

Glycosphingolipids in Edible Fungi and Their Biological Activities

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Summary

Edible fungi, mushrooms, have already been the subject of an ancient Japanese anthology "Man'yoshu" (A.D. 8C), and they are a popular food in Japan. About fifteen cultured mushroom species are available in Japanese food markets, out of about four thousand species that have been described. Recently, constituents or ingredients of edible mushrooms have drawn attention because possibilities have been seen for their medical usage. Especially in *Agaricus*, β -glucans or ergosterols may have immunoenhancing and antitumor activities. Glycosphingolipids of edible fungi have been reported as glycosylceramides (cerebrosides) consisting of 9-methyl-4,8-octadecaphingadienine or trihydroxylsphinganine (phytosphingosine) and 2-hydroxy fatty acid. These unique ceramide constituents are common structures in plants, but differ from those in animals. Basidiolipids (mycoglycolipids) of higher mushrooms have been characterized as glycosylinositol-phosphoceramides, and these have a common core structure of Mana 1-2Ins 1-[PO₄]Cer and extension of Man, Gal and/or Fuc sugar moieties.

In our laboratory, mycoglycolipids were isolated from the Shimeji mushroom, *Hypsizygus marmoreus*, and free ceramides and cerebrosides were isolated from the Eringi mushroom, *Pleurotus eryngii* by successive column chromatography on ion exchange Sephadex (DEAE- or QAE-Sephadex), magnesium silicate (Florisil) and silicic acid (Iatrobeds). Their structures were characterized by gas-liquid chromatography (GC), gas chromatography-mass spectrometry (GC-MS) and matrix assisted laser desorption ionization time-of-flight mass spectrometry (MALDI-TOF MS). Ceramide from Eringi mushroom were composed of phytoshingosine and C16 to C24 fatty acid or a long chain 2-hydroxy fatty acid; these constituents are assumed to be the predominant precursors of mycoglycolipid in Eringi mushroom. Cerebrosides from Eringi mushroom were characterized as typical fungal cerebrosides. Mycoglycolipids from Shimeji mushroom have a common core structure with extensions of galactose and branched fucose. Gal α 1-2 repeating sequence is a novel structure on the non-reducing sugar end in mycoglycolipid. Notably, one mycoglycolipid from Shimeji mushroom has B blood type activity, which was confirmed by an antibody immunostaining technique.