Anti-tumor Effects of Soybeans and Fermented Soybean Paste

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Abstract

Oral cancer is the sixth most common cancer globally. The effects of several extracts from soybeans and Korean soybean paste (doen-jang) on the growth of human oral carcinoma cells in vitro were assessed. We prepared petroleum ether extract, ethyl acetate extract, chloroform extract, methanol extract, and water extract from soybeans and soybean paste. We used KB cell, which is an oral epidermoid carcinoma cell, and investigated proliferation of the tumor cells using MTT method. Each extract of soybean paste suppressed the KB cell proliferation. A dose-response relationship was observed between the level of ethyl acetate extract of soybean paste and its suppression of the cell proliferation. The effects of soybean extracts were lower than those of soybean paste extracts. The effects might be enhanced by the fermentation of soybeans. The results of this work indicate that extracts from soybeans and Korean soybean paste could have potential as anti-tumor substances.

Introduction

It has been known that the oral cancer is the sixth most common cancer globally. Despite the introduction of novel therapy into the treatment of oral cancer, improvements in long-term survival rates have been modest. People in the oriental world have eaten soybeans and soybean paste, a fermented soybean product, for hundreds of years. Many beneficial effects on human health of these foods are documented. Nutritional components of soybeans and soybean paste have been found. Also the beneficial effects of these foods such as a hypocholesterolemic effect, the improvement of serum lipid profiles, and antioxidant activity were reported by several investigators. One of the things long-lived Korean people have in common is that they eat soybean products almost every day. Even so, the effects of soybeans or soybean paste on oral health have

rarely been tested. In this study, the suppression effect of extracts from soybeans and Korean soybean paste on an oral epidermoid carcinoma cell in an in vitro assay system were investigated.

Materials and Methods

Reagents. All inorganic chemicals and organic solvents were reagent grade or better.

Soybeans and soybean paste. Soybeans produced in Korea and a homemade-style traditional Korean soybean paste was used for this study. The soybean paste was prepared from fermented meju (soybean cakes). All of the preparation methods followed the recommended methods of the Korea Food Research Institute. After ripening for 6 months, the paste was used for this study.

Preparation of extract from soybeans and soybean paste. Soybeans and soybean paste were extracted with the appropriate volume of petroleum ether, ethyl acetate, chloroform, methanol and water, and then the extracts were evaporated with a rotary vacuum evaporator (E120, Büchi, Switzerland). A stock solution of the extracts was prepared in dimethyl sulfoxide.

Cell Culture. KB cells ATCC CCL-17, a human oral epidermoid carcinoma cell line, were provided by American Type Culture Collection (ATCC, Rockville, MD). MTT{3-[4,5-Dimethyl-2-thiazolyl]-2,5-diphenyl-2H-tetrazolium bromide} quantitative analysis was used for this study.

Statistical analyses. Analysis of variance was used for statistical analyses. Significant differences among means were determined by using Duncan's multiple-range test.

Results and Discussion

The proliferation of KB cells was inhibited by the treatment with the five types of soybean paste extracts. The ethyl acetate extract of soybean paste showed the highest inhibitory effect. A higher ethyl acetate extract level resulted in a higher level of inhibition. When the ethyl acetate extract of soybean paste was added to the assay system in different concentrations, strong inhibitory effect began to appear from the concentration of 1.25 ㎎/㎖ ($p<0.05$). These results indicate a dose-response relationship between the concentration of ethyl acetate extract of

soybean paste and suppression of the tumor cells. All types of soybean extracts also showed inhibitory effects on the cell proliferation, however, generally less than those of soybean paste extracts. The findings of this work suggest that the fermentation of soybeans increases the suppression activity. Further research is needed to compare the anti-tumor effects of soybeans and soybean paste to elucidate how the fermentation of soybeans increases their anti-tumor activity.

Conclusion

Soybeans and soybean paste may be used in preventing oral diseases. However, we should identify the active components of the extracts from soybeans and soybean paste and ensure their safety before use.

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