특집 : 고려흑삼의 성분과 생리활성

Effects of Black Ginseng against Ethanol-Induced Embryotoxicity in Mice

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INTRODUCTION

Ginseng has been widely used around the world for many years as a food or oriental herbal drug (1). In Asia, ginseng steamed at 95~100°C for 2~3 hr is called red ginseng. Black ginseng is treated with steaming process at 9 times (2). Ethanol promotes the levels of reactive oxygen species within embryo that degrade unsaturated long-chain membrane fatty acids and reduce embryo viability. Ethanol has been reported to induce fetal developmental abnormalities by disrupting cellular differentiation and growth (3). The purpose of this study is to explore the protective effects of black ginseng against embryotoxicity induced by ethanol in mouse embryos using whole embryo culture system.

MATERIALS AND METHODS

Black ginseng extract (Table 1) was obtained from Sam Kwang Bio Co. Ltd. (Keumsan, Korea). Pregnant ICR mice were killed by cervical dislocation at gestational day 8.5 and only embryos with crown-rump length of 1.5±0.3 mm were used for this experiment. The whole embryo culture system was based on a previously described model in the presence of ethanol (1 μg/mL) and/or black ginseng (1, 10 and 100 μg/mL) with ethanol (1 μL/mL) (4). At the end of 48-hr culture period, embryos were evaluated according to the morphologic scoring system (5). The significant differences were analyzed by one way ANOVA/Turkey-test.

Table 1. Main constituents of dark ginseng extracts

Analytical item	Result
Crude saponin	97.73 mg/g
Ginsenoside Rb1	0.652 mg/g
Ginsenoside Rb2	0.854 mg/g
Ginsenoside Rc	0.715 mg/g
Ginsenoside Rd	0.261 mg/g
Ginsenoside Re	0.111 mg/g
Ginsenoside Rg1	0.196 mg/g
Ginsenoside Rg3	3.946 mg/g
Ginsenoside Rh1	1.440 mg/g

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RESULTS AND DISCUSSION

Comparing to normal control group, total morphological score and many developmental parameters were significantly decreased in ethanol-treated group. However, in black ginseng treatment groups, total morphological scores and other developmental parameters were significantly increased compare to ethanol group (Figs. 1 & 2).

Red ginseng has been known that important constituents are changed and new ones are formed during the heat-treatment of ginseng. It has also more bioactivities than white ginseng (6,7). Accordingly, it is

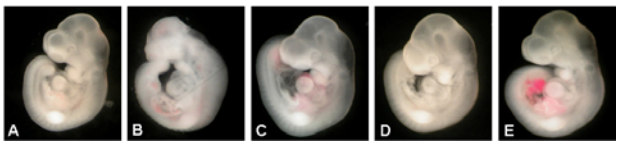

Fig. 1. The morphological features of cultured mouse embryos.
A: control, B: embryo exposed to ethanol (1 μL/mL) showing abnormal head shape and opened hind brain, C~E: embryos exposed to ethanol (1 μL/mL) and black ginseng extracts (1, 10, and 100 μg/mL), respectively.

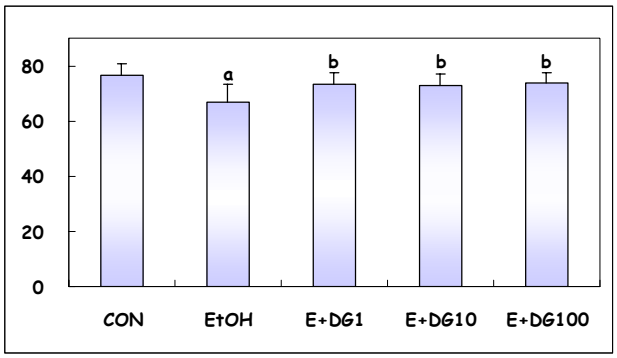

Fig. 2. Total morphological scores of cultured mouse embryos.
Significant difference between black ginseng (DS) treatment groups (1~100 μg/mL) versus normal control (a) or ethanol (b) group ($p<0.05$).

expected that black ginseng has various pharmacological effects such as red ginseng. In this study, black ginseng extract improved the morphological scores in the mouse embryos exposed to ethanol. Therefore, black ginseng has protective effects against ethanol-induced embryotoxicity.

CONCLUSION

Ginseng has been widely used around the world for many years as a food, oriental herbal drug. In order to increase the pharmacological activities, ginseng has been steamed at 95~100°C for 2~3 hr 9 times which is called black ginseng. Prenatal exposure to ethanol induces an abnormal embryonic growth and development. In this study, we examined the effect of black ginseng against ethanol-induced teratogenicity in mouse embryos using a post-implantation whole embryo culture system. Ethanol administration (1.0 mg/mL) resulted in the significantly decreased total morphological scores in comparison with the control group ($p<0.05$). However, black ginseng treatments indeed ameliorated the embryonic toxicities induced by ethanol at a significant level ($p<0.05$). Overall results indicate that black ginseng may have a protective effect against ethanol-induced embryotoxicity.

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