

Immunostimulating and Antitumor Effects by *Inonotus obliquus* (Ach.:Pers.) Pilát

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Although it has been reported that Chaga *Inonotus obliquus* (Hymenochaetaceae) shows immuno-enhancement activity and antioxidant activity, protective effects against radiation have not been investigated. In addition, although a few studies on antitumor effects *in vitro* have been reported, it is unknown whether these effects also occur *in vivo*. Many studies on the protective effects of Propolis against radiation and its antitumor activity have been undertaken using water and ethanol extracts, but studies on the whole lysate, in which the original Propolis is completely dissolved, have not been done. It is unknown what mechanisms are involved in the protective effect against radiation and the antitumor activity in these substances.

Therefore, in this study, we investigated the protective effects against radiation and *in vivo* antitumor effects of *Inonotus obliquus*. In addition, we investigated the quite novel protective effect against radiation and antitumor activity of the whole Propolis lysate. Blood cells are one of the indices for evaluating protective effects against radiation. Hemopoietic tissues and peripheral lymphocytes are highly sensitive to radiation, and a decrease of immunity caused by a decrease in white blood cells and myelocytes is remarkable after exposure to radiation. Therefore, in this study,

we focused on the antioxidant activity and immuno-enhancement activity of *Inonotus obliquus* and Propolis and examined the *in vivo* effect of radiation on the number of peripheral blood cells. Furthermore, measurement of T lymphocyte subsets, SOD-like activity, antioxidant activity, radical scavenging activity based on chemiluminescent methods, and absolute amounts of free radicals based on ESR were carried out, and radical scavenging activity, which is a mechanism of protection from radiation, was examined. In addition, we examined antioxidant activity and immuno-enhancement activity, both of which are closely related to tumor suppression, and further investigated effects on suppressive effects on tumor growth and antitumor effects of tumor necrosis factor (TNF).

The current major therapies for tumors are surgery, radiation, and chemotherapy. Immunotherapy is hoped to become a fourth therapeutic modality in the future. All of the three main therapies impose a burden on the body and weaken immunofunction. However, we hope that a combination of immunotherapy, using natural materials such as *Inonotus obliquus* and Propolis with immuno-enhancement action, may increase the percentage of patients who recover.