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Beef Cattle Research Update

United States Department of Agriculture, University of Arkansas, and County Governments Cooperating

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Effect of Supplementation of Developing Replacement Heifers With Monensin or Bambermycins on Gain and Pregnancy Rates

Beck, P.A. et al., University of Arkansas, Division of Agriculture, Department of Animal Science

Professional Animal Scientist 32:619-626 (October 2016)

Medicated feed additives (ionophores), such as lasalocid, monensin and bambermycins, have been used for years to effectively increase body weight gain of growing cattle on pasture or fed hay. Replacement heifer development is an expensive endeavor with lifetime implications on productivity of the cowherd. To optimize production and lifetime profitability, heifers should be bred at 15 months of age to calve at 24 months of age. Furthermore, heifers that calve early in the calving season tend to calve early in subsequent calving seasons, which may have effects on the ability to get primiparous cows to rebreed with their second calf within a short subsequent breeding season.

- Spring-born crossbred heifers (average body weight = 458 pounds; average age = 231 days) and fall-born (average body weight = 495 pounds; age = 276 days) were allotted to treatments and grazed nontoxic tall fescue for 188 days or grazed bermudagrass pastures and tall fescue for 161 days.
- Results indicate that medicated feed additives, specifically monensin and bambermycins, improve the growth performance of heifers grazing bermudagrass or tall fescue pastures when offered in a hand-fed supplement. The increase in growth performance resulted in heavier body weight at puberty, even though there were no improvements in puberty rates, reproductive tract scores or pregnancy rates.
- Heifers fed monensin had sparing of ruminal protein resulting in more efficient protein utilization and enhanced performance. Heifers fed monensin and bambermycin had improved energy balance from these growth promoting technologies. The increased body weight achieved from using monensin and bambermycin can provide economic advantages for beef production even though reproductive development was unaffected.

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Temperature, Relative Humidity and Dew Point of Six Commercial Trailer Compartments During Summer Transportations of Beef Calves in the Mid-South

Troxel, T. R. et al., University of Arkansas, Division of Agriculture, Department of Animal Science
Professional Animal Scientist 32:461-469 (August 2016)

Cow-calf producers are located throughout the United States with over 24 million (71.7 percent) calves born west and 9.7 million (28.3 percent) born east of the Mississippi River. Thus, the cattle industry relies on commercial truck carriers to transport cattle from cow-calf operations to backgrounding facilities or to feedlots, which are concentrated in the Great Plains.

Transporting cattle can affect shrink or body weight loss associated with loss of urine, feces, body fluid and tissue. Increased shrink is associated with reduced calf health and performance. Temperature during and duration of transport have a multiplicative effect because shrink increases most rapidly in cattle transported for both longer duration and at higher ambient temperature. The objective of this study was to determine whether temperature, relative humidity, dew point and temperature-relative humidity index differed among six compartments of a commercial trailer while transporting beef calves during the summer within the Mid-South region.

- Differences existed in the microenvironment within a commercial cattle trailer's compartments during the summer in the Mid-South as it relates to relative humidity, dew point, percentage of time exposed to greater temperature-humidity index and hourly variation in climate conditions. These differences in trailer compartment environments could affect the risk of dehydration and quantity of weight lost during transport.
- Further study is needed in the Mid-South region of the United States to determine the effect of trailer compartment microenvironment differences on individual cattle health during transit and subsequent performance including dry matter intake, average daily gain, mortality, morbidity and carcass traits. Results of cattle transportation research may lead to improved hauling practices and trailer designs that improve cattle health, welfare and performance.

Subacute Ruminal Acidosis Reduces Sperm Quality in Beef Bulls

Callaghan, M. J., et al., University of Adelaide, Adelaide, Australia, University of Nottingham, UK
Journal of Animal Science 94:3215-3228 (August 2016)

Breeding bulls are commonly fed high-energy diets before sale, generally in the form of grain. These diets previously have been shown to negatively affect sperm quality in bulls. Elevation of testicular temperature decreases both the efficiency of sperm production and sperm viability. However, anecdotal evidence from veterinary practitioners and semen morphology laboratories suggests that sperm production can be affected early in the sale preparation process, before fat deposition occurs. The rapid introduction of diets containing readily fermentable carbohydrates may precipitate ruminal acidosis, suggesting that the effect on sperm quality may be associated with either subacute ruminal acidosis or acute ruminal acidosis.

- Bulls were allowed unrestricted access to hay and grain for 125 days before inducing a challenge to mimic subacute ruminal acidosis. After the challenge, semen was then collected every third day for a period of 7 weeks and then once weekly until 12 weeks.
- Percent normal sperm decreased in bulls after the challenge period and continued to remain lower on completion of the study at 88 days after challenge to mimic subacute ruminal acidosis. There was a corresponding increase in sperm defects commencing from 16 days after challenge.
- There were associative negative effects of the subacute ruminal acidosis challenge causing the disruption of spermatogenesis and sperm development. The reduction after the challenge was sufficient to preclude the use of these bulls from single sire mating or for the collection of semen for freezing for a period of at least 90 days.
- The study findings have significant economic and practical implications for the bull breeding industry where current management practices may heighten the risk of a reduction in bull fertility, such that bulls are unable to be sold as viable breeding units or cause a reduction in herd fertility during the breeding season.

Barriers to Global Implementation of Current and Development of New Performance-Enhancing Technologies in Meat Production

Dilger, A. C. et al., University of Illinois and Zoetis, Inc.

Animal Frontiers 6:50-55 (October 2016)

In the next 40 years, the world population is predicted to increase 40 to 50 percent, resulting in an increased demand for food, including meat. Additionally, as disposable incomes increase globally, protein from meat consumption is also increasing. Currently, livestock systems occupy approximately 30 percent of the earth's ice-free land. Given that land availability for agriculture will be in flux due to climate change and population growth, increasing land devoted to crop production for livestock and to livestock themselves for grazing is unlikely, and available land may in fact decrease. This increased demand for protein from meat will need to be met by improved production efficiencies in livestock systems. Therefore, the need for technology to increase the efficiency of meat production from traditional livestock species and nontraditional animals used for meat production cannot be disputed.

- In terms of meat production and technology implementation, vast differences exist among countries of the world. Global differences in crop yields are large and directly related to economic development. Crop yields among the countries with the greatest amount of gross domestic product (GDP) are more than 300 percent greater than those with the least amount of GDP. These differences also likely reflect differences in availability of critical inputs and natural resources such as consistent water, irrigation and affordable "modern" seed and fertilizers. While these differences do not speak directly to meat protein production, it can be assumed that yield difference in meat from livestock follows the same trends.

- Given the improved yield and efficiency advantages of meat production in developed over developing nations, it might be easy to assume that global efficiency issues could be solved simply by spreading current technologies to developing nations. However, meat production in developed nations can and should also be improved by utilizing performance-enhancing technologies that not only increase production efficiency and profitability of livestock operations but that also improve animal health and well-being, enhance the quality and nutrition of meat products and reduce the negative impacts of meat production on the environment and natural resources.

- The implementation of technology in agriculture has resulted in vast improvements in agricultural yields in developed nations. According to USDA agricultural productivity estimates in 2011, total U.S. agricultural production was more than 2.5 times its 1948 level with inputs growing by a mere 4 percent between 1948 and 2011. Beef production has also made positive gains though they are not as sizeable as those of pork production. Beef producers in the U.S. produced 1.8 metric tons more beef in 2012 compared with 1970, despite having more than 39 million fewer cows. The amount of beef produced per cow has increased 98 kilograms (50 percent increase) from 1970 to 2012.

- Given that today's consumers have little experience with modern agriculture, it is not surprising that they question everything about food production, including the use of modern technology, and are vulnerable to social misinformation about technology. Consumers are skeptical about the benefits of modern food production and distrustful of its techniques.

- Underlying the skepticism and distrust of the consuming public, however, is a shift in the perception and comfort of consumers regarding risk. In order for a current or new technology to be considered "safe," it must present effectively no risk to consumers, animals and the environment. This "zero tolerance" view of risk, where any risk, no matter how small or remote, is unacceptable, has altered the structure and process for the approval of new technologies by regulatory agencies.

- In some parts of the world, this "precautionary principle" has even been extended to insulate producers of livestock and other foods from competition as new or different technologies would pose a "perceived" risk to traditional livelihoods. An

additional complication in this new and changing view of risk is that our analytical capability to detect the presence of compounds is currently outpacing our scientific ability to analyze what risk they pose.

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- Development and implementation of new technologies to enhance animal performance must address these consumer desires to lower barriers for the implementation of these technologies.