Genetic distances between horse breeds in Poland estimated according to blood protein polymorphism

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https://doi.org/10.17221/7496-CJAS

Citation: Stachurska A., Nogaj A., Brodacki A., Nogaj J., Batkowska J. (2014): Genetic distances between horse breeds in Poland estimated according to blood protein polymorphism. Czech J. Anim. Sci., 59: 257-267.

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The objective of the study was to estimate the heterozygosity and phylogenetic relationship between horse breeds in Poland, according to erythrocyte antigens and protein polymorphisms. The study included 15 434 horses: Polish Coldblood, Małopolski, Wielkopolski, Hucul, Polish Konik, Biłgorajski, Felin Pony, and ponies of Shetland origin. A total of 14 loci were studied: seven blood groups and seven protein polymorphism systems. Phylogenetic trees obtained for the erythrocyte antigens and protein variants were mostly alike which suggests that both kinds of markers may be equally used in estimating the similarity of animal populations. The lower polymorphism of the structural and enzymatic proteins, as compared with the erythrocyte antigen, resulted in a lower number of alleles per locus, lower heterozygosity, and closer genetic distances. The level of heterozygosity and phylogenetic trees of the breeds turned out to be mostly concordant with the known history of the populations. Małopolski and Wielkopolski horses are the most homozygous, the Huculs, Polish Koniks, and Biłgorajskis have a middle position, while the Polish Coldbloods and the ponies are the most heterozygous. The Polish Koniks are the most related to other breeds which shows that all the breeds studied, Polish Coldbloods included, have many indigenous ancestors. The Huculs, Polish Koniks, and Biłgorajskis are closely related. In spite of different histories, the Małopolski and Wielkopolski horses have the closest relationship. The Felin Ponies cluster together with the Shetlands. According to the blood groups and protein variation, the genetic diversity of the studied horse breeds is low and mainly due to individual differences. The low genetic variability of the breeds suggests reconsidering the long-term strategies of horse breeding in Poland, particularly of the conserved breeds.

Keywords:

erythrocyte antigen; heterozygosity; horse population; protein marker; relationship

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