

Coming Soon: Genetic Evaluations for Heifer Livability

By Drs. H. Duane Norman, Mahesh Neupane and Paul VanRaden¹

On many occasions, having a dairy calf or yearling die turns an ordinary day into a bummer. The emotional loss can be greater than the financial loss, especially if a youngster is the owner. The good news is **more genetic information on heifer livability will be available in December**, which will speed the reduction of these unpleasant occurrences.

Genetic progress has been on-going to reduce cow deaths in the milking herds and, with this newest evaluation on the horizon, the prospects are bright for doing more of the same for calves and yearlings. Genomic evaluation of this trait will increase profitability, and even more importantly will improve animal health and welfare – which will enrich the industry's image with the public.

A genetic evaluation for **Cow Livability** was initiated in August 2016. It was received enthusiastically, undoubtedly because dead and downer cows deprive producers of about \$670 million in income annually. After it was introduced, a few folks suggested that *calf/heifer livability* could also be fruitful. Although estimating the financial losses from heifers of various ages dying is difficult, it is clearly substantial. To our delight, a few of the heifer records already were being coded using the **reasons for disposal codes** (often called termination codes) designed decades ago for cows. Mel Tooker and Paul VanRaden of USDA's Animal Genomics and Improvement Laboratory (AGIL) summarized the frequencies of these heifer deaths recorded in the file shortly thereafter². These records provide a basis for revealing heifers' overall resistance to causes leading to mortality.

Heifer Files: Reporting pedigree data for heifers born in DHI herds to a central location at USDA was started 15 years ago. Assembling these from all dairy records processing centers (DRPC) in one place minimized misplacement of parents' identity from the time the animal was born to when they calved. It was particularly beneficial where heifers entered the milking lineup on different farms from where they were born. Although animal identification (ID) is usually displayed in the heifers' ears, too often their parents' ID is not passed to the purchasing owners, even though it is sent right after birth to the DRPC. Because of this enhancement, more cows now have correctly recorded ancestors, and the genetic accuracy is higher for all traits.

All heifer disposal data is from the National Cooperators Database maintained by the Council on Dairy Cattle Breeding (CDCB). Disposal codes were studied from 3.4 million heifer records of all breeds with birth dates between 2009 and 2016. A restriction of only using herds with death losses between 1 and 25% was imposed, and the number of reported deaths was 135,000 (4.0%). More than 90% of usable records were from Dairy Records Management Systems (Raleigh, NC).



Photo: Dairy Herd Management

Differences in breeds and sires confirmed the presence of a genetic component for heifer livability. This was based on deaths between two days of age and when the heifer left the herd, or until the maximum imposed of 18 months. To avoid a time-opportunity bias (i.e., to be fair to each animal regardless of the year born), records were not included until three years after the

birthdate so that the live status of contemporaries could be confirmed by a calving date. Stillbirths and deaths observed in the first two days of age were excluded as they are accounted for in the stillbirth evaluations.

The mean recorded death loss was 4%. That means that 96% remained alive during the period studied. Genomic predicted transmitting abilities (GPTA) for *Heifer Livability* in Holsteins ranged from -1.6% to $+1.6\%$ and had a standard deviation (SD) of 0.5%. GPTAs for Jersey ranged from -0.5% to $+0.5\%$ and had a SD of 0.2%. Normally about two-thirds of the observations fall within one SD.

The reliabilities (accuracies) for young animals with genomic tests averaged 46% for Holsteins and 30% for Jerseys. The accuracies for traditional parent average averaged 16% and 12%, respectively, which would be typical for those without genomic tests. Once again, this illustrates the tremendous value of genomic testing. Even when the heritability of a trait is low, the genomic accuracy obtained is usually in a moderate range.

The BV trend for Heifer Livability was $+1.4$ for HO and $+0.7$ for JE between birth years 2010 and 2015, corresponding to the other base changes reported recently. Heifer Livability had a favorable genetic trend in recent years, likely because of selection for correlated traits. Correlations of Heifer Livability were 0.44 with productive life, 0.34 to 0.36 with yield traits, and 0.36 with early first calving on proven Holstein bulls. When the Net Merit index is next updated (in 2021), Heifer Livability could get 1% of emphasis. By encouraging more recordings on calf mortality, the reliabilities of evaluations can increase significantly.

The CDCB has requested that the DRPC forward available reasons for disposal in heifer, so more extensive research studies can be completed. The CDCB's Pursuing Data Quality Committee has developed a revised format which makes future disposal coding even more comprehensive (especially for calves). Adding codes for pneumonia and diarrhea, two common diseases, were examples of changes implemented. The DRPC agreed to adopt the revisions by the end of this year.

In the future, additional use will be made of the various termination codes to calculate or improve other Predicted Transmitting Abilities, and these changes can increase the accuracy of genetic and management information available to producers. More complete and accurate information provided in any termination codes – cows or heifers – will help provide a stronger genetic improvement program.

Additional References

[Genomic Evaluation of Dairy Heifer Livability](#), presented by Dr. Mahesh Neupane, American Dairy Science Association Annual Meeting, June 22-24, 2020.

[Genomic Evaluation of Heifer Livability](#), abstract submitted to Journal of Dairy Science, 2020

¹ Dr. H Duane Norman is Technical Advisor and Industry Liaison with CDCB and the former Research Leader of USDA's Animal Improvement Programs Laboratory. Dr. Mahesh Neupane is a Postdoctoral Research Associate and Dr. Paul VanRaden is a Research Geneticist with AGIL.

² VanRaden, P.M., J.R. Wright, M.E. Tooker, and H.D. Norman. [Value of selecting for cow and calf livability](#). *Interbull Bull.* 50:30–33. 2016.