Genomic research in horses in Europe

K.F. Stock[1], L. Jönsson[2], S. Mikko[3], S. Brard[4], B. Ducro[5], S. Janssens[6], J. Philipsson[3]

[1] Vereinigte Informationssysteme Tierhaltung w. V. (vit), Genetic evaluation division, Verden, Germany
[2] University of Copenhagen, Department of Veterinary Clinical and Animal Sciences, Copenhagen, Denmark
[3] Swedish University of Agricultural Sciences, Department of Animal Breeding and Genetics, Uppsala, Sweden
[4] Institut National de la Recherche Agronomique (INRA), Génétique, Physiologie et Systèmes d'Elevage, Castanet-Tolosan, and Génétique Animale et Biologie Intégrative, Jouy-en-Josas, France
[5] Wageningen University, Animal Breeding and Genomics Centre, Wageningen, The Netherlands
[6] KU Leuven, Livestock Genetics, Department Biosystems, Heverlee, Belgium

With completion of the horse genome sequence in 2007, the potential of close international collaboration of researchers was impressively demonstrated, and an important step for genomic research in horses was taken. Since then, several European scientists have significantly contributed to the development of tools and strategies for using genomic information in the study of hereditary conditions and for improvement of breeding programs. An overview will be given of projects and initiatives in Europe in the field of equine genomics including prospected routine applications. Equine genetic and genomic research in Europe is carried by several strong and experienced research groups with high expertise and access to the latest methods and technologies, such as high-density SNP genotyping and next generation sequencing. The long standing European horse breeding organizations are in transition and have realized the potential of genomics for future practical horse breeding. Some progressive studbooks have accordingly shown considerable engagement and support in recent genomic projects. Because of their importance for the usability and overall quality of horses, health and performance have been and are still in the focus of genomic research in horses in

Europe. Skeletal conditions are highly relevant for sport horses, so results of radiological screenings of young horses have been used for identifying ways to improve locomotory health by breeding. Quantitative trait loci have been identified and their routine use for selection purposes has been envisaged in, for example, Dutch, French and German horse populations for osteochondrosis, the most extensively studied single disease condition. Promising results for gaits and jumping have indicated the potential of using genomic approaches for improving complex performance traits in sport horses. However, limited accessibility of high-quality phenotype data has retarded the development of routine genomic applications in horse breeding, which is expected to significantly benefit from the recent initiatives addressing refinement and extension of the phenotypic information basis and R&D collaborations. The exchange of genetic material between European Warmblood populations, the similarities of breeding goals and the relatively well developed infrastructure in the European horse sector make a good starting point for collaborative work across countries in the field of genomics. Synergistic effects of linking national projects and resources are obvious and have allowed prospecting a joint European genomics project aiming at improved selection for health and performance traits in Warmblood horses.