

Currently, the biggest problem concerning the health of high developed countries are citizen diseases (cardiovascular diseases, cancer, kidney disease, diabetes, and obesity). Research in the field of nutrition, as well as nutrigenomics and nutrigenetics confirms the fact that properly chosen diet can modulate metabolic processes in the human body and significantly reduce or even eliminate the occurrence of many pathological conditions. Epidemiological studies indicate that the factors significantly reduce the risk of obesity and the incidence of pathological conditions such as cancer, diabetes or heart disease should be a diet rich in legumes and probiotics.

In recent years an increase of interest in foodstuffs, which apart from providing basic nutrients have added value and have a positive effect on the human body, has been increased. In this trend the food for particular nutritional uses, also called functional food, which through its unique composition modifies and regulates the metabolic and physiological processes are well inscribed. The second direction of its activities is the ability to reduce the risk of pathological conditions.

The main objective of the project is to evaluate the potential use of the legumes sprouts as a prebiotic and carrier for the probiotic microorganisms that will ensure their growth and high survival during passage through the digestive tract. Determination of the key determinants and analysis the relationships in the *in vivo* and *in vitro* research systems aims at developing the base of knowledge that in the future will be use during designing the products personalized. The aim of the project is to also evaluate the effect of co-culture on the bioavailability and bioavailability of active ingredients and nutrients in the received synbiotics, a safeness the enriched diet as well as the possibility of its use in prevention the pathological changes generated by oxidative stress and not properly balanced diets.

The research hypothesis of the project assumes that by optimizing the conditions of co-culture of sprouts and probiotic organisms it will be possible to obtain synbiotics with a high content of probiotics as well as the nutritional and nutraceutical quality which predispose them to use in the functional diets reducing the risk of obesity and other lifestyle diseases. It is assumed that the legumes, which are a great source of resistant starch, will act as effective probiotics. On the other hand, the presence of microbiota by inducing the natural mechanisms of plants defense will be a factor inducing the overproduction of low-molecular weight antioxidants, which will translate into a significant increase the nutraceutical potential of the obtained preparations.

Research hypotheses will be verified in the model systems based on the *in vitro* and *in vivo* researches. The first phase of the project is aimed at selecting the optimal conditions for synbiotics preparations (germination temperature and the method of inoculation). The four species of legumes were selected for the study (lentil, soybean, mung bean, adzuki bean). Probiotic organisms have been selected based on their well-documented health-promoting activity and the use in the commercial probiotic preparations: *Lactobacillus rhamnosus* GG, *Lactobacillus plantarum* 299V, *Lactobacillus acidophilus* NCFM and *Saccharomyces boulardii*.

The selected synbiotics will be studied in details. The analysis involves the assessment of the survival of probiotics during storage in cold conditions and during passage through the digestive tract. It is also assumed to determine the potential inductive effect of co-culture of sprouts and microbiota on the biosynthesis of low-molecular antioxidants and the consequent increase in the nutraceutical potential of preparations. A potential bioavailability of bioactive substances, nutrients and activities: antioxidant, anti-inflammatory and anticancer properties will be analyzed in *in vitro* tests. Due to the fact that the growth of probiotic microorganisms modulates the natural microflora of food products a microbiological quality of synbiotics will be performed, with particular reference to pathogenic microorganisms. In the last phase of the project the bioavailability of nutrients as well as the security of the diets enriched with synbiotics and their protective effect to the pathological changes induced by oxidative stress caused by high-fat diet with a high amount of iron will be evaluated in *in vivo* tests.

The results are aimed to establish a base of knowledge, which may be a tool for designing functional foods - synbiotics based on sprouts (an innovative solution), which may be important in the prevention and treatment of civilization diseases. Simultaneous analysis the level and activity of selected nutrients and bioactive *in vitro* and *in vivo*, and extensive microbiological analysis is aimed to point out the effectiveness, appropriateness and safety of use the low-processed, sprouted products as prebiotics. The project is a compilation of issues from the fields of microbiology, biochemistry, nutrition, and biotechnology and food technology and is expected to provide a new and deepen the existing knowledge concerning the mechanisms of pro-health effects generating by bioactive constituents of plant-origin preparations.