

Mare's milk, known for reduced allergenic properties, is considered as a substitute for cow's milk, directed to people who are allergic to cow's milk. However, our previous study showed, that mare's milk proteins have similar immunoreactive epitopes (parts that are recognized by the antibodies) as cow's milk proteins. Therefore, the aim of the project is to explore the possibility of reduction immunoreactivity (ability to binding to the antibodies) of mare's milk proteins beta-lactoglobulin and alpha-casein by lactic acid fermentation with *Lactobacillus* strains and/or transglutaminase linking with comparison to cow's milk proteins, taking into account the changes occurring during the *in vitro* digestion in the gastrointestinal tract. The processes together, separately and sequentially will be study.

The present reason for choosing the research topic is recent scientific data indicated a new wave of increase in the incidence of food allergy to cow's milk proteins. In order to alleviate this burning issue, it is important to examine the unpopular, so far, materials, having a similar nutritional value to cow's milk, which could constitute its replacement. One of such products is the mare's milk, corresponding to human milk in terms of chemical composition and differing most from cow's milk compared to the milk of other animals (sheep, goat, pig). There are cases when people allergic to cow's milk may be also allergic to the milk of other animals. This is called cross-reaction, where antibodies present in the human serum of people with food allergy can connect with a particular protein-allergen having a structure similar to the allergen.

The aim of the project is to create a scientific basis for mare's milk proteins modifications, which in future they could be safe for people allergic to cow's milk. Within the project, two enzymatic methods of proteins modification have been selected: hydrolysis of proteins by the lactic fermentation and cross-linking with the transglutaminase enzyme with bacterial origin. The first method - usage of selected strains of bacteria has already been widely used, e.g. in the production of yogurt by the "degradation" of proteins and peptides to obtain a decreased immunoreactivity. Lactic acid fermentation is used in the bread baking process in order to reduce the allergenicity of wheat flour. In the earlier studies it was observed that a different type of bacteria can modify the proteins of mare's milk in a different manner. The project in focus will allow to verify whether the various strains of the *Lactobacillus* genus have different properties to reduce the immunoreactivity and allergenicity. The most beneficial strains in reducing the immunoreactivity of mare's milk proteins will be identified. The second method is used in food production in order to improve the texture and structure of food and to increase the capacity of water binding and products modified with this enzyme. Transglutaminase occurs naturally in the tissues, but it can also be obtained from viable microorganisms, e.g. *Streptovercillium* sp., *Escherichia coli*, *Bacillus subtilis* or *Physarum polycephalum*. This enzyme is also found in plant tissues such as soya or fodder beet. Consumption of transglutaminase does not pose a risk of an allergic reaction (study done by a team of researchers from the National University Hospital in Copenhagen in 2004.).

The enzymatic reactions occurring in the gastrointestinal tract cause the conversion of consumed food in the collection of antigens affecting the immune system. In most cases, they are identified as neutral molecules, but some people may react allergenic due to the hypersensitivity. It is believed that proteins and peptides resistant to the proteolysis are the most potent allergens. Determining the impact of mare's milk digestion products previously modified by enzymatic reactions is a key issue in understanding the impact of new types of diets containing mare's milk on the body. In the project it is planned the separation of peptides with a low molecular mass weight (<15kDa) to investigate the immunoreactivity of peptides which could potentially penetrate the intestinal wall of people suffering from food allergies is planned. The model of simulated gastrointestinal digestion, showing the breakdown of the protein by the digestive enzymes in the presence of bile salts and measuring the degree of degradation of milk proteins, will be applied. The study of immunoreactivity of main allergenic proteins beta-lactoglobulin and alpha-casein from mare's and cow's milk with sera of patients suffering from cow's milk allergy is planned.