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How to Interpret the New Animal Model for Dairy Sire Evaluation

In question and answer format this NebGuide addresses changes in genetic evaluations of both dairy cows and sores.

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Why is the United States Department of Agriculture (USDA) changing the dairy sire and cow evaluation system?

The answer is simple. The Animal Model for genetic evaluations is more accurate than the old Modified Contemporary Comparison Method (M.C.C.). Previously the major limiting factors to implementing the Animal Model were computing costs and memory requirements. With the advent of new Super Computers, the computations are feasible on a national scale.

What is the Animal Model?

The Animal Model simultaneously evaluates cows and sires using all their ancestor relationships. This means that every animal known in a given pedigree is used to evaluate both the cow and sire. This increases the accuracy of evaluation and should be a major step in breeder acceptance of the new evaluation system.

Not only are all registered animal pedigrees included in the evaluation process, but all non-registered cattle pedigrees that have been identified properly on Dairy Herd Improvement (DHI) testing are included.

We talk about an Animal Model, but exactly what is included in the model to describe a milk, fat

and protein record?

A model is a mathematical concept that is used to best describe the underlying genetic and environmental factors that influence a production record. The Animal Model used to describe a production record that has been adjusted for the length of lactation as well as the age and month of freshening includes the following effects:

1. **Herd Management Factor.** Animals are grouped by the herd in which they have produced a record, the year and month of calving (month of calving is grouped into two-month categories, i.e., Jan.-Feb., Mar.-Apr., ..., Nov.-Dec.), lactation number (first vs. later) and registry status (registered or non-registered). All of these factors influence the production of a cow.

   These factors are considered in an attempt to adjust for effects known to influence the nongenetic part of a production record.

2. **Herd and Sire Interaction.** This effect is considered to take into account any differential use of sires across herds. This will lessen the impact that any one herd has on the sire's proof due to similar treatment of daughters of a sire in the same herd, or interaction between herd management and genetic ability of a bull's daughters.

3. **Permanent Environmental Effect.** This effect takes into consideration any permanent effect that has influenced a cow's record, for example, only three functional teats, or any disease or injury that has permanently hindered her production. This effect accounts for nearly half of the variance of differences among cows.

4. The Breeding Value of the Cow. All ancestors of the cow, including female and male relatives, are included in calculating both sire and cow breeding values. In the old M.C.C., use of relatives' merit was very limited. Only maternal grandsires and sires were included. All female ancestry was ignored in the M.C.C. The Animal Model is a great improvement.

How are the proofs calculated?

The statistical computations of the evaluation system are beyond the scope of this NebGuide. Production data on individual cows are adjusted for the previous effects and then summarized over all daughters of a given sire to be published as the sire evaluation.

This is a very simplistic explanation, but you need not understand the calculations to use the evaluations produced, or to have confidence that the system is a vast improvement and can be used to increase the genetic potential of your herd.

What heritabilities will be used for the production traits?

The new heritabilities for all three production traits of milk, fat and protein will be .25.

What records will be used in the Animal Model?

There are a few changes in what records will be included in the summary:

1. Records on cows after the fifth lactation will be excluded. Since only nine percent of cows have records beyond the fifth lactation, this will not affect the accuracy of the evaluations.

2. Records of cows made in herds other than where the first record was made are not included in the sire evaluation.
3. Cows without first lactation records are not included in sire evaluations.

Will there be a new genetic base used?

The new base will have all breeding values adjusted so that cows born in 1985 average zero.

What will the evaluations be called?

The old PD82 designations will not be used. The new term will be Predicted Transmitting Abilities (PTA). Evaluations will be available as they are currently for milk, fat and protein. A dollar value using milk and its components will be published and will be called PTA dollars (PTA$). A cheese yield value also will be available.

Will repeatabilities still be calculated?

Yes, but the calculations have been modified and the term has been changed to Reliability (REL). The new REL figure will incorporate pedigree information into the estimates. The pedigree information will tend to increase REL on sires with limited herd information.

Will Modified Contemporary Deviations still be reported?

Yes, you will get a similar calculation, but it will be called a Management Group Deviation (MGD). The MGD is the average of a cow's record with the management group effect subtracted. MGDs are averaged over a bull's daughters to provide an indication of their performance adjusted for herd environment.

Summary

There are two basic concepts you should remember when using the sire evaluation results. An individual proof is meaningless -- the only things that are important are: 1) the rank of one sire compared to another, and 2) the differences among sires.

There will be many changes in the new Animal Model for sire and cow evaluation. Among the most pronounced will be:

1. use of all the pedigree data;
2. simultaneous evaluations of both cows and sires;
3. new Genetic Base;
4. adjustment for the genetic merit of the mates, and
5. a change in many of the names that we have become familiar with when using the old M.C.C. method.

The important point to remember is that if you are going to continue to increase your genetic potential, you still should follow a few basic rules:

1. always use groups of A.I. proven sires (7 to 10 per herd per year);
2. select from sires in the 90th percentile or higher (*Hoard's Dairyman* list) that you can afford to purchase;

3. use sires with 70 percent reliability or higher;
4. non-production traits should be a secondary selection tool -- select on production first;
5. use young sires as a group (15 percent of your semen purchases);
6. if using a mating service, select on production traits first, or put a minimum on the PTA$ you will accept;
7. look for the best buys available.

Following these seven basic rules will yield increased income and excellent returns over investment.

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