

Resistance to Ketosis (KETO)

INTRODUCTION DATE

April 3, 2018, and then in all subsequent weekly, monthly and tri-annual evaluations.

DESCRIPTION OF TRAIT

Genetic and genomic evaluations for resistance to ketosis (KETO) are provided for Holstein males and females. Evaluations are expressed in percentage points of resistance above or below the breed average.

Trait definition

The KETO predicted transmitting ability (PTA) represents the expected resistance of an animal's offspring to ketosis in a herd with average management conditions. Larger, positive values are more favorable.



Photo source: Holstein Association USA

Unit of measurement: Percentage points

The average resistance rate is equal to 96.1% in U.S. Holsteins. The resistance rate is equivalent to the incidence rate subtracted from 100.

Daughters of a Holstein bull with a KETO PTA of +2.0% are expected to have an average resistance rate to ketosis of 98% (assuming the breed average resistance is approximately 96%). Daughters of a Holstein bull with a KETO PTA of -2.0% are expected to have an average resistance to ketosis of 94%. Daughters from the bull with PTA of -2.0% are expected to have over three times the number of cases of ketosis as daughters from the bull with PTA of +2.0%.

Benefits of trait:

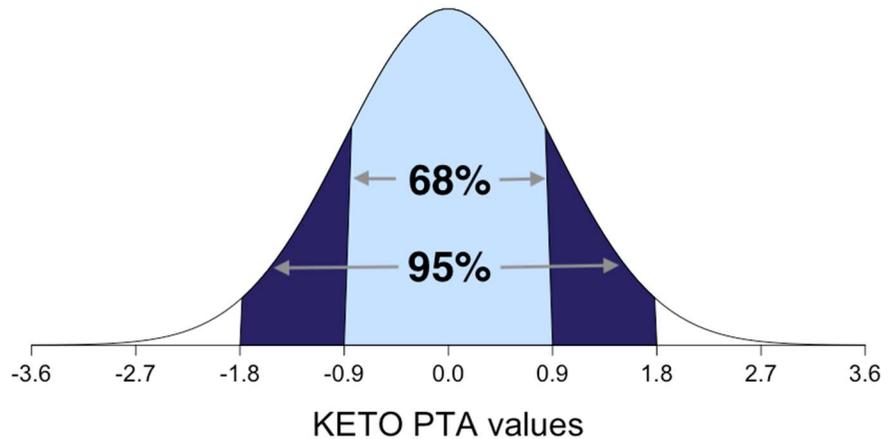
- Ketosis is one of the most frequently reported metabolic health events in dairy cattle.¹ The significant genetic component indicates that producers can select animals less likely to experience ketosis.
- The direct cost of ketosis is \$28. This does not include any associated costs such as decreases in production and fertility^{2,3} already accounted for in Net Merit.
- Animals experiencing ketosis in early lactation are also more likely to have displaced abomasum.⁴ Selecting for improved ketosis resistance should also have a favorable impact on displaced abomasum resistance.

Breeds: Initially, the evaluations will be available only for Holstein animals. As more health data become available, evaluations can be provided for additional breeds.

Data source: CDCB KETO evaluations were developed using producer-recorded data collected through Dairy Herd Information (DHI) affiliates from herds across the U.S. Strict editing was applied to ensure only the most reliable data was included for the development of genetic evaluations. The edited data included a total of more than 1.3 million KETO records from over 740,000 cows. These health records are used in conjunction with lactation data available in the CDCB cooperator database.

Range of population:

The standard deviation (variation) for KETO PTA is 0.9%. Because one and two standard deviations normally include 68% and 95% of observations, respectively, we assume about 68% of bulls will have a KETO PTA between -0.9 and +0.9 percentage points while 95% of the bulls will range from -1.8 to +1.8 percentage points.



KETO PTAs range from 3.1 percentage points below to 2.1 percentage points above average in evaluated Holstein bulls born since 1990 with reliabilities $\geq 90\%$ (December 2017).

Pre-release testing indicates the active AI Holstein sires in December 2017 (614 bulls) range from -1.4 percentage points to +1.3 percentage points, with the average at approximately 0.1 percentage points.

Reliability range: Young genomic bulls are expected to have reliabilities averaging 41% for resistance to ketosis, and progeny tested bulls are expected to have genomic reliabilities averaging 46%. As additional data are accumulated, reliabilities will increase.

Heritability: Estimated heritability is 1.2% for resistance to ketosis (observed scale).

Use in net merit indices: This trait will not be incorporated into net merit indices at launch; development of a health-enhanced net merit is expected in the future (date to be determined).

It is suggested that producers continue to rely primarily on a composite economic index with the specific choice dependent on the farm's milk payment situation and management system. In the meantime, producers might consider avoiding those service bulls having low predictions for resistance to ketosis.

PTA Correlations: Significant ($P < 0.05$) correlations with PTA for resistance to ketosis included daughter pregnancy rate PTA at 0.59 and cow conception rate PTA at 0.49.

Future developments:

In the future, further model improvements and development will be researched and tested. This may include the development of a multi-trait model that incorporates multiple metabolic disorders.

RESEARCH REFERENCES

¹Oetzel, G.R. 2007. Herd-Level Ketosis – Diagnosis and Risk Factors. *In* Proceedings of the 40th annual conference of bovine practitioners. Vancouver, Canada. 67–91.

²Donnelly, M. R., A. R. Hazel, B. J. Heins, & L. B. Hansen, 2018. Health treatment cost of Holsteins in 8 high-performance herds. *J. Dairy Sci.* (in preparation).

³Liang, D., L.M. Arnold, C.J. Stowe, R.J. Harmon, & J.M. Bewley, 2017. Estimating US dairy clinical disease costs with a stochastic simulation model. *J. Dairy Sci.* 100(2): 1472–1486.

⁴Parker Gaddis, K.L., J.B. Cole, J.S. Clay, and C. Maltecca. 2012. Incidence validation and relationship analysis of producer-recorded health event data from on-farm computer systems in the United States. *J. Dairy Sci.* 95:5422–5435. doi:10.3168/jds.2012-5572.