

Resistance to Mastitis (MAST)

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 mastitis (MAST) are provided for Holstein males and females. Evaluations are expressed in percentage points of resistance above or below the breed average.

Trait definition:

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

Unit of measurement: Percentage points

The average resistance rate is equal to 89.8% in U.S. Holsteins. The resistance rate is equivalent to the incidence rate subtracted from 100.

For example, daughters of a Holstein bull with a MAST PTA of +3.0% are expected to have an average resistance rate to mastitis of 93% (assuming the breed average resistance is approximately 90%). Daughters of a Holstein bull with a MAST PTA of -4.0% are expected to have an average resistance of 86%. Daughters from the bull with PTA of -4.0% would be expected to have twice the number of cases of mastitis as daughters from the bull with PTA of +3.0%.

Benefits of trait:

- Mastitis is one of the most commonly encountered health problems in a dairy herd.¹ Including a direct measure of clinical mastitis in genetic selection will allow for additional progress in improving resistance.
- The direct cost of clinical mastitis is \$75 per case. This does not include associated decreases in production and fertility^{2,3} already accounted for in Net Merit.
- Genetic evaluations for resistance to mastitis will undergo international validation through INTERBULL, which will provide an independent test for consistency of the CDCB MAST evaluations.

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

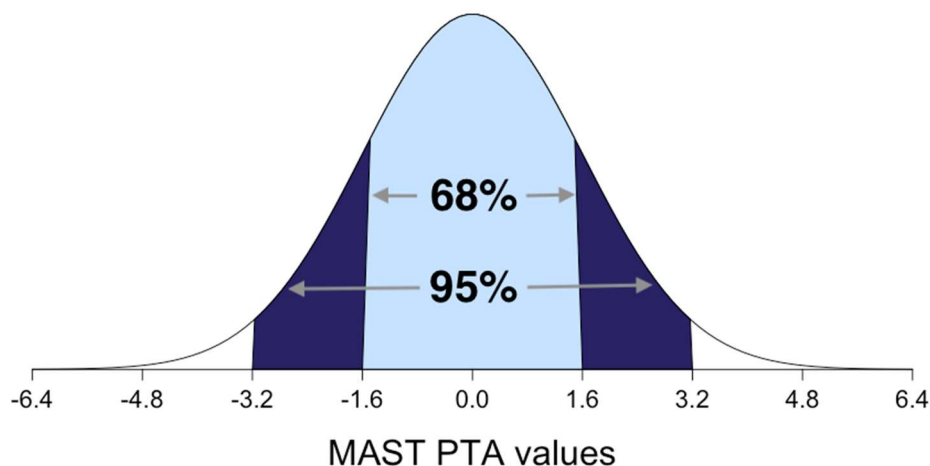
Data source: CDCB MAST evaluations were developed using producer-recorded data collected through Dairy Herd Information (DHI) affiliates from herds across the U.S. Strict editing was applied to ensure only the most reliable data was included for the development of genetic evaluations. The edited data included a total of 2.5 million MAST records from 1.4 million cows. These health records are used in conjunction with lactation data available in the CDCB cooperator database.



Photo source: University of Wisconsin-Madison Dairy Science

Range of population:

The standard deviation (variation) for MAST PTA is 1.6%. Because one and two standard deviations normally include 68% and 95% of observations, respectively, we assume about 68% of bulls will have a GL PTA between -1.6 and +1.6 percentage points while 95% of the bulls will range from -3.2 to +3.2 percentage points.



MAST PTAs range from 5.9 percentage points below to 4.1 percentage points above average in evaluated Holstein bulls born since 1990 with reliabilities $\geq 90\%$ (December 2017).

Pre-release analysis indicates the active AI Holstein sires in December 2017 (614 bulls) range from -3.6 percentage points to +2.5 percentage points, with the average at about -0.1 percentage points.

Reliability range: Young genomic bulls are expected to have reliabilities averaging 49% for resistance to clinical mastitis, and progeny tested bulls are expected to have genomic reliabilities averaging 56%. As additional data are accumulated, reliabilities will increase.

Heritability: Estimated heritability is 3.1% for resistance to clinical mastitis (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 mastitis.

PTA Correlations: The largest significant ($P < 0.05$) correlation with PTA for resistance to clinical mastitis was with SCS PTA at -0.68, indicating that SCS decreases as resistance to clinical mastitis increases. Additional significant correlations were 0.39 with productive life PTA, 0.22 with livability PTA, 0.21 with cow conception rate PTA, and 0.20 with daughter pregnancy rate PTA.

Future developments:

In the future, a bivariate analysis with SCS will be investigated. There is a large amount of historical data on SCS that may help to more accurately predict resistance to clinical mastitis given their significant correlation.

RESEARCH REFERENCES

¹Martin, P., H.W. Barkema, L.F. Brito, S.G. Narayana, and F. Miglior. 2018. Symposium review: Novel strategies to genetically improve mastitis resistance in dairy cattle. *J. Dairy Sci.* 101:2724–2736. doi:10.3168/jds.2017-13554.

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.