

Although the occurrence of various forms of skin and hair depigmentation is a common feature in horses of various breeds, its molecular basis in many cases remains unclear. The studies conducted so far indicate the potential interaction of mutations located in several different genes (e.g. *KIT*, *MITF*, *PAX3*), as well as the putative influence of epigenetic factors. Unfortunately, the results presented in the scientific literature are often breed-specific and therefore cannot be easily applied to all the equine breeds.

In the case of Polish Primitive Horse and Hucul breeds, the presence of white markings on the head and/or limbs is an undesirable trait, remaining under selection pressure. This selection is currently based exclusively on the animals' phenotype. However, this process is difficult and insufficient, especially in the case of the Hucul breed, where the tobiano coat color pattern is common. In its reduced form (so-called crypto-tobiano) it is often indistinguishable from the solid coat with white markings. Till date, the molecular mechanism that determines the extent of the white, unpigmented areas on the skin and hair of Hucul horses has not been discovered. Apart from the primitive horse breeds mentioned above, the various forms of skin and hair depigmentation occur also in warmblood horses, often as a result of new genetic variants, not previously described in the literature. Currently in Poland among the one family of half-bred horses (descendants of the stallion born in 1992), a pattern of white spots present usually on the animal's abdomen is observed. Molecular basis of this pattern remains unknown.

The aim of this project is a comprehensive analysis of the molecular background of the white markings occurrence in primitive horses kept in Poland, based on the techniques of structural genomics (DNA sequencing) and on some functional studies (DNA methylation analysis, gene expression level measurements). Moreover, in the case of Hucul horses, it will be attempted to detect the genetic and/or epigenetic markers influencing the extent of depigmentation areas. The above-mentioned half-bred horses with unpigmented areas of unknown origin will be also analyzed in the form of case study, in order to determine the molecular basis of the observed phenotype.

The obtained results will certainly enrich the knowledge regarding association of genetic variants with the occurrence of white markings and other depigmentation forms occurring in horses. In the case of Polish Primitive Horses and Hucul breeds, these results may significantly support the selection carried out in order to eliminate the undesirable trait (markings on head or limbs) from the population, as well as help breeders in the correct classification of coat colors.