

Inbreeding and genetic variability in Holstein Horse breed ascertained by pedigree data

L. Roos*, D. Hinrichs*, T. Nissen†, J. Krieter*

*Institute of Animal Breeding and Husbandry, Christian-Albrechts-University, Hermann-Rodewald-Straße 6, D-24118 Kiel, Germany

† Verband der Züchter des Holsteiner Pferdes e.V., Abteilung Zucht, D-24106 Kiel, Germany

Abstract

A pedigree data set including 129,923 Holstein warmblood horses was analyzed to determine genetic diversity, coefficients of inbreeding, the age of inbreeding and the genetic contributions of founder animals and foreign breeds. The reference population includes all horses which had been born between 1990 and 2010. The average Pedigree Completeness Index (PEC) for the reference population was determined as 0.88 and the average complete generation equivalent (GE) was computed at 5.62. The mean coefficient of inbreeding for the reference population (inbred and non-inbred horses) was 2.27%. Most of the inbreeding was defined as “new” inbreeding, which had evolved during recent generations. The effective population size and the effective number of founders were calculated to be 55.31 and 50.2 effective individuals respectively. The most influential foreign breed was the English Thoroughbred with a contribution of 25.98%, followed by Anglo Normans (16.38%) and Anglo Arabians (3.27%). At 2.75%, Hanoverian warmblood horses were determined to be the most contributiv German horse breed. The stallions Cor de la bryere, Ladykiller xx and Cottage son xx were found to be the most important male ancestors. The mare Warthburg was defined as the most affecting female. It was possible to detect the occurrence of the loss of genetic variability within the Holstein horse breed, related to unequal founder contributions caused by the intensive use of particular sire lines. However, a slight increase in the effective population size and a stagnation of inbreeding during the last generation might show the impact of more open access given to foreign stallions in the recent past.