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Licorice Root (*Glycyrrhiza uralensis* Fisch) Induced Apoptosis and Cell Cycle Arrest in MCF-7 Breast Cancer Cell

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Licorice root is a botanical, a shrub native to southern Europe and Asia, the roots of which have primarily desirable qualities such as sweetening and herbal medicine. We recently demonstrated that the herbal combination PC-SPES, which contains Chinese licorice root (*Glycyrrhiza uralensis* Fisch), had potent estrogenic activity *in vitro*, *in vivo* and in patients with prostate cancer. In addition, it's well known that licorice root has antitumor activity in breast cancer.

In this study, the roots of Chinese licorice, *Glycyrrhiza uralensis* Fisch not only have estrogenic effect but also inhibit cell proliferation in MCF-7 cell line. The extracts of licorice root were fractionated in EtOH: H₂O (80: 20) (80% EtOH). These extracts exhibited estrogenicity as the 17- estradiol (E2) and induced apoptosis in breast cancer cell demonstrated by Hoechst 33258 staining. These results were associated with up-regulation of tumor suppressor gene p53 and pro-apoptotic protein Bax demonstrated by Western blotting. This test compound might be also up-regulation of p21^{Waf1} and 80% EtOH extract of licorice root induce G1 cell cycle arrest by flow cytometry.

This is the first study to indicate that root of *Glycyrrhiza uralensis* Fisch have estrogen-like activities and also anti-cancer effects against human breast cancer through the multi-mechanism. Therefore, these results suggested that EtOH extract of *Glycyrrhiza uralensis* Fisch might have beneficial effect on the treatment of estrogen-related disease such as osteoporosis etc. without breast cancer risk. This study was supported by technology Development Program for Agriculture and Forestry, Ministry of Agriculture and Forestry (200001-03-3-CG000, 203004-03-HD110), Republic of Korea.

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