

## Screening of Several Basidiomycetes Extracts for Their Immunomodulating Activity

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During the course of serious Gram-negative infection, endotoxin (LPS)-induced stimulation of phagocytes results in the cascading production and release of inflammatory mediators. LPS induces phagocytes response by binding to a cell-surface-protein, CD14.

We screened several basidiomycetes extracts for their ability to inhibit the binding of fluorescein isothiocyanate (FITC)-labeled LPS to CD14<sup>+</sup> cells and to exert an effect on the liberation of proinflammatory [interleukin (IL)-1 $\beta$ , IL-6, tumor necrosis factor- $\alpha$  (TNF- $\alpha$ )] and regulatory [IL-2, IL-4, IL-10, interferon (IFN- $\gamma$ )] cytokines and on the release of reactive oxygen species (ROS). Cytotoxic effects and LPS contents of the extracts were measured as prescreening studies.

The dichlormethan, ethanolic, and aqueous extracts of fruiting bodies of the following species were investigated: *Daedalea quercina* (L.) Pers., *Heterobasidion annosum* (Fr.) Bref., *Lactarius velutinus* Bres., *Laetiporus sulphureus* (Bull.) Fr., *Phaeolus schweinitzii* (Fr.) Pat., *Piptoporus betulinus* (Bull.: Fr.) P. Karst., *Pleurotus*

*ostreatus* (Jacq.: Fr.) Kumm., *Polyporus badius* (Pers.) Schw., *Sparassis crispa* (Wulf.) Fr., *Thelephora terrestris* Ehrh., *Trametes versicolor* (L.: Fr.) Lloyd, and *Tricholomopsis rutilans* (Schaeff.) Sing.

Fifteen, mostly ethanol, extracts inhibited the binding of FITC-LPS to CD14<sup>+</sup>-Chinese Hamster Ovary (CHO) cells. Furthermore, 8 extracts decreased also the binding of FITC-*E. coli* to these cells. Again 15, but partly different, extracts did lower the LPS-stimulated release of IL-1  $\beta$ , IL-6, and TNF- $\alpha$ . The release of IL-4 was stimulated by nine extracts. We found no influence on the release of IL-2, IL-10, and IFN- $\gamma$ . A weak inhibition of the ROS release was shown by three extracts.

Only two of the extracts showed cytotoxic or membrane-toxic effects. Some aqueous extracts had LPS contents, which were intolerable in spite of our test systems.

Further study has to be done on the isolation of the biologically active substances.

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