

# Focus on Genomics

*Highlights of the 2009 BIF Research Symposium and Annual Meeting.*

by **Troy Smith**

Sacramento, Calif., was the site of the 2009 Beef Improvement Federation (BIF) Research Symposium and Annual Meeting. Formed more than 40 years ago as a federation of multiple state and national beef organizations, BIF promotes research and education regarding methods applied to evaluation and genetic selection of beef cattle. During the annual BIF symposium, animal scientists report findings from recent research and active producers share their experiences with practical applications of production concepts.

In Sacramento a majority of speakers and much of the committee discussion focused on the bovine genome – that particular collection of genetic “stuff” which makes the cow critter unique as a species – and the use of DNA information to assist genetic selection. Much current research is devoted to genome analysis and “marker-assisted” selection.

In 2008, panels of 50,000 single nucleotide polymorphisms (SNPs), or genetic markers, became available. These SNPs indicate changes in the genome sequence, and many have been identified for their association with genes



that influence certain traits. While some traits are controlled by single genes, geneticists say most economically important traits are controlled by many genes and influenced by the environment too. Research is focused on discovering

additional associations but also on estimating the effect of each SNP on important traits.

According to University of Melbourne (Australia) research geneticist Mark Goddard, the goal is to derive a better selection tool by incorporating estimates based on DNA into calculations of expected progeny difference (EPD) values. EPDs currently are created from phenotypic information – the performance data of the individual (if any) and its relatives. Goddard told the symposium audience how combining a molecular breeding value, based on DNA information, with the traditional EPD should result in a prediction tool that is more accurate than either information source alone. This new estimate is often referred to as a genomic EPD.

“However,” said Goddard, “obtaining a prediction equation

that accurately predicts breeding value from SNP genotypes has proven difficult in beef cattle. We have often found that a prediction that works in one breed or herd does not work in other breeds and herds. Therefore we need to estimate the prediction equation from very large reference populations which include several breeds and then test or validate the prediction equations across (different) large populations also comprising several breeds.”

While creating more accurate predictors for traits related to growth and carcass merit is important, the loftier goal is to apply genomic technology to the prediction of traits that are hard to measure, such as disease resistance or longevity. Goddard said the 50,000 SNP panel provides opportunity to select for all the traits breeders seek to improve.

“The real power of genomic selection will be achieved when results can be extended beyond the basic suite of EPD traits,” said Dorian Garrick, Iowa State University geneticist.

According to Garrick, this extension will require collection of specific phenotypes from dedicated populations. He noted work at Texas A&M University to measure temperament and docility, in addition to feed intake, reproductive traits and carcass merit. A project led by New Mexico State University involves female fertility. Several other populations are providing feed intake data, including those at University of Alberta, Guelph University, University of Missouri and the U.S. Meat Animal Research Center (USMARC), Clay Center, Neb.

USMARC geneticist Mark Thallman explained a current research project designed to collect



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Large group of around 450 for the Saturday luncheon.

genotypic data on a large number of influential beef cattle sires. The discovery population includes 2,000 sires representing 16 breeds. Some of the bulls had been part of the USMARC Germplasm Evaluation Project, but most were selected by respective breed associations, which also provided semen from which DNA could be sampled.

When sires have been genotyped, DNA-based selection will be tested against a population for which there is both phenotypic and genotypic data, with respect to various economically important traits. This training population will consist of cattle at USMARC — both steers and females consisting of progeny and grand-progeny of 22 sires representing seven different breeds.

According to Thallman, practical application comes after prediction equations for various traits are calculated, validated and incorporated with traditional EPDs to create genomic EPDs. For the short term, said Thallman, genomic EPDs will be breed-specific.

“The initial focus will be on weight traits, with carcass traits to follow,” added Thallman. “The loftier goal is to provide [genomic EPDs] for hard-to-predict traits, including efficiency.”

### Efficiency pays

Among the cow-calf producers invited to speak at this year's symposium was Chip Ramsey, manager of the Nebraska-based Rex Ranches. Ramsey said he was hopeful that progress would be made in the development and application of tools enabling selection for improved efficiency traits. Improved efficiency should be every rancher's goal because “efficiency pays every day,” Ramsey said.

Acknowledging the tremendous potential value that might be derived through use of DNA marker-based selection for efficiency traits, Ramsey said rank-and-file producers will need to be educated as to their appropriate use. Otherwise, he said, it's like a consumer buying a round steak and not knowing how to use it. If he takes it home and throws it on the grill, the outcome probably won't be as satisfactory as if he had been given

instructions for the best way to cook that steak. Similarly, said Ramsey, producers need instruction in the use of the emerging genetic selection tools.

Reporting on a producer survey conducted by the University of

Idaho, Jason Ahola, Extension beef specialist, said results suggest cow-calf producers are receptive to the use of DNA marker-assisted selection technology. Survey respondents

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## Harrell Hereford Ranch, Bruce Orvis Honored at BIF

Harrell Hereford Ranch was honored with the 2009 Beef Improvement Federation (BIF) Seedstock Producer of the Year award, and Hereford breeder Bruce Orvis, Farmington, Calif., was presented the Pioneer Award during the 2009 BIF Annual Meeting and Research Symposium in Sacramento, Calif.

Harrell Hereford Ranch, located near Baker City, Ore., is a diversified family operation. It incorporates six ranches, 300 registered Hereford cows, 400 black baldie commercial cows, an 800-head backgrounding feedlot and 45 Quarter Horse broodmares.

The Harrells' operation consists of Bob Jr., his wife, Becky; daughter, Lexie; and his mother, Edna, as well as sister and brother-in-law, Beth and Wannie Mackenzie, who are also partners in the Harrell-Mackenzie Quarter Horse operation. Look for more about the Harrell program on Page 176.

A lifelong Hereford breeder, Orvis currently has 300 registered cows and heifers at his ranch located in the foothills of the Sierra Nevada Mountains. Orvis markets 50 to 60 bulls annually to producers throughout California, Nevada, Oregon and Mexico. The operation also runs 300-500 stockers on grass each year.

Orvis Cattle Co. has been performance-testing cattle since 1952 and began ultrasound testing in 1987. The operation is one of the longest-running herds in the state. Through the years Orvis Cattle Co. bulls have been recognized at shows and sales across California, including the Grand National Stock Show and the Red Bluff Bull Sale.

While in college Orvis joined the family ranch, which was established in 1918 by his father and grandfather, C.B. Orvis & Son and later W.S. Orvis & Sons. Orvis served on the American Hereford Association (AHA) Board of Directors from 2001-2004. He is a founding member of the California Beef Cattle Improvement Association (CBCIA), serving on its board of directors from 1959-1985. He was president of the organization from 1961-1962. Orvis was named the CBCIA Seedstock Producer of the Year in 1993 and in 2000. In 1997 he received the CBCIA Horizon Award for his dedication to the California beef cattle industry.

Since 1970 Orvis has been an avid supporter of the Western Nugget National Hereford Show and Sale, hosted each winter in Reno, Nev. In 1995 he was appointed to the Western States Hereford Association, which oversees the event. In addition, the Orvis family is an avid supporter of Hereford youth programs.

Bruce and his wife, Roma, have four children and 12 grandchildren. In 1996 the ranch was preserved for future generations when it was placed in a conservation easement with the California Rangeland Trust, an organization governed by ranchers working to conserve the open space, natural habitat and stewardship of California ranches. **HW**



Craig Huffhines, AHA executive vice president, is pictured with BIF award winners Bruce Orvis and Bob Harrell.

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indicated they currently try to select for feed efficiency by evaluating mature body size, growth rate and body condition score. However, a majority of respondents admitted to limited knowledge of feed efficiency measures, including feed-to-gain ratio and residual feed efficiency. While the feed conversion ratio is a more traditional concept, researchers say residual feed efficiency is a better measurement because it is not related to mature cow size but is highly correlated to mature cow efficiency.

The issue of mature cow size has prompted some producers to draw lines in the sand and defend their particular views, but USMARC research scientist Harvey Freetly told the symposium audience there is no such thing as a one-size-fits-all cow. However, maintenance requirements are influenced by cow size. As an example Freetly noted how a 1,100-lb. cow requires 6 lb. less hay daily, at maintenance, than does a 1,600-lb. cow.

"But big cows are not bad. It just depends on your production inputs," he explained. "Sometimes it is advantageous to select cattle that need greater inputs, if there is increased value in their resulting products."

Freetly advised producers to evaluate marketing goals and management preferences and consider available input resources. Optimizing the ratio of outputs to input resources will lead to a more efficient cow herd. He defined total efficiency as a product of feed efficiency and production life. Cows with short production lives decrease herd profitability, increase replacement costs and hamper genetic improvement.

### Value of heterosis

Championing the cause of crossbreeding, University of California-Chico animal scientist Dave Daley said the value of capturing breed complementarity and heterosis has been documented by 50 years of research.

"The data are clear and irrefutable," declared Daley.

Yet, many commercial cow-calf producers maintain straightbred herds. Daley says he thinks many ranchers believe crossbreds may be less likely to fit the industry emphasis on value-based marketing and development of vertically

integrated marketing systems. Those producers may think crossbreeding will make it harder to achieve goals for consistency, uniformity and carcass merit. Allowing that crossbreds may give up some quality grade potential, Daley cited research showing how feed efficiency, cost of gain and net return typically favor crossbreds, over straightbred steers, even in a vertically integrated system.

Saying the value of maternal heterosis should not be ignored, Daley listed improved fertility, calving rate, calf survival to weaning and average weaning weight as obvious advantages. Furthermore, the crossbred cow offers a 38% improvement in longevity compared to a straightbred cow.

"Crossbreeding systems tend to be most effective in increasing net return, rather than making major changes in any single trait," stated Daley. "Effective, planned crossbreeding systems can reduce inputs while increasing profitability."

### AI is an option

During the National Association of Animal Breeders (NAAB) meeting, hosted in conjunction with the BIF symposium, California rancher Herb Holzapfel addressed what he thinks to be popular misconceptions about application of artificial insemination (AI) in commercial cow herds. Most commercial cow-calf producers don't use AI, he said, because they think it's too expensive and too time-consuming.

"The reality is that AI is very do-able for the average cowman," said Holzapfel, who first began using AI in 1973.

Taking into account the cost of buying "good" bulls for natural service, Holzapfel considers AI to be a less expensive way to access top-end genetics. And ranchers don't have to have fancy facilities to make AI work, he insisted. Implementing any synchronization protocol does require planning and time spent putting cattle through a chute. However, Holzapfel said low-stress cattle handling techniques make it easier, faster and more fun for his family.

According to Holzapfel, the payoff comes in the form of calves with "added value." He cited greater

consistency and uniform quality among marketed steers and heifers and heifers kept for herd replacements.

However, experience has taught Holzapfel that all sires are not created equal. Stressing the importance of getting cows bred on the first heat cycle as a means to generate more profit, he advised producers to seek out "high-conception-rate" AI sires.

### Economist view

Calling himself the "token economist" at a symposium for animal scientists, Iowa Beef Center Director John Lawrence said he has been asked how the new era of higher prices and higher costs should change the way producers approach genetic selection. Admitting that government energy policy and economic recession contribute to new equilibrium prices for feedstuffs and cattle, Lawrence said the long-term relationship between input and output prices hasn't changed much. The cattle price and feed price ratio remains about the same as it was in 1985.

Noting increased volatility, Lawrence said short-term prices will deviate from the long-term relationship, but these "shocks" should be managed with short-term management decisions, such as changing placement and marketing weights, ration formulation, culling and retention decisions.

"I would advise producers to avoid basing genetic selection on short-term deviations from the long-term relationship," Lawrence said. "Genetic selection needs to have a long-term focus."

The 2009 BIF Research Symposium and Annual Meeting, hosted by the California Beef Cattle Improvement Association (CBCIA) and the California Cattlemen's Association (CCA), brought more than 450 attendees from 37 states and nine countries together to learn about the latest information and advances in beef cattle genetic selection, technology and research. For more BIF highlights, visit the BIF conference Web site, [www.bifconference.com](http://www.bifconference.com). **HW**