Range Cow Logic PART 2

Genetics and reproduction take center stage.

In Part 2 of our published coverage of the 19th Range Beef Cow Symposium (RBCS), we provide overviews of presentations during the genetics and reproduction sessions. The Dec. 6-8, 2005, symposium in Rapid City, S.D., was sponsored by the Cooperative Extension services and the animal science departments of South Dakota State University (SDSU), Colorado State University (CSU), the University of Wyoming and the University of Nebraska. For Angus Productions Inc.'s (API's) online coverage of the event, which includes summaries of all the sessions and a link to audio/video coverage, log on to the newsroom at *www.rangebeefcow.com.*

GENETICS

Improving Feed Efficiency Through Genetics

PHOTOS BY LYNN GORDON

Mark Allan

While improved feed efficiency is desired by most cattle producers, and it is considered a moderately heritable trait, there has been minimal progress in understanding the genetics of feed efficiency. However, according to geneticist Mark Allan, technology has been developed to better implement genetic selection for energy efficiency.

A researcher at the Roman L. Hruska U.S. Meat Animal Research Center (MARC), Clay Center, Neb., Allan told RBCS attendees that previous attempts to select for feed efficiency frequently resulted in unintended increases in mature female body size. Bigger cows generally mean higher production (feed) costs. Another correlated, but unfavorable response, was increased calf birth weight.

The reason, Allan said, is that the most common measure of feed efficiency has been feed conversion ratio. When heavy selection pressure is placed on reducing the feed-to-gain intake ratio, increases in mature weight and birth weights should be expected.

Presently, however, residual feed intake (RFI) is the trait of choice among most researchers. This measure of feed intake is not directly correlated with traits like growth rate and mature size, allowing selection for favorable feed efficiency without detrimental effects on other important traits. The downside is that no data currently exists to analyze the long-term consequences of selection for RFI.

Allan said experiments have been initiated at MARC to gather this much-needed data. The project includes a study of the variation in nutrient utilization in finishing steers and in breeding females.

In the short term, Allan said, the industry will see the development of feed efficiency expected progeny differences (EPDs), most likely from RFI. The first EPD for RFI will most likely be for the finishing phase. Allan warned producers that feed efficiency EPDs should be used with care. Extreme selection pressure for feed efficiency by using such an EPD without knowledge of correlated responses or long-term effects on fitness and adaptability could possibly lead to a less efficient cow herd.

"My gut feeling is that the most efficient feeding animal might not make the most efficient cow," Allan explained. "That is the reason for the female production efficiency experiment."

A primary objective of the steer and female experiments is development of tools needed to create EPDs and identify gene markers to assist selection. Application of genetic markers should allow opportunities to improve the profitability of beef production through genetic selection for feed efficiency without measuring feed intake directly. If differences exist between cow efficiency and finishing efficiency, markers would allow producers to improve a specific phase of production.

— by Troy Smith

Using New Selection Tools

CSU's Mark Enns and his fellow geneticists have long said that if you can measure a genetic trait, they can produce an EPD for it. Enns told RBCS attendees that EPDs have been the best tools for producers to use in making

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Mark Enns

genetic selection decisions.

During the years, the number of trait EPDs available has grown from five to 15 or more. With so much information to sift through, however, the process of making selection decisions has become a daunting task for many producers.

"How does a producer decide which traits have the greatest influence on income and expenses?" Enns asked.

Fortunately, there are ways to help ease the process of selecting for cattle that are more profitable. The first process, Enns said, is to sort for economically relevant traits (ERTs) vs. indicator traits. Distinguishing between the two will reduce the number of EPDs to be considered for selection.

Enns described ERTs as those traits that directly relate to cost or revenue from production. If performance in these traits is changed one unit, there is a direct effect on either expense or income. Indicator traits are not directly related to profitability, he explained, but can add accuracy to the calculation of EPDs for economically important traits.

For example, decreasing birth weight by 1 pound (lb.) is not likely to have a direct effect on costs or revenue. However, increasing calving ease by 1%, meaning 1% fewer heifers requiring assistance at calving, can lower labor costs and increase the number of calves for sale.

ERTs can reduce the amount of information to be considered and help combine the economics of production and genetic improvement; however, the concept does not completely evaluate each EPD's effect on profitability, Enns said. "To put a dollar value on EPDs, producers can use a selection index suited to their operation. … The best indexes account for costs as well as income."

For example, a producer might determine that increasing weaning weight is worth a certain amount of added income due to increased pay weights. But, the index would also account for an accompanying increase to mature weight of females and potential increases to feed costs. A number of breed associations have developed generalized indexes for producers to use in the process of assigning values to EPDs.

"The next step beyond the selection index is the decision-support system," Enns said. "This tool allows producers to tailor the selection system to his specific operation, taking into account current production levels, costs of production and the marketing program."

As part of the National Beef Cattle Evaluation Consortium (NBCEC), CSU is developing a Web-based decision-support tool to simplify the process of selecting breeding stock that produce more profitable offspring.

— by Troy Smith

Utilizing Carcass Traits in a Breeding Program

Through the use of artificial insemination (AI) and a disciplined focus on carcass traits, Blair Bros. Angus, near Sturgis, S.D., has moved its cow herd from producing calves that grade 65% USDA Choice to calves that consistently grade 98% Choice. Rich Blair, who operates the family Angus ranch with his brother, Ed, and their sons and a son-in-law, shared the story of their success with RBCS attendees.

The Blairs began using AI sires in 1989. "Our matings were geared toward what would build a good cow herd for us," Blair shared. "We want cows that are efficient on grass and will produce calves that perform in the feedlot and produce a desirable consumer product."

Rich Blair

He added that they've always kept an eye on calving ease and have never selected for extreme growth.

In 1998, they sent their first set of steers to U.S. Premium Beef (USPB) to be marketed on the grid. At that time, the cattle went 65% Choice and earned a $5-per-head premium. Blair said they were pleased with the results, but recognized there were greater premiums to be had, particularly for USDA Prime.

"We recognized it starts with genetics," he said. "I knew I could change birth weights, weaning weight and calving ease through genetics, and I found out marbling score and ribeye area are even more heritable."

As the Blairs used more AI with a selection focus on marbling and retained the second generation of AI-sired females, they began to see more expression of desirable carcass traits in their herd. They've had some groups of calves achieve 100% Choice with an 80% or higher *Certified Angus Beef*® (CAB®)-acceptance rate. One set of heifers fetched a premium of more than $200 per head.

Blair attributed their success to the focus on cow herd genetics. "That's what happens when you stack a couple generations of marbling on top of each other," he said.

Regarding premiums, he added, "I think raising pounds is great, but if you're selling on a grid, pounds isn't everything. It's often said packers don't want Yield Grade (YG) 4, but if that animal goes Prime, the premium is worth it.

"Sometimes in selection there are tradeoffs in traits, but I haven't seen a tradeoff in our pursuit of marbling," Blair said.

"Without good data," he concluded, "it's hard to make good progress

in breeding. The American Angus Association has done a good job of providing data. Their sire data is our bible, and I think the recently developed indexes are going to make even more of a difference in enhancing trait selection."

— by Kindra Gordon

Heterosis & Crossbreeding

What rancher wouldn't appreciate a 25% improvement in the lifetime productivity of his or her cow herd? According to veteran NU geneticist and Extension beef specialist Jim Gosey, that's the potential advantage offered by crossbred cows. Yet, recent years have seen many commercial cow-calf producers opt for straightbred cow herds.

Gosey told attendees of the 2005 RBCS that reasons for the shift to straightbreds may include the desire to simplify breeding programs and the belief that straightbred cattle produce more uniformity and consistency. Or, he added, producers may be targeting breed-specific or certain premium markets.

Jim Gosey

Gosey said he fears too many producers are ignoring two major benefits of crossbreeding: heterosis (hybrid vigor) and the complementary effects of breed differences.

"Many producers are using EPDs to stack good genes on good genes for an additive effect. But why not use heterosis, too?" Gosey asked.

Gosey advised using EPDs to select for highly heritable traits that respond best to direct selection. Heterosis, on the other hand, has the greatest influence on lowly heritable traits such as reproduction, early growth and lifetime productivity of females.

Maternal heterosis accounts for about two-thirds of the total crossbreeding advantage, Gosey said. It affects reproductive performance through earlier puberty, higher conception rates, faster breed-back, greater longevity and the maternal effect on calf performance. Individual heterosis generally accounts for the other one-third of the potential 25% increase in lifetime productivity, affecting early calf vigor and growth rate.

Gosey said an often-overlooked advantage of the crossbred cow is increased longevity — an average of 1.9 years more than the average of straightbred cows, or an average of 766 lb. of greater lifetime productivity.

Crossbreeding allows producers to take advantage of breed differences, he added. By matching the strengths of different breeds, he said, producers can better manage trait antagonisms such as that which exists between marbling and retail product yield.

While some rotational crossbreeding systems that maximize heterosis are complex, Gosey said simple programs to optimize heterosis and utilize breed differences can be developed.

— by Troy Smith

REPRODUCTION

Management Strategies to Reduce Embryonic Loss

Tom Geary

Embryonic loss may represent the single greatest economic loss for cow-calf producers, Tom Geary, U.S. Department of Agriculture (USDA) Agricultural Research Service (ARS), told producers at the 2005 RBCS. "With 40 million beef cows and heifers exposed to breeding each year in the U.S., annual losses exceed $1.2 billion. … If we could prevent embryo wastage in just five out of every 100 cows, we would wean an additional 2,100 pounds per 100 cows."

Geary reviewed the estrous cycle and stages of pregnancy, noting the differences between early embryonic mortality (EEM; fertilization to Day 27), late embryonic mortality (LEM; Day 28 to Day 42) and fetal mortality (after Day 42). The majority of losses are EEM. Geary then divided the causes of embryonic loss into four categories: genetics, nutrition, environment and miscellaneous.

Genetics. Genetic abnormalities account for approximately 10% of embryonic losses, with the most common defect being an abnormal number of chromosomes resulting from polyspermy (fertilization by more than one sperm). Polyspermy is more common when AI occurs closer to ovulation. Although the fertilization rate is lower when insemination occurs closer to the onset of estrus, the embryonic survival rate is higher. Geary recommended AIing 12 hours after the onset of estrus.

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Nutrition. Embryonic losses due to nutritional factors represent approximately 32% of losses, Geary said. Cows bred when they are gaining weight have higher pregnancy rates than cows bred when they are losing weight. He recommended determining cow body condition scores (BCSs) shortly after calving and adjusting diets accordingly.

He cautioned producers against selecting for excess milk, since all lactating cows have a negative energy balance. "Use early weaning at the start of the breeding season. You can go from a negative energy balance to a positive energy balance in just two days," he said, which will have a positive effect on fertility.

Some studies show feeding fishmeal suppresses oxytocin-induced prostaglandin secretion in heifers with low progesterone concentrations. Geary explained that this suggests fishmeal "may improve an embryo's ability to signal maternal recognition of pregnancy."

Environment. Environmental factors influence approximately 15% of embryonic losses. Geary cited heat stress and handling stress as the most common environmental culprits.

He explained that gathering and handling cattle through working facilities is more stressful for heifers than cows. Thus, injectables designed to inhibit prostaglandin production and increase pregnancy rates are often less effective in heifers than in cows. Geary said the stress caused by handling alone is enough to counteract the possible benefit of such an injection in heifers.

Miscellaneous. "Progesterone is obligatory for the establishment and maintenance of pregnancy," Geary said. The use of a CIDR®, gonadotropin-releasing hormone (GnRH) or human chorionic gonadotropin (HCG) may increase progesterone concentrations, but Geary cited several studies showing their inconsistent ability to improve embryo survival and pregnancy rates.

— by Meghan Soderstrom

Factors Affecting Breeding Success

George Perry

SDSU's George Perry discussed management factors affecting breeding success.

"Reproductive failure costs the beef and dairy industries over $1 billion annually," Perry said. The major place for error, he explained, is in cows not getting pregnant — fertility problems. Perry spent time discussing the advantages and disadvantages of AI and natural service, as well as management tips and possible problems for each.

AIing cows is a popular choice, he said, partly because there is a reliable source of quality semen. "The limitation is, you have to get out and detect estrus," he noted. One solution for that problem is estrus synchronization.

Perry compared the benefits of synchronizing to not synchronizing. He pointed out that some benefits appear only within certain time windows. In most cases, he said, if calves are bringing 50¢ per pound, 41 lb. will pay for synchronization protocols, and everything else is profit. He also emphasized the importance of following protocols exactly — not just regarding synchronization, but also regarding all other management decisions.

Perry then discussed the pros and cons of using natural service. He began by noting that a study of cows bred AI and natural service showed no difference in pregnancy rates between the two measures — if the bull used in natural service was healthy and fertile. To judge a bull's fertility, Perry said a breeding soundness exam (also referred to as a BSE) is an absolute necessity.

A breeding soundness exam measures three main things about the bull in question: physical health, scrotal circumference (SC) and semen quality. Perry emphasized the importance of a bull's physical health in breeding cows. "Especially in range situations, vision is very important," he said, since many bulls detect cows in estrus by watching cows mount one another.

Structure is also crucial, he noted, explaining that the bull needs to be physically able to mount the cow.

Semen quality, measured through both volume and semen motility, is also a necessity. "Just collecting the semen is not enough to know how well that bull can breed," Perry said. If sperm are not moving forward, they can't get the job done.

Other issues producers should consider when deciding which bull to use include service capacity and social dominance. How many cows will that bull be able to breed? Perry suggested producers carefully consider bull-to-cow ratios. If running several bulls in one pasture, does one bull dominate the others? In a multi-sire pasture, up to 90% of the cows can be bred by only one bull (if running several bulls) if that bull is dominant, Perry said. If the dominant bull is not fertile, pregnancy rates can drop dramatically.

Perry closed by noting the huge amount of information available regarding factors affecting breeding management, and he encouraged listeners to seek further information.

— by Brooke Byrd

Heifer Development Strategies

When it comes to developing replacement females, Trey Patterson of the Padlock Ranch, Ranchester, Wyo., suggests there are different ways to do things. At the 2005 RBCS, the former SDSU Extension beef specialist suggested it might even be OK to sell open heifers.

The goal with heifers is often to get as many bred as possible. Patterson

Trey Patterson

suggested producers consider costs and shift that goal to an optimum level of reproduction. "Spending more money to get [the] maximum [number of] females bred can actually decrease profits on the ranch," he explained.

In moving toward optimum reproduction as a more cost-effective goal, Patterson suggested producers rethink having heifers at 60%-65% of their mature weight by breeding season. Instead, he suggests keeping heifers smaller and getting them to 50%-55% of mature weight. "Cattle have changed so much since that initial target was set," he explained.

Patterson said there is no denying that weight influences puberty, and age of puberty is also affected somewhat by breed. A 910-lb. heifer is possibly necessary for maximum reproduction, he added, but not for optimum reproduction.

Patterson shared recent research showing a heifer group with an average weight of 638 lb. can still have a 90% pregnancy rate. In another study where heifers were fed to 50% of their mature weight, the group had an 87% pregnancy rate.

Patterson concluded by saying there is more risk of reproductive failure if heifers are developed at smaller weights, but there is also less development cost. In those scenarios, he pointed out, it may be a paying proposition to sell the open heifers. Smaller development weights may mean smaller cows, he said. "That's a plus, because it means lower maintenance requirements, which translates to less feed."

Patterson said the Padlock Ranch will be producing its crossbred females with this new concept of smaller development weights, and they believe it will be a success.

"We think we can build a better young cow that will have lower inputs," he said.

— by Kindra Gordon