Glucan—many faces of one molecule

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Fungi and yeasts represent an important natural source of various biologically active compounds, including polysaccharides. These molecules are often used as biological response modifiers. Among these compounds, the most studied and at the same time the most promising, are β-D-glucans. These molecules represent a group of chemically heterogeneous polysaccharides existing with a backbone made of β-(1→3) linked glucose sequence and side chains linked by β-(1→6) or β-(1→4) bonds.

The considerable heterogeneity of all glucans, based on their natural character, continues to be the source of some contradicting conclusions thus diminishing the interest of pharmaceutical companies.

Most of the original studies of biological activities of glucan focused on mice. Only later, extensive research data demonstrated that glucan has identical immunostimulating effects on wide variety of species, ranging from shrimp to humans. Activation of the immune system by β-glucans increases resistance of organisms against viral and microbial infections. The immunomodulating effects of these polysaccharides are important as mild and non-aggressive prevention of tumor metastases and in supporting treatment during the course of chemotherapy. In addition, glucans can serve as dietary fiber components, showing nutritional benefits such as restriction of indigestion problems, positive influence of cholesterol, fat and glucose metabolism.

In this special issue, we focused on structural analysis of glucans as the tool for better understanding of the relationship between the physicochemical characteristics and biological activities. Hand-by-hand with the possible heterogeneity of natural molecule goes the search for optimalization of glucan-based oligosaccharides. The next part of this issue is devoted to possible use of glucan in human medicine. Article on glucan effects on bone marrow describes not only animal data, but also hypothesize about the use of glucan in support of chemotherapy and irradiation. These experiments are further developed in an article on glucan-based protection of DNA against radiation damage.

The following articles are focused on the effects of glucan on immune reaction. One article describes the immune-enhancing effects of mushroom-derived glucans, another one deals with possible mechanisms of glucans on inflammatory bowel disease. An additional article moves the studies even further and describes clinical trials of effects of glucan supplementation in children with chronic respiratory problems.

The last part of our issue is devoted to effects of glucan in farmed animals, since glucans are being routinely used in these animals, ranging from aquaculture to chickens and pigs. First, glucan effects on immune status of pigs are described with hypothesizing about the potential importance for commercial farming. The next article describes the advantages of the use of barley glucan in the diet of poultry.

We believe that data summarized in our special issue on glucan will serve as a summarizing point showing that more and more data has brought new important insights into the multifactorial roles glucans play in various biological reaction. In both animals and humans, the significant potential in the activation of various reactions (including immune reactions) clearly cannot be overlooked.

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