Association between somatic cell count and functional longevity in Polish Holstein-Friesian cows

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OBJECTIVE: **Survival analysis was used to examine the impact of somatic cell count on functional longevity of Polish Holstein cows**

MATERIAL AND METHODS

DATA

TD production, SCC and culling data from the SYMLEK Polish National Recording System were provided by the Polish Federation of Cattle Breeders and Dairy Farmers

- **646,635** cows
- **4245** sires
- **3043** herds
- years of first calving: **1997–2010**

Longevity

length of productive life (LPL) – number of days from first calving to culling (uncensored records) or last test day (censored records)
functional longevity – LPL corrected for within-herd-year-season phenotypic production of a cow

- level of censoring **48%**
- mean LPL **956 days** for uncensored and **887 days** for right censored records

Lactation SCS (LSCS)

$SCS = \log_2(SCC/100{,}000) + 3)$
LSCS – first lactation arithmetic mean of test-day SCS

Weibull proportional hazard model

$$h(t) = h_0(t) * exp[hys(t) + age + ys(t) + ls(t) + hsize(t) + fat(t) + prot(t) + LSCS]$$

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 effect: hys – herd-year-season. **Fixed effects: age** – age at first calving, **ys** – year-season , **ls** – lactation number x stage of lactation, **hsize** – herd size variation , **fat, prot** – fat and protein production levels, **LSCS** – first lactation SCS mean.

Estimation. The Survival Kit version 3.12 was used.

- ❒ significance of effects determined based on the likelihood ratio test
- ❒ influence of particular effects on longevity analyzed by comparing their contribution to the log-likelihood function
- ❒ solutions expressed as relative risks of culling

RESULTS

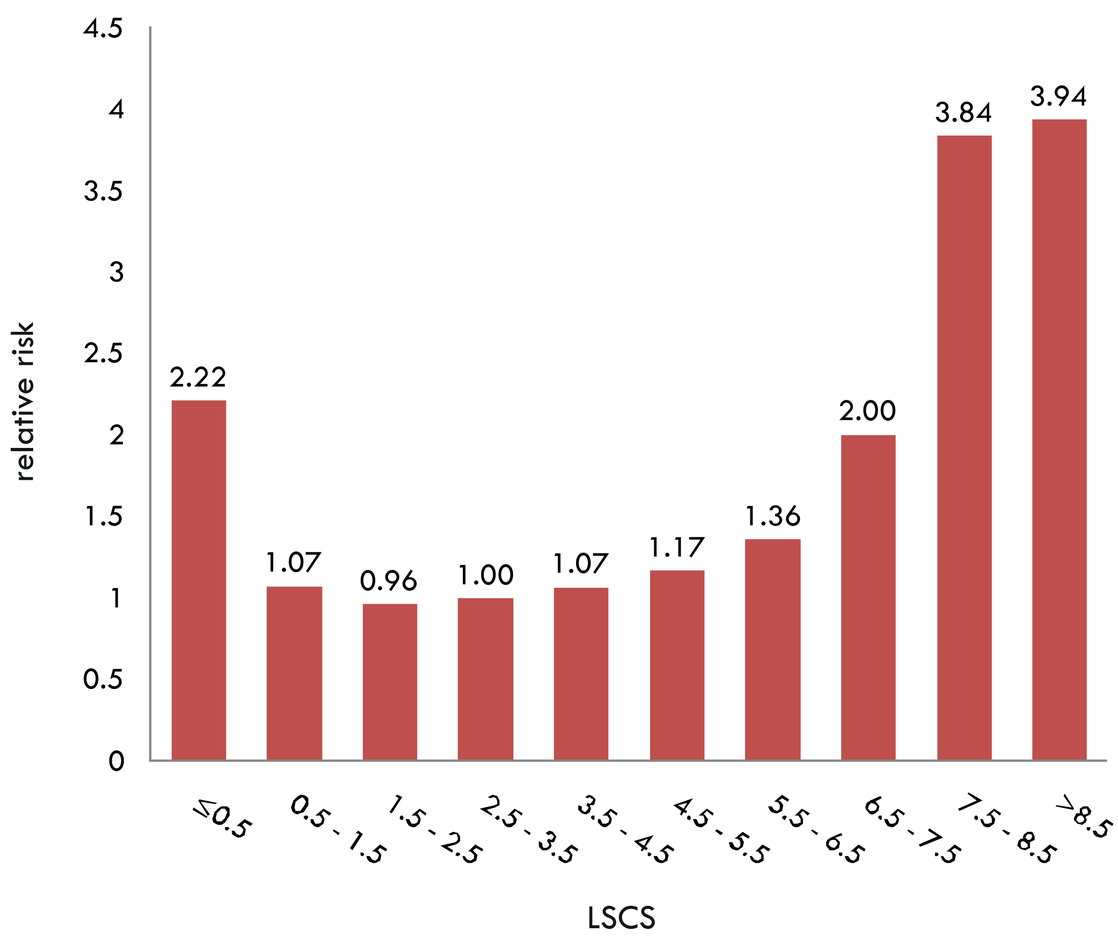

Figure 1. Relative risk of culling by class of LSCS

- ❒ LSCS showed a highly significant ($P < 0.001$) association with functional longevity.
- ❒ LSCS values between 0.5 and 4.5, corresponding to low and average somatic cell count levels, were not associated with increased risk of culling (Fig. 1).
- ❒ For LSCS in the interval between 5.0 and 8.0 the relative risk rose gradually with increasing score.
- ❒ Cows with highly elevated somatic cell counts (LSCS>8.0) were almost four times more likely to be culled than cows with low or average LSCS.
- ❒ The risk of culling was also higher for extremely low SCC (LSCS≤0.5). Some authors have attributed a high risk of culling of cows with low SCC to a low number of leukocytes and consequently a weaker defense mechanism.