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## 2003 Beef Research Report Summary

Iowa State University

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# 2003 Beef Research Report Summary

## **Abstract**

Abstracts of all articles included in the 2003 Beef Research Report.

## **Disciplines**

Agriculture | Animal Sciences

## **Body Composition Changes in Bulls from Weaning to Yearling Part I – Muscle, Waste Fat and Taste Fat Deposition**

A. S. Leaflet R1822

Gene H. Rouse, professor of animal science; Doyle E. Wilson, professor emeritus; J. R. Tait, graduate student;  
Mike Anderson, graduate student and Abebe Hassen, associate scientist

### **Summary**

These results suggest how muscle, subcutaneous fat and intramuscular fat are deposited from weaning to yearling. How might these results be explained?

- Tissue maturity - muscle matures earlier than fat in the growth process and has nutrient priority over fat when muscle is making maximum growth. Cattle normally make maximum growth, rate/day, when muscle is being deposited at the maximum rate. Why? Muscle has a much higher water content than fat, therefore, it requires less nutrients to deposit a pound of muscle than a pound of fat.
- 10-1 Concept - during the fattening process, 10 pounds of waste fat (subcutaneous, seam and internal fat) is deposited for each pound of taste fat, (intramuscular fat). This concept may partially explain why waste fat reaches maximum deposition after most of the muscle has been deposited and taste fat is more dependent on age than weight. There may be enough energy available for taste fat to keep ticking along each day - determined by the genetic potential for intramuscular fat.

Developing EPDs for these three independent traits: rib eye area, subcutaneous fat and intramuscular fat allows all segments of the industry to develop functional cattle and by “managing fat” fit unique consumer driven carcass targets.

## **Estimating Heritability of Percentage of Intramuscular Fat and Ribeye Area Measures By Scan Session in Angus Bulls and Heifers**

A.S. Leaflet R1823

A. Hassen, Associate Scientist; D. E. Wilson, professor of animal science and G. H. Rouse, professor of animal science

### **Summary**

The present study included 3,066 ultrasound-predicted percentage of intramuscular fat (UPFAT) and 4,502 ultrasound ribeye area (UREA) measures of bulls and heifers from the Iowa State University beef cattle breeding project. Data were collected over a four-year period between 1998 and 2001. The objective of the current study was to estimate variance components and heritability of UPFAT and UREA. Data were analyzed based on single- and multiple-trait animal models. Heritability of UPFAT increased from a minimum of 0.36 at a mean age of 37 weeks to a maximum of 0.54 at a mean age of 54 weeks. Heritability of UREA ranged from 0.30 at a mean age of 35 weeks to a maximum of 0.48 at a mean age of 50 weeks. Heritability of yearling UPFAT and UREA were 0.50 and 0.45, respectively. For the range of ages included in the present study the results suggest optimum heritability of UPFAT and UREA starting at about one year of age.

## **Estimation of Heritability and Repeatability of Ultrasound Ribeye Area Measures Using Random Regression Models**

A.S. Leaflet R1824

A. Hassen, Associate Scientist; D. E. Wilson, professor of animal science and G. H. Rouse, professor of animal science

### **Summary**

The present study included 4,653 observations from 882 Angus bulls and heifers born during the spring of 1998 to 2001. Each year cattle were scanned four to eight times for ribeye area (UREA) and other ultrasound traits, starting at a minimum age of 27 weeks. The objective of the current study was to estimate variance components, heritability,

and repeatability of UREA. Direct additive genetic variance increased from 7.11 to 19.4 cm<sup>4</sup> as measurement age increased from 27 to 62 weeks. For the same time period direct permanent environmental variance increased from 14.7 to 26.6 cm<sup>4</sup>. When averaged by four weeks intervals, heritability of UREA ranged from 0.29 to 0.39. Mean repeatability values ranged from 0.80 to 0.86. Yearling heritability and repeatability were estimated at 0.39 and 0.80, respectively. For the range of ages considered, the present results showed an optimum heritability and repeatability of UREA measures around 52 weeks through at least 62 weeks of age.

### **Heritability and Repeatability of Ultrasound Predicted Percentage of Intramuscular Fat Measures in Angus Bulls and Heifers**

A.S. Leaflet R1825

A. Hassen, Associate Scientist; D. E. Wilson, professor of animal science and G. H. Rouse, professor of animal science

#### **Summary**

The present study included repeated ultrasound-predicted percentage of intramuscular fat (UPFAT) measures from 675 Angus bulls and heifers collected over a three-year period between 1998 and 2000. Each year cattle were scanned four to six times for UPFAT and other ultrasound traits, starting at a minimum age of 28 weeks. The objective of the current study was to estimate variance components, heritability, and repeatability of UPFAT in young bulls and heifers. Heritability of UPFAT ranged from 0.32 at 28 weeks of age to a maximum of 0.53 at 63 weeks. Repeatability of UPFAT increased from a minimum of 0.60 at ages 28 to 39 weeks to a maximum of 0.80 at ages 61 to 63 weeks. Heritability and repeatability of yearling UPFAT was 0.50 and 0.71, respectively. The present results showed an optimum heritability and repeatability of UPFAT measures around 52 weeks and through at least 63 weeks of age. This suggested that differences in UPFAT measures during this period also are good measures of differences in marbling genetic potential of Angus cattle.

### **Genetic Analysis of the Iowa Beef Tenderness and Carcass Evaluation Project**

A.S. Leaflet R1826

J. A. Minick, graduate assistant; D. E. Wilson, professor of animal science and D. R. Strohbehn, professor of animal science

#### **Summary**

Steers from the Iowa Beef Tenderness and Carcass Evaluation Project were harvested and carcass data, including Warner-Bratzler shear force values, were collected. The heritability estimate of Warner-Bratzler shear force in this data set was 0.45, and the genetic correlation between tenderness and marbling score was -0.40. Steers with more marbling were more tender. Heritabilities for feed consumed per pound of gain and for feed consumed per day were 0.25 and 0.26 respectively. These traits were highly correlated with gain, but had no relationship to each other. The heritability of dressing percentage was 0.52. These preliminary estimates can be expected to change as more data are collected.

## Comparison of Ultrasound and Carcass Measures to Predict Percentage of Beef Retail Product from Four Primal Cuts –

### Final Report

A.S. Leaflet R1827

J. R. Tait, graduate assistant; G. H. Rouse, professor of animal science and  
D. E. Wilson, professor emeritus of animal science

#### Summary

The objective of this study was to determine how real-time ultrasound (RTU) measurements would compare with carcass measurements to predict the percentage of retail product from the four primals (PRP4P). Data were collected on market ready cattle (n=471). Traditional carcass measures collected were: 1) hot carcass weight (HCW), 2) 12-13<sup>th</sup> rib fat thickness (CFAT), 3) 12-13<sup>th</sup> rib ribeye area (CREA), and 4) percentage of kidney, pelvic, and heart fat (CKPH). Live animal ultrasound measures collected were: 1) scan weight (SCANWT), 2) 12-13<sup>th</sup> rib fat thickness (UFAT), 3) 12-13<sup>th</sup> rib ribeye area (UREA), 4) subcutaneous fat thickness over the termination of the *biceps femoris* in the rump (reference point) (URFAT), 5) depth of the *gluteus medius* below the reference point (URDEPTH), and 6) area of the *gluteus medius* anterior to the reference point (URAREA). A model to predict PRP4P was developed for both carcass and RTU measures. Significant measures ( $P < 0.001$ ) for the carcass data were CFAT, CREA, and CKPH with a model  $R^2 = 0.297$ . HCW was not a significant trait in the carcass data model ( $P = 0.171$ ). Significant measures ( $P < 0.001$ ) for the RTU data were SCANWT, UFAT, UREA, and URDEPTH with a model  $R^2 = 0.448$ .

## Use of Molecular Markers to Determine Parentage in Multiple Sire Pastures

A.S. Leaflet R1828

Artur J.M. Rosa, Postdoctoral Research Associate; Emilie Schafhouser, Undergraduate Student; Abebe Hassen, Associate Scientist; Gene H. Rouse, Professor of Animal Science; Doyle E. Wilson, Professor of Animal Science and James M. Reecy, Assistant Professor of Animal Science

#### Summary

The purpose of this research was to determine the parentage of animals generated by multiple sire technique. Test of paternity was performed on 63 Angus animals, belonging to 29 families within the Rhodes breeding project, using multiplexed microsatellites. Paternity was determined for 23 families. One of the two possible sires was excluded with multiple markers for 19 families and with a single marker for four families. One of the possible sires was excluded for two families but DNA was not available for the other possible sire. Thus it wasn't possible to confirm paternity. Four families had both possible sires excluded. In these six cases, it's necessary to collect blood again and redo the paternity test in order to confirm the results, especially if it's an important animal to be registered. This study demonstrated the importance of performing a paternity test in breeding populations in order to reach the maximum expected annual genetic gain especially for herds that employ multiple sires.

## **Evaluation of Individual Feed Intake, Body Composition, and Performance of Performance-Tested Angus Bulls during a 14-year Period**

A. S. Leaflet R1829

Claudio C. Ribeiro-Filho, graduate research assistant; Dan Loy, professor of animal science; Allen Trenkle, professor of animal science and Darrell Busby, field livestock specialist

### **Summary**

Two hundred fifty-five purebred Angus bulls had their performance tested by the Wardens Farm in Council Bluffs, Iowa over a 14-year period. The bulls feed intake was recorded individually, and performance and ultrasound measurements were determined. Performance and body composition data were used to estimate required feed intake by Perry and Fox (1997) model, and estimated and observed DMI were compared. Average estimated DMI was 25.84 lbs/day and average observed Dry Matter Intake (DMI) was 24.93 lbs/day. The results indicated that the model is promising in estimating feed intake of purebred Angus bulls, but a few adjustments may be needed in certain situations to increase accuracy in estimating intake of bulls.

## **Effects of Dietary Energy Density and Frame Size on Performance and Body Composition of Feedlot Steers**

A.S. Leaflet R1830

Claudio C. Ribeiro-Filho, graduate research assistant; Allen Trenkle, professor of animal science and Dan Loy, professor of animal science

### **Summary**

Thirty-six steers were sorted by frame size and individually fed diets containing 2.4, 2.7, or 3.0 Mcal of ME/kg of DM to evaluate the effects of dietary energy density and animal frame size on performance and body composition. Frame size did not have an effect on performance or body composition. Steers fed the 2.4 or 2.7 Mcal/kg diet had a higher feed intake than those fed the 3.0 Mcal/kg diet, but they were less efficient. The results indicated that steers fed the diet with higher energy concentration deposited more fat earlier and had larger ribeye area than steers fed the diets with lower energy concentration. The results also indicated that dietary energy density affects composition of gain more than average daily gain.

## **Effects of Dietary Energy Density on Diet and Nutrient Digestibility in Beef Cattle Diets**

A.S. Leaflet R1831

Claudio C. Ribeiro-Filho, graduate research assistant; Allen Trenkle, professor of animal science and Dan Loy, professor of animal science

### **Summary**

Steers were fed diets containing energy concentrations of 2.4, 2.7, or 3.0 Mcal of ME/kg of DM to evaluate nutrient and diet digestibility and to determine the existence of associative effects when feeding diets with varying forage and concentrate ratios. The steers were placed in metabolism crates for total fecal collection. Dry matter digestibility was higher for diets with greater energy density. The 2.7 Mcal/kg diet showed a small negative associative effect on digestibility and the non-fiber carbohydrate fraction was the nutrient that had an inhibition on digestion. The results indicated that diets varying in concentration of forage and concentrate may have different digestibilities and nutritional values.

## Feedlot Performance of Cattle Program Fed Supplemental Protein

A.S. Leaflet R1832

A. Trenkle, professor of animal science and K. Barrett, graduate student in animal science

### Summary

One hundred sixty eight 12 to 13 month-old steers weighing 740 lbs were allotted to 28 pens. Seven pens were allotted to each of four programs for providing supplemental protein. The programs were I: Continuous supplementation with soybean meal (12.4% crude protein), II: Continuous supplementation with urea (11.7% crude protein), III: Feeding supplemental soybean meal (12.4% crude protein) and changing to urea supplementation (11.7% crude protein) at 42 days and IV: Feeding supplemental soybean meal (12.4% crude protein), changing to urea (11.7% crude protein) at 42 days followed by decreasing the concentration of supplemental urea (10% crude protein) at 84 days. During the first 42 days, Programs I, III and IV provided adequate metabolizable protein and ruminally available nitrogen and Program II provided adequate ruminally available nitrogen but inadequate metabolizable protein. During the period from 42 to 84 days all programs provided adequate ruminally available nitrogen and metabolizable protein in excess of requirement. Metabolizable protein was provided in greater excess during the final period of 84 to 135 days by Programs I, II and III. Program IV was designed to provide ruminally available nitrogen at 80% of predicted needs during the final stage of finishing. During the final period, Program IV provided metabolizable protein in excess of requirement but less than the other three programs. Steers fed the diet containing soybean meal during the first period gained more and were more efficient than those fed urea. There were no differences in performance among programs during the second and third periods. Overall steers fed soybean meal tended to have increased gain and improved feed efficiency. These results indicate finishing steers can be fed less supplemental protein during the final stages of finishing and be fed less ruminally available nitrogen than predicted needs without affecting feedlot performance. Carcasses averaged 79% low Choice or better and were 68% yield grade 1 and 2. Other than weight, carcass measurements were not affected by the programs to furnish supplemental protein. Total feed costs were decreased by reducing supplemental protein as the steers finished, but the greatest benefit was reduction in nitrogen excretion; 5.4 and 2.5 lbs nitrogen/steer in Program IV compared with Programs I and III, respectively. The results of this experiment indicate it is possible to reduce the environmental impact of feedlot cattle on the environment by program feeding of supplemental protein.

## The Effects of Direct-fed Microbials on Feedlot Performance and Carcass Characteristics of Finishing Steers Fed Wet Corn Gluten Feed

A.S. Leaflet R1833

A. Trenkle, professor of animal science

### Summary

This experiment was conducted to evaluate the efficacy of daily feeding a live microbial preparation containing live organisms fed to finishing cattle. Additions of live organisms to the rumen are thought to improve the fermentation and overall digestion. Three strains of a lactobacillus and a propionibacterium were studied in this experiment. The study was conducted with Angus steers with an average initial weight of 625 lbs and fed a finishing diet containing on a dry basis 30% wet corn gluten feed, 60% rolled corn, 8% chopped hay and 2% supplement for 174 days. Feeding the microbial product being marketed for feeding cattle improved daily gain and feed efficiency 2.2% and 1.1%, respectively, but the differences were not statistically significant. The microbial preparation increased carcass weights 1.1% and tended to increase carcass fat. Use of different strains of lactobacillus with the propionibacterium did not improve performance or affect carcass grades. It is concluded that potential benefits of feeding the live microbial product may be somewhat less when a portion of the corn is replaced with corn gluten feed.

## **Opportunities and Challenges for Dairy Steer Production in Northwest Iowa**

**A.S. Leaflet R1834**

Beth Doran, Extension Beef Field Specialist; Ron Orth, Iowa Institute for Cooperatives and  
John Lawrence, Associate Professor of Economics and Director, Iowa Beef Center

### **Summary**

A dairy steer survey, co-sponsored by Iowa State University Extension and the Iowa Institute for Cooperatives, was mailed to 635 cattle producers in northwest Iowa to assay the potential opportunities and challenges of feeding dairy steers. Replies from 177 surveys were summarized. Thirty-seven percent cited profitability as the major reason they had fed dairy steers. In comparing beef and dairy steers, reduced feeder calf cost was cited as an advantage with dairy steers. However, market access, finished market price and feed efficiency of dairy steers rated poorer than with beef steers. The biggest challenge to dairy steer production was market access, followed by weather and increased health problems. This survey indicates that while there may be opportunities for dairy steer production in northwest Iowa, the number one impediment is restricted market access and, hence, the finished market price.

## **Effects of Grazing Management on Pasture Production and Phosphorus Content of Forage**

**(A Progress Report)**

**A.S. Leaflet R1835**

Mathew M. Haan, research assistant in animal science and sustainable agriculture; Jim Russell, professor of animal science; Wendy Powers, assistant professor of animal science; Steve Mickelson, professor of agricultural and biosystems engineering; S. I. Ahmed, postdoctoral research associate in agricultural and biosystems engineering; John Kovar, soil scientist, USDA National Soil Tilth Laboratory and Richard Schultz, professor of forestry

### **Summary**

In spring 2001, pastures were grazed at the ISU Rhodes Research and Demonstration Farm to determine the effects of grazing management on pasture productivity and phosphorus (P) content of forage. Treatments included an ungrazed control, summer hay harvest with winter stockpiled grazing, continuous stocking to a residual height of 2 inches, rotational stocking to a residual height of 2 inches, and rotational stocking to a residual height of 4 inches. Forage production was greatest in June and July, decreased in August, and had a slight rebound in September and October before going dormant in November. Phosphorus concentration of forage was at a maximum in May at 0.27% and decreased to 0.11% in November. Ungrazed paddocks had no net uptake of P during the grazing season, while forage harvest stimulated P uptake. Forage growth and P uptake in buffers were unaffected by pasture management strategies that occurred upslope.

# Effects of Grazing Management on Sediment and Phosphorus Losses in Run-off (A Progress Report)

A.S. Leaflet R1836

Mathew M. Haan, research assistant in animal science and sustainable agriculture; Jim Russell, professor of animal science; Wendy Powers, assistant professor of animal science; Steve Mickelson, professor of agricultural and biosystems engineering; S. I. Ahmed, postdoctoral research associate in agricultural and biosystems engineering; John Kovar, soil scientist, USDA National Soil Tilth Laboratory and Richard Schultz, professor of forestry

## Summary

In 2001 and 2002, pastures at the ISU Rhodes Research and Demonstration Farm were grazed to determine the effects of stocking treatment on nutrient and sediment loss from pastureland. Treatments included an ungrazed control (UG), summer hay harvest with winter stockpiled grazing (HS), continuous stocking to a residual height of 2 inches (2C), rotational stocking to a residual height of 2 inches (2R), and rotational stocking to a residual height of 4 inches (4R). At three times in 2001 (late spring, mid-summer, and fall) and four times in 2002 (early spring, late spring, mid-summer, and fall), rainfall simulations were conducted at 6 sites within each paddock and 6 sites in a buffer zone down slope from each paddock. Run-off was collected and analyzed for total sediment, total phosphorus, and dissolved phosphorus. Simultaneous to each rainfall simulation, ground cover, penetration resistance, surface roughness, slope, contents of phosphorus and moisture of the soil, and the sward height and mass of forage were measured. In years 1 (late spring 2001 through early spring 2002) and 2 (late spring 2002 through fall 2002), mean concentrations of sediment in runoff did not differ between ungrazed or grazed paddocks. Mean concentrations of total P in the run-off were greater ( $P < .05$ ) in paddocks grazed to 2 inches by continuous or rotational stocking than in paddocks that were ungrazed, grazed to 4 inches by rotational stocking or harvested as hay and grazed as stockpiled forage. In year 1, mean losses of sediment, total P, and soluble P were greater ( $P < .1$ ) from paddocks grazed to 2 inches by continuous or rotational stocking than other treatments. In year 2, mean losses of sediment and total P in paddocks grazed to 2 inches by continuous stocking and mean losses of soluble P from paddocks grazed to 2 inches by rotational stocking were greater ( $P < .05$ ) than the other treatments.

# Effects of Corn Crop Residue Grazing on Soil Physical Properties and Subsequent Soybean Production in a Corn-Soybean Crop Rotation

A.S. Leaflet R1837

Justin Clark, research assistant in animal science; Jim Russell, professor of animal science; Douglas Karlen, soil scientist, USDA–National Soil Tilth Laboratory; Darrell Busby, southwest Iowa area livestock extension specialist; Brian Peterson, USDA–Natural Resource Conservation Service; Larry Pellack, USDA–National Soil Tilth Laboratory and Dallas Maxwell, Armstrong Research Farm staff

## Summary

For three years beginning in 1999, a 96-acre field near Atlantic, Iowa was used to study the effects of corn residue grazing by beef cows on soil characteristics and soybean yields the following growing season. Each winter, cows were allowed to graze corn crop residues inside selected paddocks in four sub-fields over five monthly periods. To compare the effects of grazing, one paddock was left as an ungrazed control. At the end of grazing in the spring, soil bulk density, moisture content, and penetration resistance were measured inside and 15 ft outside twelve grazing enclosures in each paddock. Soil surface roughness, texture, and type were also measured in twelve locations in each paddock. Corn crop residues were collected for yield, cover, and composition at the initiation, middle and termination of grazing. Precipitation and soil temperature also were recorded throughout the grazing season. Each following year, soybeans were planted in replicated subfields with disking or no tillage and harvested using a combine equipped with a yield monitor and global positioning system (GPS).

Cattle grazing corn crop residue has shown no effect on soil bulk density but there has been a measurable effect on penetration resistance ( $P < 0.05$ ). There is an increase in soil surface roughness during certain periods of cattle grazing where 24% and 7% of the variation can be contributed to increase in the amount of time soil temperature is above freezing and increased 24 hour precipitation event. Cattle grazing has shown no effect on soybean plant population. There has been some effect on soybean yield where up to 38% of the variation can be contributed to soil surface roughness.

### **Rotational Grazing Demonstrations with Beef Cows on CRP Land in Adams County**

**A.S. Leaflet R1838**

Chris Nelson, Adams County extension education director; Rick Sprague, Adams County district conservationist, NRCS; Russell BreDahl, extension field specialist, beef-forage; Brian Peterson, grassland conservationist, NRCS; Bill Bartenhagen, Adams County FSA director and John Klein, NRCS project manager

#### **Summary**

Two grazing systems have been demonstrated on CRP land near Corning, Iowa annually from 1991 to 2002. This report summarizes the 2002 production data. A 13-paddock intensive-rotational grazing system and a 4-paddock rotational grazing system were established in 1991 to show economically feasible grass alternatives to row crops and CRP on steeply sloping (9-14% slope), highly-erodible land (HEL). On a 13-paddock grazing system in 2002, 23 crossbred calves nursing crossbred dams gained 2.33 pounds per head per day for 153 days. Grazing started on April 24 and ended on September 24, 2002. Total calf production per acre in 2002 was 236.65 pounds. Cows on this system gained an average of 60.64 pounds. Grazing also started on April 24 and ended on September 24 in the nearby 4-paddock system. This system produced 215.45 pounds of calf gain per acre. Calves gained an average of 2.43 pounds per head per day.

### **Intensive Rotational Grazing of Steers on Highly Erodible Land at the Adams County CRP Project, 2002**

**A.S. Leaflet R1839**

Russell BreDahl, extension field specialist, beef-forage; Chris Nelson, Adams County extension education director; Rick Sprague, Adams County district conservationist, NRCS; Brian Peterson, grassland conservationist, NRCS and John Klein, NRCS project manager

#### **Summary**

The CRP Research and Demonstration Project was organized by the Southern Iowa Forage and Livestock Committee to study alternatives to row crops on highly erodible land. Ninety-eight native southwest Iowa steers were purchased between February 5 and 18, 2002 at sale barns near Corning, IA. They were grown at the Armstrong farm near Lewis, IA until April 17 when they were delivered to the CRP project farm near Corning. The pasture included 74.4 acres divided into 34 paddocks with electrified fencing. Tall fescue and red clover were the predominant species, but the system also included approximately 11.1 acres of warm-season native grasses. Two rules guided the grazing management; 1) during each grazing cycle, graze no more than half the forage on offer when the animals began grazing the paddock, and 2) let each paddock rest approximately 30 days between grazing cycles. Ninety-seven steers were weighed on July 10, 2002. The remaining were sold on September 19, 2002. The average daily gain per steer was 2.26 lbs; higher than any other year in the 9-year history of steer grazing at the CRP project. The 97 steers gained a total of 23,581 lbs. If the rental value of the pasture with its water and fencing improvements is assumed to be \$60 per acre, the cost of gain on pasture was \$35.99 per cwt.

## Effect of Ghrelin Injection on Blood and Body Composition in Rats

A.S. Leaflet R1840

Michelle Bohan, graduate research assistant; Travis Knight, assistant scientist III of animal science; Aimee Wertz, postdoc of animal science; Allen Trenkle, distinguished professor of animal science and Donald Beitz, distinguished professor of animal science and biochemistry

### Summary

Ghrelin has been reported to cause hyperglycemia in humans and adiposity in rodents. The objective of trial one was to test the effects of ghrelin on blood and body composition in rats. The objective of trial two was to evaluate the effect of two doses of ghrelin on blood and body composition. **Trial One:** Adult male Sprague Dawley rats were administered 1 µg/rat ghrelin in 0.15 M NaCl or vehicle (0.15 M NaCl) every morning for 30 days. The terminal blood sample was analyzed for glucose, urea nitrogen, and nonesterified fatty acids concentrations. The carcasses were analyzed for total lipid and nitrogen content. Blood urea nitrogen, nonesterified fatty acids, carcass total lipid, and carcass total nitrogen concentrations were similar for the control and ghrelin groups. However, blood glucose concentration tended to be higher in the ghrelin group than in the control. Ghrelin administered at 2.4 µg/kg did not cause adiposity in rats but did tend to cause hyperglycemia. **Trial Two:** Adult male Sprague Dawley rats were administered 1 µg/rat ghrelin, 20 µg/rat ghrelin, or vehicle every morning for 30 days. The terminal blood sample was analyzed for glucose and cholesterol concentrations. The carcasses were analyzed for total lipid and nitrogen content. Carcass total nitrogen concentrations were similar for the control and ghrelin groups. Carcass percent lipid was higher in the 1 µg/rat ghrelin group ( $P = 0.04$ ). Feed intake among all three groups was the same. Blood glucose concentration, however, tended to be higher in the ghrelin groups than in the control. Blood cholesterol concentration was lower in the ghrelin treated animals. In the second trial, ghrelin injection of 1 µg/rat did cause an increase in adiposity whereas 20 µg/rat did not cause an increase in adiposity. Both ghrelin treatments tended to cause hyperglycemia in rats. In summary, ghrelin increased blood glucose concentration without changing body composition.

## Use of 25-Hydroxyvitamin D<sub>3</sub> to Improve Beef Tenderness

A.S. Leaflet R1841

Aimee E. Wertz, postdoctoral research associate; Donald C. Beitz, professor of nutritional physiology; Allen Trenkle, professor of animal science; Travis J. Knight, postdoctoral research associate; Ronald L. Horst, research physiologist National Animal Disease Center USDA-ARS; Elisabeth J. Huff-Lonergan, professor of meat science and Frederick C. Parrish, professor emeritus of meat science

### Summary

Feeding the 25-hydroxyvitamin D<sub>3</sub> (25-OH D<sub>3</sub>) metabolite of vitamin D<sub>3</sub> has been reported to improve beef tenderness and result in lower vitamin D<sub>3</sub> metabolite concentrations in meat. Because 25-OH D<sub>3</sub> remains elevated in plasma for at least 8 d subsequent to feeding, we believe that 25-OH D<sub>3</sub> can be fed as a one-time oral bolus and allow a flexible time frame for harvest with the same improvement in postmortem calcium-dependent proteolysis and beef tenderness. To test this hypothesis, 108 crossbred steers were allotted, six steers per pen to 18 pens and treatments were assigned randomly to pen. Treatments were 25-OH D<sub>3</sub> dosage (62.5 or 125 mg) and time of administration of the one-time oral bolus (4, 7, 21, or 35 d before harvest). Control steers received no 25-OH D<sub>3</sub>. Regardless of time of bolusing relative to harvest, the one-time oral bolus elevated plasma 25-OH D<sub>3</sub> concentration and it remained elevated through harvest for steers assigned to either dosages of 25-OH D<sub>3</sub>. Plasma calcium concentration, however, remained unchanged compared with that of controls, regardless of dosage or time of bolusing relative to harvest. The one-time oral bolus of 25-OH D<sub>3</sub> did not result in an improvement in tenderness as determined by Warner-Bratzler shear force or an improvement postmortem proteolysis as determined by troponin-T degradation. We conclude that a one-time oral bolus of 62.5 or 125 mg of 25-OH D<sub>3</sub> was sufficient to elevate plasma 25-OH D<sub>3</sub> concentration and maintain an elevated plasma 25-OH D<sub>3</sub> concentration for up to 35 d. The dosage of 25-OH D<sub>3</sub>, however, was insufficient to result in elevated plasma calcium and therefore did not enhance calcium-dependent proteolysis postmortem to result in beef that is more tender.