BEEF CATTLE RESEARCH UPDATE

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Phase Feeding of Protein for Feedlot Cattle

Feedlots are facing increased concerns because of environmental issues. Environmental issues are related to nutrient management, runoff nutrients, odor, and aerial emissions of ammonia, methane, and dust[1]. The primary environmental issues faced by the cattle feeding industry stem primarily from nitrogen and phosphorus delivered to the yard as feed that is subsequently deposited on the pen surface as manure[2]. Manure nitrogen (N) contributes mainly to air nitrogen concerns since much of the nitrogen is volatized from the pen surface as ammonia and other nitrogenous gases, whereas, manure phosphorus (P) contributes mainly to water quality issues. Decreasing dietary nitrogen inputs in feedlots could potentially decrease environmental concerns related to air and water quality. In addition, decreasing dietary protein content may also decrease dietary phosphorus since plant supplemental protein sources usually contain high phosphorus levels (cottonseed meal contains ~1.2% P and soybean meal contains ~0.7% P on a dry matter basis).

The nitrogen requirements for feedlot cattle change during the feeding period, being greater initially when rates of protein deposition are high and diminishing during the later stages of finishing. Recent research[3] conducted at the Texas Agricultural Experiment Station near Bushland, TX evaluated the effect of decreasing crude protein concentrations as time on feed increases (phase feeding) on performance, blood urea nitrogen, manure N:P ratio, and carcass characteristics of feedlot steers in two experiments. In Experiment 1, 45 crossbred steers (initial weight of 931 lb) were individually fed a diet formulated to contain 13% crude protein for 62 days. Supplemental protein was provided from equal amounts of N provided by urea and cottonseed meal. On day 63 (approximately half of feeding period), dietary crude protein was maintained at 13% or reduced to 11.5% (removed equal proportions of N from urea and cottonseed meal) or 10% (all supplemental N was removed) until slaughter. Reducing the dietary protein content reduced the dietary P content from 0.34 to 0.30%. In Experiment 2, two pen-fed trials were conducted using 184 (initial weight of 893 lb) and 162 (initial weight of 752 lb) crossbred steers. All steers were fed a 13% crude protein diet until reaching approximately 1049 lb (estimate of halfway point of feeding period). As each pen reached an average body weigh of 1049 lb, dietary protein was maintained at 13% or reduced to 11.5 or 10%. Supplemental protein was provided as previously described for experiment 1. Reducing the dietary protein content reduced the dietary P content from 0.31 to 0.28%.

Reducing dietary crude protein concentration did not affect feedlot performance in either experiment. In Experiment 1, carcass characteristics were not affected by dietary protein. In Experiment 2, fat thickness was greater for cattle fed the 11.5% protein diet compared with either 13 or 10% protein diets, whereas, carcasses from cattle fed 13% protein had greater marbling scores than steers fed the 11.5 or 10% protein diets. In Experiment 1, blood urea nitrogen (BUN) at slaughter (day 109) tended to be greater for steers fed more dietary protein (13.85, 12.08, and 10.04 mg/dL, for 13, 11.5, and 10% protein, respectively). In Experiment 2, BUN concentrations at slaughter were also greater for steers fed 13% protein compared with steers fed either 11.5 or 10% protein (8.36, 6.51, and 6.14 mg/dL, respectively). Texas Tech research[4,5] suggested that excessive N intake and N wastage would be indicated by levels of BUN greater than 5 to 8 mg/dL. The high BUN concentrations in Experiment 1 would suggest wastage of N. BUN concentrations in Experiment 2 for steers on the 13% protein diet suggest that N requirements were exceeded. Lower concentrations of BUN in animals fed lower concentrations of protein suggest less wastage of N.

In Experiment 2, manure from each pen surface was sampled for laboratory analysis at the end of each trial. No differences were observed in manure nutrient concentrations collected from the dietary protein treatments. However, the N:P ratio was increased with the 10% protein diet compared with the 11.5 or 13% treatments. A lower N:P ratio leads to P build up on cropland. These researchers proposed that the increased N:P ratio with lower protein diets suggest that deceasing the crude protein level in the diet resulted in less N being metabolized and excreted via urine. Thus, more N was excreted in the feces relative to P, causing an increase in the N:P ratio and suggesting that less N was volatilized. The increased N:P ratio could potentially reduce the need for supplemental N when this manure is applied to cropland on the basis of P needs.

In summary, reducing dietary protein to conserve nitrogen during the final stages of the finishing phase of feedlot cattle could decrease N excretion into the environment without reducing performance. Reducing dietary protein will also likely reduce P excretion since protein supplements generally contain high P levels.

Bovine Respiratory Disease in Feedlot Cattle

Recently published research[6] from the U.S. Meat Animal Research Center in Clay Center, NE, characterized environmental, genetic, and economic factors influencing the incidence of bovine respiratory disease (BRD) in feedlot calves. Records from 18,112 calves representing 9 pure breeds and three composites breeds fed at the center from 1987 to 2001 were evaluated. Calves were spring-born and placed on feed at an average age of 176 days with an average initial body weight of 451 lb. Calves were fed a starter or backgrounding diet for approximately 5 weeks to become adjusted to the finishing diet. The average feeding period was 200 days.

The incidence of BRD varied across the 15-year span from about 5 to 44% with an average annual incidence of 17%. From 1987 to 1992, the annual incidence generally exceeded 20%. However, after 1992 the incidence did not exceed 14%. The researchers speculated that this occurred because killed vaccines were used from 1987 to 1992 as compared to modified live vaccines being used from 1993 to 2001. The incidence of BRD in this study is similar to that reported in a 1999 study[7] in which the average incidence of BRD for 520 commercial feedlots was 14.4%.

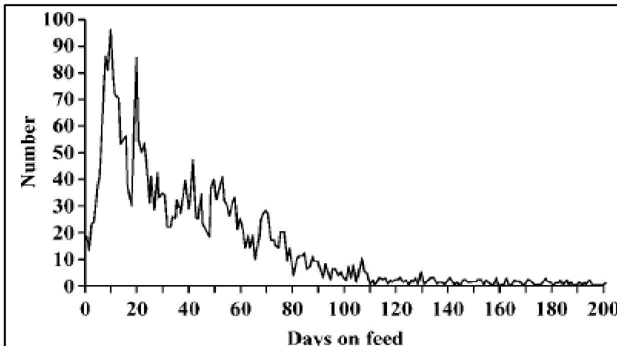

Figure 1. Number of feedlot calves observed with BRD by days on feed.

The average age when feedlot calves were treated for BRD was 200 days and ranged from 109 to 522 days. The incidence of BRD increased dramatically after calves had been on feed for 5 days and remained high until approximately 80 days on feed (Figure 1). After 110 days on feed, the number of calves observed with BRD per day was negligible. The incidence of BRD was higher in steers than heifers (20 vs 14%). The researchers suggested that castration before entry in the feedlot may predispose male calves to BRD.

Few differences in the incidence of BRD were detected among breeds. Approximately 4% of calves detected with BRD died which contributed to a total death loss of 1%. The composite breeds appeared to offer no advantages in regards to the incidence of BRD or mortality compared with the pure breeds. Estimates of heritability of resistance to BRD in the feedlot were low ranging from 0.04 to 0.08.

In this study, calves diagnosed with BRD gained about 4% slower than healthy calves (2.09 vs 2.18 lb/day) over the entire 200 day feeding period. Economic loss associated with lower gains and treatment cost for BRD infection in a 1,000 cattle feedlot was estimated as $13.90 per animal, not including labor and associated handling costs.

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