



Research Briefs

► Compiled by *Kindra Gordon*

Feedlot, carcass highlights from ASAS

This month we continue our review of research presented at the American Society of Animal Science (ASAS) meeting in Phoenix, Ariz.

Feedlot

Hold the salt in beef cattle finishing diets. That's the finding of a University of Nebraska (NU) study that evaluated the effects of increasing levels of salt (NaCl) inclusion on animal performance and feed intake.

The researchers found that salt supplementation was not effective in increasing average daily gain (ADG), dry-matter intake (DMI) or the feed-to-gain ratio (F:G) among the 59 yearling heifers that were utilized in the trial. Inclusion of salt also did not affect fat, marbling or yield grade (YG) data among the heifers.

Prior to the start of the study, the 59 yearling heifers were randomly assigned to one of five treatments and adapted over 21 days to a diet that included 42.5% high-moisture corn, 42.5% dry rolled corn, 7.5% grass hay, 3% tallow and 5% supplement. Following this adaptation period, the heifers were fed diets with one of the five salt treatments for 113 days.

The five treatments were formulated to include increasing levels of salt in the supplement at 0%, 0.125%, 0.25%, 0.375% and 0.5% of diet dry matter (DM). The treatments bracketed 1996 National Research Council (NRC) minimum sodium requirements of 0.08% of DM. Water intake was also measured using water meters to evaluate additional sodium intake by the heifers.

At the conclusion of the study, heifer performance averaged 3.2 pounds (lb.) per day across all five treatments, and performance data showed no significant difference in ADG, DMI or F:G with different levels of NaCl. The researchers also report that no significant effects were detected for fat, marbling or yield grade data across all treatments.

"These results suggest that salt inclusion in feedlot finishing diets is not necessary, and the sodium requirement is less than current NRC recommendations," according to NU researchers. They also say that reducing NaCl

in the feedlot animals' rations should help reduce the excretion of sodium in the environment and help to make feeding cattle more environmentally sustainable by minimizing sodium buildup in acres receiving manure and runoff water.

For more information contact NU Extension feedlot specialist Galen Erickson at (402) 472-6402 or geericks@unlnotes.unl.edu.

Can feedlot odors be reduced? Yes, according to the findings of a study conducted at the Roman L. Hruska U.S. Meat Animal Research Center (MARC) in Clay Center, Neb. The study indicates that weekly applications of slow-release thyme oil granules can help reduce odor and pathogens in feedlot manure. *E. coli* and concentrations of coliforms were reduced by nearly 90% in manure treated with these applications.

Previous laboratory studies indicated that plant oils with antimicrobial activity, such as thyme oil, can control pathogens and odor emissions from cattle and swine wastes.



Applying thyme oil in granular form once a week can reduce odor emissions and fecal coliforms in feedlots.

However, these oils are volatile and were ineffective when topically applied to a feedlot surface.

In this study, the thyme oil was incorporated into corn cob granules and topically applied once per week to feedlot manure. To determine the effectiveness of the granule product, manure samples were collected three times a week for eight weeks from control and treated pens.

The researchers found that during the eight weeks, the desired concentration of 0.15% to 0.2% thyme oil was maintained in the manure during all but the seventh week. Production of odor [volatile fatty acids (VFA)] in treated pens was less than the rate of odor production in control pens, and the concentrations of *E. coli* in treated pens was 91% less than control pens. Similarly, concentrations of coliforms were 89% less in treated pens than control pens.

From these results, the researchers concluded that applying thyme oil in granular form once a week can reduce odor emissions and fecal coliforms. Future studies will look at other granules that have the capacity to incorporate higher concentrations of thyme oil into them, which could help reduce the number of applications necessary, says MARC researcher Vincent Narel.

For more information contact Varel at varel@e-mail.marc.usda.gov.

The amount and source of crude protein (CP) in a finishing diet can impact feedlot performance and carcass characteristics of beef steers, according to findings of studies at Texas Tech University (TTU) and New Mexico State University (NMSU).

For the research, crossbred steers at two locations were assigned to one of three treatments with differing CP levels of 11.5%, 13% and 14.5% DM, respectively, and three sources of supplemental CP, including 100% urea, 50:50 blend of urea and cottonseed meal, or 100% cottonseed meal.

Steam-flaked, corn-based diets were fed, and steers in the experiment were initially implanted with Ralgro[®] and reimplanted with Revalor[®]-S 56 days later.

The researchers found that DMI was not affected by CP level or source. Differences in backfat thickness and yield grade (YG) were negligible across treatments, and marbling score and percentage of carcasses grading Choice were not affected by CP level or source.

However, results from the study indicate that increasing CP levels from 11.5% to 13% slightly increased ADG and carcass-adjusted ADG. Increasing the levels of supplemental urea also increased carcass-adjusted ADG, the

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gain-to-feed ratio, hot carcass weight, *longissimus* muscle area and dressing percent.

But, the researchers caution that a CP level greater than 13% seemed to be detrimental to ADG and hot carcass weight.

Additional studies have been conducted and are currently being summarized to determine the effects of these same treatments on nitrogen and phosphorus retention and excretion in feces and urine. Preliminary results indicate that feeding growing steers 11.5% to 13% CP, supplemented with higher proportions of degradable protein, may potentially optimize nitrogen utilization and reduce nitrogen losses to the environment.

For more information contact TTU's Michael Galyean at (806) 742-2453 or michael.galyean@ttu.edu.

Combining wet corn gluten feed (WCGF) with hay or corn silage in finishing diets can reduce feed efficiency,

according to a University of Minnesota (UM) study. Additional forage sources are often added to WCGF as a fiber source or as a backup forage, should WCGF deliveries fail due to weather or price factors. Based on these findings, however, doing so compromises feedlot performance, researchers say.

The study followed 223 Angus crossbred steers to evaluate effects of various forage sources in corn-based finishing diets containing WCGF. The steers were randomly assigned to one of five dietary treatments that consisted of diets balanced (13% CP) using high-moisture and dry ground corn with one of the following forage sources: corn silage, WCGF, WCGF in combination with corn silage, WCGF in combination with grass-legume hay, or WCGF in combination with both grass hay and corn silage.

The researchers noted the following observations.

- 1) Steers fed diets containing WCGF had similar performance and carcass characteristics as the cattle fed the corn silage diet.
- 2) Steers fed the diet containing WCGF without added forage gained faster, required fewer pounds of dry matter per pound of gain, and were heavier at harvest (live and carcass weights) than steers fed diets containing WCGF with additional forage.
- 3) Steers fed the diet containing WCGF and hay gained body weight faster, reached heavier final and carcass weights, and had greater dressing

percentages than those fed the diet containing WCGF and corn silage.

- 4) Steers fed diets containing WCGF in combination with both forage sources and cattle fed diets containing WCGF combined with either forage source had similar feedlot performance and carcass characteristics.

Combining WCGF with corn silage, hay or both led to associative effects that reduced feedlot performance and estimated energy content of diets. This effect was greater for the diet containing WCGF in combination with corn silage.

“When deciding to feed wet corn gluten feed to feedlot cattle on high-grain diets, feeders may choose to include an additional forage source, albeit at a lower efficiency than feeding a diet based only on wet corn gluten feed and corn,” says UM animal scientist Alfredo DiCostanzo. “Using home-grown hay or corn silage may permit some consistency to feeding, as feeders can plan ahead to maintain a constant supply of the forage. However, to compensate for reductions in feed efficiency when using additional forage in wet corn gluten feed and corn diets, the opportunity price for corn silage or hay should be 1.4% or 35.5% lower than market value, respectively.”

For more information contact DiCostanzo at dicoz001@umn.edu.

NU researchers have concluded that sorting steers into marketing groups when they enter the feedlot pays off in heavier, more profitable steers.

The study followed 200 steers that were randomly assigned to either an intensive or normal management treatment. Both groups of steers grazed winter corn residue for 91 days and were then moved to a drylot for 52 days of hay feeding with WCGF supplementation. Steers under the “normal” management scenario received 5 lb. of WCGF DM daily, while “intensively” managed steers received 6 lb. of WCGF daily with Bovatec® and were implanted with Ralgro on the first day of the study and Synovex-S® the day before being moved to the drylot.

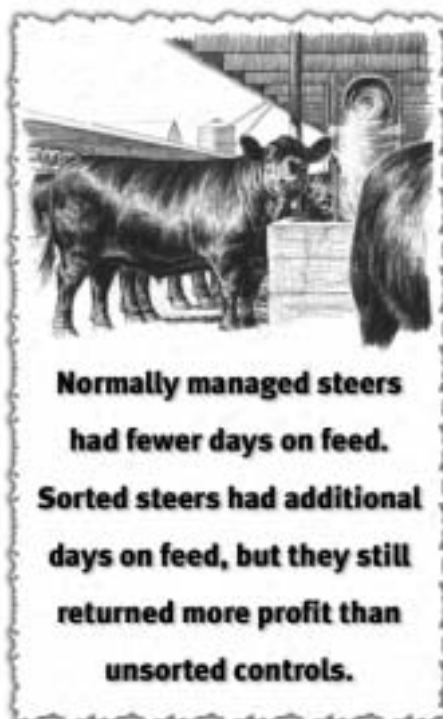
At the end of the drylot feeding session, all steers received a Revalor®-G implant and began the summer grazing period. Intensively managed steers were placed on feed at Day 220, and normally managed steers on Day 264. At initiation of feedlot finishing, steers were implanted with Revalor-S and stratified by weight and assigned randomly to one of two additional treatments, sorted or unsorted.

Sorted steers were divided into three weight groups — the heavy 25%, the middle 50% and the light 25% — and marketed at a common fat thickness target of 1.14 centimeters (cm). Heavy steers were marketed 14 days prior, middle steers were marketed 7 days after, and light steers were marketed 21 days after the unsorted control group.

The researchers found that steers under normal management, and sorted, had significantly greater ADG, DMI, hot carcass weight and final weight and lower feed conversion than intensively managed, unsorted steers. Normally managed steers had fewer days on feed. Sorted steers had additional days on feed, but they still returned more profit than unsorted controls.

“A very inexpensive and practical way to sort cattle is by weight as they enter the feedlot,” says Terry Klopfenstein, NU animal scientist. “This allows feeders to market the big cattle before they get too big. Maybe more importantly, sorting allows feeders to feed the remaining cattle longer, which produces more carcass weight. In turn, more carcass weight without discounts results in more profit.”

For more information contact Klopfenstein at (402) 472-6443 or tklopfenstein1@unl.edu.



End Product

Steers outperform heifers in feedlot performance, carcass characteristics and muscle tenderness, according to results of a Montana State University (MSU) study. The researchers found that under the genetic and environmental conditions of the study, steers had faster daily gains, produced heavier carcasses at similar levels of subcutaneous fat compared to heifers and received more favorable taste panel ratings for overall tenderness than steaks from heifers.

For this research, 202 progeny of Angus and Simmental sires were evaluated for the effects of gender on rate of gain, carcass traits, shear force and trained sensory panel ratings of beef palatability. Ninety-nine steers, 57 heifers and 46 spayed heifers were commercially fed for 161 days. No implants were administered, and heifers were not fed melengestrol acetate (MGA) to suppress estrus.

Researchers found the following results.

- 1) Steers had faster daily gains than spayed and intact heifers (3.57 lb. per day vs. 3.26 lb. per day and 3.13 lb. per day, respectively).
- 2) The heavier final live weights of steers resulted in hot carcass weights that were 55 lb. heavier at similar levels of fat thickness compared with heifers.
- 3) Spayed heifers had a 5.7% smaller ribeye area compared with steers and intact heifers, which were similar among treatments.
- 4) Calculated yield grades and USDA quality grades were similar among treatments, although marbling scores were lower for steers compared to intact and spayed heifers.
- 5) Warner-Bratzler shear force values after seven and 14 days of aging were lower (more tender) for steers compared to intact and spayed heifers, which were not different from each other. Mean

shear force values at seven and 14 days of aging were 3.3 and 3.3 (steers), 3.8 and 3.6 (intact heifers), and 3.6 and 3.5 (spayed heifers), and did not differ among genders after 21 days of aging.

A trained sensory panel evaluated steaks aged 14 days from 193 of the cattle. Steaks from steers received more favorable ratings for muscle fiber tenderness, connective tissue amount and overall tenderness compared with spayed and intact heifers.

Based on these findings, the researchers recommend that cuts from heifer carcasses be aged for a longer period of time than steers to help alleviate differences in tenderness. No preharvest factors have been identified or associated with the tenderness differences and, therefore, no recommendations are available for producers other than maintaining beef quality assurance (BQA) practices at the ranch, says John Paterson, MSU Extension beef specialist.

For more information contact Paterson at (406) 994-5562 or johnp@montana.edu.

Oil supplementation in finishing diets can boost marbling and quality grade scores, say University of Georgia (UG) meat scientists. Those findings are based on two separate studies utilizing different kinds of oil supplements.

In one study, canola oil and a combination of canola oil and fish oil were supplemented in a finishing diet for 24 Angus-Hereford-cross steers to determine the effect on animal performance, meat quality and tissue fatty acid composition.

Steers were randomly allotted to one of three diets, including:

- 1) basal high-concentration diet (88% concentrate, 12% grass hay);
- 2) basal diet plus 4% canola oil; or
- 3) basal diet plus 3% canola oil and 1% crude fish oil.

All steers were implanted with Synovex-S at the initiation of the study and fed the basal diet for the first 41 days. After 41 days on feed, animals were gradually switched to treatment diets during a two-week period. Then, for 50 days until harvest, all steers received their appropriate treatment rations. At 24 hours postmortem, carcass data was collected.

ADG tended to be greatest for cattle fed the diet supplemented with the canola and fish oil compared to the other two treatments during the final 50 days on feed. Cattle fed the canola oil and canola-fish oil

Feeding supplemental oils increased marbling scores and quality grades. The addition of fish oil with canola oil also increased conjugated linoleic acid concentration and lipid oxidation of ground beef.

supplements also had higher marbling scores and quality grades than cattle that had no oil supplementation. Hot carcass weight, dressing percentage, fat thickness, ribeye area and yield grade did not differ between treatments.

Ground beef samples from steers fed the canola-fish oil supplement or no supplement received higher juiciness and tenderness scores from sensory panelists compared to beef from steers only fed the canola oil treatment. Steaks from steers fed the canola oil supplement tended to be tougher, as indicated by higher Warner-Bratzler shear force values, than the canola-fish oil treatment, with the nonsupplemented treatment being intermediate.

The researchers concluded that feeding supplemental oils increased marbling scores and quality grades. The addition of fish oil with canola oil also increased conjugated linoleic acid (CLA) concentration and lipid oxidation of ground beef.

In a second UG study, these researchers studied the effects of supplemental corn oil or rumen protected CLA on fat deposition of finished beef cattle.

Thirty-six Angus-cross heifers were used. After an initial 56-day feeding period, they were assigned to one of three dietary treatments, including:

- 1) basal ration containing 88% concentrate and 12% grass hay;
- 2) basal ration plus 4% corn oil; or
- 3) basal ration plus 2% rumen-protected CLA salt.

Carcass data revealed that heifers fed the diet with 4% corn oil tended to have higher marbling scores than heifers in the other two dietary treatments. However, quality grade and total fat content of the *longissimus* did not differ among the three treatments. The researchers concluded that lipid supplementation to feedlot diets altered fat

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deposition, increased CLA and altered cellular diameter.

While the findings of these studies are promising, lead researcher Susan Duckett says, "More research is needed to determine the optimal level of oil supplementation for increased marbling deposition and to determine the economics of oil supplementation."

For more information contact Duckett at (706) 542-0942 or sduckett@arches.uga.edu.

Ultrasound rump fat thickness measurements are a good predictor of total body fat in Angus cattle, confirms a large Iowa State University (ISU) study. "This research validates prior research and methods already being used by the American Angus Association in conjunction with ISU to calculate fat expected progeny differences (EPDs) with ultrasound data," says ISU's Gene Rouse. Currently, the 12th-rib fat measurement is weighted 60%, and the rump fat measurement is weighted 40% to calculate the EPD.

The study, which was designed to evaluate heritability and repeatability of 12th-rib fat cover and rump fat thickness in Angus cattle, included data from 912 purebred Angus bulls and heifers born from spring 1998 to spring 2001. Each year, calves were measured for 12th-rib fat thickness, rump fat thickness and other ultrasound measures starting at weaning time, and then at four- to six-week intervals until harvest.

Bull and heifer rump fat thickness measures showed higher heritability values than 12th-rib fat for all scan sessions. Heritability of 12th-rib fat increased from 0.13 at the first scan (mean age of 35 weeks) to 0.29 at the fifth scan (mean age of 53 weeks). Heritability of rump fat thickness increased from 0.33 at the first scan to 0.44 at the sixth scan (mean age of 56 weeks).

Genetic correlation between yearling 12th-rib fat and earlier rump fat thickness measures, including scans one to four, were 0.58, 0.62, 0.77 and 0.83, respectively.

Heritability of rump fat thickness ranged from 0.27 to 0.39 as compared to 0.24 to 0.34 for 12th-rib fat measures.

At one year of age, heritabilities of 12th-rib fat and rump fat thickness were 0.34 and 0.38, respectively. Both traits showed similar repeatability values, ranging from 0.71 to 0.91.

The relatively higher heritability values of early rump fat thickness measures and the strong genetic association with yearling 12th-rib fat suggest that rump fat thickness

Increased oxidation of muscle proteins early postmortem could have negative impacts on fresh meat color and tenderness.

measures are an effective additional source of information for earlier evaluation of Angus cattle for fat cover and other related traits, according to researchers.

For more information contact Rouse at (515) 294-5641 or grouse@iastate.edu.

Irradiation appears to interfere with the aging — and resulting tenderization process — of meat, according to an ISU study. The research was designed to determine the effects of early postmortem oxidation on beef quality.

"We know that tenderness of beef improves with postmortem aging," says ISU meat scientist Steven Lonergan. "Much of the improvement in tenderness is attributed to degradation of meat proteins by activity of a muscle proteinase, μ -calpain. Specifically, regulation of μ -calpain, and ultimately tenderization in beef, has been attributed to a calpain inhibitor in muscle, calpastatin. What is not known is what other factors have the potential to regulate μ -calpain and tenderization in beef."

Lonergan, fellow ISU researcher Elisabeth Huff-Lonergan and graduate student Laura Rowe initiated studies funded through the U.S. Department of Agriculture (USDA) National Research Initiative Competitive Grants Program to determine how protein oxidation influences calpain activity and beef tenderness.

To achieve different levels of oxidation, two treatments were used; supplementing beef animals with vitamin E during the last 126 days on feed and irradiating products

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early postmortem. Vitamin E is an antioxidant that may prevent oxidation; irradiation can accelerate oxidation.

Ten beef steers were fed a finishing diet that included vitamin E at 1,000 international units (IU) per head per day. Another 10 beef steers were fed the same finishing diet without vitamin E. Steaks from each carcass were assigned to irradiation treatments of 0 kilograys (kGy) or 6.4 kGy at 26 hours postmortem.

The researchers found that steaks from cattle fed the vitamin E diet had significantly higher vitamin E content and demonstrated more rapid degradation of troponin-T (an indication that the aging response was more rapid) than steaks from animals fed the control diet. At zero days postirradiation, within diet, steaks that had been irradiated were darker. Irradiated steaks, regardless of diet, were less red than nonirradiated steaks at all aging times. Irradiation also resulted in greater protein oxidation, as documented by protein carbonyl content. Additionally, correlation analysis revealed that higher carbonyl content resulted in higher Warner-Bratzler shear force values (less-tender beef).

The explanation for this observation is that postmortem protein oxidation (through irradiation), before tenderization was complete, resulted in inactivation of μ -calpain, slower proteolysis of key structural proteins, and less inactivation of calpastatin, the researchers report.

The researchers concluded that increased oxidation of muscle by irradiation or other processes in the early postmortem period has the potential to decrease the rate of inactivation of calpastatin and may influence proteolysis of other meat proteins. These results indicate that increased oxidation of muscle proteins early postmortem could have negative impacts on fresh meat color and tenderness, Lonergan says.

He adds, "We would recommend that irradiation of whole muscle cuts not take place until aging is complete. This is based on our observation that irradiation significantly slowed down the tenderization processes."

For more information contact Huff-Lonergan at elonerga@iastate.edu or Lonergan at slonerga@iastate.edu.

Management can make a difference in final quality grades of steers, according to University of Illinois (UI) research. Specifically, early weaning and/or creep-feeding can increase marbling scores, reports UI animal scientist Dan Faulkner. He says, "Our research proves that we can reduce fat

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and improve quality by using appropriate management strategies.”

Most recently, UI researchers have found that selecting for marbling traits, combined with early weaning management, appears to increase the number of animals that will grade low-Choice or better. The study followed 144 early-weaned Simmental crossbred steers of known genetics selected for marbling and yearling weight expected progeny differences (EPDs). Steers were weaned at an average of 87 days of age and all were fed a high-concentrate diet for approximately 90 days.

Calves were implanted with Synovex®-C at weaning and were successively implanted with Synovex-S and Revalor-S. Steers were fed a 90% concentrate, whole-shelled corn and corn silage diet, supplemented to contain 15% crude protein (CP) using soybean meal for 247 days before being harvested at 422 days of age.

On average, the steers gained 3.6 lb. per day and consumed 19.7 lb. of dry matter (DM) per day. Steers finished with a 1,428 lb. final weight, 886 lb. hot carcass weight, 1.12 centimeter (cm) 12th-rib fat and 14.2 square inch (sq. in.) ribeye area.

USDA Yield Grades (YG) were calculated, with 23.2% of steers receiving YG 1; 54.9%, YG 2, 20.4%, YG 3; and 1.4%, YG 4. USDA Quality Grades (QG) were 17.7% Select, 44.7% low-Choice, and 36.9% average-Choice or better.

The American Simmental Association database reported that steers of the same breed type graded 55% low-Choice or better under traditional management, while early weaning resulted in 81.6% grading low-Choice or better.

The researchers concluded that selecting for greater marbling, combined with early weaning, can improve carcass quality. However, selecting for greater yearling weight may increase hot carcass weight and lower yield grade, they caution.

Previous UI research has also shown that creep-feeding can influence quality grade. “We have seen an increase in final quality grade as the amount of creep feed consumed increased. The source of creep feed also has a dramatic influence on final quality grade. Calves creep-fed with a corn-based diet had much higher final quality grades than those fed a soybean-hull-based diet, even though the daily gains of the calves were similar,” Faulkner says.

He adds, “Based on our research data, it appears that the calves need to be on a high-

grain creep feed for about 80 days to increase quality grade.” In the studies, all calves were weaned at 205 days of age and adapted to a finishing diet within 28 days of weaning. Faulkner reports that there were few differences in feedlot performance between creep-fed and non-creep-fed calves.

However, Faulkner cautions that the influence of creep-feeding heifers appears to be negative on their subsequent milk production. “We conducted a study with Simmental×Angus crossbred heifers and found a 25% reduction in milk production, which is similar to other research findings. We would not recommend creep-feeding heifer calves, but we feel that creep-feeding steer calves can improve quality grade with no decrease in feedlot performance,” Faulkner says.

Based on the last decade of research at UI, Faulkner offers these management recommendations to produce quality beef:

- ▶ If you plan to creep-feed, calves should be on creep feed for at least 80 days, Faulkner says. In a previous study, creep-feeding for just 55 days prior to weaning had little benefit on quality grade — probably because the time was insufficient to initiate marbling deposition.
- ▶ If you are early weaning the calves, you can wean at about 80-90 days (just prior to breeding) to get reproductive benefits for the cow and performance and carcass benefits for the calf. When comparing 90, 150 or 210 days of age at weaning, researchers have observed that the calves weaned at 90 days had greater than 50% more cattle that graded above average-Choice — even when the calves were harvested at less backfat.
- Or, you can creep-feed and wean at about 150 days and still get performance and carcass benefits for the calf. Among calves weaned at 150 days, research has shown a 30% increase in calves that graded average-Choice or above, compared to traditional weaned calves.
- ▶ Calves need to be on a high-concentrate diet as early as possible to initiate marbling deposition. The diets should be based on corn or other high-energy grains, rather than high-fiber supplements like soyhulls, to maximize the initiation of marbling, Faulkner says. If calves are fed a low-energy diet after they were on a high-energy diet for some period of time, they may lose the marbling that was initiated and ultimately not grade as well, he adds. These high-energy diets should include a

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16% protein level until the calves weigh 600 lb. It can then be reduced to about 12.5%. Including ionophores in the diet is also important to reduce acidosis and bloat.

- ▶ Calves should be implanted twice, about 100 days apart, with estrogenic implants, such as Ralgro or Synovex, Faulkner says. Two Synovex implants in a row aren't recommended because it may increase the number of tough carcasses. For the last 120 days, the calves should be implanted with a combination estrogen-androgen implant, such as Revalor or Synovex-Plus.® These implants will increase final weight and will not reduce marbling in our system, he adds.
- ▶ Let the cow be a low-input, low-cost “factory.” Part of the feed cost of early weaning can be recovered through reduced supplemental feed cost of the cow, Faulkner says. Early weaning calves can also effectively increase the stocking rate by as much as 35% and may reduce reproductive costs in the herd.
- “We have demonstrated that the goal of producing high-quality carcasses from steers placed on feed as calves is achievable. Management of the calves to get them on a high-energy diet as early as possible is critical. This management has been more important than the calves' genetic merit for marbling in our studies,” Faulkner says. But he adds, “The effects of high-marbling EPDs have been additive with our management program, so both are important.”

For more information contact Faulkner at danb@uiuc.edu.

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