Lipid compounds are perceived mainly as a concentrated source of energy supplied with food or a form of reserve energy storage in the human body. However, over the past decade, a rapid growth of interest in lipidomics, the field of study focused on the determination of the role of lipid compounds in the functioning of the human body, both in physiological and pathological condition can be observed. Understanding the impact of the food-delivered lipids on the molecular mechanisms occurring at the cellular, tissue and organism level is also an important part of lipidomics research.

Rich sources of phospholipids delivered into the body with food are egg yolks, pork liver or soy products. After consumption, phospholipids are absorbed from human intestine in more than 90%. About 20% of them are absorbed in native form without their hydrolysis by phospholipases present in gastrointestinal tract. The digestion products, including lysophospholipids and free fatty acids are absorbed through the epithelial cells of the small intestine and are resynthesized to phospholipids. After this step, phospholipids in a lipoprotein form are released into the bloodstream or lymph and are distributed throughout the human body. Then, food-delivered phospholipids can be incorporated into cell membranes or be converted to molecules involved in cell signalling. Phospholipids, especially those containing polyunsaturated fatty acids exhibits many key biological activities. On the other hand, these compounds are particularly susceptible to oxidation. Long-term thermal treatment of food can lead to formation of a number of oxidation products, among which oxidized phospholipids can be distinguished. For this reason, the first objective of proposed project is to characterize the products of thermal-oxidation of phospholipids isolated from chicken egg yolk, which are the main dietary source of phospholipids. For this purpose, a set of analytical techniques including spectrophotometric tests, to monitor the process of phospholipid oxidation and chromatographic methods that allow their separation, identification and quantification, will be applied.

Previous studies indicated that, endogenous phospholipid oxidation products formed in human body contribute to the development of atherosclerosis, inflammation or ischemia. However, there are no scientific reports determining the impact of phospholipid oxidation products delivered to human body with food on the functioning of intestinal epithelial cells exposed on direct contact with modified phospholipids. High bioavailability of native phospholipids suggests also high bioavailability of the oxidized phospholipids. If these were to happen, highly bioactive oxidized phospholipids could originate not only from intracellular *in vivo* oxidation, but also might be derived with food and absorbed by cells. Therefore, in proposed studies, it is planned to determine the toxicity of oxidized phospholipids in human colorectal cells. To simulate the processes occurring in the human digestive tract, it is planned to carry out *in vitro* digestion of oxidized phospholipids and to determine also the toxicity of their digestion products including lysophospholipids and free fatty acids. In addition, it is planted to determine the potential ability of oxidized phospholipids and their digestion products to induce oxidative stress in human intestinal epithelial cells. For this purpose, it is planned to assess degree of cellular DNA damage and oxidation of proteins and lipids present in cells exposed on phospholipids modified by oxidation and products of their digestion.

The results of this project will enable characterisation of phospholipid oxidation products, which may have potentially negative impact on consumers' health. In addition, it will be possible to determine conditions under which the oxidized phospholipids are formed as a result of heat treatment of chicken egg yolk. The planned study will also help to disclose the potential mechanism of toxicity of these compounds at the gastrointestinal tract cells level, which can contribute to the understanding of the etiology of food related disorders, where the lipid compounds, especially bioactive phospholipids may play an important role.