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Prevention of Oxidative Damage to Cellular DNA by Mushroom-Derived Components

Y-L. Shi,[1] A. E. James,[3] I. F. F. Benzie,[4] and J. A. Buswell[1,2]

[1]Department of Biology and [2]Centre for International Services to Mushroom Biotechnology, The Chinese University of Hong Kong; [3]Laboratory Animals Services Centre, The Chinese University of Hong Kong; [4]Department of Nursing and Health Sciences, The Hong Kong Polytechnic University, Hong Kong SAR, China

The ability of mushroom-derived preparations (MDPs) to prevent oxidative damage to cellular DNA has been evaluated using the single-cell gel electrophoresis ("Comet") assay. MDPs were obtained from the fruiting bodies of *Agaricus bisporus* (J. Lge) Imbach, *Flammulina velutipes* (Curt.: Fr.) P. Karst., *Ganoderma lucidum* (Curt.: Fr.) P. Karst., *Auricularia auricula-judae* (Bull.) Wettst., *Hypsizygus marmoreus* (Peck) Bigel., *Lentinus edodes* (Berk.) Sing, *Pleurotus sajor-caju* (Fr.) Sing., and *Volvariella volvacea* (Bull.: Fr.) Sing. using two different extraction procedures. The capacity of the various MDPs to protect against DNA strand breakage was assessed using an *in vitro* assay of cultured human B-lymphocyte cells (Raji). Cells were pretreated with each individual MDP for 2 hr, washed, and then challenged with 10 μM H_2O_2.

The MDPs tested showed wide variation in their ability to protect against oxidative DNA damage with the highest protection afforded by an MDP obtained by cold water extraction of *A. bisporus* fruiting bodies (Ab-cold). In this case, MDP concentrations as low as 0.5 mg/ml of tissue culture medium provided virtually complete protection against H_2O_2-induced damage to cellular DNA. This genoprotective effect is not due to cellular uptake or binding of a catalase-like activity within the MDP. Furthermore, no cytotoxic effects *per se* were seen with Ab-cold MDP at concentrations up to 1 mg/ml, even after 24 hr exposure. Intraperitoneal administration of Ab-cold MDP also protected the DNA of rat lymphocytes against H_2O_2-induced damage in an *ex vivo* assay. High levels of protection against H_2O_2-induced damage were also afforded by hot water (100°C) extracts of *G. lucidum* (Curt.: Fr.) P. Karst. (Gl-hot). However, neither Ab-cold nor Gl-hot MDPs protected tissue cells against damage to DNA induced by bleomycin or ethyl methanesulfonate (EMS). No protective effects were observed with MDPs from the other mushroom species examined. Indeed, increased DNA damage was seen with hot and cold water extracts of *A. auricula-judae* and *H. marmoreus*, and hot water extracts of *A. bisporus*. Research is now underway to purify and characterize the active components from *A. bisporus* and *G. lucidum* and to establish the nature of the protective mechanism(s).

These findings indicate that some edible mushrooms represent a valuable source of biologically active compounds with potential for protecting cellular DNA from oxidative damage. Such materials could be incorporated into low-cost mushroom-based food supplements for lowering the risk of diseases linked with oxidative stress, and provide therapeutic treatments for offsetting the adverse effects of chemo- and radiation therapies used in the treatment of certain cancers.

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