

## Immunomodulating Activity of *Bjerkandera* sp.

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Medicinal mushrooms are widely used now as traditional medicinal ingredients for the treatment of various diseases and related health problems. Our studies were devoted to the biological activity of submerged mycelium of wood-rooting mushroom *Bjerkandera* sp. (Hapalopilaceae, Polyporales). Fruit bodies of the mushroom were collected in the forest of the Leningrad region of Russia and introduced into culture. Mycelium was cultivated on the semi-synthetic media containing glucose as a carbon source and peptone as a source of nitrogen.

Immunomodulating activity of aqueous extracts from fruit bodies and submerged mycelium was preliminarily studied in a test for generation of reactive forms of oxygen by the cells of human peripheral blood, using the method of luminal-dependent chemiluminescence. The test was selected on the basis of the supposition about stimulating effect of extracts on phagocytes, because it is known that compounds of a polysaccharide nature boost phagocytosis. Obtained results demonstrated pronounced activity of the extracts from fruit bodies. Mycelia extracts also possess significant activity, but the level of chemiluminescence detected for mycelium was lower than for fruit bodies.

The mitogenic activity of mycelium extracts was studied in the reaction of blast transformation of spleen and thymus cells of CBA strain mice. Fruit body extracts demonstrated high proliferation

activity on spleen cells, whereas mycelium extracts were active only in relatively high concentrations. Thymus cells were not influenced by fruit body extracts or by mycelium. From the obtained results we can conclude that the studied preparations from fruit bodies and submerged mycelium of *Bjerkandera* sp. generally stimulate B-lymphocytes and macrophages, causing a significantly lower influence on the functional activity of T-lymphocytes.

The ability of extracts to participate in the synthesis by human blood cells of immunoregulating proteins—cytokines, particularly interleukine-1 $\beta$  and interleukine-8, a key mediator of inflammatory and immune responses of an organism—was studied. The results display a stimulating effect on both proinflammatory cytokines production by peripheral blood cells. On the contrary, there was no influence of extracts detected for the production of interleukine-2.

Interesting results, which were not detected for the extracts of other Basidiomycetes, were obtained during the studies of the influence of extracts of submerged mycelium of *Bjerkandera* sp. on the proliferation of spleen and thymus cells, preliminarily stimulated by concanavaline A. It appears that the addition of high concentrations of extracts was suppressing the proliferation of overactivated T and B cells. The resembling effect was detected during the studies of the influence of preparations on

the production of interleukine-2 by concanavaline A stimulated spleen cells. Low concentrations of extract (less than 6  $\mu\text{g}/\text{mL}$ ) did not influence the activity of stimulated cells, whereas higher concentrations of extracts sharply decreased the levels of interleukine-2.

The detected ability of extracts of *Bjerkandera* sp. to suppress the activity of overstimulated immunocompetent cells can be useful in the development of preparations for treatment of various disorders of the immune system, such as allergies and autoimmune diseases.