Statistical Indicators
E16
Breeding value
Temperament during milking

▪ Introduction

A cow must fulfil many demands before a cattle breeder is completely satisfied with her. One of those demands may be the Temperament during milking.

The Temperament of a cow is heritable. It is known that animals of certain families show more quiet or restless Temperament during milking. The cause of an animal's restless temperament may be nervousness, stress or a kind of aggressiveness. In order to learn which sires produce quiet daughters and which sires produce restless ones, the CRV has started to collect data about the temperament of cows.

From 1991 in the VRV area (Belgium) and 1994 in The Netherlands, cattle breeders that participate in the linear classification program are requested to evaluate their heifers on temperament. From April 1994 the breeding values for temperament have been calculated on the basis of the data of these surveys. These data are used for the estimation of breeding values, so that we may learn what the average temperament is of a daughter group in the milking parlour.

▪ Data

Scores for temperament during milking are collected via the linear classification program. To this end Dutch cattle breeders who participate in the linear classification program are requested to evaluate their heifers on Milking Speed on a scale of 1 to 9 inclusive. The VRV scores on a scale from 1 – 5 till 01-06-2003 and 1 – 9 from 01-06-2003. The description of the temperament for the various scores is stated in table 1.

In the NL animal model for temperament the data must comply with the following requirements:
1. the cow must be registered in the herd book;
2. the cow (milking heifer) must have calved before 3 years of age;
3. the cow must have a known herd and calving date at the time of classification;
4. the cow must be classified according to the Z, R, Y or F standard;
5. the cow must be in the herd classification system or in an additional classification system;
6. Linear traits are scored from 1 to 9 or 1 to 5.
7. The first classification of cow is used in the breeding value estimation, when a cow is classified more than once as a heifer by the same or different organisations.

Table 1. Description of score for temperament during milking as used with the linear classification program. (VRV: 1-5 till 01-06-2003 and 1 – 9 since 01-06-2003, NL: 1-9)

unmanageable		restless		average		quiet		very quiet
1		2		3		4		5
1	2	3	4	5	6	7	8	9

- ## Use of Pedigrees

The use of pedigrees in the animal model for milking speed is equal to that in the breeding value estimation for type traits.

- ## Statistical Model

The calculation of the breeding values is done with a sire model, in accordance with the BLUP technique (Best Linear Unbiased Prediction). In the calculation of breeding values disturbing factors to the scores are taken into account, in which the following statistical model is used, based on research by De Jong (1993):
in which:

$$y_{ijklmn} = HS_i + CM_j + AGE_k + LST_l + MLK_m + A_n + e_{ijklmn}$$

in which:

y_{ijklmn}	:	Score for temperament (on a scale of 1-9 or 1-5) for a cow, present in herd i, calved in month j, at age k at the time of classification, with lactation stage l at time of classification, with a deviation from the herd average of the milk production m, of cow n;
HS_i	:	Herd*season i, in which the cow is present. The herd*season is determined by herd*survey date;
CM_j	:	Month of calving j;
AGE_k	:	Age k of the cow at the time of classification
LST_l	:	Lactation stage l at the moment of classification;
MLK_m	:	Effect m of milk yield (305-days' lactation production) as deviation from the average of the other cows in the farm in the HS_i class;
A_n	:	Additive genetic effect of breeding value of animal n;
e_{ijklmn}	:	Residual term of y_{ijklmn} which is not explained by the model.

The effects in the model
The six effects in the model are:
1. herd;
2. month of calving;
3. age at the time of classification;
4. lactation stage at the time of classification;
5. milk yield;
6. additive genetic effect or breeding value.

Scale
The differences in scale: 1-9 and 1-5 scores are solved by taken the VRV data as a correlated trait. The genetic correlation between Dutch (NL) and VRV data is 0.88.

Herd
The cattle breeder assigns scores to his cows. Each herd*survey combination forms a group in which the cows are compared with one another. By incorporating the herd effect in the model the difference in level of scores that cattle breeders may make in evaluating cows is taken into account.

Month of calving
It turns out that animals that calve in the autumn behave more quietly on average during milking than cows that calve in the spring.

Age
21 Age categories are distinguished, from which category 1 is adjusting classifications to the age of 21 month and younger. Category 2 to 20 incl. adjusts to the age of 21 to 40 months incl. at classification. In category 21 all the cows are included that are 41 months old or older.

Lactation stage
The temperament of a cow is evaluated as somewhat less quiet at the beginning of the lactation period than in the second half of the lactation. The familiarisation of the heifer with milking by means of, for example, the milking machine and milking parlour plays a role here. 13 Lactation stage classes are distinguished, one for each month in lactation. In class 13 are all cows classified in month13 or later in lactation.

Milk yield
The temperament during milking is evaluated as quieter as a cow distinguishes herself as a better milk producer from the other cows at the farm. Apparently the cattle breeder is more tolerant towards a cow with a good milk yield. There are 15 classes in total, in which the deviations are divided into classes of 200 kg of milk.

Additive genetic effect of breeding value
For the calculation of breeding value for temperament a heritability of 0.11 is used for the NL data and 0.11 for the VRV data. For the calculation of breeding values see chapter E-7.

▪ **Publication**

Breeding values for temperament during milking are presented with an average of 100 and a standard deviation of 4. A breeding value of over 100 means that the cow is more quiet during milking than the average. In the case of a breeding value of lower than 100 one may expect the cow to be more restless than the average.

The meaning of 4 points standard deviation
The standard deviation of 4 points of the presented breeding values corresponds with a standard deviation of 0.39 points on the 1 to 9 scale. A sire can only transmit half of his breeding value to his daughters. This means that a sire with breeding value 104 will produce daughters who score on an average 0.20 points, on a scale of 9 classes, quieter than the daughters of a sire with breeding value 100. A sire with breeding value 110 will produce daughters who will score 0.50 points higher on an average than the daughters of a sire with breeding value 100. This sire with 110 breeding value decreases the chance of a daughter with very restless temperament as compared to a sire with breeding value 100.

Condition for publication
See chapter 'Publication rules sires'.

▪ Basis

See chapter 'Bases for breeding values and base differences'.

▪ Reliability

For the calculation of the reliability of temperament during milking, a heritability of 0.11 is used.

▪ Literature

De Jong, G, 1993. *Analyse van enquête voor gedrag bij melken, melksnelheid en melkuitliggen bij vaarzen. NRS-notitie* (Analysis of survey of Temperament in milking, milking speed and milk leaking with heifers. NRS-note)

Pelt, M. 2008. Parameterschatting voor melksnelheid en karakater op basis van Nederlandse en Vlaamse scores. R&D/08.0122/MvP/MB.