DESCRIPTION FOR THE GENERAL PUBLIC

The endothelium is a highly specialized single-line of cells that covers the interior surface of vessels. A properly function of the endothelium plays a crucial role in the homeostasis of the organism. It produces various biological mediators, which can affect locally or globally. These mediators moderate the function of the cardiovascular system, are responsible for the permeability of the vascular wall, determine its structure and remodeling and controlled the angiogenesis process. Additionally they regulates thrombotic and inflammatory processes and are involved in cancer metastasis. The endothelial dysfunction is an important component of the pathology leading to a variety of diseases, include: atherosclerosis, diabetes, stroke, it also has a great significance in the development of neurodegenerative disorders. The Glycocalyx (GLX) is a negatively charged layer lines the luminal side of the endothelium, composed mainly of proteoglycans (PG) and glycopeptides. It interacts with different plasma proteins and other constituents to create the physiologically active layer called the endothelial surface layer (ESL), which play an important role in maintaining the vascular endothelial integrity, regulation of coagulation and inflammation. Due to the placement of the GLX – between the bloodstream and the endothelium – it plays an important role in the maintaining of the integrality of the vascular endothelium. It forms the interface between the vessel wall and the blood, which regulates the interaction of the blood compounds by acting as a barrier to certain molecules and as biding sites to another. However, the GLX is extremely sensitive to insults and can be easily injured. Nowadays, more and more sources indicate that the proper function of the glycocalyx is essential for the appropriate functioning of the vascular endothelium. Based on this hypothesis GLX degeneration can be considered as the first element of pathomechanism of endothelial dysfunction. So far, many studies focused on GAG-polysaccharides, which are one of the GLX building blocks, are established, notwithstanding they seem to describe only a fraction of knowledge about quantitative and qualitative changes in GLX that occur during the development of the endothelial dysfunction. The available GLX testing methods have limitations: they can be used only for *ex vivo* materials (immunohistochemistry, atomic force microscopy), they are based on the quantitative analysis of only one of the GLX components (e.g. enzyme-linked immunosorbent assay (ELISA)), or they are not sensitive enough. To our knowledge, no studies have been carried out to explain how individual classes of GAG, behave during subsequent stages of GLX damage associated with the development of the endothelial dysfunction. We suppose that the study of plasma concentrations of GLX-building GAG classes (heparan sulfate heparin, dermatan sulfate chondroitin sulfate, hyaluronan can reflect in more comprehensive way the complexity of the GLX damage process and consequently become a more sensitive biomarker of GLX degradation compared to currently. The project assumes that the assessment of concentrations and composition of all glycosaminoglycans in one sample, will be a better approach to fully describe the complexity of setting pathological process. Tests based on GAG concentration may be more sensitive than those based on proteoglycans (PG) as GAG fraction is faster released from biological connections than PG. Thanks to the possibilities offered by the use of capillary electrophoresis, it is possible to simultaneously explore the interesting compounds in a single analysis. Additionally using the capillary electrophoresis technique can make studies faster, easier and more economic. The proposed project may become the first step towards the diagnosis of the endothelial dysfunction at a very early stage based on the diagnosis of GLX injury. The use of CE, which is a high-throughput and relatively cheap technique, can introduce a new quality among the available methods and become a "gold standard" in the diagnosis of the early vascular endothelial damage.