

Bioactive Substances in YAMABUSHITAKE, the *Hericium erinaceum* Fungus, and its Medicinal Utilization

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Summary

1. Culture and cultivation

Recently in Japan, cultivation of YAMABUSITAKE on fungus beds, featuring use of bags and bottles, has become established to supplement the original method with wood material so that this species now ranks among the cultivated mushrooms most freely available on the market.

2. HeLa-cell growth-inhibitory substances

On the basis of the HeLa-cell screening method, three acid substances, Y-A-2, Hericenone-A, and -B could be isolated from fruiting bodies of Yamabushitake.

In addition, we observed Y-A-2 to demonstrate pollen-tube growth-inhibiting activity as well as inhibition of HeLa-cell, while the hericerine compounds blocked germination of pollen-tubes, at concentrations of 100-125 mg/L and above.

3. Substances inducing synthesis of the nerve growth factor (NGF)

Six substances, Hericenone-C, -D, -E, F, G and H were found to induce the synthesis of NGF, this being associated with Alzheimer's dementia and forming the basis of a newly-developed bioassay.

4. Antitumor polysaccharides

Fruiting bodies of Yamabushitake were extracted in series with hot water(100°C), 1 % ammonium oxalate(100 °C), and 5 % sodium hydroxide(30 °C) to generate the polysaccharides, FI, FII, FIII-1 and FIII-2. Each of these were then further fractionated and purified by ion-exchange chromatography, gel-filtration chromatography and affinity chromatography, to give a final total of fifteen polysaccharides. In an assay for antitumor activity, five of the polysaccharide fractions (FI0-a-β, FI0-a-β, FI0-b, FII0-1, and FIII-2b) proved strongly positive, also existing a prominent longevity effect.

5. Utilization

In China, the drug "Wei Le Xin Chong Ji" is available as an excellent remedy for chronic disease. The polysaccharides (HEPS) in the fruiting body of Yamabushitake mushroom may have beneficial effects on stomach, oesophageal and skin cancer among others, due to their influence on immune function.

In addition, it has been found that Yamabushitake (its fruiting body, mycelium, and products in the medium), widely used in recent years for research and development in Japan, contains some lower-molecular weight pharmaceutical constituents, like the novel phenols (Hercenone-A and-B) and novel fatty acids (Y-A-2) mentioned above with chemotherapeutic agents for cancer.

Other polysaccharides fractionated from Yamabushitake, like xylan, glucoxytan, heteroxyloglucan, and their protein complexes have characteristics as biological response modifiers (BRM), and thus priority should be placed on their possibly benefit for immunotherapy.

Moreover, it may be anticipated that the phenol-analogous compounds (Hercenone-C, -D, -E, -F, -G, and -H) inducing the synthesis of nerve growth factor (NGF) might have a healing effect in Alzheimer's dementia cases.

Since it has shown that acid (Y-A-2) and neutral (Hercerin) components isolated from the pileus of Yamabushitake have a growth-inhibiting activity and block of pollen germination tube at low concentrations, it should be also probable that they may find application as agricultural chemicals.