A NEW NATIONAL AI BULL FERTILITY EVALUATION

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A new national evaluation for bull fertility has arrived. Starting with the August 2008 USDA evaluations, a new and more accurate service sire fertility evaluation will be available to dairy producers. From 1986 to November 2005, bull fertility evaluations termed ERCR (Estimated Relative Conception Rate) were provided to the industry by Dairy Records Management Systems (DRMS). In May 2006, the Animal Improvement Programs Laboratory (AIPL) assumed responsibility for evaluation of U.S. bull fertility. As an initial step, AIPL implemented the ERCR evaluations without change in calculating methods.

An extremely intense effort was made developing methods that would improve the accuracy of the evaluation, and at the same time attempts were made to broaden the scope of the data. Over 4 years of research was completed before the new Sire Conception Rate (SCR) was ready to replace the ERCR, and these studies can be roughly categorized into two approaches/efforts. First, it was determined what factors/variables related to the bull providing the unit of semen helped improve the prediction of whether that unit of semen resulted in a pregnancy; second, it was determined what factors/variables related to the cow receiving the unit of semen distorted the fertility measure for the bull providing the semen.

The latter were called nuisance variables by Dr. Melvin Kuhn who was responsible for the majority of this research and development. Nuisance variables is an appropriate term for these effects because they had to be adjusted out (i.e., removed) so they would not distort obtaining the best measure of success of the bull.

What effects associated with sires contribute to the prediction?

Inbreeding coefficient of the bull; inbreeding coefficient of the embryo from the mating; age of the bull; stud-year; and the bull effect itself.

What are the nuisance variables that are removed to improve the prediction?

Herd-year-season-parity-registry status groups; year-state-month, lactation number, service number, short interval between breeding effect, cow age, standardized milk yield, cow effect (both permanent environment and genetic).

Comparison of data used in old ERCR vs. new SCR

Item	*ERCR*	*SCR*
Trait evaluated	First service 70-d non-return rate	Conception rate
Breeds evaluated	Holsteins and Jerseys	All 6 traditional breeds
Lactation included	All parities, ≥sixth set to sixth	First to fifth
Service number	First	First to seventh
Bulls included	AI, <12 yrs	AI but not Inactive, <14 yrs,
Minimum number of breedings	≥300 first services	≥300 services in the last 4 years for Holsteins, ≥100 in the last year; somewhat less for other breeds.
Minimum number of herds	None	10
Fertility expressed:	Dev. from mean, to nearest 1%	Dev. from mean, to 0.1%
Base assigned	Published bulls sum to zero	Published bulls sum to zero
DRPC participating	AgSource, DRMS, MN DHIA	AgSource, Agri-Tech, DRMS

The interpretation of how to use the bull fertility evaluations remains largely unchanged. Technically there is a difference between 70-day non-return rate and CR in that the CR is based on confirmed pregnancy, but the two traits are highly related when derived from the same cows. A bull with an SCR of +2.0 is predicted to produce a CR near 32% in a herd that normally averaged 30% CR and historically had used average conception rate bulls. The term expected means when based on extremely large numbers of matings. Obviously, a herd with only two inseminations to that bull could only realize a CR of 0, 50, or 100%.

More inseminations included in the new fertility evaluation is one of the main reasons for the higher accuracy achieved. Not only are extra services, i.e., 2nd through 7th, being used from the same herds (giving about 3 times the data), but there are additional large herds now included, specifically from Agri-Tech Analytics. However, there are other reasons the new evaluations are more accurate. The new evaluations incorporates many desirable features from the previous fertility evaluations plus adds a number of new benefits that have been shown to improve accuracy in predicting the conception rate (CR) on an independent data set.

More details concerning the supporting research for the development of this project follows:

- Kuhn, M.T. and Hutchison, J.L. Prediction of dairy bull fertility from field data: Use of multiple services and identification and utilization of factors affecting bull fertility. J. Dairy Sci. 91(6):2481–2492. 2008. || Abstract
- Kuhn, M.T., Hutchison, J.L., and Norman, H.D. Modeling nuisance variables for prediction of service sire fertility. J. Dairy Sci. 91(7):2823–2835. 2008. || Abstract
- Kuhn, M.T. and Hutchison, J.L. Prediction of dairy bull fertility from field data: A comparison of linear and threshold models and effects of matings with unknown outcomes. J. Dairy Sci. ABSTRACT ONLY, SUBMITTED DEC. 2007