

Genetic parameters for linear type traits in Czech Holstein cattle

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Abstract

Genetic parameters for linear type traits were estimated in first calved Holstein cows in the Czech Republic using animal model and REML method. Estimated genetic parameters were in line with previous estimates for Czech population as well as with published results. The highest heritabilities were found for Stature (0.45), Rump Width (0.40) and Body Condition Score (0.36), whereas lowest values (from 0.05 to 0.10) of heritability were found for some feet and legs traits (Locomotion, Rear legs Rear View, Foot Angle, Rear Leg Set).

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Introduction

System of description and genetic evaluation of linearly described type traits of cows belonging to population of Holstein cattle in the Czech Republic has been developed and improved in several last years according to international standards in this area (Štípková et al., 2004). For this reason and as well as for continual changes in population there was need of new estimation of genetic parameters both for newly incorporated and currently established traits.

Material and Methods

The data consisted of the type classification records extracted from Czech-Moravian Breeder's Association official database. Data were edited to include only cows classified between the 30th and 210th day of the first lactation. The final dataset included type classification from 78 886 Holstein cows firstly calved between 2003 and 2007. The dataset was completed by the age of the cows, season of calving, herd and date of classification, identification of classifier, and pedigree information (4 generations of ancestors).

The animal model used for analysis included effect of herd-date of classifications-classifier (*HDC*), classifier (*C*) and season of calving (*S*) as fixed effects, quadratic regressions on age at calving (β_a) and stage of lactation at evaluation (β_s) and random effect of animal (*A*). The model equations can be described as follows:

$$y_{ijklmn} = \mu + HDC_i + C_j + S_k + A_l + \beta_1 a_m + \beta_2 a_m + \beta_1 s_n + \beta_2 s_n + e_{ijklmn}$$

The parameters were estimated in single-trait models using REML (Remlf90; Misztal, et al 1999).

Results and discussion

The estimated values of heritability (h^2) are presented in Table 1. The highest heritabilities were found for Stature (0.45), Rump Width (0.40) and Body Condition Score (0.36), whereas lowest values (from 0.05 to 0.10) of heritability were found for some of feet and legs traits

(Locomotion, Rear legs Rear View, Foot Angle, Rear Leg Set). The heritabilities for traits related to udder were found between 0.17 (Udder Width) and 0.32 (Udder Depth). The cluster of so called feet and legs traits showed slightly lowest heritability ranged from 0.10 (Rear Legs Rear View, Claw Conformation) to 0.28 (Bone Quality). These values are in line with previous findings for Czech Holstein population (Štípková et al., 2002, 2004) and in the common range of h^2 reported for other Holstein populations.

The traits newly incorporated to the system of genetic evaluation of Holstein cattle in the Czech Republic were characterized by heritability of 0.05 for Locomotion, 0.2 for Hock Joint Quality and 0.35 for Body Condition. These values could be influenced by relatively small number of records in regards to the other traits, but there were found some strong correlations between this group and some other linear traits. In the next step, we would like to describe the relationships between conformation traits.

Table 1: Estimated heritabilities of linear type traits in Czech Holstein cattle

Trait	Heritability	Trait	Heritability
Udder Traits		Feet and Legs	
Fore Udder Attachment	0.2435	Rear Legs Rear View	0.0954
Teat Length	0.2842	Rear Legs Set	0.1559
Udder Depth	0.3172	Claw Conformation	0.0995
Fore Teat Placement	0.2641	Bone Quality	0.2771
Rear Teat Placement	0.2838	Other Traits	
Udder Width	0.1672	Stature	0.4466
Rear Attachment Height	0.2497	Chest Width	0.1773
Median Suspensory	0.1962	Body Depth	0.2444
New Traits		Angularity	0.3099
Body Condition	0.3564	Rump Angle	0.3409
Hock Joint Quality	0.2001	Rump Width	0.4048
Locomotion	0.0528		

Conclusions

The estimated heritabilities were between 0.5 and 0.45. The highest h^2 were found for Stature, Rump Width and Body Condition Score whereas the lowest for Locomotion, Rear Legs Rear View and Claw Conformation. The presented results for Udder and Feet & Legs traits are in line with previous estimates as well as with estimates from other populations.

Next step of our work is to describe the relationships between linear type traits of Czech Holstein cows.

References

- Misztal, I. (1999):* REMLF90 Manual. Available at <http://nce.ads.uga.edu/~ignacy/numpub/blupf90/docs/remlf90.pdf>.
- Štípková, M., Bouška, J., Urban, F. (2002):* Hodnocení zevnějšku provotek holštýnského skotu včetně dílčích indexů ve vztahu k jejich užitkovým vlastnostem a dlouhověkosti. DZZ, VÚŽV, 20 s.
- Štípková, M.; Němcová, E. ; Bouška, J. ; Řehák, D. (2004):* New Type Evaluation Traits in Holstein Cows. Sustain Life - Secure Surfoval II, Conference proceedings, Prague, 22 – 25 September 2004, p. 180 (abstract; full paper on CD).