

Abstract of the doctoral thesis of Magdalena Jakiel entitled:

“Genetic parameters of calving ease in the population of Polish Holstein-Friesian cows”

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The incidence of difficult calvings (dystocia) and perinatal mortality has a significant impact on the profitability of milk production. The direct economic losses caused by difficult calvings are due to the additional costs of veterinary care, possible death of the cow and increased calf mortality. Indirect losses include reduced milk yield of a cow after a difficult parturition, problems with reproduction and, consequently, an increase in the level of culling of cows, limiting the possibility of optimal replacement.

The aims of the study were: 1) to assess the incidence of difficult calving and stillbirth in the population of Holstein-Friesian cattle; 2) to estimate genetic parameters of calving ease and perinatal mortality of calves, taking into account direct effects (genetic effect of sire of calf) and maternal effects (sire of cow); and 3) to compare genetic parameters and breeding values of bulls estimated according to linear and threshold models.

The calving ease in Poland is classified in six categories, and perinatal mortality of calves is recorded in three categories. Due to the way coding is done, the phenotypes of the examined traits are categorical in character.

Data from the SYMLEK system of the Polish Federation of Cattle Breeders and Dairy Producers contained 6,133,130 descriptions of calves and perinatal mortality of 2,560,474 Black and White Polish Holstein-Friesian cows. Very difficult, difficult and caesarean parturitions accounted for 3.07% of all calvings, and the remaining 96.93% were easy calvings. Cows calving for the first time, as compared to multiparous cows, had the lowest percentage of unassisted parturitions (28.35%) and the highest percentage of very difficult, difficult parturitions and caesarean sections (4.95%).

In the population under study, 5.26% of calves (322,336 calves) were stillborn or died within 24 hours. The highest percentage of perinatal mortality of calves (47.58%) was found in the case of difficult calvings.

The incidence of very difficult and difficult calvings in the Black and White Polish Holstein-Friesian cattle population is similar to the frequencies reported in other studies of dystocia in Holstein-Friesian populations. For calf mortality the frequency was similar to that found in other populations.

Genetic parameters were estimated separately for heifers and cows using the Bayesian method (Gibbs sampling). A binary "sire-maternal grandsire" model was used, obtaining estimates for direct effects (genetic effect of sire of calf) and maternal effects (effect of mother cow's sire). Calculations were performed separately according to the linear model and the threshold model.

The breeding values of bulls for calving ease and stillbirth were estimated according to the models used to estimate genetic parameters. Correlations between linear and threshold sire breeding value rankings were estimated using Spearman's rank correlation coefficient.

The heritabilities of calving ease and perinatal mortality of heifers and cows, obtained according to the threshold and linear model, were very low. This applies to both direct and maternal effects. Estimates ranged from 0.0019 to 0.053. The exception is the heritability of 0.129 obtained for the maternal effect of stillbirth according to the threshold model.

Low genetic variance of the examined traits, shown by heritabilities close to zero, is confirmed by many domestic and foreign studies.

Negative genetic correlations between direct and maternal effects in calving ease (from -0.38 to -0.61) limit the possibility of selection for both effects simultaneously. In practice, it is recommended to select sires of cows with high maternal breeding value and the select sires of calves with good direct breeding value.

For calf mortality, the only positive and significant genetic correlation (0.51) between the two effects creates the possibility of simultaneous selection for both effects.

The rank correlation coefficients between the breeding values of bulls estimated with use of the threshold model and the linear model were high, ranging from 0.80 to 0.99.

The similarity of the results of estimation of genetic parameters and breeding values obtained with the linear or threshold models indicates that the choice of model may be guided by practical considerations.