

The growing incidence of chronic inflammatory bowel disease, particularly colitis, in Polish community stimulates the search for new effective preparations which parallel would be an effective remedy in such undoubtedly onerous clinical conditions and would be easily accessible and readily used by people affected by this disorder .

Non-specific, chronic inflammatory bowel diseases represent cases of not yet explained etiology having a different course and various clinical symptoms and often being systemic. It is known that in their development two interrelated mechanisms are crucial: oxidative generating an excess of free radicals and pro-inflammatory activating cascade of immune responses. They are interdependent, since the cause of development of inflammatory conditions include imbalance in redox cells, which in turn can lead to the development of inflammation, for instance by over-activity of enzymes from cyclooxygenase group or increased synthesis and release of cytokines. Inflammation, or inflammatory reaction is nonspecific process, where leukocytes move outside the area of the blood vessel to a place that has been damaged. The target of inflammation is a quick and selective assembly of cells capable of removing a damaging agent of given tissue. Another very important result of inflammation is an increase in vascular permeability due to the affected tissue which can penetrate the plasma proteins, serving protective functions, for example antibodies or cytokines.

In the treatment of chronic inflammation, the most important is the elimination of causative agent of inflammation and pharmacological treatments that should be introduced only after dietary modification or change of life style does not give the expected results. In the initial stage of advancement of the disease use nutritional therapy can be applied, primarily preparations that can stimulate the immune system mobilizing its various components to intensifying of defensive functions - anti-inflammatory and/or antioxidant. Another important factor may also be other potential feature of such formulations - a beneficial effect on metabolic and clinical results of dysfunction and/or loss of the mucosal barrier of the gastrointestinal tract. In this aspect, a special role is attributed to the soluble fractions of dietary fiber - beta-glucans being one of the polysaccharides of higher plants and fungi.

Of the two isomeric forms of these compounds present in the cell walls of yeast, fungi, and grains, mainly barley and oats, the most important in the application of a disorder of the gastrointestinal tract should be 1,3/1,4-D- beta-glucan isoform- fraction soluble in water and occurring only in grains of these cereals. The water-soluble isoform of beta-glucan by forming viscous gels resistant to the action of enzymes and hydrochloric acid, coats and penetrates the mucous membranes of individual sections of the gastrointestinal tract, whereby creates a kind, smooth "dressing", to accelerate healing of damage and loss of security from the ravages of digestive enzymes. If beta-glucans are administered per os it comes into direct contact of these compounds with the intestinal immune system, particularly cells of the GALT located in the Peyer's patches in the intestinal wall. Connecting to specific receptors on the surface of GALT cells, these compounds will trigger an immune response, including by stimulating the synthesis of cytokines. Beta-glucans are also absorbed by the intestinal macrophages, fragmented and transferred to the bone marrow and cells of the reticular endothelial system and also into the bloodstream.

Planning this study it was decided to use the properties of such formulation which should be highly purified, isolated from oat aleurone layer of 1,3/1,4-beta-D-glucan beta. It should be emphasized that oats is still underestimated grain, with many pro-health properties, in addition, which is easy to cultivate and does not require special environmental conditions - climatic and soil conditions.

Another advantage of the planned research is the fact that it will be used as an integral component of the diet and high purified beta-glucans free from residual proteins and peptides, which, in case of such component in the food can cause allergies and intolerances. Since the physiological effects of beta-glucan depends on their molecular weight, in this studies will be used isolated oat beta-glucan of two different a molecular weight fractions.

The aim of the planned research will be to identify the cellular and molecular mechanisms that occurs in the colon affected by inflammation during orally administered oat beta-glucan with different molecular weight. Inflammation of the colon will be induced experimentally in laboratory rats (model of non-specific inflammatory conditions of the colon in human (Inflammatory Bowel Diseases, IBD) and the beta-glucan of both fractions are an integral component of the feed to be administered to rats.

The biological material derived from experimental animals (intestine, blood) the markers of inflammation and oxidative stress, parameters of antioxidant defences and the expression of genes involved in inflammation microarrays confirmed by RT-PCR will be marked. The histopathological examination of the large bowel wall will also be performed. The novel analysis techniques will be applied to the analysis of results including flow cytometry, transcriptomic analysis, fluorescence imaging and immunohistochemistry, RT-PCR and quantitative analysis of lactic acid bacteria.

Transcriptomic analysis in colorectal cancer tissues will help to determine the relationship between the broad spectrum activity of the test compounds on the body and signal transduction.

The planned study will shed new light on the molecular mechanisms ongoing in the wall of the colon inflammation, as well as molecular and cellular mechanisms to counteract these pathologies by cereal polysaccharides, which are highly purity, varied in molecular weight oats beta-glucans.

Extremely important is the social dimension of the results, because, with the increasing number of cases of IBD, which has occurred in recent years and as this is a trend growing, understanding of mechanisms and the possibility of applying a simple nutritional intervention seems to be very valuable. It is also important source used in the experiment of beta-glucans - oats, the crop which cultivation should be increased due to the numerous health-related advantages.