PROTEOMIC ANALYSIS OF ANIMAL BY-PRODUCTS FOCUSED ON THE IDENTIFICATION OF SPECIFIC PEPTIDE MARKERS

The combination of omics techniques with chemical analytics for assessment of the composition of food as well as its nutritional properties and impact on human health has given rise to a new research area for scientists called foodomics. The results of foodomics research have a direct impact on food safety and consumer health. They help consumers to choose food products that support the prevention of certain diseases, including allergies, to ensure a longer lifespan and better health status.

Proteins are one of the basic nutrients contained in food. The type and amount of consumed protein depend largely on the religion, lifestyle, or presence of food allergies. Over the past 20 years, there has been a marked increase in the incidence of allergies to animal proteins, e.g. those derived from red meat, which were previously considered rare. **Authentication of the composition of food products is of paramount importance for consumer protection.**

Adulteration of meat products with animal by-products or cheaper proteins of animal or plant origin is a global problem reported worldwide. The increase in the production of meat products, their complex nature, their various processing modes, and the increasing sophistication of adulteration make the identification difficult. The current methods for detection of food adulteration are still insufficient. Authentication of food, especially processed meat and offal products, is a constant challenge. Among the methods employed to authenticate the composition of food products are new technologies based on omics studies, which facilitate the determination of the protein composition through the identification of specific short protein fragments, the so-called peptide markers. Numerous scientific publications present the use of advanced analytical techniques, e.g. liquid chromatography coupled with tandem mass spectrometry (LC-MS/MS), to identify peptide markers specific for meat tissue from various animal species. Despite the importance of this issue, there are no literature data on the identification of peptide markers that would be specific for tissues derived from animal by-products. Filling this knowledge gap is the main goal of the project. The availability of validated peptide markers unique to a wide range of animal by-products is essential in order to facilitate **the detection of adulteration with multiple offal products from different animal species in a single LC-MS/MS analysis**.

The primary objective of the project is to identify the unique peptide markers, so-called authenticity markers, specific for edible animal by-products, i.e. the liver, kidney, lung, heart, cartilage and skin connective tissue of the six most commonly consumed animal species: chicken, turkey, duck, goose, pork, and beef, and to develop a new quantitative and qualitative LC-MS/MS method for the authentication of the composition of food products with the use of identified markers. To confirm the most specific proteins for the experimental groups, an analysis of genes encoding selected proteins, called messenger RNA (mRNA) expression analysis, will be carried out. The quantitative assessment of the expression of selected genes will facilitate the assessment of the activity of genes encoding individual proteins and confirmation of their synthesis in the analysed raw materials.

This interdisciplinary project will combine research in the areas of proteomics, genetics, food technology, and analytical chemistry.