

# Hepatoprotective Effects of Waxy Brown Rice Cultured with *Agrocybe cylindracea* (DC.) Gillet

Kyung-A Lee,<sup>1</sup> Jong-Suk Lee,<sup>1</sup> Jae-Don Yoon,<sup>1</sup> Min-Wook Chung,<sup>1</sup>  
Hyo-Cheol Ha,<sup>2</sup> & Jae-Sung Lee<sup>1\*</sup>

<sup>1</sup>School of Bioindustry, Yeungnam University, Gyongsan, 712-749, S. Korea; <sup>2</sup>Institute of Food and Culture, Pulmuone Co. Ltd., Seoul, 120-600, S. Korea

\*Author to whom all the correspondence should be addressed

The hepatoprotective effects of functional rice, produced by cultured *Agrocybe cylindracea* (Agaricomycetidae) on waxy brown rice, were investigated. After oral administration of the methanol extracts of functional rices for 14 days, rats were treated with carbon tetrachloride to induce hepatotoxicity. The enzyme activities were determined, and biochemical analyses of serum were carried out in order to examine the hepatoprotective effects exerted by the samples. A histological study on liver tissue using electron microscope was also conducted.

The body weights and internal organs weights of the rats were measured. The body weight of the group treated with only CCl<sub>4</sub> increased less than those of the groups fed with sample extracts prior to CCl<sub>4</sub> treatments. The weight of internal organs among the treatment groups did not show substantial difference except that the hepatic hypertrophy was observed in the group treated only with CCl<sub>4</sub>. On the other hand, the COCIII group and the CIC groups administered with the methanol extracts from the waxy brown rice and cultured with *A. cylindracea*, respectively, showed an organ weight similar to that of the normal group.

The activity of serums AST and ALT of rats increased highly in the group treated with CCl<sub>4</sub> only. The COC and CIC groups showed a strong suppression on the AST and ALT augmentation almost to the level of normal rats without CCl<sub>4</sub> treatment. In particular, the CICI and CICI groups were able to maintain both the AST and ALT activity in a

manner similar to the normal group without CCl<sub>4</sub> treatment, and was statistically not significant.

The activity of serums ALP, LDH, and Y-GPT was significantly increased by carbon tetrachloride treatment, but methanol extracts of brown rice, cultured with *A. cylindracea*, significantly decreased the activity of those enzymes, which was supposed to be increased by the carbon tetrachloride treatment. CICI and CICI groups especially demonstrated a strong protective effect by suppressing the increase of these enzymes.

The control group treated only with CCl<sub>4</sub> showed a severe decrease in albumin level, total protein, and HDL-cholesterol content in comparison with the normal group. The COC group and the CIC group considerably alleviated the decrease of those components. The content of total cholesterol, triglyceride in liver was increased by administration of CCl<sub>4</sub>. However, the COC and CIC groups did not show the increases and kept them at almost the same level as the normal rats without CCl<sub>4</sub> treatment.

The content of lipid peroxide in the CCl<sub>4</sub>-treated group significantly increased in comparison with the normal group, but the COCIII and CIC groups had a tendency to maintain lipid peroxide content at a much lower level.

The liver tissue of rats was observed by transmission electron microscope. The injury range of cells was shown to be widest in the control group treated with CCl<sub>4</sub> only. In groups administered with the extracts from waxy brown rice cultured with *Coprinus*

*comatus* (Müll.:Fr.) S.F.Gray and *C. cinereus* (Schaeff.: Fr.) S.F.Gray prior to CCl<sub>4</sub> treatment, diminished lipid degeneration and infiltration of local inflamma-

tion caused by CCl<sub>4</sub> were alleviated considerably. In particular, the CICI group showed almost the same integrity as normal rats without CCl<sub>4</sub> treatment.