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This is the last issue of *Beef: Questions and Answers* for the 2002-03 season. Have a great summer, and be sure to send back your enclosed reader survey—we appreciate your feedback! (If you can't live without *Beef:Q&A* until next fall, be sure to visit our back issues on-line at <http://animalrangeextension.montana.edu/Articles/Beef/Main-beefqa.htm>)

John Paterson, MSU Extension Beef Specialist and newsletter editor, MSU-Bozeman
 (406) 994-3414
johnp@montana.edu

Plans in place for 2003 summer grilling program

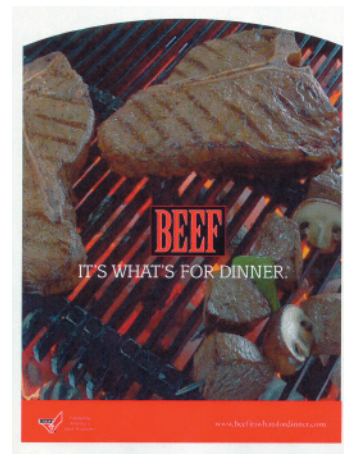
by Charlene Schuster, Executive Director, Montana Beef Council



An aggressive campaign to move more beef during summer 2003 will be conducted through the beef check-offs Summer Grilling promotion. The intent of the promotion to increase demand for all cuts of beef, including undervalued cuts from the chuck and round, is to convince grill users to grill beef more often. The majority of growth in beef grilling sales happens during non-holiday periods, when sales sometimes slip due to lack of feature support.

The integrated retail marketing program in Montana includes radio advertising, in-store merchandising and strong public relations activities. It will be conducted on behalf of the Cattlemen's Beef Board by the National Cattlemen's Beef Association and the Montana Beef Council. Extensive manufacturer and retailer tie-ins will significantly expand the campaign.

The 2003 campaign will include partnerships with several beef manufacturers, as well as companies like A1 Steak Sauce^(c), Kingsford Charcoal and Gallo Winery.



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Strong family tradition and attention to detail make Centennial Livestock unique

By John Maki, Beaverhead County Extension Agent

Describe your operation.

Over 80 years ago, Les Staudenmeyer went into the ranching business. His keen business sense, hard work and ability to take advantage of opportunities enabled Les and his family to build what is today Centennial Livestock.

Les passed away in 2001 at 103. Les's son Bill and his wife Judy, Bill's daughter Debbie and her husband Tom Tamcke and Bill's son Will and his wife Patti Jo carry on with Les's strong sense of development and diversification.

Centennial Livestock is a diversified operation raising Black Angus cattle, paint and quarter horses, wheat, malting barley, alfalfa and native hay. The ranch also includes a recreational hunting and fishing business and a very popular Ranch Cookhouse. The Ranch Cookhouse has served people from all over the world at its "authentic" sit-down-with-the-ranch-hands family style dining. The cookhouse always features ranch home-grown beef, and with the beef comes the opportunity to promote and educate people about the beef business and Montana agriculture.

The ranch contains about 60,000 acres, including a 3,000-acre farm in Dillon, a summer grazing unit in the Centennial Valley and the Cross Ranch in the Horse Prairie that provides native hay and a place to winter and calve their 2,400 Angus cows.

What have been your most effective management strategies in recent times?

Centennial Livestock takes advantage of new technology. They are continually looking for ways to improve their beef cattle production through better nutrition, by using the highest quality bulls, obtaining carcass data on their steers and using that data to help with management decisions. The beef produced on



Centennial Livestock are for the most part all natural beef. They use a good mineral nutrition program to improve immunity and reduce sickness. They feel that most calf sickness can be treated with natural remedies. Debbie admits that occasionally they have to use antibiotics to save the life of a calf, but that calf is identified and is not included in the natural beef group.

What are your biggest challenges?

Will, Patti Jo, Tom and Debbie all agreed that one of the biggest challenges is maintaining profitability. Tom said there are consumers who want their natural product and are willing to pay for it, and do pay a premium at the meat counter, but the ranch does not receive this added value.

What are the biggest challenges of the livestock industry?

Will and Tom agreed that one of the biggest challenges facing the livestock industry is trying to stay ahead of the consumer demands. The consumer wants a high quality product that is safe, wholesome and is consistent in flavor and tenderness. To provide this quality and consistency, the producer has to know what he is producing and it is sometimes difficult to get the carcass data to make the best management decisions to improve the product. Another challenge of the industry is meeting the demands placed on it by people and groups outside the industry. This is why Debbie and Patti Jo use every opportunity in their Ranch Cookhouse to educate the public on the importance of the livestock industry and that the people on the land are its best stewards. Yet another challenge is finding ways to allow young people who were raised on farms and ranches to come back to those farms and ranches.



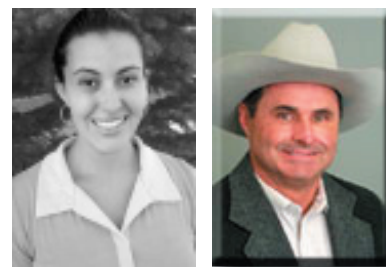
*Will Staudenmeyer,
Patti Jo
Staudenmeyer, Debbie
Tamcke and Tom
Tamcke*

Learn more about Centennial Livestock by visiting its website at: centenniallivestock.com



Prairie dogs: The eye of the storm?

by Carolyn Johnson and Jim Knight, Extension Wildlife Program, Animal and Range Sciences Department, Montana State University



Prairie dogs. Love 'em or hate 'em, everyone's got an opinion. Producers often view them as agricultural pests. Conservationists want them protected, and shooters want to, well, shoot them.

In the late 1800s and early 1900s, prairie dog populations boomed due to disturbances caused by settlers, such as overgrazing and cropland conversion. Prairie dogs were perceived as pests, and poisoning and shooting campaigns began that lasted throughout much of the 20th Century.

In the 1980s and 1990s, attitudes towards prairie dogs began to shift as preservation of the grassland ecosystem gained importance. This view shifted so much, in fact, that in 1998, the U.S. Fish and Wildlife Service received a petition requesting that the black-tailed prairie dog be protected as a threatened species under the Endangered Species Act.

The USFWS found that protection was warranted, but could not be done because other species were in more immediate need of protection. The black-tailed prairie dog still is a "candidate" species, one that receives yearly review to determine whether protection is needed.

How will it affect prairie dog management in Montana? Many Montanans feel that Montana's prairie dog populations are more than healthy, and that the petition to list is a joke. It isn't. The petition suggested that prairie dogs have beneficial or neutral effects on livestock forage. The research supporting these conclusions had been conducted in South Dakota or Colorado, but not Montana.

The highest concentrations of prairie dogs in Montana are in Phillips County. When word of the petition hit the street, many producers and managers in north-central Montana questioned the statements made in the petition. Montana State University was contacted, and in cooperation with the Bureau of Land Management and the Montana Department of Fish, Wildlife and Parks, developed a study to quantify the effects of prairie dogs on the vegetation of Montana mixed grass prairies. The objectives of this study were to compare total plant biomass, number of different plant species, ground cover, nutritional differences and shrub dynamics between prairie dog colonies and adjacent uncolonized sites.



During the summers of 2000 and 2001, vegetation was sampled on and adjacent to 40 prairie dog colonies in Phillips County. Total standing crop biomass was more than twice as great on uncolonized rangeland than within a prairie dog town, and was dominated by cool-season perennial grasses and sagebrush. Although of little or no value to livestock, sagebrush is an important habitat requirement of many native prairie-dwelling species. Vegetation within prairie dog colonies was dominated by fringed sagewort, and sagebrush was virtually eliminated. There also was more variety of plant species at uncolonized locations.

Although live herbaceous vegetative cover was similar between colonized and uncolonized sites, bare ground was higher within prairie dog colonies, and litter was greater on adjacent rangeland. This is primarily due to prairie dogs clipping vegetation to increase visibility and facilitate movement on their colonies. Due to the clipping, mid-grasses are not allowed to attain their full height in colonies, whereas off prairie dog colonies, grasses mature, die, and then become a litter component on the ground. Further, as is true with any grazed area, prairie dog colony plants tended to have slightly higher digestibility and crude protein content (1-2 percent higher) compared to uncolonized, or less heavily grazed rangeland.

It had been suggested that this increase in nutritional content of vegetation on prairie dog colonies would offset the decrease in total biomass available on prairie dog colonies. In Montana, this does not appear to be true. Although crude protein content of vegetation is slightly higher on a percent basis on prairie dog colonies, there is more vegetation and therefore a greater amount of total crude protein available on uncolonized rangeland.

The decrease in total standing crop biomass may have varying effects on different animal species. This may have a detrimental effect on species needing herbaceous cover, such as sage grouse or mule deer. The increase of bare ground that is found on prairie dog colonies may have a positive effect on animal species that require open spaces with less cover, such as the mountain plover and burrowing owl.

We found that older prairie dog colonies located in the mixed-grass prairie of eastern Montana have less total standing crop biomass, reduced number of species, and less total crude

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How did we discover that trace minerals were necessary for livestock? Part V



by John Paterson, MSU Extension Beef Specialist

One of the textbooks I routinely use to answer questions about trace minerals is *Minerals in Animal and Human Nutrition* by Lee McDowell from the University of Florida. Dr. McDowell's book is fascinating, because he gives the history of our knowledge of trace minerals and how scientists and livestock producers described symptoms of both deficiencies and toxicities. I think you might enjoy some of the history of trace mineral research.

Copper, molybdenum and sulfur:

- The necessity of copper for cattle was first established in the 1930's with the discovery in Florida that cattle that had a wasting disease were deficient in cobalt, iron and copper. Researchers in Northern Europe described this wasting disease by animals as having diarrhea, loss of appetite, and anemia.
- In the late 1930's, scientists in England described a severe scouring disease of cattle called "teart" that was caused by ingestion of forage with high levels of molybdenum. Later scientists discovered that large doses of copper sulfate could prevent this condition. Still later it was shown that molybdenum limited the retention of copper in the body especially in the presence of adequate amounts of inorganic sulfate in the diet (water?). It was this discovery that led to numerous studies on the relationship among copper, molybdenum and sulfate. We can summarize these interrelationships as:
 1. Molybdenum in the presence of sulfate reduces the deposition of copper in organs and increases the excretion of copper in the urine.
 2. An increase of dietary copper reduces molybdenum deposition in the liver.
 3. When the copper to molybdenum ratio of forages in the presence of adequate sulfate was less than 2.8 to 1, then copper deficiency is evident. A copper to molybdenum ratio of no less than 4:1 has been proposed to ensure that the copper requirement will be met.
 4. High levels of dietary zinc and iron depress copper absorption and tend to increase the requirements.

High dietary levels of zinc (100 ppm) reduce liver copper storage.

5. Cattle can die from copper poisoning; these animals may experience nausea, vomiting, salivation, abdominal pain, convulsions, paralysis, and death. The usual cause is improperly formulated supplements or diets.

Zinc:

- Zinc is widely distributed through the body, but animals have a limited ability to store zinc in a form that can be mobilized to prevent a deficiency. In cattle, the highest concentrations of zinc were found in the following order: pancreas, liver, pituitary gland, kidney and adrenal gland. Additional reports have shown that the testicles and accessory sex glands contain high concentrations.
- It is suspected that zinc was applied as an ointment for skin lesions by several cultures, including the Egyptians.
- In 1960 scientists discovered that a skin disorder of cattle could be cured with zinc therapy.
- Loss of appetite is one of the first signs of a zinc deficiency and in calves, a bowing of the hind legs and stiffness of the joints is noted.
- In lab animals, severe zinc deficiency during pregnancy has resulted in offspring with impaired learning ability.
- Additional clinical signs of a zinc deficiency in cattle include:
 - inflammation of the nose and mouth with submucous hemorrhages
 - unthrifty appearance
 - rough hair coats
 - stiffness of the joints with swelling of the feet in front of fetlocks
 - cracks in skin of coronary bands around the hooves
 - dry scaly skin on the ears

cont. on next page

Trace minerals, continued

- gnashing of the teeth
- red, scabby and wrinkled scrotal skin

- In grazing animals, a marginal zinc deficiency results in subnormal growth, fertility, low serum zinc values, resistance to infection and stress.

Selenium:

During the 1930's selenium was identified as the toxic element in some forages that caused animals to lose hair, nails and hooves. Selenium is now known to be required by food animals and humans. Consumption of feedstuffs containing both toxic and deficient concentrations of selenium presents a problem for grazing livestock.

- Marco Polo in his travels in western China (ca. 1295) described a syndrome resulting from the ingestion of seleniferous plants. He reported that when horses ate this poisonous plant, hooves dropped off.
- In 1860 an army surgeon in South Dakota also described a fatal disease in horses grazing near Fort Randall. The horses exhibited extreme tenderness and inflammation of the feet, accompanied by loss of hair from the mane and tail.
- Some speculate that many horses of the U.S. Cavalry commanded by General Custer exhibited selenium toxicity during the summer of 1876.
- Pioneers on the northern Great Plains in the 1890s also described selenium toxicity of their livestock. They associated the disease with alkali seeps and waters of high salt content. It became known as alkali disease.
- In the 1950s, selenium was reported to be beneficial

for livestock and shown to prevent liver necrosis in swine and muscular dystrophy in calves and lambs.

- Selenium is closely linked to vitamin E; both nutrients protect biological membranes from degeneration. Lack of these nutrients results in tissue breakdown.
- Selenium deficiency in ruminants is called white muscle disease and is a degeneration of striated muscles. Animals with it have generalized weakness, stiffness and muscle deterioration. Animals have difficulty standing.
- There are a couple of clinical patterns. The first is a congenital type of muscular dystrophy in which calves are stillborn or die within a few days of birth after sudden physical exertion such as nursing or running. It is observed in calves between 1 and 4 months of age.
- Poor reproductive performance also is a symptom of selenium deficiency and includes retained placenta. Work from Ohio showed that the incidence of retained placentas was reduced from a mean of 51 percent to 9 percent when cows were injected with a combination of selenium and vitamin E.
- When consumed in sufficient amounts causes toxicity. Alkali disease generally happens when animals graze forages with selenium in the range of 5 to 40 parts per million. Certain selenium accumulating plants have between 100 and 9,000 ppm selenium.
- Animals suffering from selenium toxicity have loss of appetite, lack of thriftiness, cirrhosis of the liver, loss of hair, lameness and elongated hooves.

If you would like additional information on these or other trace minerals, call John Paterson at 406.994.5562.



Prairie dogs, continued

protein. These findings contradict those stated in the petition to list the prairie dog as a threatened species.

The impacts of these effects will depend on the goals of land managers. MSU's findings suggest that prairie dog colonies may not be ideal for grazing cattle due to a decrease in total standing crude protein. Unlike other findings that suggest prairie dogs may have beneficial or neutral effects to native rangeland, the MSU study indicates that prairie dogs may have detrimental effects for some species. The unique area created by the presence of prairie dog colonies may have beneficial effects

on prairie dogs, mountain plovers, and burrowing owls while having detrimental effects on cattle and sagebrush obligates such as sage grouse.

Now for another complication! Sage grouse have also been petitioned for listing as a threatened species under the Endangered Species Act. How will we manage these rangelands when one potentially threatened species is actively modifying habitat for another potentially threatened species? To answer that question, we will have to battle one heck of a storm.



Summaries of beef cattle research from Montana State University

Nitrate Concentration of Cereal Forage Species at Three Stages of Maturity

L.M.M. Surber, S. D. Cash, J.G.P. Bowman, and M.C. Meuchel

ABSTRACT: Cereal forages have become an increasingly economical source of winter feed for livestock producers, comprising 11% of all hay harvested in Montana. Livestock producers need to be concerned with nitrate concentrations when feeding annual cereal forages. Six cereal forage species (18 varieties) were grown in a field trial under irrigated conditions in Bozeman, MT, and were used to test the effects of cereal forage species and stage of maturity on forage nitrate concentration. Forage clip samples were collected at three stages of plant maturity: boot, anthesis and when the plots were harvested for hay (milk stage of maturity). Samples were ground and evaluated for DM and nitrate-nitrogen ($\text{NO}_3\text{-N}$). The range in $\text{NO}_3\text{-N}$ was from 0.01 to 0.55%. There were significant ($P < 0.05$) cereal forage species, stage of maturity and species x maturity interaction effects on $\text{NO}_3\text{-N}$ concentration. Nitrate-nitrogen concentration at the boot stage of maturity did not differ ($P > 0.05$) when compared to the anthesis stage of maturity (avg. 0.244 %). However, $\text{NO}_3\text{-N}$ concentration at harvest was 36% lower than at anthesis (0.168 vs. 0.230 %). Barley forage $\text{NO}_3\text{-N}$ was similar ($P > 0.05$) when compared to emmer, triticale and wheat x spelt crosses (avg. 0.195%) and lower ($P < 0.001$) when compared to oats and spelt forage (0.186 vs. 0.341 and 0.258%, respectively). Barley forage $\text{NO}_3\text{-N}$ concentration was highest ($P < 0.05$) at the boot stage, intermediate at anthesis and lowest at harvest (0.230, 0.195 and 0.131%, respectively). Oat forage maintained high $\text{NO}_3\text{-N}$ concentrations at all growth stages ($P > 0.05$; avg. 0.341%).

It appears that stage of maturity and cereal forage species greatly affect $\text{NO}_3\text{-N}$ concentration. Also, $\text{NO}_3\text{-N}$ concentrations of various cereal forage species respond differently at boot, anthesis and harvest. This implies that different harvest management must be implemented for oats when compared to other cereal forage species.

Effects of Barley or Corn on Performance and Digestibility in Finishing Diets

J. J. Kincheloe, J.G.P. Bowman, L.M.M. Surber, D. L. Boss, M. F. McDonnell, K. A. Anderson, and T. K. Blake

ABSTRACT: Barley is an important feed grain throughout Canada and the Pacific Northwest, while corn is the predominant grain source in finishing diets throughout the United States. Limited comparisons are available evaluating differences between the feed value of corn and barley. Eighty steers (avg initial wt 758 lb) were fed finishing diets for 112 days to determine the effects of corn and three barley varieties (H3, Harrington, and Valier) on feedlot per-

formance, nutrient digestion, carcass characteristics, and grain energy content. Grains were dry-rolled, and diets were formulated to contain 15% CP, 0.92 Mcal/lb NEm and 0.62 Mcal/lb NEg. Steers were allotted by weight to 16 pens in a completely randomized design with pen as the experimental unit. Steers were weighed every 28 days and diet, ort, and fecal samples were collected, composited by pen, and analyzed for nutrient content. Steers were harvested when 70% were visually estimated to grade Choice. There were no differences ($P > 0.10$) among diets for ADG (avg 3.48 lb/d), feed efficiency (avg 16.3 lb gain/100 lb feed), intake (avg 21.2 lb), or starch digestibility (avg 97%). Fat thickness was greatest ($P = 0.03$) for steers fed corn (avg 0.47 in), and least for steers fed H3 and Valier (avg 0.37 in). Steers fed corn had higher ($P = 0.07$) yield grades than steers fed barley (avg 3.1 vs 2.8, respectively); however, there were no differences ($P > 0.10$) detected for any other carcass characteristic. Barley had similar ($P > 0.10$) NEm and NEg values as compared to corn (avg 0.99 and 0.69 Mcal/lb, respectively).

Lack of differences in animal performance and grain energy values suggest that barley has equal feeding value to corn in finishing diets, and that the NRC may underestimate net energy values for barley.



Students in John Paterson's Feedlot Management class learn how to grade beef carcasses. Pictured are Kim Skinner of Drummond, Tracy Ross of Jackson, Wyo. and Erika Williams of Billings.

Effects of Barley Processing, and Test Weight on Feedlot Performance and Carcass Characteristics of Finishing Beef Steers

M.F. McDonnell, J.G.P. Bowman, L.M.M. Surber, J. J. Kincheloe, M.A. Thompson, K.A. Anderson, and T. K. Blake.

ABSTRACT: Eighty crossbreed beef steers weighing 849 lb were fed a finishing diet (83% barley, 6% chopped straw, 3% oil and 8% supplement) in a study examining the effects of barley processing (whole vs. cracked), and test weight (heavy vs. light; 49 lb/bu and 39 lb/bu, respectively) on animal performance and carcass characteristics. A processing and test weight interaction ($P < 0.01$) was detected for final weight, ADG, intake, and feed efficiency. Final weight was highest ($P = 0.005$) for steers fed cracked heavy barley and cracked light barley (avg. 1263 lb), intermediate for steers fed whole light barley (1113 lb) and least for steers fed whole heavy barley (1032 lb). Average daily gain was highest ($P = 0.001$) for steers fed cracked heavy and cracked light barley (avg. 3.64 lb/d), intermediate for steers fed whole light barley (2.34 lb/d), and least for steers fed whole heavy barley (1.65 lb/d). Dry matter intake was greatest ($P = 0.01$) for steers fed cracked heavy barley and cracked light barley (avg. 25.6 lb/d), intermediate for steers fed whole light barley (21.4 lb/d), and least for steers fed whole heavy barley (17.9 lb/d). Feed efficiency (gain/100 units of feed) was highest ($P = 0.002$) for steers fed cracked heavy barley (14.7), followed by cracked light barley (13.9), whole light barley (9.7), and whole heavy barley (8.1). Cracked barley had higher ($P = 0.001$) NEm and NEg values than whole barley (avg. 0.93 vs. 0.77 Mcal/lb for NEm; avg. 0.64 vs. 0.49 Mcal/lb NEg). No effect ($P = 0.40$) of barley test weight was seen on NEm or NEg values. No differences ($P > 0.08$) in carcass characteristics were detected for barley test weight or processing.

In summary, barleys with test weights of 49 and 39 lb/bu had energy similar contents, while NEm and NEg for cracked barley were 22 and 30% higher, respectively, than for whole barley fed to finishing steers.

Effects of Processing and Test Weight of Barley When Fed to Backgrounding Calves

D.L. Boss, J.G.P. Bowman, L.M.M. Surber, D.G. Sattoriva and T.K. Blake

ABSTRACT: A study was initiated to evaluate the effects of light or heavy test weight barley fed whole or dry rolled to calves on a backgrounding diet. Eighty commercial Angus steers were allotted to 16 pens on an equal pen weight basis with treatment being randomly assigned to pen. A 2 x 2 factorial arrangement was used to test the effects of barley test weight (light; 39 lb/bu vs. heavy; 48 lb/bu), processing (whole vs. dry rolled) and their interaction. Steers had ad libitum access to feed and water throughout the 56-day trial. The diets were balanced to meet or exceed all NRC requirements and to provide 0.65 Mcal/lb NEm and 0.39 Mcal/lb NEg, enabling a 750 lb steer to gain 2 lb/d. Diets were offered once daily at 0800 and consisted of 49.0% Pubescent wheat grass (chopped to pass a 3 inch screen), 45.0% barley

(‘Morex’) and 5.7% commercial backgrounding pellet on a DM basis. Water was used as a diet conditioner. Data were analyzed using GLM procedure of SAS. No interactions were detected ($P > 0.10$). Dry matter intakes were not different ($P = 0.51$, avg 19.6 lb/d) for the 56-d trial. There was no difference ($P > 0.05$) in final weights or ADG when light (838 lb, 2.4 lb/d) or heavy (842 lb, 2.4 lb/d) test weight barley was evaluated. Feeding dry rolled barley resulted in heavier final weights ($P = 0.06$; 853 vs 826 lb) and increased ADG ($P = 0.001$; 2.6 vs 2.2 lb/d) when compared to whole barley-fed steers.

Barley test weight did not affect steer performance in the trial. However, processing the barley (dry rolling) before feeding it to steers in a backgrounding diet increased performance by 17% when compared to feeding the barley whole.

Effect of Barley Varieties Harvested for Forage on Backgrounding Steer Performance and Diet Digestibility

A. L. Todd, J.G.P. Bowman, L.M.M. Surber, M. A. Thompson, J. J. Kincheloe M. F. McDonnell, and P. F. Hensleigh.

ABSTRACT: Barley harvested as hay is a significant source of winter forage for livestock producers in Montana. Limited data is available using hay barley as a roughage source for backgrounding steers. Ninety-six Angus cross steers were allotted to 16 pens in a randomized complete block design. The objectives of this study were to 1) determine the effects of four barley varieties on animal performance and diet digestibility, and 2) determine the effects of feeding awned vs. hooded head type barley. MT 981060, Westford, and Haybet are all hooded forage barley varieties while Valier is an awned feed barley variety. Steers were given ad libitum access to their roughage source, 5.7 lb/head/d of cracked feed barley, and 1 lb/head/d of a commercial 32% CP supplement. All roughage was chopped to 2 inches. Pen was the experimental unit in the 60-day trial. Steers were weighed and diet, and fecal samples were obtained on day 28 and upon completion (day 60) of the trial. Diet and fecal samples were composited by pen and analyzed for nutrient content. Steers fed MT981060 and Valier had 55% greater ($P < 0.01$) ADG when compared to steers fed Haybet and Westford barley (avg 3.29 vs. 2.75 lb/d, respectively). Dry matter intake was greatest ($P < 0.01$) for steers fed MT 981060 and Valier, intermediate for Haybet and least for Westford (avg 22.2 vs. 21.2 and 17.8 lb/d, respectively). Steers fed MT 981060, Valier, and Westford barley had 14.4% improvement ($P < 0.01$) in feed efficiency when compared to steers fed Haybet barley (avg 15.07 vs. 12.9 lb gain/100 lb feed, respectively).

Feeding an awned variety did not impact intake, ADG, or feed efficiency. MT 981060 had superior feeding value for backgrounding steers and is scheduled for release by the Montana Agricultural Experiment Station.

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Effect of Exogenous Progesterone Before Calf Removal and Prostaglandin F₂ on Estrous Response And Pregnancy Rates In 3-Year-Old Beef Cows

J.L. Olson, A.J. Roberts, J.A. Paterson, and R.N. Funston

ABSTRACT: Objectives for this experiment were to determine effects of a 7 d pretreatment with an intravaginal progesterone insert (CIDR) on estrous response and pregnancy rates in 3-year-old postpartum beef cows synchronized with calf removal and prostaglandin F₂. Cows (BW = 1074 ± 16.3 kg; body condition score = 3.8 ± .07; days postpartum = 58.7 ± 1.2 d) were randomly allotted to either Control (n = 22; i.m. injection of 25 mg PGF₂ [Lutalyse] on d 0) or CIDR treatment from -7 to 0 d preceding, PGF₂ injection on d 0 (n = 18). All calves were weaned on d 0. Cows were observed for estrus for 120 h after PGF₂ and inseminated by AI approximately 12 h after the onset of estrus. A bull was placed with cows 12 d after PGF₂ and removed 40 d after PGF₂. Circulating progesterone concentrations were determined in blood samples collected on d -7, 0, and 18. Pregnancy status was diagnosed by ultrasonography on d 54 and 145 after PGF₂. Synchronization rates were higher (P < 0.05) for CIDR (100%) compared to Control (77%) cows. Time of estrus did not differ (P > 0.10) between Control and CIDR cows (2.41 ± .15 d). Pregnancy rates by AI were not different (P = .28), between Control (18%) and CIDR (33%) cows. Overall pregnancy rates were higher (P < 0.10) in Control (97%) compared to CIDR (80%) cows. Concentrations of progesterone on d -7, 0, and 18 did not influence (P > 0.10) overall pregnancy rates; however, progesterone concentrations were increased (P < 0.05) in CIDR cows on d 0 (5.6 vs. 2.9 ng/mL, for CIDR vs. Control) and d 18 (7.1 vs. 4.8 ng/mL, for CIDR vs. Control).

Administration of a CIDR 7 d before calf removal and PGF₂ increased concentrations of progesterone on d 0 and 18, and increased the proportion of cows exhibiting estrus. However, CIDR treatment did not improve conception and AI pregnancy rates and reduced overall pregnancy rates.

The Effects of Cattle Gender on Feedlot Performance, Carcass Characteristics and Muscle Tenderness

Travis Choat, J. A. Paterson, B. M. Rainey, M. C. King, R. J. Lipsey, K. E. Belk and G. C. Smith

ABSTRACT: The effects of gender on rate of gain, carcass traits, shear force and trained sensory panel ratings of beef palatability were evaluated using 202 progeny of Angus or Simmental sires. Steers (n=99), heifers (n=57) and intravaginally spayed heifers (n=46) were fed a high energy diet for 161d. No implants were administered and heifers were not fed melengestrol acetate to suppress estrus. Steers had faster (P < 0.01) daily gains than heifers. The heavier (P < 0.01) final live weights of steers resulted in 55 lb heavier (P < 0.01) hot carcass weights at similar (P = 0.86) levels of fat thickness compared with heifers. Spayed heifers had a



Students in John Paterson's Feedlot Management class learn to grade beef carcasses. Pictured are Mike Morris of Augusta, Salvador Madrigal of Guadalajara, Mexico, and Tucker Rice of Choteau.

5.7% smaller longissimus muscle area (P < 0.05) compared with steers and intact heifers, which were similar. Calculated yield grades were similar (P = 0.21) among treatments, and USDA Quality grades and marbling scores were lower (P < 0.01) for steers compared to heifers. In order to directly examine gender effects on tenderness, shear force and sensory panel data were analyzed using an ANOVA model with marbling score as a covariate. Shear force values after 7 and 14 d of aging were lower (P < 0.01) for steers compared to heifers which were not different between treatments. Mean shear force values at 7 and 14 d of aging were 7.3 and 7.3 lb (steers) 8.4 and 7.9 lb (intact heifers) and 7.9 and 7.7 lb (spayed heifers), respectively. After 21 d of aging, shear force did not differ (P = 0.11) among genders. A trained sensory panel evaluated steaks (aged 14 d postmortem) from 193 of the cattle for juiciness, muscle fiber tenderness, connective tissue amount and overall tenderness using an 8-point structured rating scale. Steaks from steers received more favorable ratings (P < 0.01) for muscle fiber tenderness, connective tissue amount and overall tenderness at similar levels of marbling compared with spayed and intact heifers. Under the genetic and environmental conditions of this experiment, steers had faster daily gains and produced heavier carcasses at similar levels of subcutaneous fat, compared to heifers.

Intact and spayed heifers produced strip loin steaks that had higher average shear force values (i.e., were less tender) and lower average ratings for sensory panel tenderness than were those from steers.

Effect of Age, Gender and Grain Processing Method on Rate and Efficiency of Gain and Diet Digestibility by Beef Cattle

B.M. Rainey, J.A. Paterson, M.C. King, L.W. Barney, W.T. Choat

ABSTRACT: The objectives of these experiments were to determine the effects of animal age (cows vs. calves),



animal gender (steers vs. heifers) and barley processing method (whole vs. rolled) on rate and efficiency of gain and diet digestibility when barley was fed as a supplement to medium quality grass hay (12.3% CP; 37.7%ADE, DM basis). Also evaluated was a control treatment in which animals were not supplemented with barley. Forty, 36 mo old, Angus cows (1085 ± 108 lb), 21 heifer calves (98 ± 8 d of age; 235 ± 33 lb), and 19 steer calves (99 ± 7 d of age; 266 ± 35 lb) were allotted to treatments in a 2 x 2 x 2 + 1 arrangement. All cattle were blocked by age and sex and fed for 65 d with pen as the experimental unit. Light test weight barley (46 lb-bu-1) was supplemented at 0.5% BW (5.3 lb-cow-1-d-1 and 1.32 lb-calf-1-d-1, DM basis). Grass hay was offered to cows at 21.4 lb-hd-1-d-1 and to calves at 6.2 lb-hd-1-d-1 (DM basis). Rations were formulated to be isonitrogenous using a 31.6% CP supplement and cows received 1.0 lb-hd-1-d-1, while calves received 0.50 lb-hd-1-d-1. Individual full weights were taken on two consecutive days at the beginning and end of the study. Data were analyzed as a factorial for the main effects of animal age, gender, barley processing method and the processing x age interaction. No interactions were measured in this study. Animals fed the control diet had similar ($P > 0.05$) rates and efficiencies of gain as supplemented animals. Barley processing had no effect ($P > 0.05$) on rate or efficiency of gain for cows or calves. However, cows gained ($P < 0.05$) weight faster than calves, consumed more ($P < 0.05$) DM but were less efficient (12.6) than calves (avg. 7.6). A digestion study was conducted using animals from Exp 1. The protocol and dietary treatments remained the same with the exception that animal was the experimental unit. Differences ($P < 0.01$) were observed for DMI between age groups. There were no differences in digestibility of OM, N, ADE, NDE, or starch between cows vs. calves and whole vs. rolled barley supplements. As expected g of starch disappearance were greater for the supplemented diets vs. unsupplemented treatment.

Results suggest that improved performance and digestibility were not measured when the barley was rolled. Also, gains were more efficient for calves than cows.

Evaluation of Drought Management Strategies for Cow-Calf Enterprises

R.E. Kruse, M.W. Tess, R.K. Heitschmidt, J.A. Paterson, and B.F. Sowell

ABSTRACT: The objective was to evaluate alternative drought management strategies for their effects on profitability based on early detection of drought. A bio-economic model was parameterized to represent a range-based cow-calf production system in the Northern Great Plains. The base management system was characterized by inputs required to maintain herd size of 511 cows during an average climatic year with a fixed forage base of 4,329 AUM of range forage, plus 629 ton grass and 208 ton alfalfa hay. Treatments were factorially arranged where management (early vs normal) and intensity of drought (moderate, 20% reduction in available forage vs severe, 40% reduction in available

forage) were evaluated for effects on system performance. The early management (EM) scenario included detecting drought by July 15 and decreasing the average age at weaning to 90d. The normal management (NM) scenario included no 'early' management changes to emerging drought, but nutritional management was modified as needed to maintain in animal performance. A second bio-economic computer model was used to simulate drylot performance for early-weaned calves. Outputs from the two models were combined and treatments were evaluated based on feed costs, average weaning weight, ranch gross margin (gross margin – variable costs, RGM), and cumulative gross margin (ranch gross margin + revenue from drylot calves, CGM). During average climatic conditions CGM under the base management system was \$137,730. During drought CGM was reduced compared to the base system: EM (17.6 and 48.8%) and NM (33.6 and 72.3%) for moderate and severe drought, respectively. For both levels of drought, EM had lower purchased feed costs and higher CGM than NM. Directly feeding EM calves proved more efficient than feeding NM cows to produce milk to maintain calf performance.

Early weaning should effectively reduce the negative effects of drought on gross margin.

Effects of Flunixin Meglumine on Embryonic Loss in Stressed Beef Cows

M. L. Merrill, R.P. Ansotegui, N.E. Wamsley, P.D. Burns, and T.G. Geary.

ABSTRACT: The objective of this study was to determine if flunixin meglumine reduces early embryonic death in cows subjected to stress. Approximately 14 d following synchronization of estrus and artificial insemination (AI), 97 cows were assigned to one of three treatments by AI sire, AI date, and AI technician. Treatments were control (CON), induced stress (S), and induced stress with flunixin meglumine (1.1mg/kg, i.m; SFM). Rectal temperatures were recorded and blood samples collected (caudal venipuncture) for measurement of cortisol, and PGF metabolite (PGFM) concentrations before and after induced stress. Control cows remained at the ranch with their calves and had access to water but not feed, while S and SFM cows were loaded on semi-trucks and transported for 4 h (mean ambient temperature 75° F). Cows were not exposed to clean-up bulls until after treatment. Transrectal ultrasonography was used to determine AI pregnancy status 55 to 57 d post AI. Pregnancy rates to AI tended ($P = 0.17$) to be higher among SFM cows (84%) than S cows (69%) while AI pregnancy rate of CON cows was intermediate (76%). Cortisol concentrations before and after treatment were 21 and 24 ng/ml, 23 and 17 ng/ml, and 18 and 8 ng/ml, for CON, S, and SFM cows, respectively. Change in cortisol concentration was different ($P < 0.06$) between CON and S or SFM, but not S versus SFM ($P > 0.10$). No changes ($P > 0.10$) in PGFM were detected among the three groups between the sampling periods. Body temperature decreased between the sampling periods for all treatments, but the change in temperature was greater ($P < 0.03$) for S and SFM cows compared to



CON. Across treatments, change in cortisol concentration between sampling periods did not influence ($P > 0.10$) AI pregnancy status, however, PGFM increased ($P < 0.09$) 24.72 pg/ml or decreased 5.19 pg/ml in cows diagnosed open or AI pregnant.

In summary, flunixin meglumine appears to decrease the stress-induced embryonic loss, but the role of PGF and cortisol remain unclear.

Using Prescribed Burning to Rejuvenate Prairie Riparian Ecosystems: Preliminary Results

Clayton B. Marlow

ABSTRACT: Efforts to reverse the downward trend in riparian function on a BLM grazing allotment in central Montana have been stymied by inadequate water supplies. Additional sources for water development are lacking because of a combination of drought and extensive conifer invasion within the allotment. However, the presence of riparian communities in large draws away from the main stream channel indicated that water had been more widely distributed in past decades. Range ecology literature suggests that conifer encroachment may be exaggerating drought effects and that removal of all or part of the conifers would reduce the draw-down of shallow ground water levels. Higher groundwater levels would either allow springs to flow again or facilitate low-cost well development. Approximately 1,000 acres of conifer woodland was burned in the spring of 2002. Initial results from ground water monitoring indicate that water levels in burned areas increased more than in unburned areas following rain and snowfall in late May and early June 2002. If this pattern continues, there should be more opportunity to disperse livestock grazing across the allotment and reduce grazing pressure on riparian areas.

A Systems Approach to Reducing Morbidity in Feeder Calves

D. J. Fennewald, J. A. Paterson, R. J. Lipsey, and R. N. Funston

ABSTRACT: A group of 1,836 calves from eight ranches were individually identified to determine if a standardized weaning protocol which included vaccinations, nutrition and 45-d of backgrounding could reduce morbidity (sickness) from weaning until shipment into the feedlots. Freshly weaned calves were randomly allocated to two treatments: 1) Present Ranch Management (PRM) which was defined as present weaning practices or 2) MSU Protocol (MSU) in which calves were fed either 4.0 lbs/day of a weaning pellet or 1 lb/day of liquid supplement for 28 d. The supplement contained additional levels of Cu, Zn, Mn, CP, vitamins A, D and E and a coccidiostat. All ranches divided calves into PRM and MSU groups (779 and 1057 animals, respectfully) and group size ranged from 26 to 188 animals. Overall morbidity was 2.7% for calves on the MSU protocol compared to 4.5% for calves on the PRM protocol ($P < .05$). The range in morbidity was 0 to 9.8% for calves on MSU vs. 0 to 24.7% for calves on PRM. During the first 28 d after weaning, ADG was not different ($P = .14$) between

treatments. However, ADG was greater ($P < .05$) for MSU from 0-45 d compared with PRM (2.46 vs. 2.29 lbs/day). Calves exhibiting morbidity had 19% slower ($P < .05$) ADG compared to healthy calves (1.96 vs. 2.42 lbs/day).

These results suggest that calves which followed a protocol of defined vaccinations, nutrition and backgrounding performed better than control calves.

Calving Ease of Heifers Bred to Angus and Simmental Sires Selected for Decreased Dystocia

H.C. Van Wagoner, R.P. Ansotegui, M.D. Ropp, and R.J. Lipsey

ABSTRACT: The objective of this study was to compare birth weight, gestation length, and percent assisted births of calving ease Simmental and low birth weight Angus sires. Angus yearling heifers were bred in two consecutive years (1999 and 2000) at four locations by AI using semen collected from Simmental ($n = 20$) and Angus ($n = 27$) sires. Birth weights, gestation lengths, and calving ease scores (1 = unassisted, 2 to 4 = various levels of assistance) of 1,039 calvings in 2000 and 2001 were analyzed to determine sire breed effect. Calving ease scores were recorded so that the percentage of assisted births could be calculated. The statistical model included the fixed effects of year of birth, sire breed, calf sex, ranch, two-way, and three-way interaction. Sire breed affected ($P < 0.01$) birth weight, gestation length, and percent assisted. Simmental sired calves were 4.7 lbs heavier at birth, 2.90 ± 0.48 days longer in gestation length, and assisted 1.44 more times than Angus sired calves. Calf sex affected ($P < 0.01$) birth weight and gestation length. Bull calves were 6.1 lbs heavier at birth and 1.30 ± 0.27 days longer in gestation length than heifer calves. Furthermore, bull calves were assisted 2.51 and 1.36 times more than heifer calves, 2000 and 2001, respectively.

In this study, calf sex was the leading cause of dystocia, followed by sire breed.

Effect of Supplemental Trace Mineral Level and Form on Peripubertal Bulls

W.L. Alexander, R.P. Ansotegui, D.S. Spickard, C.K. Swenson, E.E. Grings and T.W. Geary

ABSTRACT: Adequate dietary trace minerals are an essential component to growth and sexual development in males. Our objectives were to determine if different supplemental trace mineral levels and/or forms (sulfate and metal amino acid complexes) influence age at puberty, semen quality and scrotal circumference. Forty-three crossbred, prepubertal bulls were blocked by age ($258 \text{ d} \pm 8.9$) and scrotal circumference into five different treatment groups: 1) 1x sulfate form (1S); 2) 1x complexed form (1C); 3) 1S + 1C (2SC); 4) 1S + 2x1C (3SCC); and 5) 3x1S (3S). Each 1x supplementation level contained 360 mg Zn, 125 mg Cu, 200 mg Mn and 12.5 mg Co. Bulls were assigned to Calan gate pens with one animal/treatment/pen. Supplements were individually fed daily in 0.45 kg of wheat middlings from day 0 to 100. The basal diet of 7% alfalfa hay, 10.5% corn, 75.5% corn silage and 7% protein supplement was fed



Beef Checkoff, cont. from p. 1

State beef councils will again play a major role in both the rollout of the campaign and expansion of messages within their own states.

Targets for the national and state messages will be adults ages 25-54 who love beef and who are grilling enthusiasts. It will involve a national focus with broader reach, blanketing the entire country throughout the summer.

It is expected that more than 110 million coupons will be distributed through free-standing inserts in newspapers, and more than 22 million through in-store efforts. The coupon support completely funded by partner participation will

drive consumers to purchase more beef.

Manufacturing partners are investing more than \$2 million in the campaign. Retailers will also invest significantly in the program.

In Montana, 125 retail stores have signed up to participate. Stores must agree to run three additional beef features throughout the summer in exchange for signage and materials to distribute to consumers.

Beef: Questions & Answers is a joint project between MSU Extension and the Montana Beef Council. This column informs producers about current consumer education, promotion and research projects funded through the \$1 per head checkoff. For more information, contact the Montana Beef Council at (406) 442-5111 or at beefcncl@mt.net



Research summaries, continued

to all bulls and was formulated to achieve 1.2 kg ADG. Liver biopsies were collected on days -21 and 100, and were analyzed for Zn and Cu concentrations. Scrotal circumference, semen, and blood samples were collected on days -14, 14, 42, 70, and 98. Semen was collected by electroejaculation and spermatozoa evaluated for morphology and motility. Puberty was defined as the age at which an ejaculate contained a minimum of 50×10^6 total spermatozoa with at least 10% progressive motility. All bulls were deficient in Cu yet adequate in Zn on day -21 according to liver concentration. Following 100 d on treatment, liver Zn concentrations decreased ($P < 0.01$) and liver Cu concentrations increased ($P < 0.01$) in bulls regardless of treatment. Day 100 liver Zn concentrations were similar ($P = 0.59$) across treatments, but there was a tendency for liver Cu concentrations to be greater ($P = 0.07$) in 3SCC and 3S bulls compared to 1C and 1S bulls, whereas 2SC bulls were intermediate. Scrotal circumference did not differ ($P > 0.10$) among treatments throughout the trial. Two bulls did not reach puberty and were removed from the puberty data. On day 42, more ($P = 0.03$) bulls fed complexed trace minerals (1C, 2SC, 3SCC; 79%) were pubertal compared to those fed only sulfate trace mineral (1S, 3S; 47%). Bulls fed complexed supplement tended to reach puberty after fewer ($P = 0.11$) days on treatment (43.9 ± 5.7 d) than bulls fed only sulfate supplement (58.5 ± 6.7 d). Bulls fed 3SCC tended ($P = 0.07$) to reach puberty at a younger age (315.2 ± 7.9 d) than bulls fed 3S (336.8 ± 7.9 d). On day 42, 3S bulls had a larger ($P = 0.08$; 39.2%) percentage of proximal and distal droplets in ejaculates compared to all other treatments (1S, 1C 2SC, 3SCC; 15%, 20%, 25%, 21.6% respectively).

Based on decreased final liver Zn concentrations regardless of treatments, we conclude that NRC recommendations for Zn may be inadequate for bulls during the peripubertal stage of development. Supplementing Cu and Zn deficient prepubertal bulls a complexed form of trace minerals may lower the age at puberty. However, no apparent differences ($P > 0.41$) in semen characteristics existed at one year of age.

Effects of corn and barley based diets on meat characteristics

C.J. Bergner, J.A. Boles, J.G.P. Bowman, D.L. Boss, T. Spinner, K. Groenlund

Steers ($n=160$) were fed isocaloric finishing diets based on one of three barley varieties (Chinook, Logan or H3 a newly released barley variety) or corn (40 steers/treatment) at two feedlots in Montana. Steers were assigned to pens in the feedlot by weight so that pen weights were similar. Steers were harvested when visual inspection of animals determined that 75% of the carcasses would grade Choice. Steers were harvested at a commercial packing plant, using standard industry practices. Carcass measurements, carcass weight, fat thickness, ribeye area, internal fat content, and marbling scores were obtained from each carcass. Beef ribs (IMPS 103) were removed from 72 carcasses, vacuum packaged and transported under refrigeration to Montana State University (MSU) for analysis. Three consecutive steaks (1.25 inch) were removed from each rib and used to determine color stability, tenderness, proximate analysis and pH. The study was a completely randomized design with animal as the experimental unit. There were no site by treatment interactions detected ($P > 0.05$). Diets fed to steers had no effect ($P > 0.05$) on the quality and yield grade of the carcasses nor on tenderness of beef steaks from the carcasses. Diet fed to steers had no effect ($P > 0.05$) on the initial color of beef steaks, however steaks from steers fed diets based on Logan barley had a more rapid decline ($P=0.001$) in Hunter a^* values (redness) during storage than did steaks from steers fed corn or other barley varieties.

Greater color stability results in a longer shelf-life hence different diets fed to cattle can contribute to variability of color in the retail case and thus affect retail shelf-life. Further research is necessary to determine the cause of the color differences.

If you would like additional information on any of these projects, please call (406) 994-3721 or email mwtess@montana.edu

Upcoming events

Annual Nutrition Conference, Bozeman, April 29 and 30.
Main topic: Country of Origin Labeling legislation. For more information, contact Alex Offerdahl at 761-4596 or Anita Gray at 994-3414.

MSU Extension's Women's Week, Bozeman, June 11-14, 2003. Over 30 classes, including Dutch oven cooking, plumbing, Montana history, herbal remedies, gardening, crafts and raft trips. Call (406) 994-3273 for a brochure, or visit www.montana.edu/wwwpb/womensweek/2003.html

The programs of the MSU Extension Service are available to all people regardless of race, creed, color, sex, disability or national origin. Issued in furtherance of cooperative extension work in agriculture and home economics, acts of May 8 and June 30, 1914, in cooperation with the U.S. Department of Agriculture, LeRoy Luft, Interim Vice Provost and Director, Extension Service, Montana State University, Bozeman, MT 59717.



Photo of the month: MSU Extension wildlife specialist Jim Knight shows a wolf trap to students Carina Sulzen of Casper, Wyo. and Tiffany Edwards of Gillette, Wyo.

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Dr. John Paterson
MSU Extension Beef Specialist
PO Box 172820
Montana State University
Bozeman, MT 59717