

## Production of Immunostimulating Polysaccharides from the Cultivated Mycelia of *Inonotus obliquus* (Pers.:Fr.) Pil. and Its Action Mode

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### Abstract

Batch fermentations of *Inonotus obliquus* (Pers.:Fr.)Pil. were conducted in a 300 L pilot fermentor. Crude endopolysaccharides and exopolysaccharides were isolated from the culture broth, and their immunomodulating activities on culture time were investigated. The specific activity of active endopolysaccharides was higher than that of active exopolysaccharides. But production of the active endopolysaccharides fraction seems to depend on specific culture condition. In the next, cell type-specific immune responses of active endopolysaccharides and its immunostimulating mechanisms were investigated. active endopolysaccharides enhanced the proliferation and polyclonal IgM antibody production of B cells. It also activated the expression of IL-1 $\beta$ , IL-6, TNF- $\alpha$  and iNOS in macrophages, and the NO production of iNOS. However, active endopolysaccharides did not affect the proliferation of T cells, the IL-2 expression of Th1 cells and the IL-4 expression of Th2 cells at all. We investigated the immunotherapeutic activities of active endopolysaccharides against tumor cell growth. When the fraction of active endopolysaccharides was intraperitoneally injected at dose levels of 3 and 10 mg/kg, the survival rate of the B16F10-implanted mice was increased up to 25%. Active endopolysaccharides did not induce direct toxicities in cancer cells, which is known as a representative characteristic of immunotherapeutic agent. Our results show that active endopolysaccharides is a specific activator for B cells and macrophages but not for T cells. Active endopolysaccharides of *Inonotus obliquus*, which showed an unique immunomodulating activity without any toxicity, can be used as a new candidate of immune response modifier.

## References

1. Takshi M, Cun Z, Kuniaki A, Hidehumi O, Tadash K, Shigeo U, Sophie L, Laurent M. (1999), Antitumor and hypoglycemic activities of polysaccharides from the sclerotia and mycelia of *Inonotus obliquus* (Pers.:Fr.) Pil. (Aphyllophoromycetidae), *Int. J. Medical Mushroom* **1**, 301-16.
2. Han, S. B., Kim, Y. H., Lee, C. W., Park, S. M., Lee, H. Y. (1998), Characteristic immunostimulation by angelan isolated from *Angelica gigas* Nakai, *Immunopharmacology* **40**(1), 39-48.