Relationships between conformation traits and milk yield, lifetime production and number of lactations in Czech holstein cows

Adéla Nosková[1], Josef Přibyl[1], Luboš Vostrý[2]

[1]Genetics and Breeding of Farm Animals, Institute of Animal Science, Praha – Uhříněves, Czech Republic

[2]Department of Genetics and Breeding, Czech University of Life Sciences, Prague, Czech Republic

The phenotypic relationships between type traits and functional traits were analyzed in Czech Holstein dairy cows born between years 2002 and 2015, with minimum proportion of Holstein genes 88%. Two slightly different models were used to evaluate the effects of 1 measured trait (in cm), 20 linear type traits (9 classes each), 6 composite traits, and final score (both with scales 0 – 100 points) on milk production traits and longevity. Sample for analysis of effect on milk yield included observations from 247 790 cows within one to four lactations (570 671 rows in total), second sample for longevity study included data from 228 161 cows with sums of one to maximum six lactations. Cows were required to obtain type classification scores between 30th and 210th day of the first lactation in age between 650 and 1206 days. Milk yield (in kg) records below 5079 kg and above 16 622 kg were set to absent. Longevity traits were defined as lifetime performance, i.e. total milk yield in kg for whole productive life, and as total number of lactations. Lifetime production was between 1004 kg and 95 480 kg. Maximum number of lactations was 6, cows with higher count or cows, which were not culled before the possibility of survival of 6 lactations, were not included.

Analysis were performed for linear type traits altogether as well as separately for each of 20 type traits. Squared scores of type traits were included to derive polynomial regression and best fitting curve. They were added into the Linear models, which included fixed effects of herd-year-season of birth and classifier-herd-year-season of scoring, age at first calving and age at scoring in days, day of lactation at scoring, effect of classifier and (not for longevity model) number of lactation, service period and parturition interval. Different shapes of regression lines were obtained. Some traits showed linear relationship, straight line with both negative or positive slope (with higher contribution for 1 point or for 9 points), some were curved with best values either for middle values (4 – 6 points) or marginal values (1 and 9 points). Also composite traits did not show a clear linear relationship, as would be expected.

The highest impacts on milk yield were from type traits (in decreasing order) body condition score, udder width, udder depth, rear udder height and angularity. The strongest influence on lifetime production was found for body condition score, udder depth, body depth, rump angle and rear legs side view. Importance of udder width, body condition score, udder depth, bone quality and rear legs side view for number of lactations was confirmed. Some traits, such as stature, angularity, rump angle and width and body condition score, showed a clearly intermediate optimum for longevity traits, while greatest milk yield was expected for one of the extreme scores.

Keywords: linear type traits, conformation, milk yield, lifetime performance, number of lactations