POPULAR SCIENCE ABSTRACT

With the development of our civilization and the increase of the comfort of life we pay less attention to having a healthy lifestyle. Unbalanced diets and the lack of physical activity have become the major reasons for serious chronic illnesses, such as: atherosclerosis, diabetes, hypertension, and obesity.

One of the metabolic consequences of the development of obesity is the non-alcoholic fatty liver disease (NAFLD). The illness is mainly associated with the increased accumulation of fatty drops in liver. The excessive inflow and accumulation of fat combined with increased oxidative stress slowly leads to the shift from NAFLD to non-alcoholic steatohepatitis (NASH). NASH is mainly associated with the formation of a chronic inflammation in the liver. The inflammation can also be connected with the transformation of fatty acids into their inflammatory derivatives. These processes appear due to the influence of specific enzymes – cyclooxygenases and lipoxygenases – and due to direct peroxidation related to increased oxidative stress in liver cells.

The differentiation of the specific stages of fatty liver and the existence of NASH is difficult to estimate. The "golden standard" for the diagnostics of these illnesses is liver biopsy which belongs to the panel of invasive testing. In the case of testing the initial stages of steatosis, biopsy is not performed as a standard treatment. Therefore, there is a great need to find a marker that would enrich the panel of non-invasive testing and help in better evaluation of the stages of development or regression of the illness.

Our research has showed that the profile of fatty acids and their derivatives provides valuable information about non-alcoholic fatty liver disease. However, the pro-inflammatory substances coming from the changes of arachidonic and linoleic acids draw even more attention. These substances are produced due to a specific enzyme – 5-lipoxygenase – which, as we confirmed in our pilot study, plays a very important role from the very beginning of the illness.

The aim of our project is to select those lipid markers (fatty acids and their specific derivatives) that could help evaluate the degree of fatty liver. So far, there has been no research that could conclusively point to the usefulness of the aforementioned lipid compounds in the evaluation of NAFLD/NASH. The most important thing seems to be the evaluation of the correlation between the concentration of fatty acids and their derivatives in plasma, and their concentration in liver. Thanks to this, it will be possible to answer the question if the labelling of these compounds in blood reflects the metabolic state in the liver. The evaluation is possible only on the basis of an animal model.

The research is going to be carried out on rats with a model example of the development of NAFLD/NASH. Initially, the study and test groups are going to consist of 36 rats each. Within the period of 48 weeks, every 8th week, blood, adipose tissue, and liver (6 specimens from the study group and 6 from control) are going to be collected from the rats. In the animals' tissue, the concentrations of fatty acids and their derivatives (LC-MS, GC-MS), and the activity of 5-lipoxygenase (ELISA) are going to be labelled. In the rats' blood, the following pro-inflammatory markers are going to be labelled: TNF-α, IL-6, HOMA-IR, TGF-β, and the total antioxidant activity.