Selection Decision Tools

Selection tools are advancing. Researchers share insight on economically relevant traits, developmental programming and epigenetics.

*by **Kasey Brown,** associate editor*

"There has been a lot of time, money and effort invested in collecting data on economically relevant traits (ERTs), but not as much effort in how to use those data. That's something we need to talk about," said Bruce Golden, department head and professor of the Dairy Science Department at California Polytechnic State University–San Luis Obispo. He spoke to the joint meeting of the Advancements in Selection Decisions and Advancements in Producer Applications committees at the 2014 Beef Improvement Federation (BIF) Annual Meeting & Research Symposium in Lincoln, Neb., June 18-21.

Expected progeny differences (EPDs) are just parameters in the decision-making process in the beef industry, he said. However, they depend upon submitted data, so they are not complete. He recounted some of the history of performance records and EPDs. With the advancement of technology and trait data collection, the sire summary of the future could be huge. With too many options, though, breeding decisions don't get easier.

That's why ERTs have importance as selection tools. He illustrated two categories of traits, ERTs and indicator traits. ERTs are traits that directly affect profitability by being associated with cost or the income stream. Indicator traits have a genetic correlation to ERTs and can be used in analyses to increase the accuracy of ERT EPDs.

►Bruce Golden, department head and professor of the Dairy Science Department at California Polytechnic State University–San Luis Obispo, likened decision analysis tools to the book and movie *Moneyball.* They can take the bias out of the decision and narrow the options to the important traits. In the age of genomic data, decisions are complex and expensive.

However, using the EPDs of indicator traits rather than ERT EPDs in selection decisions actually decreases the accuracy of that decision, and thus decreases the likelihood of making a good decision. Indicator traits are only part of the equation.

Not all traits are straightforward as being an ERT or indicator trait. Weaning weight can be either, depending on the situation. It is an ERT if you sell calves at weaning. If you sell calves as yearlings, the weaning weight EPD is an indicator trait. This is why indexes are helpful, explained Golden.

Should indicator traits be measured? Of course, he answered, but should they be published? For instance, the birth weight EPD is mostly an indicator trait for calving ease. On the other hand, he asked if indicator traits are not published, then will cattlemen continue to submit the data if they think indicator traits are less valuable?

He proposed only publishing EPDs that are used in any type of Partial Budget Decision Analysis, which predicts the financial impact of incremental changes in revenue and costs from alternative decisions.

Sire summaries have gotten better, Golden asserted. Enhancements include selection indexes, more fertility EPDs, elimination of ultrasound EPDs, and working toward a feed consumption EPD.

He likened decision analysis tools to the book and movie *Moneyball.* They can take the bias out of the decision and narrow the options to the important traits. In the age of genomic data, decisions are complex and expensive. New models and methods allow new things, he added.

He concluded by recommending investment in production-level simulation models, both for producers and breeders. He added that what ERTs are produced completely depend on the models.

Don't blame the bull

With the recognition of potential developmental programming and epigenetic effects, Dan Moser, now president of Angus Genetics Inc., proposed the idea of redefining contemporary groups to attendees of the joint meetings of the Advancements in Selection Decisions and Advancements in Producer Applications committees.

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He explained that traditional methods of genetic evaluation consider the animal through genetic effects; the environment through contemporary groups; unexplained variation through residual effects; and genetic and environmental variance, which are components of heritability.

However, Moser asked, if other effects impact the calf before birth, how does that change the comparisons?

Developmental programming is the phenomenon that management during pregnancy affects the calf. Epigenetics is the phenomenon that progeny show modified gene expression when the dam is subjected to severe stresses during pregnancy. This isn't a change in the DNA, he clarified, but it does change the regulation of gene expression. This means the modified gene expression doesn't show up on a SNP chip. Some of these potential stressors include

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forage availability and quality, higher milk production during early pregnancy, late weaning, and a mismatch of genetics and environment.

Can we successfully model developmental programming? He suggested a few options to consider. One option is expanding the definition of contemporary group by extending it to include common management from weaning of the previous calf. Another is grouping first-calf heifers in their own contemporary groups. The developmental programming effects might be partially accounted for with age-of-dam adjustments on a breed-wide basis.

Nevertheless, these options would reduce contemporary group size. For a long time, Moser noted, the industry has preached larger contemporary groups because you lose information with smaller groups. This poses the question of how much do we gain with more effects accounted for but in smaller groups? He did grant that loss of contemporary group size can be partially offset with genomic evaluation.

To model epigenetic effects, Moser suggested grouping progeny data by the dam's birth year. For example, this would group the cows that were born in a severe drought together and observe their calves together. Producers who retain females to older ages would see greater division of groups.

He doesn't recommend changing the model overnight, especially with additional concerns. Most likely, heifer calves from malnourished dams would be less likely to enter the herd, lessening the overall impact of these effects. However, such effects may be more prevalent with embryo transfer and cooperator herds. So far, the effects of developmental programming and epigenetics appear small; and the stucture of contemporary groups limits our ability to model the effects. Field data research with detailed management information is needed to clarify the significance of the effects, he concluded.

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Editor's Note: *The* Angus Journal *and* LiveAuctions.tv *provided comprehensive online coverage of the event at* www.BIFconference.com. *Visit the Newsroom for summaries, proceedings, PowerPoints and audio of the sessions; the Awards page for announcements of award winners; and the Photos page for galleries of photos from the meeting and the tours.*

Feedlot Focus

Researchers speak on feedlot issues such as heritability of disease resistance, feed efficiency and methane.

by ***Troy Smith,*** *field editor*

The 2014 Beef Improvement Federation (BIF) symposium's theme "Novel traits: Novel or Needed?" continued with emphasis on feedlot considerations. The symposium was hosted June 18-21 in Lincoln, Neb. Three of the general session presentations are listed here. To access coverage of the other two speakers within that general session, check out the Newsroom at *www.bifconference.com.*

Genetic edge to BRDC resistance

The development of genomic breeding values for sires that produce calves that are less susceptible to bovine respiratory disease is under way. According to Washington State University animal geneticist Holly Neibergs, the effort to calculate genomic-enhanced expected progeny difference (GE-EPD) values for disease susceptibility is part of ongoing, multi-institutional research driven by USDA-grant funding.

►The bovine respiratory disease complex (BRDC) is the most prevalent and costly disease challenge for the U.S. beef industry, said Holly Neibergs.

According to Neibergs, the bovine respiratory disease complex (BRDC) is the most prevalent and costly disease challenge for the U.S. beef industry. Despite efforts to suppress the disease through vaccination and metaphylaxis (mass treatment with antimicrobials) incidence of the disease remains relatively unchanged. BRDC morbidity and mortality rates have stood at about the same levels for 20 years. Neibergs called BRDC a significant health management challenge for 97% of U.S. cattle-feeding operations.

"That's probably underestimated, since more than 60% of all slaughter cattle show some evidence of lung lesions resulting from BRDC, even though some cases of illness in the feedlot went undetected," added Neibergs.

Costs attributable to BRDC include prevention and treatment products, labor, and death loss, but the biggest hit comes from reduced carcass value. Generally, cattle experiencing BRDC produce fewer carcasses of USDA Choice quality than do healthy cattle. Neibergs said recent research findings support that which virtually all cattle feeders have experienced.

"It wasn't slippage from Choice to Select. Instead, [BRDC-affected cattle] actually fell off the grid. They went to no-roll, were condemned at slaughter or died before they got there," reported Neibergs.

Research suggests the average loss in value for BRDC cases, compared to healthy animals, was $162.78 in 2013. That's money lost as a result of reduced carcass quality. Add in treatment costs, and the estimated cost of each BRDC case in the feedlot is more than $200.

The good news comes through evidence indicating susceptibility to BRDC is at least partially a result of genetic predisposition. Differences in BRDC susceptibility have been found between cattle breeds and between sire lines. Heritability is estimated to be in the low to moderate range. This suggests that selecting for BRDC-resistant cattle could have a real effect on disease prevalence and industry profitability.

"If we want to get serious about this," Neibergs stated, "I think there is some opportunity."

Increasing feedlot efficiency

During its 45-year history, the BIF has focused on evaluating and increasing the awareness of methods for genetic improvement of beef cattle. In recent years, there has been increased interest in developing genetic selection tools for improving feed efficiency, both for cattle fed grain-based diets in feedlots and for breeding herds whose diets consist primarily of forage.

University of Nebraska Beef Feedlot Specialist Galen Erickson said improving feed efficiency is all about improving production, reducing inputs that result

in added cost of production. That is a goal shared by savvy managers engaged in all segments of cattle production.

"I'm a feedlot guy, and I'm going to focus on feed efficiency in grain-fed cattle," said Erickson. "In the feedlot, feed efficiency has been improved significantly, mostly through manipulation of nutrition."

►Galen Erickson, University of Nebraska Beef Feedlot Specialist, said improving feed efficiency is all about improving production.

While other grains can be and are utilized, Erickson called corn the most common feedgrain in the United States. He explained different methods for processing corn to aid digestion of its high starch content, including dry-rolling, ensiling high-moisture corn and steam-flaking. Erickson said corn processing method can have dramatic effects on feed efficiency, noting that high-moisture corn offers a 1%-2% advantage over dry-rolled corn, but steam-flaking improves feed efficiency by 12%-15% (based on studies involving diets with 80%-85% corn inclusion.)

Erickson called the availability of corn byproducts of ethanol production — mainly distillers' grains and corn gluten feed — a huge opportunity for the cattle-feeding industry. He added that nearly all feedlots currently use some byproducts in cattle rations. Historically, said Erickson, producers have purchased distillers' grains at 70%-80% of corn price. That changed in recent years, with distillers' grains costing 100%-130% of corn price in 2013 and 2014.

Erickson explained the differences in value of different distillers' grains products, depending on whether they are dried, partially dried or fed wet (wet distillers' grains plus solubles). Calling wet distillers' grains the most popular form, he cited data suggesting that it has 143% of the value of corn, at a 20% inclusion rate, and 130%-140% when included as 40% of the ration.

How well distillers' grains work in feedlot rations depends on how corn is processed, said Erickson. Unlike historical corn-based diets with 80%-85% grain, where steam-flaked corn offers the greatest feed efficiency, diets containing distillers' grains work best with dry-rolled or high-moisture corn. Erickson called the reasons unclear, but the results are repeatable.

"In my opinion, Nebraska is competitive in cattle feeding today because feeding wet distillers' grains with dry-rolled corn can achieve feed efficiencies comparable to steam-flaked corn," stated Erickson. "The wetter the better, and that is a huge advantage when distillers' grains can be bought locally."

Erickson said forages — referred to as roughage in feedlot lingo — are routinely included in feedlot diets in gradually decreasing amounts to gradually adapt cattle to high-grain diets. Roughages are bulky with large shrink losses, which feedlots would rather avoid, and feed efficiency generally improves as forage concentration is decreased. However, low levels are included in finishing diets to maintain rumen function and reduce acidosis. That digestive disturbance results in lower feed intake and lower average daily gain.

Erickson also talked about the use of growth-promoting implants, which generally increase average daily gain by 10%-15% and feed efficiency by 8%-12%.

"Implanting does not depress quality grades of cattle if compared at equal fatness," stated Erickson. "No other technology used today in feedlot cattle has as great of a return as use of implants."

Turning to the use of beta-agonists, Erickson explained that these feed additives are introduced to rations near the end of the feeding period to increase carcass weights, gain and feed efficiency. Zilpaterol (trade name Zilmax®) is currently unavailable, but ractopamine (trade name Optaflexx®) remains commercially available.

Erickson said measuring feed efficiency of individual animals is a challenge, since feeding cattle in a feedlot pen setting prohibits accurate measures of individual animal feed intake. Another challenge is managing cattle appropriately for their age, which affects feed efficiency.

Calf-feds always eat less feed per day and gain less per day, but they are always more efficient in converting pounds of feed to pounds of gain than yearlings, said Erickson, adding that summer yearlings are more efficient than fall yearlings.

While it is true that the longer cattle are fed, the less efficient they become, Erickson said there is incentive for producers selling cattle on a carcass-weight basis to feed cattle longer than when selling on a live basis. The common objective for all cattle feeders, he added, is to sell more weight without increasing the cost of production.

'It's not about cow farts'

Interest in improving feed efficiency in cattle is motivated primarily by the desire to reduce production costs and thus increase profitability. However, U.S. Meat Animal Research Center scientist Harvey Freetly says increasing feed efficiency of cattle by reducing their feed intake also reduces their production of methane — one of the so-called greenhouse gases. A project leader in nutrition and environmental management research, Freetly talked about the link between feed efficiency and methane production.

Freetly said he felt compelled to correct a widely held misconception regarding methane production in cattle. He criticized the mainstream media for repeatedly getting it wrong in articles that associate methane emissions with cattle flatulence. For Freetly, it has become a pet peeve.

"It's not about cow farts," stated Freetly, explaining that more than 80% of the methane production occurs in the rumen and is expelled as burps. "Only 13% of methane is produced in the lower intestinal tract, and some of that comes back up. Only 2% to 3% of the methane an animal produces is expelled through the anus."

►Harvey Freetly, USMARC, explained that, if feed efficiency is increased by improved digestion, methane production would actually increase with increased feed efficiency.

People who blame large-scale cattle-feeding operations for major contributions to methane production also get it wrong. Freetly explained that animals consuming high-concentrate feedlot diets actually produce less methane than breeding herds and growing cattle whose diets consist of mostly or exclusively forage.

Freetly explained that methane production increases with feed intake. Therefore, animals that consume less feed produce less methane. So, increasing the feed efficiency of cattle holds promise for reducing methane production.

"The methane footprint can be reduced by decreasing days between birth and harvest, and by decreasing the total feed requirement," Freetly affirmed.

He said the methane footprint of the cow herd is reduced when each cow weans a calf every year, weaning weights are increased and cow feed requirements are low.