Effect of calving ease and calf mortality on functional longevity in Polish Holstein-Friesian cows

M. Morek-Kopeć¹ and A. Zarnecki¹
¹University of Agriculture in Krakow, Mickiewicza 24/28, 30-059 Krakow, Poland
²National Research Institute of Animal Production, Balice, 32-083 Krakow, Poland

OBJECTIVE: Survival analysis was applied to evaluate the effect of first and later calvings on longevity of Polish Holstein-Friesian cows

MATERIAL AND METHODS

Calving ease (CE) and calf mortality (CM) scores for 744,843 first and 1,418,583 later calvings were recorded in 2006 – 2012.

Length of productive life (LPL) of a cow was measured by number of days from first calving to culling or censoring.

- level of censored: 21.2%
- mean LPL: 1097 days for uncensored records
- 959 days for censored records

Functional longevity was defined as LPL corrected for production.

Subclasses of CE or CM scores x parity (1, >=2) x sex of calf were analyzed in a Weibull PH model based on the model used in the routine national longevity evaluation.

Weibull proportional hazard model

$$h(t) = h_0(t) \times \exp[\lambda + \alpha \times y(t) + \beta \times s(t) + \gamma \times a(t) + \delta \times f(t) + \epsilon \times p(t) + \zeta \times C(t)]$$

- time from first calving to culling or censoring, $h(t)$—hazard function for a cow at time $t$; $h_0(t)$—Weibull baseline hazard function

Random effects: $\psi = \text{herd-year-season}$.
Fixed effects: $\alpha = \text{age at first calving}; \beta = \text{year-season}; \gamma = \text{calving number}; \delta = \text{stage of lactation}; \lambda = \text{size variation}; \zeta = \text{fat and protein production levels}$.

CEclass/CMclass—subclasses of CE or CM scores x parity (1, >=2) x sex of calf.

Estimation. Survival Kit v.6.06 was used (Ducretaz V, Stöckler L, Mézédon G., 2010).

- significance of effects based on the likelihood ratio test
- influence of fixed effects on longevity expressed as relative risk of culling (RRC)

RESULTS

- Increased risk of culling was associated with difficult calvings of dams

  In first-parity cows, difficult birth of bull or heifer increased RRC 2.18 or 1.26 times, respectively, as compared with calving without assistance.

  In later parities, RRC related to difficult calving category was 2.0 times higher for male and 1.33 times higher for female calves than RRC associated with calvings without assistance.

- Calf mortality showed a negative impact on longevity in both heifers and cows

  First-parity stillbirth increased RRC depending on sex of calf by 18% in females, and by 15% in males. The increase of RRC was smaller (respectively 7% and 9%) in later parities.