EPD Fact or Fiction

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Concerning the subject of Estimated Predicted Differences or EPD's and how they can be utilized in breeding programs today, I would first like to reflect back on some of the things that have happened in the beef cattle industry. When we look at selection in beef cattle for the economically important traits or for any population, there are three ways that we can change a population of cattle. Selection, migration or gene migration, and mutation. Needless to say, beef cattle selection utilizing mutation has played a very small part because very few positions mutations happen within population. Migration probably has had more effect on populations of cattle especially beef cattle, than any other particular way of improving cattle. There has been two or three times where gene migration has had a major impact on the American cattle scene. The first time, would have been the importation of the European breeds of cattle in the United States in the 1800's and early 1900's. The second time would be the importation of the Bos Indicus cattle in the 1900's through mid 1900's. The third actually started with the Charolais cattle back in the 1930's but the greatest impact occurred in the 1970's with the opening up of the quarantine stations. This made it possible to move many of the European cattle into the United States at that time.

Interesting enough, when I observe selection in beef cattle for the economically important traits, I feel that we have accomplish very little. Most of our selection in beef cattle has always been from a phenotypic standpoint. From the years 1700 to 1900's, we basically had a Longhorn-base herd of national cattle and dual purpose cattle. During this time, the first breed associations were formed. Interestingly enough in Europe and here, selection was primarily based for fat, because fat was worth more than beef at that particular time. In 1801, this steer was exhibited and weighed 3,000 pounds. This is the white heifer that traveled in 1806 and weighed in excess of 2,800 pounds. This was a Grand champion Steer in 1867 at the Smithfield's Show, a 4 year old that weighed 2,200 pounds. Between the 1900's to 1970 era, it was really the British breed era. We went from large to small type cattle. All selection was basically done from a phenotypic standpoint. During this period performance testing and within herd selection and central test stations were developed. We did a lot phenotypically to the cattle at that time. Pictured here is the 1926 International Champion Angus Bull - Quality Marshall. We drastically changed frame size on these cattle and pictured here is the 1953 International Champion Female. As you can see from these two pictures we drastically changed the size. Between 1970 and 1980 was another era in which we had the introduction of European Cattle. The breed associations all started establishing data bases. Artificial insemination was utilized, very widely across purebred cattle operations. Other major changes occurred. Embryo transfer became popular, the feedlot industry moved west, grain became more expensive. This became the performance tested bull era and

intense selection for both growth and frame size occurred. All of this resulted in some drastic differences in our population shown by these two animals, a heifer weighing 835 pounds and a steer weighing 1,930 pounds. Because of the emphasis on the European breeds of cattle and our tremendous emphasis on growth and frame size, we started to see a major difference in the cattle population for these two particular traits.

As we move to the 1980's, the first sire summaries were published and there was a greater acceptance by breeders to utilize sire summaries. Crossbreeding became accepted, the animal model was introduced to beef cattle selection, and we had intense selection for growth and frame. Box beef and specification beef became a reality because of labor, expenses and a tremendous consumer resistance to fat. When we take into consideration all of these particular aspects, it influences me on how I will discuss EPD's or Estimated Progeny Differences. The particular traits that we are looking at can all be described when we talk about EPD's. To most of you in the industry, as far as your breeding programs are concerned today, you feel about as mixed up as this old boy. He doesn't know whether to go with the show ring, the EPD's, pedigrees, type, 205 day weights, 365 day weights, etc. I think this slide depicts what I like to think about when we are talking about breeding cattle.

This is Lord Kelvin's saying "When you can measure what you are speaking about, and express it in numbers, you know something about it. But when you cannot measure it, when you cannot express it in numbers, your knowledge is a meager and unsatisfactory kind. It might be the beginning of knowledge but you have scarcely in your thoughts advanced to the stage of science." I really feel that is where we are in the cattle breeding industry today. Available to us now are some very factual numbers that predict what cattle will do from a performance standpoint. Not only for growth but also for some of the other economically important traits such as milk production and birth weights. Certainly in the next few years, I am certain that many of the carcass traits will be refined and we will be printing EPD's on the different carcass traits for particular animals.

There has been a tremendous amount of discussion concerning if EPD's really work. As we all realize, the EPD's on a young animal is made up of the prediction using his sire information, his dam information, and his own performance information. If we are predicting milk production on an animal we strictly use the sire's information and the dam's information. For many years, many of us in the cattle breeding industry have tried to get a better handle on whether the offspring of a particular sire will milk. Through the use of the new Animal Model, we can now separate out the two components called growth and pure milk.

The evaluation of progeny data utilizing the Reduced Animal Model produced the first Angus Summary that could separate the maternal components.

These maternal components are Growth and Pure Milk. There has been much discussion concerning whether the Pure Milk EPD on young sires that do not have daughters in production should be reported or not.

Many individuals stated that because of the great inaccuracies of the data it should not be printed since it might influence breeders decisions and they would not use the bull. The Board of Directors of the American Angus Association went on record and removed from the 1986 Sire Summary the data on bulls that did not have an accuracy value of .50 or higher.

Many breeders ask me if young bull has an accuracy of .20 why do you even print the data? After much discussion and thought, I felt we needed to take a look at the projected data and see how it compared to the actual data once it became available. This was accomplished by looking at the progeny data on all bulls with high accuracy values for Milk and then looking at their Pure Milk EPD projection resulting from data on their sire and their dam. My procedure was as follows.

I requested from the American Angus Association Performance Pedigrees on all bulls in the main report that had accuracy values of Pure Milk of .70 or higher. The reason for this was that these bulls would have a large number of daughters in production and at .70 accuracy much of the pedigree value is washed out of the data. I then went through the Performance Pedigrees and calculated a projected EPD for Pure Milk on all of the bulls. This was accomplished by taking their sire's EPD and their dam's EPD adding them together and dividing them by 2. If the sire or dam did not have an EPD for Pure Milk I did not include them in the evaluation. The following results were obtained from the data that I evaluated.

There were 257 bulls that had a projected EPD for Milk and had accuracy values of .70 in the 1987 Sire Summary. Analyzing what happened to these bulls from their original projections, I discovered that of the 257 bulls, 82 went up from the original projections and 175 went down from original projections.

The standard error figure for young non parent bulls with an accuracy of .20 is $\pm$ 7 lbs. 193 bulls fell within 1 standard error of their projection or within $\pm$ 7 lbs. 50 bulls fell within 2 standard errors or $\pm$ 14 lbs. of their original projections. 14 bulls fell within 3 standard errors or $\pm$ 21 lbs. of their original projection. Looking at the % breakdown of 257 bulls, 75.2% were within one standard error, 19.4% were within 2 standard errors and 5.4% were within 3 standard errors. The average Milk EPD of 257 bulls was +1.74 lbs. and their actual progeny data was -1.25 lbs. Of the 257 bulls, 117 were sired by minus sires for Milk and 71 bulls had minus dams for Milk.

Breaking down and grouping the bulls into 5 lbs. groups and comparing their original projections to their proven EPD values, there were 13 bulls that had a projected EPD of +10 lbs. or higher. The original projection of these bulls was +13.30 lbs. They ended up having progeny data of +11.98 lbs. None of these bulls were below 0 lbs. for Pure Milk and therefore were 100% above average.

The next group of bulls had projected EPD's of +5 lbs. to +9.9 lbs. There were 53 of these bulls and their original projection was +7.06 lbs. and ended up having progeny data of +6.67 lbs for Milk. 46 of these bulls were above 0 lbs. and 7 were below 0 lbs. for Milk. 87% of them were above 0 lbs. and 13% were below 0 lbs. for Milk.

The next group was for 0 to 4.99 lbs. There were 110 bulls in this group. Their original projection was +2.16 lbs. and after they were progeny tested they averaged +.05 lbs. 52 of the bulls were above 0 lbs. and 58 of the bulls were below 0 lbs. which resulted in 47% being plus bulls and 53% minus bulls.

The next group went from 0 to -4.9 lbs. on projection. There were 50 bulls in this group. Their original projection was -2.31 lbs. milk and their progeny data indicated them to be -8.36 lbs. for Milk. 46 of these bulls were below 0 lbs. and 4 were above 0 lbs. 92% of this group were minus and 8% were plus for Milk.

The next and last group were the bulls that projected EPD for Milk was -5 lbs. or greater. This group averaged -7.70 lbs. projected and their progeny data was -14.10 lbs. All of these bulls or 100% were below 0 lbs. for Milk. The following table summarizes the above data.

Group	No. Bulls	Projected EPD	Actual EPD	% Above 0	% Below 0
+10 or higher	13	+13.30	+11.98	100%	0%
+5 to +9.9	53	+7.06	+6.67	87%	13%
0 to +4.99	110	+2.16	+ .05	47%	53%
0 to -4.9%	50	-2.31	-8.36	8%	92%
-5.0 or lower	27	-7.70	-14.10	0%	100%

Summarizing the EPD data concerning milk, I think one realizes that the EPD projection on young bulls was very accurate. If we are going to sample young bulls it would be wise to utilize young sires with EPD's for milk of +5 lbs. or greater if we want to stack the deck in our favor. The closer the EPD approaches 0 lbs., there is a great change of a sire becoming minus for milk.

In the beef cattle industry in the future, if we are going to make maximum genetic improvement, breeders must utilize sire summaries. We must start to breed cattle utilizing the high EPD bulls for the particular traits we are interested in. With sire summary information on bulls now possible to take much of the guess work out of breeding cattle. The result will be high performing, high milking offspring.

GROWTH

110 TOTAL BULLS

88 + FROM PROJECTION
22 - FROM PROJECTION

86 ± 0 → 1 ST. ERROR 78%
23 ± 1 → 2 ST. ERROR 20.9%
1 ± 2 → 3 ST. ERROR .9%

0 → +10 EPD PROJECTION FOR GROWTH (16 BULLS)

5.74 LBS. PROJECTION
10.45 LBS. PROGENY

PROGENY RESULTS

0 → - 10 = 3 BULLS
0 → + 10 = 3 BULLS
+10 → + 20 = 8 BULLS
+20 → + 30 = 2 BULLS

+10 → +20 LBS. EPD PROJECTION FOR GROWTH (22 BULLS)

+13.99 LBS. PROJECTION
+19.08 LBS. PROGENY

PROGENY RESULTS

-10 → 0 = 1 BULL
0 → +10 = 1 BULL
+10 → +20 = 9 BULLS
+20 → +30 = 8 BULLS
+30 → +40 = 2 BULLS

+20 → +30 LBS. EPD FOR GROWTH (32 BULLS)

AVG. PROJECTION +24.63
AVG. PROGENY +32.34

PROGENY RESULTS

+10 → +20 = 4 BULLS
+20 → +30 = 12 BULLS
+30 → +40 = 8 BULLS
+40 → +50 = 6 BULLS
+50 → = 2 BULLS

+30 → +40 LBS. EPD PROJECTION FOR GROWTH (22 BULLS)

AVG. PROJECTION +33.90
AVG. PROGENY +39.85

PROGENY RESULTS

0 → +10 = 1 BULL
+10 → +20 = 0 BULLS
+20 → +30 = 2 BULLS
+30 → +40 = 7 BULLS
+40 → +50 = 11 BULLS
+50 → +60 = 0 BULLS
+60 → +70 = 1 BULL

+40 ⟶ +50 LBS. EPD PROJECTION FOR GROWTH (14 BULLS)

+43.68 PROJECTION

+55.7 PROGENY

PROGENY RESULTS

+30 ⟶ +40 = 1 BULL

+40 ⟶ +50 = 3 BULLS

+50 ⟶ +60 = 6 BULLS

+60 ⟶ +70 = 2 BULLS

+70 ⟶ +80 = 2 BULLS

GROUP	NO.	AVG. PROJECTION	AVG. PROGENY
0 ⟶ +10	16	+ 5.74	+10.45
+10 ⟶ +20	22	+13.99	+19.08
+20 ⟶ +30	32	+24.63	+32.34
+30 ⟶ +40	22	+33.90	+39.85
+40 ⟶ +50	14	+43.68	+55.7