

DESCRIPTION FOR THE GENERAL PUBLIC (IN ENGLISH)

Nowadays, there is a trend to perform rapid, specific and inexpensive analyses of clinically relevant substances by point-of-care tests (POCT, “bedside” tests). The construction of a device for those test is often a laborious undertaking. It consists of many stages, starting from the basic research, testing real samples and finally marketing. This project will involve basic research, the results of which will expand the knowledge related to modification of the layer of the sensor immobilized on the surface of electrode. Acquiring this type of knowledge can prove helpful with constructing sensitive and selective biosensors.

Currently it is estimated that approximately 31% of the all deaths in the world are caused by cardiovascular diseases, CVD (http://www.who.int/cardiovascular_diseases.en). One example of diseases connected to cardiovascular system is atherosclerosis which is associated with endothelial dysfunction (ED). The high concentration of reactive oxygen species promotes the development of inflammatory processes, modification of LDL to oxLDL, platelet aggregation and thrombus formation. Thus, both, LDL and oxLDL may be regarded as biomarkers of oxidation state of the endothelium.

Therefore, **the main objective** of this project is to develop a platform for the **simultaneous electrochemical determination** of low density lipoprotein (**LDL**) and oxidized low density lipoprotein (**oxLDL**). This platform will be based on antibody-redox active molecule conjugates used as a recognition element. The electrochemical detection system fits perfectly into POCT trend, mainly because of the possibility of miniaturization as well as analysis of small sample volume (order of microliters). On the other hand, our great experience in the formation of redox active layers on the surface of gold electrodes and the use of electrochemical techniques will be very useful in the project realization.

In the recent years, there has been a growing interest in plants used as spices, which were known for their health-promoting properties centuries ago. Nowadays, these plants are in their heyday. In the course of this project, we are going to demonstrate the impact of individual components of black cumin or fenugreek on the oxidation process of LDL. We are going to analyse **thymoquinone**, **thymol**, as well as plant alkaloids, **nigelline** and **trigonelline**.

To our best knowledge, there are no examples of electrochemical sensors for the simultaneous determination of native and oxidized LDL. This is the **main reason for undertaking this research topic**. Thus, the development of platform for simultaneous LDL and oxLDL determination is very interesting not only from a **scientific point of view**, but it has a profound **social significance**. The level of **LDL** or **oxLDL** in serum may help to assess the **risk of cardiovascular disease**.