



Purification, Structural Characteristics of Polysaccharides from *Pholiota squarrosoides* (Peck) Sacc and Their Hepatoprotective Effects on Alcohol-induced Liver Disease in Mice

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Abstract

Alcoholic liver disease (ALD) is associated with oxidative stress, impaired alcohol metabolism and progressive liver injury. Mushroom polysaccharides are potential hepatoprotective agents, but the polysaccharides from *Pholiota squarrosoides* (Peck) Sacc remain poorly characterised. This study optimised the ultrasound-assisted extraction of polysaccharides from *P. squarrosoides* fruiting bodies, purified the main fraction, characterised its basic structural features and evaluated its protective effect in mice with alcohol-induced liver injury. The optimal extraction conditions were 200 W ultrasonic power, a solid-to-liquid ratio of 1:60 g/mL, 60 °C and 40 min, giving a crude polysaccharide yield of 7.72%. The crude extract was fractionated using DEAE Sephacryl FF anion-exchange chromatography, and the major neutral fraction was further purified by Sephacryl S-400 HR gel filtration to obtain *Pholiota squarrosoides* (Peck) Sacc polysaccharide (PSP). The polysaccharide recovery was 78.03%, and the purified fraction showed a total carbohydrate content of 94.49% by the phenol–sulfuric acid method. Ultraviolet analysis indicated no detectable nucleic acid or protein absorption. Structural analysis showed that PSP was mainly composed of galactose, glucose, mannose and glucuronic acid, with a molar ratio of 30.13:39.91:29.18:0.78, and contained pyranose-type residues with α - and β -glycosidic linkages. In mice, medium and high doses of PSP reduced the liver index and serum alanine aminotransferase and aspartate aminotransferase activities. PSP also increased hepatic superoxide dismutase and glutathione peroxidase activities, decreased malondialdehyde content and improved liver histology compared with the alcohol model group. These findings suggest that PSP may attenuate alcohol-induced liver injury, mainly through antioxidant protection and improved alcohol metabolism.

Keywords *Pholiota squarrosoides* · Mushroom polysaccharide · Ultrasound-assisted extraction · Molecular characterization · Alcohol-induced liver injury · Oxidative stress