DESCRIPTION FOR THE GENERAL PUBLIC

Lack of physical activity, in addition to incorrect diet or smoking, is a significant risk factor of so-called civilizational diseases such as obesity, metabolic syndrome, high blood pressure, ischemic heart disease or stroke. According to the WHO data, over 60% of the world population does not show adequate levels of physical activity, and this percentage is constantly growing due to increasing urbanization. Limitation of physical activity is observed more and more often, also among young people. As a disorder at a molecular level in the mentioned diseases, the occurrence of oxidative stress, i.e. the imbalance between the level of reactive oxygen as well as nitrogen and the antioxidant capacity of blood, is often mentioned. The source of reactive oxygen and nitrogen in adipose tissue are both adipocytes and macrophages as well as monocytes activated by pro-inflammatory interleukins. Skeletal muscle cells also form reactive oxygen and nitrogen, with regular physical activity increasing antioxidant capacity. Adipose tissue secretes many biologically active peptides that exert a multi-organ effect. For example, adiponectin exerts anti-inflammatory and antiatherosclerotic effects. In the skeletal muscles, this leads to increased fatty acid oxidation and glucose consumption. It increases the synthesis of nitric oxide vasodilatation in vascular endothelial cells. On the other hand, hyperlepinemia favours the formation of atherosclerotic plaques by reducing elasticity of vascular walls, the increase in platelet adhesion and the intensification of oxidative stress. Factors associated with the increase in leptin level include an increase in subcutaneous and visceral fat, the effect of glucocorticoids, estrogens or the proinflammatory TNF-α interleukin. Decreases in leptin levels are observed as a result of, among others, catecholamines or growth hormones, which may be associated with regular physical activity. The recently described adipocytokine is asprosin (in 2016), which is responsible for the regulation of carbohydrate metabolism. Some peptides, such as irisin described in 2012, are secreted by both adipocytes as well as myocytes, and are called adipomiokines. The correct mutual ratio of individual adipocytokine and myokine concentrations determines the body's energy balance. One of the mechanisms of gene expression control, for adipocytokines and myokines as well, are oxidative and reductive reactions. Changing prooxidant-antioxidant status as a result of oxidative stress may affect oxidative damage to macromolecules and cause the disruption of biochemical processes, including hormonal balance. The level of oxidative stress indicators increases with age due to weakening of antioxidant defence, and is also positively correlated with body mass index (BMI). A higher BMI value may result both from increased body fat content and increased muscle mass.

So far, the results of scientific research in the field of exercise-induced changes in the concentration of biologically active peptides secreted by adipocytes and/or myocytes mainly concern people with excess body fat, and their results are often ambiguous. The low number of scientific publications on the secretion and function of asprosin does not include studies on exercise responses in this area. Therefore, the aim of the study is to determine the mutual dependence between the secretion of selected adipocytokines, in particular asprosin and irisin, and the changes in biochemical markers of oxidative stress in men, which may occur as a result of physical exercise of varying energetic basis and differing types of muscle work, depending on body composition, efficiency, physical activity and age.

The results of stress tests at maximal and submaximal intensity performed by 20-year-old and 60-year-old males will be analysed. Research will explain, among others, whether there are changes in the concentration of asprosin, irisin and other adipocytokines after exercise and whether they depend on the intensity of the effort and the type of muscle work (concentric, eccentric)? Are these changes influenced by the increased content of adipose tissue? Does muscular tissue also influence the secretion of these compounds? Do changes in adipocytokines in the blood following efforts of various intensities depend on age, physical fitness and physical activity? Does the level of oxidative stress markers influence the secretion of adipocytokines?

The proposed research will contribute to broadening knowledge on the fundamental biological processes occurring in the human body as a result of exercise-induced homeostasis disturbances. This will be the first research on asprosin exercise secretion. The implementation of the project will allow broadening knowledge on the physiology and biochemistry of physical efforts, as well as the regulation of metabolic processes depending on age, physical fitness and body composition.

In the future, the results may contribute to better programming physical activity as a form of prophylaxis and therapy in many diseases associated with disorders of carbohydrate-lipid metabolism.