

Lifestyle modification with diet, regular exercise, and weight control, remains the primary intervention for lowering triglycerides and glucose levels, as well as has been proven effective in the prevention and treatment of the metabolic syndrome. Due to the high cost of metabolic syndrome, both in terms of human lives and monetary expenditures, it seems highly desirable to search safe, effective natural agents to support treatment. One of the therapeutic target for treatment of obesity and other disorders related to metabolic diseases is inhibition of nutrients, such as lipids and carbohydrates, digestion and absorption through an inhibition of digestive enzymes. For this reason, the role of gastrointestinal tract, including a gut barrier, is crucial in such disorders. The monolayer of intestinal epithelial cells provides a complex defense system separating the intestinal contents from the host tissues, as well as contains the immunological cells. The integrity of this system is required for the maintenance of the normal intestinal permeability because an imbalance leads to the passage of the luminal contents into the bloodstream (gut barrier leaking), as well as to the development of low-grade chronic inflammation in tissues. It is considered that this permeability alteration is the basis for the pathogenesis of many diseases, such as inflammatory bowel diseases, irritable bowel syndrome, autoimmune diseases (celiac disease, atopic manifestations), diabetes mellitus type I, acute pancreatitis, liver cirrhosis as well as multiple sclerosis and rheumatoid arthritis. Even diseases not directly related to the mucosal barrier function, such as heart failure and ischemic reperfusion injury, are likely to be intensified due to the inadequate mucosal perfusion. Therefore, the prevention of gut barrier leaking or gut inflammation by plant-derived preparations or plant materials rich in bioactive phytochemicals becomes more and more clinically relevant. The current project attempts to indicate the beneficial role of the medicinal or traditional plants preparations, which are very common in countries of central Europe. Due to the fact of their use in the form of herbal teas, marmalades, jellies, jams, as well as beverages, it is also reasonable to search the active inhibitors of absorption of some dietary constituents among these safe plant materials. Among commercial dietary constituents, a wide range of plant-derived products, such as hop, fruits of chokeberry, elderberry, quince, cornelian cherry or dog rose, as well as flowers of roselle and hazelnuts. Others like fruits of sea buckthorn, barberry, rowanberry or acorns seems to be more and more valuable. On the other hand, tarragon and seeds of black caraway are used as spices in the cuisine.

In the context of research of multi-target agents effective in the treatment of metabolic diseases among these species rich in bioactive substances, the first selection will be performed based on an evaluation of their activity against enzymes associated with a reduction of lipids and carbohydrates absorption. For the most effective ones the artificial gastrointestinal process of digestion will be used. Thus, the indication of plant-derived constituents, which actually reach the colon, will be possible. Finally, the project sets up using the human intestinal epithelial cell model, cell line named Caco-2, applied to the assessment of intestinal absorption of compounds *in vitro*. Recent studies have brought an interesting insights into signals sent out from the gut microbiota, as well as its interaction with the intestinal mucosa. It is considered that the bacteria-epithelium interaction is important for maintenance of gut homeostasis and has a great impact on the host immune system. The project purposes to explain the role of plant materials in gut homeostasis and mucosa protection, especially against factors secreted by pathogen bacteria, which might be absorbed into the body system and affect the immune response. Additionally, the study will allow to establish which constituents of preparations are potentially absorbed and if they have an anti-inflammatory activity.

The increasing consciousness of patients is apparent in the growth of probiotics distribution, not only linked with antibiotic therapy, in the pharmaceutical market. More and more often the probiotics are recommended to reduce incidents and severity of diarrhea in children, as well as so frequent nowadays autoimmune system diseases (atopic dermatitis). It is considered that the immature "brush border" of post-natal children is the crucial way of allergen invasion. The natural products might enhance the functions of physiological barrier between gut microbiota and intestine, as well as protect against pathogenic factors. This kind of effect is likely to be translated into health benefits from childhood to adulthood. The administration of dietary fiber and natural compounds, in particular polyphenols and polyphenols-rich preparations used in everyday life like teas or beverages, may provide an effective support for conventional therapy and prevention of the civilization disorders. The safety of these preparations should be also noted compared to drugs used in the long-term therapy of metabolic diseases. In particular, the patients discouraged to the conventional therapy due to the side effects of synthetic drugs preferentially choose the natural products. In the future the solution of the proposed argument may be clinically relevant. Bearing in mind that prevention provide more benefits than treatment, this kind of prophylaxis at the intestinal level seems to be profitable both for patients and health care system.