Antitumor Activity and Hematopoietic Response of a ß-Glucan Extracted from the Mushroom *Sparassis crispa* (Wulf.) Fr.

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Spazassis crispa (Wulf.) Fr. is an edible mushroom only seldom found in the field. It is worthwhile to establish a stable cultivation system, as for other mushrooms, such as *Lentinus edodes* (Berk.) Sing., *Grifola frondosa* (Dicks.: Fr.) S. F. Gray, *Ganoderma lucidum* (Curt.: Fr.) P. Karst., *Agaricus blazei* Murr., and so on. After long and extensive study by our research group, the cultivation method was completed, and is now capable of stable supply. The time of harvesting of the first batch of *S. crispa* and the chemical composition of the mushroom was evaluated by Japan Food Research Laboratories. Interestingly, the β-glucan content was 43.6 g/100 g of mushroom. This is an unbelievably high content, and thus prompted precise examination of the mushroom.

According to tradition, some of the mushrooms show potent antitumor activity. Active components in mushrooms have been extensively studied during the 20th century, and it was found that some of the polysaccharides composed of β-D-glucose and β-glucan show strong antitumor activity. Among β-glucans, 6-branched 1,3-β-glucan is the most precisely characterized. Hot water, cold NaOH, and hot NaOH extracts were prepared from the mushroom. By structural characterization of *S. crispa* extracts using chemical, physical, and biochemical methodologies, it contains a significantly high content of 6-branched 1,3-β-glucan even in the hot water extract, and the branching ratio was approximately one in every third main chain unit. It shows strong metachromacy to aniline blue, like other gel-forming 1,3-β-glucans. All of the extracts show strong antitumor activity against the solid form of Sarcoma 180 in ICR mice with strong VDH (vascular dilation and hemorrhage) reaction by administration of microgram quantities. Using ion-exchange chromatography, a purified β-glucan preparation, SCG, was prepared.

The extracts and SCG show enhancement of the hematopoietic response in cyclophosphamide (CY) induced leukopenic mice by intraperitoneal as well as peroral routes. Analysis of the leukocyte population by flow cytometry showed that monocyte, granulocyte, and γδT cells in blood and in the peritoneal cavity recovered faster than in the control group. In Peyer's patches, recovery of the T/B ratio was faster than in the control group. The ratio of natural killer cells in liver, spleen, and the peritoneal cavity was also increased. In contrast, $CD4^+CD8^+$ cells in thymus were significantly decreased by administration of SCG. In *in vitro* culture of CY-treated peritoneal exudated cells, interleukin-6 production was enhanced by SCG treatment. These facts strongly suggested that the enhanced hematopoietic response by the extracts/SCG would be due to the enhanced cytokine production.

The gastrointestinal tract has recently been confirmed to be one of the major immune organs in the body. There are many leukocytes in the tract to modulate the immune system, especially against invading microbes and food-related allergens. This system is specifically designated as "mucosal immune system." *S. crispa* might activate the systemic immune system by modulating the mucosal immune system.

REFERENCES

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