

Range Beef Cow Symposium XX

Dec. 11-13, 2007 • Larimer County Fairgrounds and Events Complex, Fort Collins, Colo.

Gene Testing: What Does It Mean for Producers?

by Troy Smith

FORT COLLINS, Colo. (Dec. 13, 2007)—Application of genome technology in livestock production, while no longer in its infancy, has reached adolescence. Use of gene marker-assisted selection for economically important traits is progressing, said Bob Weaber, University of Missouri animal scientist.

Weaber shared his insights during Wednesday afternoon's Range Beef Cow Symposium XX discussion of cattle selection and genetics. The cooperative extension services and animal science departments of Colorado State University, South Dakota State University, the University of Wyoming and the University of Nebraska hosted the symposium Dec. 11-13 at the Larimer County Fairgrounds and Events Complex near Fort Collins.

"Put simply, a DNA marker represents a way to track a piece of genetic material associated with a particular trait," Weaber said. "DNA markers can be used to track the inheritance of simple traits controlled by a single gene or complex traits controlled by many genes. Examples of simple traits include coat color, horned or polled, and some genetic diseases or defects. Complex traits include traits like weaning weight, tenderness and marbling, which are controlled by many genes. DNA markers simply identify a sequence of DNA just as ear tags identify individual calves."

Marker-assisted selection can be used to increase the frequency of desirable forms of a gene within a population by selection



► Bob Weaber

of parent stock that carry the gene. The potential benefits are greatest for those traits that have low heritability, are difficult or expensive to measure, cannot be measured until later in life (carcass or maternal traits), are not routinely measured (tenderness), and are genetically correlated with another trait you do not want to change. An example of the latter would include selection for intramuscular fat (marbling) without affecting external fat.

Weaber said several limitations challenge implementation of DNA marker technology by seedstock producers or commercial

ranchers. One involves the frequency of a favorable gene variation. If it occurs with a frequency of 90% in a population, for example, the gene variation is almost fixed in the population, and it probably wouldn't be worthwhile to test all of the animals to find those that do not carry it. Alternatively, if the gene is at very low frequency, it may require selection over many generations to increase it to a beneficial level.

"If the population has [a gene variation] that is not very frequent but accounts for 80% of the genetic variation in a particular trait, it might be worth going after," Weaber explained. "It's important to know the frequency and the magnitude of the effect to know if you're going to get enough bang for your buck."

It's also important to know if the trait is co-dominant or recessive. If it is recessive, both sire and dam must be carriers for the calf to have a high probability of inheriting the trait. Selection for recessive traits is difficult and time-consuming.

Weaber stressed that marker-assisted selection is not a substitute for selection based on expected progeny difference (EPD) values. Both marbling and tenderness, for example, are complex traits controlled by many genes, but only a few genes have useful markers associated with them. More response to selection will be obtained if both marker-assisted selection and EPD values are used, with the latter being the primary driver of selection decisions.

AY



Editor's Note: API coverage of the Range Beef Cow Symposium XX is made available for distribution to all media via an agreement with the Range Beef Cow Symposium Committee and API. Headquartered in Saint Joseph, Mo., API publishes the Angus Journal and the Angus Beef Bulletin, as well as providing online coverage of events and topics pertinent to cattlemen.