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Studies on the Antioxidant Components of Korean Ginseng(II)

The Effect of Ferric Ion on the Antioxidant Activity

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人蔘의 抗酸化作用에 關한 硏究(Ⅱ)

人蔘의 抗酸化活性에 대한 三價鐵 ion의 영향

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Methanolic extracts of fresh ginseng, white ginseng and red ginseng were found to have a biological antioxidant activity against ethanol induced lipid peroxidation in the mouse liver. This antioxidant activities were repressed by the addition of ferric ion to the Korean ginseng in the process of its extraction.

Introduction

In the oriental medicinal book[1], the decoction of Korean ginseng in an iron vessel is contra-indicated. The description will suggest some interaction of ferric ion, which must be liberated from the iron vessel during the decoction, with the effective components of Korean ginseng leading to the loss of biological activity of the drug. However no paper dealing with the scientific background of the description is available at present.

In the previous paper[2], it was described that maltol(3-hydroxy-2-methyl-γ-pyrone) and some other phenolic substances in Korean ginseng were shown to be a biologically active antioxidant.

On the other hand, ferric ion is known to destroy the phenolic substances by catalytic oxidation and to bind strongly with maltol by chelation[2].

Present paper describes on the repression of antioxidant activity of Korean ginseng by the addition of ferric ion during the extraction process.

Experiments

1) Preparation of ginseng samples

The gross-cutted main roots of six year grown fresh ginseng(45g), white ginseng(15g), and red ginseng(15g) were extracted twice with 100ml portions of hot methanol under nitrogen stream for three hours. The combined extracts were concentrated to dryness and dissolved in 25ml saline.

This solution and the appropriately diluted solutions were used as the ginseng samples for the medication of mouse.

2) Preparation of ferric ion treated ginseng samples

Fresh ginseng, white ginseng and red ginseng of the above experimental size were extracted in the presence of 2ml of 2% ferric chloride solution.

The other procedure for the preparation of samples was almost same with the above experimental procedure.

3) Animals

Male mice weighing 24±2g were used without considering their strains and maintained on a normal diet purchased from market. One experimental group was consisted of 4~6 mice.

4) Medication

Mice received orally the ginseng samples as a saline solution(0.3ml/30g body weight which corresponds roughly 0.2mg, 2mg, 20mg ginseng /30g body weight) once daily for three days. Throughout all the experimental periods, the animals were freely fed with a normal diet and drinking water. Control mice received the equal amount of saline.

5) Induction of lipid peroxidation in the liver and its assay(TBAvalue)[2]

The lipid peroxidation was induced by the method of G.H. Kalish[3]. The animals which had received the ginseng samples for three days were fasted for eight hours after sixteen hours of the last medication and then received orally a single dose of 0.3ml 50% ethanol per 20g mouse.

The animals were freely fed with a normal diet and water 30 minutes after the ethanol intoxication. Control mice received saline instead of ethanol. Twenty four hours after the ethanol treatment the animals were decapitated, blood in the liver was removed as possible by bleeding and the livers were removed in order to assay the lipid peroxide content by thiobarbituric acid method (TBA method).

The lipid peroxide content in the liver was assayed by F. Masugi procedure[4] of thiobarbi turic acid method after some modification as follows; The livers in one group animals were pooled, washed with saline, weighed and homogenated for three minutes in an ice cooled motor driven homogenizer after addition of five volume of M/20 phosphate buffer (pH 7.4).

To 0.5ml homogenate in a glass stoppered tube 0.4ml of 10% sodium dodecyl sulfate was added and incubated at room temperature for 30 minutes. To the incubation mixture 2ml of 0.1N HCl and 1.0ml of 1% thiobarbituric acid solution were added and heated for 50 minutes in a 95°C water bath to develop the red colour of TBA-pigment. After cooling, the TBA-pigment was extracted with 5ml butanol. The butanol layer was obtained by centrifugation at 3000 r.p.m. for ten minutes and its optical density was measured at 535nm. The lipid peroxide content in the liver was expressed as TBA value(A 535/gm. wet weight of liver).

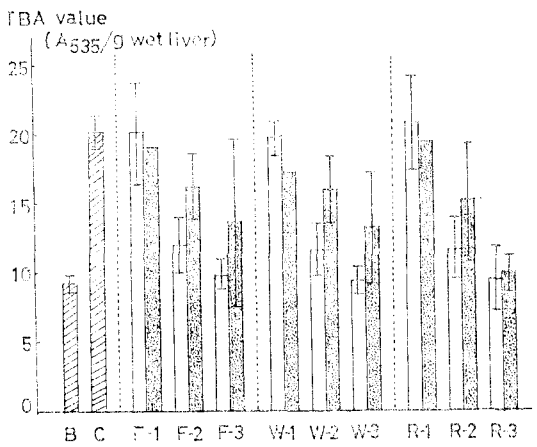
Results and Discussion

1) The antioxidant activities of ginseng samples and ferric ion-treated ginseng samples are summarized as the histogram shown.

As shown in the histogram, methanolic extracts of fresh ginseng, white ginseng and red ginseng are equally active in the inhibitory activity on the lipid peroxidation in the liver induced by ethanol intoxication.

The activity of these samples shows also dose dependency.

2) As shown by shaded column in the histogram, the antioxidant activities of ferric ion treated samples are significantly diminished



The effect of ferric ion treatment on the antioxidant activity of ginseng extracts;
Blank column: nontreated ginseng groups
Shaded column: ferric ion treated ginseng groups
B: blank, C: control (ethanol intoxication only)
To F-1, F-2, F-3, W-1, W-2, W-3, R-1, R-2, and R-3 group animals, the ginseng samples were administered for 3 days before the induction of lipid peroxide by ethanol intoxication was conducted. Each group was consisted of 4-6 mice and the results are the mean value of four repeated experiments.
The prefix F, W, and R denote fresh ginseng, white ginseng and red ginseng. The suffix -1, -2and -3 denotes the dosages of 0.2, 2.0, 20mg, ginseng/30g body wt. mouse.

compared to the corresponding non-treated ginseng samples. In this case, the increased dosage of ferric ion treated ginseng samples resulted in the de-repression of antioxidant activity suggesting the partial repression of antioxidant activity by ferric ion treatment on ginseng.

3) Considering the poor absorption of ferric ion from gastrointestinal tract, the repression of the antioxidant activity by ferrirc ion treatment may be due to the direct interaction of the ferric ion with the effective components of Korean ginseng.

Summary

Fresh ginseng, white ginseng and red ginseng are almost equally active in their antioxidant activities. Ferric ion treatment on the ginseng samples in the process of extraction resulted in the partial repression of antioxidant activity. This observation will serve as the underlining evidence for the description in the oriental medicinal book that decoction of ginseng in the iron vessel is contraindicated.

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