The role of mikrovesicles in shaping exercise capacity in horses

It is well known that from all animals' athletes the race horses are at the greatest risk of the injury. It is caused by very young age because they commence physical training at the age of 2 years, thus it is before the termination of skeletal growth and remodeling. The significant intensity of physical exercise may cause tissue damage following the weakening the locomotor system's structures. Then the accumulation of microtrauma may contribute to the formation of fatigue fractures. Orthopedic injuries are responsible for nearly 70% of the lost training days in race horses. Usually, the evaluation of a horse's preparation for competing in race is based on clinical and haematological examination and monitoring of heart rate. However, the ideal biomarker of horse fitness level does not exist. Worth mention is that selecting an optimal training program for animals is very difficult. Thus, novel techniques allowing for evaluation of horses adaptation to increasing workload during physical training are searched.

The skeletal muscles act as an endocrine organ (muscle weight is ~40% of total body weight) secreting the 'myokines' which are transported in circulation and influence on distant organs. However, mostly classical pathway by which proteins influence on cells has been evaluated, while other additional pathways connected with the lack of a secretory signal sequence may be secreted in microstructures. One of the novel mechanism of intercellular communication is the production of lipid membrane-enclosed vesicular structures. A rapidly growing area of research connected with microstructures has begun to uncover a potential delivery mechanism, with some data suggesting that they transport different types of valuable cargos (ex. proteins).

The adaptational reactions involve many systems in the athletes' organism and are still not fully understood. The project will focus on the processes which reflect the status of the whole organism. Thus, will examinate the role of microstructures in exercise adaptation. In the project the most advanced technology will be used which allow for subsequent targeted analyses to identify molecules related to specific biological processes and signaling pathways that modulate adaptation to increasing loads. Also processes which indicate the risk of injury in the horse athletes will be examinated. In addition, as horse model is used in human exercise physiology studies, thus it will also broaden the knowledge of the general impact of exercise on the health and performance in humans.