

Endurance ability – multiomics investigation of organism adaptation to long lasting effort based on Arabian horses model

Endurance-type effort is a complex issue that has been extensively studied in humans and other mammals, including horses. The ability to cover marathon and longer distances is a unique example of the body's adaptation to extreme exertion. This type of physical activity is characterised by very long durations at the same time as moderate intensity, being the exact opposite of speed (sprint-type) exercise. Recent publications have shown a number of biochemical processes and genetic predispositions determine the body's adaptation to endurance-type exercise. However, these features have not been described so far. The aim of this project is to expand knowledge in this field based on the example of Arabian horses.

Arabian horses are one of the hot-blooded breeds, often also considered the quintessence of equine beauty. Years of evolution and human interference in breeding processes have resulted in unique anatomical and metabolic traits in representatives of this breed predisposing them to take part in endurance rides (even up to 160 km). These features make them an excellent research object in this field.

The main purpose of this project is to describe the predisposition to long-term exercise in mammals basing on the Arabian horse model. The control group will consist of venous blood taken from a group of horses before the endurance ride, and the research group after the 80, that will then be used for advanced biochemical analyses. The blood, a reflection of all the changes taking place in the body, will be analysed for gene expression analysis and the expression of small non-coding miRNA molecules. The information about switched-on and switched-off molecular pathways will be extended in a next step to include profiling of protein levels and metabolites such as lipids, amino acids and carbohydrates. The innovation of the project is based on the assumption that the final results will be formulated as the product of four separate analyses - transcriptome, miRNA, proteome and metabolome, what has not been done before.

The results obtained so far suggest the existence of specific gene variants, proteins and biochemical pathways directly influencing the unique endurance traits of Arabian horses. The aim of our project is to verify this hypothesis on the basis of a differential analysis of samples taken before and after the endurance ride, what will make it possible to isolate factors closely related to the exposure of the horse's organism to intense physical exertion. As a result, the project will provide insight into the basis of the Arabian horse's predisposition to endurance exercise and will advance our understanding of analogous adaptations in other mammals.