UNRAVELING THE SECRETS OF MICROPLASTIC - THE INFLUENCE OF FACTORS INDUCING THE RELEASE OF MICROPLASTIC FROM PACKAGING, ITS ROLE AS A CARRIER OF METALLIC CONTAMINANTS, AND BIOAVAILABILITY DURING *IN VITRO* DIGESTION

Nowadays, when buying food, it can be stated with almost 100 percent certainty that its packaging consists mostly of plastic. To date, the world has produced 8.3 billion tons of this material. If we produce so much of it, and it has found so many applications in this world today, does it surely constitute a safe part of our lives? It turns out not. In fact, more and more information has been reported recently about the dangers of plastics for animal and human health. It has been found that they can degrade into smaller particles of so-called microplastic (MP), ranging in size from 0.1 to 5,000 µm.

Unfortunately, with MP being ubiquitous in the environment, it has become an element passed along the food chain, with humans as the last link. The most common route of exposure to these particles is through the gastrointestinal tract. It is estimated that people around the world intake between 0.1 to 5 grams of MP per week by unknowingly ingesting it. Another problem resulting from the presence of MP in food is its potential to carry contaminants. The properties of these particles, including their large surface-to-volume ratio, allow them to adsorb organic as well as inorganic compounds. As a result, they can affect living organisms in unexpected ways. A recent report by the Food and Agriculture Organization of the United Nations from 2023, makes clear that despite increased scientific interest in MP, there is a lack of information about its effects on the human body, the factors that induce its formation, bioavailability, the establishment of acceptable doses, and methods for its determination.

Therefore, the **aim of the planned research will be to determine the factors inducing the release of MP from plastic packaging in the environment of food imitating liquids, to evaluate the potential of MP as a carrier of metallic contaminants, and to assess MP behavior in a simulated gastrointestinal tract using an *in vitro* model of digestion.**

The proposed research plan is multidisciplinary, combining concepts from food science, chemistry, and physics. Such a comprehensive approach to the problem will provide a deeper understanding of the MP threat and contribute to food safety and human health protection. The project will comprehensively verify for the first time the risk of MP formation from packaging, made of polyethylene (PE), polypropylene (PP), poly(ethylene terephthalate) (PET), under the influence of model liquids imitating the food matrix (10%, 20%, 50% ethanol, 3% acetic acid, and ultrapure redistilled water) over a wide range of temperatures and time periods. Furthermore, a thorough understanding of the determinants of adsorption and desorption of elements (Cd, Pb, Ni, Zn) on/from their surfaces is crucial in the context of food safety. Microplastics can enter the food chain and contribute to new threats to human health and the environment. Simultaneously, model studies simulating the conditions of the human gastrointestinal tract, including the passage of MP through dialysis membranes, using different food matrices, have not been conducted to date. It will also be an important task to verify the hypothesis regarding the effect of different food matrices on the rate of MP degradation in the gastrointestinal tract.

Maintenance of a high level of food safety is crucial to protecting consumer health. This project belongs to the category of basic research. However, it is of great importance, both exploratory and practical. The results obtained will form the basis for the introduction of appropriate MP research procedures, provide the necessary information for clinical trials and further experiments to determine acceptable levels of MP in food. Moreover, the results of this project may help develop strategies to reduce the negative impact of MP on the environment.