By the Numbers

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Angus feed efficiency: Residual average daily gain

Feed consumption has long been recognized as one of the most important factors in determining profitability of beef cattle production. Selection tools have been limited for efficiency traits, although breeders continue to request expected progeny differences (EPDs) to make genetic progress in this area. The American Angus Association provides residual average daily gain (RADG) EPDs on a weekly basis as a genetic selection tool to better characterize postweaning efficiency.

Feed intake database

The feed intake data used as part of the national cattle evaluation (NCE) includes feed intake results from cooperating breeders, bull test facilities and multiyear research projects funded by the American Angus Association and the Angus Foundation. The evaluation procedures for conducting a genetic evaluation of feed intake was developed using these data in conjunction with other traits already analyzed in the Angus evaluation system, such as growth and ultrasound components. The end result is residual average daily gain (RADG) provided as a regular part of the American Angus Association's suite of EPDs.

Genetic evaluation of feed intake

The initial steps to generate the components needed to calculate RADG include a comprehensive genetic evaluation of multiple phenotypic traits, with the additional inclusion of genomic results from Igenity and Pfizer. Phenotypic traits include individual calf dry-matter intake, weaning weight, postweaning gain, ultrasound subcutaneous fat thickness, and dry-matter intake genomic values. The weight, gain, fat and genomic pieces function as indicator traits to predict genetic feed intake values.

The genomic results are for the trait of dry-matter intake (DMI), and these values are integrated into the genetic evaluation as a correlated trait to standardized phenotypic dry-matter intake from the Association's intake database. Inclusion of genomic results allows calves to be included in the evaluation, and to ultimately have an RADG EPD prediction, as a result of the incorporation of DNA technology. A similar scenario occurs with indicator traits of ultrasound and genomic values in the carcass EPD model.

From this multitrait animal model evaluation, the resulting feed intake EPD is used to calculate residual gain. In this step, the genetic feed intake EPD and the genetic ultrasound fat EPD (a small composition adjustment) are used to adjust the postweaning gain EPD — thus, residual gain (RADG) is created. Weighting factors or regression coefficients representing genetic trait relationships are used to adjust the intake and fat EPDs in the math.

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RADG is presented in pounds (lb.) per day, or average daily gain, with a higher value being more favorable. The genetic RADG is reflective of the postweaning period. It is not a cow efficiency tool. RADG is reported with other production growth traits, but more specifically characterizes genetic differences in gain, given a constant amount of feed.

At first glance, one might think that RADG is all growth and gain. However, the efficiency components are relevant and impactful on animal rankings. In the Association database, the sire rank correlation between yearling weight (YW) EPD and RADG EPD is only 0.52. With a correlation of 1 being perfect, one can see that sire rankings change depending on whether RADG EPD is the tool of interest or straight postweaning growth through the YW EPD.

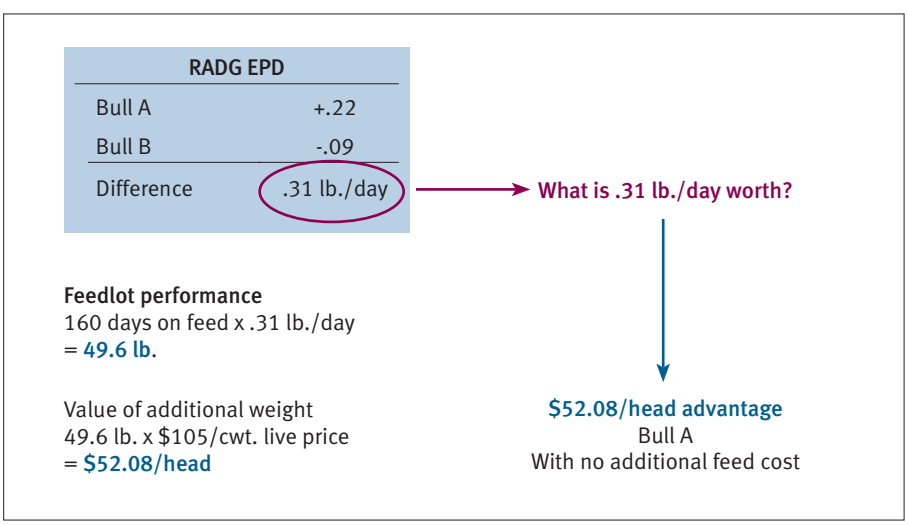
Feed efficiency genetic differences are reflected in the RADG EPD and will help identify animals that would be more profit-oriented in a feedlot scenario.

The RADG EPD as a genetic selection tool is far more comprehensive than individual phenotypic measures of intake and efficiency. As a more familiar example, Angus breeders use the weaning weight EPD rather than individual weaning weight to select breeding stock and make genetic progress.

Economic importance of RADG

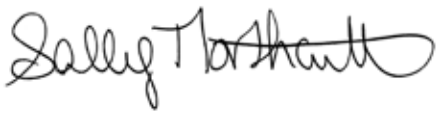
In Fig. 1, assume two Angus sires have RADG EPDs of 0.22 and -0.09, respectively. On the average, calves sired by Bull A are expected to have a 0.31 lb.-per-day advantage in average daily gain over calves sired by Bull B when fed the same amount of feed during the postweaning phase of production.

Fig. 1: RADG and economic benefits



This difference results in a large economic benefit in the feedlot. During a typical 160-day feeding period, Bull A's progeny will gain almost 50 lb. more (0.31 lb. per day x 160 days on feed = 49.6 lb.) as compared to the progeny of Bull B, with no additional feed cost. If fed cattle are selling for $105 per cwt. live, Bull A's progeny generate a net economic advantage of $52.08 per head (49.6 lb. extra x $105 per cwt. = $52.08). Feedlot operators would consider this a sizable benefit, and will bid more aggressively when buying feeder cattle that perform like those sired by Bull A. If fed cattle are selling for $105 per cwt. live, the advantage would be $52.08 per head.

Use of the RADG EPD allows producers to characterize Angus genetics that will perform more efficiently in a postweaning feeding environment. It provides a balanced approach to identify cattle that, with a given quantity of feed, will still perform at industry acceptable levels. Individual feed intake data captured at efficiency collection facilities has the most sizable impact on improving the accuracy of the EPD. Leveraging the individual intake data and the genomic information on dry-matter intake in a weekly genetic evaluation will give Angus producers nearly "real time" selection of more feed efficient genetics.



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Editor's Note: *"By the Numbers" is a column by Association performance programs staff to share insights with Angus members about data collection and interpretation, the National Cattle Evaluation (NCE), genetic selection, and relevant technology and industry issues. If you have questions or would like to suggest a topic for a future column, contact Sally Northcutt, director of genetic research, or Bill Bowman, director of performance programs, at 816-383-5100.*