BEEF CATTLE RESEARCH UPDATE

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Effect of Rapid or Gradual Grain Adaptation on Subacute Acidosis by Feedlot Cattle

Adaptation of feedlot cattle from high-forage to high-concentrate diets causes marked changes in the ruminal environment and time is required to establish a stable microbial population. An abrupt change from a high-forage to a high-concentrate diet can result in acute or subacute acidosis. In acute acidosis, an animal may become sick to the point of death, but subacute acidosis is much more difficult to recognize. The major manifestation of subacute acidosis is reduced feed intake with a corresponding reduction in performance. To minimize the risk of acidosis, cattle feeders have traditionally increased dietary concentrate in an incremental manner by feeding a series of diets with sequentially increasing levels of grain over 3 to 4 weeks. Rapidly adapting cattle to grain is desirable because daily gain and feed efficiency are typically improved. However, more rapid adaptation to grain may increase the incidence of acidosis.

Canadian researchers[1] used twelve crossbred heifers (845 lbs) to determine whether gradual adaptation to a high-grain diet modulates ruminal pH, feed intake and ruminal fermentation patterns to a greater extent than rapid adaptation to a high-grain feedlot diet. Dietary transition from 40 to 90% concentrate (DM basis) was accomplished either over 3 days using one intermediate diet of 65% concentrate (rapid adaptation) or over 15 days using five intermediate diets (gradual adaptation). Daily feed intake and ruminal pH were monitored for 20 days. Ruminal pH was monitored continuously for 23 hours of each day using ruminal electrodes.

In this study, adaptation method did not affect dry matter intake or day-to-day variation in intake. In addition, few ruminal pH measurements were affected by rapid vs. gradual adaptation to a high-concentrate diet. However, the variability of most pH values (daily mean, minimum and maximum pH, and daily durations of pH less than 6.2, 5.6 and 5.2) was far greater for rapidly adapted than gradually adapted heifers. This increased variability represents a greater opportunity for acidosis to occur in some individuals. A range of individual responses to grain challenge was observed in this study. The objective of high-grain adaptation programs in feedlots is to minimize or prevent acidosis, which requires that management be tailored to the most susceptible individuals. Although data in this study suggest that most cattle can be readily adapted to high-grain diets, minimizing acidosis in the most susceptible individuals requires decreasing the rate of grain adaptation for the entire group.

Influence of Creep Feeding & Protein Level on Maternal Performance of Replacement Heifers

Many research trials have shown that creep feeding nursing calves generally increases weaning weight (frequently, not economically), but creep feeding negatively influences subsequent maternal performance of heifers (depresses future milk production, calf weaning weight, and lifetime productivity). Illinois researchers[2] recently looked at the effect of creep feeding and creep feed crude protein level on the performance and first lactation milk production of replacement beef heifers. A group of 102 crossbred cows (Simmental X Angus) were divided into three treatment groups: no creep (NC), 14% crude protein creep (14C), and an 18% crude protein creep (18C). The calves were 132 days of age at the initiation of creep feeding and were offered creep ad libitum for 84 days until weaning at 216 day of age.

Creep feeding increased heifer weaning weights by 49 and 61 lbs over no creep, respectively for 14C and 18C treatments. Feed conversion (lb creep/lb of added gain over NC) was significantly better for 18C (7.7) than 14C (10.0). At breeding, creeps fed heifers were still heavier than no creep feed heifers (32 lb for 14C and 33 lb for 18C). There were no differences between heifer creep

treatments for pregnancy rate, calving rate, weaning rate, calf birth weight, or calving ease. Research has shown that critical mammary development occurs between 3 months of age and puberty. High energy intake during this prepubertal growth period increases fat deposition which impairs mammary development. In this study, creep-fed heifers were significantly fatter at breeding than non-creep fed heifers and produced significantly less milk at all periods of the first lactation. Providing additional dietary protein in the creep feed did improve milk production during the first half of lactation (13.5 vs 11.7 lb/day for 18C vs 14C at 108 days postpartum), yet total production over 210 days was not different because of creep protein content.

In summary, creep feeding increased pre-weaning growth. Pre-weaning feeding management did not influence subsequent reproductive efficiency. However, creep feeding did depress first lactation milk production. Increasing the protein content of the creep feed may prevent some of the milk production loss.

Effects of Trace Mineral Source on Cow Productivity

Florida researchers[3] recently used 160 Braford cows over three years to study inorganic vs organic sources of cobalt, copper, manganese, and zinc. The inorganic sources of these trace minerals were cobalt carbonate, copper sulfate, manganese oxide, and zinc oxide. For the organic trace minerals, Zinpro Corporation's Availa-4® was used. In general trace minerals were fed at two to three times the level of current NRC recommendations. In this study, cow body weight, cow body condition score, and calf weaning weight were not effected by mineral source. Three- and four-year old cows on organic minerals had shorter calving intervals in year 1 (355 vs 374 days) and year 2 (374 vs 400 days) of the study and higher pregnancy rates in year 2 (89 vs 57%) and year 3 (88 vs 65%). These researchers concluded that organic minerals may improve reproductive performance in young cows, but not in mature cows.

In a recent Colorado study[4], young beef females (21 to 22 month old heifers to start with) were fed either inorganic sources or a 50/50 combination of inorganic and organic sources of copper, manganese and zinc over a two-year period. Inorganic trace minerals were supplemented in the sulfate form, whereas organic minerals were provided from Alltech's Bioplex® proteinated trace minerals. Trace minerals were fed at current NRC recommendations. Final liver copper concentrations and final liver manganese concentrations were greater in females receiving organic minerals. No differences in cow/calf performance or reproductive performance were noted. However, organic trace minerals appeared to increase the immune response to foreign antigens which may be beneficial if animals encounter a stressor or are exposed to disease.

Research has generally shown that organic trace minerals are more bioavailable than inorganic minerals. Research suggest that organic trace minerals may enhance the immune response or improve health above that observed with animals fed inorganic trace minerals. Thus, organic trace minerals may be of greater value when an animal is under nutritional, disease or production stress.

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[3] Arthington, J.D. and C.K. Swenson. 2004. Effects of trace minerals source and feeding method on the productivity of grazing Braford cows. Prof. Anim. Sci. 20:155-161.

[4] Ahola, J.K., D.S. Baker, P.D. Burns, J.C. Whittier, and T.E. Engle. 2005. Effects of copper, zinc, and manganese source on mineral status, reproduction, immunity, and calf performance in young beef females over a two-year period. Prof. Anim. Sci. 21:297-304.