NEED FOR MARKER-ASSISTED EPDs

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Currently, bull buyers have a plethora of information from which to make selection decisions. Open up a sale or semen catalog and you'll be quickly overwhelmed with actual and adjusted measurements, ratios, EPDs, economic index values, and perhaps now the results of DNA marker tests. EPDs are the integration of pedigree, animal, and eventually progeny information. So, in the previous list EPDs already account for actual and adjusted records and ratios, but in general do not include the results of DNA marker tests. There is one exception. The American Angus Association does so for carcass traits using only an Angus specific panel through one company at present. The current issue is how to capitalize on this potentially useful information, and the logical method is to integrate it into EPD estimations.

The benefits of the inclusion of molecular scores into EPD calculations include higher accuracy values (particularly for younger animals) and a decrease in generation interval leading to an increased rate of genetic change. Another key benefit is easing the current confusion that surrounds the process of bull selection due to an information overload. It is important to understand the differences between an EPD and the results of a marker panel test. A Breeding Value (an EPD is half of a breeding value) is the cumulative additive effect of all genes that impact a given trait. This becomes the genetic potential of an animal. Molecular Breeding Values (one reporting style for marker panels) are derived by summing the additive effects of all markers (SNPs) on the panel for a particular trait. Currently, there can be confusion in trying to evaluate animals with both these sources of information in hand.

Example:

Assume that two Angus bulls (denoted below as animals 1 and 2) both have been DNA tested by company X for their marbling panel and the test results have been provided in the form of a molecular breeding value. Also assume that these two bulls have an ultrasound record that has been included in their marbling EPD. If you just look at the MBVs you would assume that animal 2 is superior. However, if you look at the EPDs it appears that animal 1 is superior. From this it can be confusing as to which bull is really more desirable for marbling. From this information alone, it is impossible to directly compare these two tools. Particularly in the context of having available EPDs, it is hard to justify using a disjoined indicator trait instead.

Animal	MBV	EPD	EPD Accuracy
1	0.10	.30	.17
2	0.40	.20	.15

The above situation can easily arise particularly if the proportion of genetic variation explained by a marker panel is limited. The animal with the superior EPD might not be better for the markers measured by commercial panel, but is more desirable for a much larger number of genes that impact marbling. This disparity becomes less likely as both the accuracy of the EPD and the proportion of the genetic variation explained increases. If the accuracy of the EPD were 1.0 (It might be above 0.9 but can never be 1.0) and the proportion of genetic variation explained by a test was 100% (un-validated company claims only reach approximately 60% at the most) then we would expect the two to be in agreement. With this in mind, how beneficial is molecular information in the context of discriminating among high accuracy AI bulls? If their exists a high accuracy EPD for the trait of interest, then the additional disjoined marker score adds little, if any, information that would aid in the selection process.

The other benefits, increased accuracy of EPDs for young animals and decreased generation intervals, can impact both seedstock and commercial producers alike. Decreasing the generation interval will have the largest impact in the seedstock sector. Increased accuracy values can help commercial producers make more informed bull selection decisions by being able to pick truly superior bulls and mitigating the risk that is associated with low accuracy values. Traditionally, these two benefits would have trade offs. If generation interval was decreased then accuracy generally decreased as there was less time to accumulate progeny records. However, ignoring caveats like time needed to re-estimate marker effects, MA-EPDs can help to achieve both of these goals.

This information is rapidly changing. In the fall of 2009 the American Angus Association integrated marker information for carcass traits. For marbling the panel accounted for 14% of the genetic variation leading to an accuracy value similar to that of including an animal own scan record in the EPD estimate. Today, the proportion of variation has greatly increased to roughly 42% for a trait like marbling and larger impacts on accuracy have become evident.

Making uninformed selection decisions can negatively impact profitability. The development and utilization of MA-EPDs can aid in making correct decisions. However, for this to come to fruition requires action by all segments of the industry. MA-EPDs will require that a genetic evaluation is in place for the trait that is going to be assisted by marker information. Breed associations must provide guidelines for the collection of quality phenotypes in quantity for some traits that are currently sparsely recorded (i.e. reproduction traits). There must also exist the ability to capture this data as if it were another phenotype (database resources and updated genetic parameters). Seedstock producers have to report data to their respective breed associations and be able to understand the differences between all the information currently confronting them. The same is true for commercial producers, education is critical.