Investigation of *Phellinus linteus* mushroom extract on cell cycle of colon cancer cell LS 174T under oxidative stress challenge

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Phellinus linteus (PL) has traditionally been used as a medicinal mushroom in some countries such as China, Japan and Korea. It was found the fruiting body of *PL* is rich in bioactive phytochemicals. The antioxidant property of *PL* has been associated in preventing cancer progression. It is also suggested that the polysaccaharides component of *PL* is responsible for antitumor and immuno-modulatory effect *in vivo* and *in vitro*. However, the mechanism of the inhibition effect and invasive behavior of *PL* on cancer such as LS 174T colonic carcinoma is not well elucidated. *PL* is suggested to be able to inhibit cancer cell adhesion and invasion of the extracellular matrix. Therefore, it is believed that *PL* can exert antitumor effect by initiating apoptosis and cell cycle blockade in cancerous cells.

Colon cancer is an emerging health problem in Asia due to change in dietary habits. In this study, the effect of *PL* on cell cycle and its association with antioxidant activity of LS 174T cells were investigated. Two different doses (50 μg/ml and 300 μg/ml) of *PL* extract that has high antioxidant activity (unit of 3 TEAC) were added to LS 174T cells with or without 200 μM H_2O_2 challenge. Catalase activity, cell viability and cell cycle of the cells were determined at stationary phase of cell growth.

It was found that treatment of *PL* alone showed decreased ($p<0.01$) catalase activity when compared to control. Oxidative stress challenge (200 μM H_2O_2) increased catalase activity ($p<0.01$) compared to control. However, addition of *PL* reduced the catalase activity ($p<0.01$) but not to control level. This effect was not dose-dependent in which both *PL* doses showed similar catalase activity.

Cells treated with *PL* alone or 50 μg/ml *PL* + 200 μM H_2O_2 or 300 μg/ml *PL* + 200 μM H_2O_2 showed comparable cell viability as control and higher ($p<0.01$) cell viability than 200 μM H_2O_2 treated cells. However, the difference was not significant between two *PL* doses.

Treatment of 50 μg/ml and 300 μg/ml *PL* showed increased ($p<0.05$) cell apoptosis when compared to control. However, the difference was not significant between the two *PL* doses. It was noted G2/M phase elevated ($p<0.05$) when the cells were treated with 300 μg/ml *PL* only.

Cells challenged with 200 μM H_2O_2 increased apoptosis compared to control. However addition 50 μg/ml or 300 μg/ml *PL* showed reduced ($p<0.05$) cell apoptosis but not to control level. Also, a decrease ($p<0.05$) in G2/M phase for cells treated with 300μg/ml *PL* + 200 μM H_2O_2 was recorded compared to 200 μM H_2O_2 treated cells.
Our findings indicate *PL* alone could induce cell apoptosis. It is plausible higher dose of *PL* can effectively reduce cell apoptosis and cell cycle arrest at G2/M phase by its antioxidant effect. Thus, *PL* interacts with LS 174T cells effectively under oxidative stress to maintain homeostasis: a possible mechanism of hormesis.