thin to avoid unnecessary stressors.

Temperament can be another factor in determining successful reproductive systems, he continued.



►**"There is a direct connection between cortisol levels and pregnancy conception rates," said Reinaldo Cooke, associate professor at Oregon State University. "We must understand and recognize the three stressors and find an alternative to alleviate the stressors."**

"Cows act excited or aggressive around humans because they're not comfortable around us," Cooke said. "They are trying to run away or run over us as a fight-or-flight response. Fear is a psychological stress."

By studying and classifying females by temperament, Cooke's research found that stressed or nervous cows weaned lighter calves. Weaning lighter calves led to a $52 decrease per cow, he said.

"Stress has direct implications on reproduction success," Cooke said.

— by Katy Holdener

Arthington and Cooke spoke during Tuesday's ARSBC session focused on nutritional components. Visit the Newsroom at *www.appliedreprostrategies.com,* which features comprehensive coverage of the symposium, to view their PowerPoints, to read the proceedings or to listen to the presentations. Compiled by the *Angus Journal* editorial team, the site is made possible through sponsorship by the Beef Reproduction Task Force. To access video of the presentations, visit the Beef Reproduction Task Force page on Facebook.

The 2017 ARSBC Symposium was hosted by the Task Force and Kansas State University Research & Extension. Next year's symposium will be Aug. 29-30 in Ruidoso, N.M.

Editor's Note: *Katy Holdener is the American Angus Association's digital content manager. Troy Smith is a cattleman and freelance writer from Sargent, Neb.*