ABSTRACT FOR THE GENERL PUBLIC

The functioning of the living things is based on biopolymers. Consequently, natural polymers and their modified derivatives are widely used in many areas of life and various industries. In recent years, the possibility of employing the biopolymers in the technology of controlled release systems of active substances has aroused great interest. Polymers able to modify the pharmacokinetic properties have been gained considerable importance in modern medicine. The concept of controlled release has also attracted growing attention in terms of its use in the technology of production of emitters - modern active packaging whose task is to extend the shelf life or to preserve and improve the quality of packaged food. The largest group of emitters is composed of packages releasing antioxidant and antimicrobial compounds.

The selection of the appropriate carrier should be a starting point in the design of active materials with optimal physicochemical parameters and desired diffusion mobility. Packaging material (carrier) should enable releasing the active substance continuously and uniformly throughout the entire storage period. As part of the project, a basic study will be carried out to gain knowledge on the effect of physicochemical parameters of hydrogel carrier systems on the release of non-polar active substances. Systems of controlled release of three antioxidants: ascorbyl palmitate (AP), astaxanthin (AST), curcumin (CUR) will be developed. The carriers will be prepared in the form of binary films made of a mixture of gelatin (GEL) and polysaccharides with emulsion-stabilizing effects: gum Arabic, carboxymethyl cellulose, octenyl succinic anhydride starch, and water-soluble soy polysaccharides. Comprehensive studies on the optical, structural, barrier, mechanical, pharmacokinetic (kinetic of release and stability of active compound), and antioxidant properties of the materials obtained will be carried out. Given the supplementation potential of the proposed antioxidants, their bioavailability will be determined *in vitro* under simulated gastrointestinal digestion conditions. The mechanism of release of the active substance depends on the presence of auxiliary substances. Therefore, the possibility of acquisition of different release profiles by changing the properties of polysaccharide/GEL matrix by incorporation of rheological (hydroxypropyl methylcellulose (HPMC)) and surface-active (lecithin) modifier will be explored.

Water is destructive factor negatively affecting the stability of edible packaging. The project foresees that oil-vacuum impregnation can yield a composite carrier system with improved water vapor barrier properties and a modified profile of active substance release. For the impregnation, sea buckthorn oil belonging to the group of drying oils with a high content of health-promoting substances will be used.

Fat, apart from providing food with specific sensory qualities, is necessary for the development and proper functioning of the human organism. However, fat-containing products easily undergo oxidative rancidity, which prevent their use due to the formation of harmful substances. The prospective data can be useful for designing active edible barriers delaying the adverse environmental effects on the quality of packaged products, in particular food with moderate and high fat content. Hence, a later stage will consist in storage tests, which will provide information on possibility of using of the selected carriers system to form protective coating on the surface of hazelnuts and rennet cheese.

Interactions between the active substance and matrix components may influence on the rate of its migration from the packaging material to food, and in the case of release in the organism, may affect the bioavailability of the active substance, i.e. strengthen or weaken its action. The mechanisms of interactions between active biomolecules and polymers have not been fully elucidated; therefore, the designed research is intended to provide information on the phenomenon of interaction in the proposed carrier systems and the impact of this interaction on the antioxidant activity of the fortified packaging material. The strategic aspect of the project will be to determine the relationship between the structure, physicochemical properties, and expected function of the material. The proposed research will provide a strong knowledge base, with particular emphasis on problems related to the improvement of the properties of active packaging materials. Packaging allowing preservation of the quality of food guarantees its health safety. Fortification of food and protection of its physiologically active ingredients is targeted at improvement of public health through prevention of diet-related diseases. In the aspect of health, as well as environmental protection by excluding plastics from food packaging, the proposed research is of great societal importance.