Abstract #366

Effects of recent and ancient inbreeding on performance of Dutch Holstein Friesian dairy cattle.

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Inbreeding decreases animal performance (inbreeding depression), but not all inbreeding is expected to be equally harmful. Inbreeding on recent ancestors is expected to be more harmful than inbreeding on more ancient ancestors, because of purging. Purging is the removal of deleterious recessive alleles over time by selection. We investigated inbreeding depression in Dutch Holstein Friesian cattle, expecting to find stronger effects of recent inbreeding compared with ancient inbreeding. The effect of inbreeding on yield, fertility and udder health traits was determined with linear mixed models using 38,792 first-parity cows. Pedigree data were used to compute traditional inbreeding (F_{PED}) and 75k genotype data were used to identify regions of homozygosity (ROH) and compute ROH-based inbreeding (F_{ROH}). Inbreeding depression was apparent, e.g., a 1% increase in F_{ROH} was associated with a decrease in 305-d milk yield of 36.3 kg (SE = 2.4), an increase in calving interval of 0.48 d (SE = 0.15) and an increase in mean somatic cell score in d 150 to 400 of 0.86 units (SE = 0.28). Distinguishing recent from ancient inbreeding gave mixed results. For example, only very long ROHs (indicating more recent inbreeding) significantly increased calving interval, whereas both long and short ROHs decreased protein yield. Across all traits, standard errors were larger for inbreeding that was more ancient. When F_{PED} was split into new and ancestral components, based on whether alleles were identical by descent for the first time or not, there was clear evidence of purging. For example, a 1% increase in new inbreeding was associated with a 2.2 kg (SE = 0.4) decrease in 305-d protein yield, compared with a 0.9 kg (SE = 0.8) increase for ancestral inbreeding. The mixed results we obtained may be partly due to difficulties in determining ancient inbreeding. Distant ancestors are less well registered, and short ROHs may be less reliable than long ROHs. Furthermore, selection history is complex and purging may have acted on some, but not on all alleles. Results suggest that, despite the presence of purging, both recent and ancient inbreeding contribute to inbreeding depression and should be considered in management strategies.

Key Words: inbreeding depression, purging, dairy cattle