Peptidomics and metabolomics are new areas of science, enabling a comprehensive analysis of proteins and peptides, as well as low molecular weight substances, i.e. metabolites, involved in a variety of chemical reactions in the examined system (organism, tissue, cell). Peptidomics allows to define the protein composition of a sample by analyzing peptides, i.e. short protein fragments composed of two or more amino acids, basing on their molecular weight and amino acid sequence in the peptide chain. At present, the term "peptidome" is defined as a set of all peptides present in a cell, tissue or organism. Similarly, metabolome is defined as a set of all low molecular weight substances in the analyzed system. The objective of peptidomic and metabolomic studies is often to simultaneously analyze and identify thousands of peptides and metabolites present in complex biological samples. As a result, **it has become possible in food science to detect and identify unique peptide or metabolomic markers - compounds specific to a given species, tissue or process in complex food products. The markers can be applied to study of a variety of technological processes, as well as to analyze authenticity, e.g. for the detection of food frauds and adulterations.**

The purpose of the project is to identify new metabolomic and peptide markers of plant and animal origin food components resistant to technological processes that will help develop methods for sensitive and selective detection of individual components of food products. **The subject of study are fish: pollock, hake, sole, panga and other fish species sold in shops under the trade name of "panga", as well as guinea fowl and farmed rabbit and plant oils: rapeseed, linseed, pumpkin seeds, milk thistle, nigella, sunflower seeds, or evening primrose, sesame, coconut and hemp seeds.** Proteins, peptides and metabolites will be identified, those specific to processed food components and resistant to technological processes, such as cooking, roasting, smoking, sterilization in the case of animal products and pressing, extraction, and refining in the case of crude plant oils. Special attention will be given to the detection, identification and evaluation of stability of allergenic proteins during the technological processing. Fish are on the list of 14 products that are the main source of food allergens, which also includes eggs, milk, soy, sesame, gluten, shellfish. In the case of oils, metabolic research will focus especially on pro-health compounds including polyphenols and triglycerides, and markers of product quality to assess changes during storage (oxidation) and hence the suitability for human consumption.

Research will be performed using modern metabolomics and proteomic tools as well as genetic methods based on polymerase chain reaction (PCR). Samples of raw materials and food products will be analyzed by chromatographs coupled with mass spectrometry (LC/MS). Bioinformatics tools will help to identify markers specific to a given food component that will allow for unambiguous detection and identification of components, especially those of allergenic nature, in processed food products. Quantitative analysis of the individual component will be developed by the use of chromatographs coupled with the triple quadrupole mass spectrometer (LC/QQQ). The results will be compared with the capabilities of genetic methods such as classical PCR and real-time PCR.

Identified new metabolomic and peptidomic markers of fish species, guinea fowl, rabbit and ten types of oils will enable to identify and differentiate processed food components, **enable fast and reliable quantification of a given component in food products**. It will provide new information and knowledge on species-specific proteins, peptides, metabolites resistant to technological processes. It will help assess the health hazards of food by identifying and monitoring markers of allergenic components as well as the quality of food products by analyzing the markers of oxidation. Proposed studies and the discovery of species-specific markers will contribute to the development of quantitative analysis in food sciences, and thus **to improve the quality of food**.