# COMPARATIVE STUDIES OF PANAX GINSENG AND PANAX QUINQUEFOLIUM ON TCDD-INDUCED WASTING IN RATS

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## Introduction

A prominent feature of 2,3,7,8-tetrachlorodibenzo-p-dioxin (TCDD) toxicity in rats is wasting[1]. TCDD-induced wasting is characterized by reduced feed intake and decreased body weight[2]. Since a dose-dependent weight loss was validated in rats treated with sublethal doses of TCDD[3], we evaluated protective effects of ginseng by measuring body weight of rats coadministered with ginseng and TCDD. Among ginseng species, *Panax ginseng* C.A.Meyer (Korean ginseng) and *Panax quinquefolium* (American ginseng) were chosen and administered to TCDD-intoxicated rats for twenty-one days. Results indicate that *Panax ginseng* and *Panax quinquefolium* display differential effects on TCDD-induced weight loss.

## Materials and Methods

*Preparation of saponin fraction from ginseng root*

Roots of *Panax ginseng* C.A.Meyer (Korean ginseng) and *Panax quinquefolium* (American ginseng) were extracted with 10 volumes of distilled water at 85°, concentrated under a reduced pressure and lyophilized to a dark brownish powder. Resulting powder was dissolved in water and subjected to adsorption chromatography using macroreticular resin (Diaion HP-20). The column was eluted with water, 25 % ethyl alcohol (EtOH) and 100 % EtOH consecutively. Saponin fraction was obtained from 100 % EtOH eluate.

*In vivo administration*

Male Sprague Dawley rats (180-200 g) were maintained under controlled conditions of 23±1°, 40-60 % of relative humidity and 12 hr-light/dark cycle. Rats were allowed free access to chow diet and drink tap water. Experimental groups consisted of normal control, TCDD only and TCDD plus ginseng saponins. Ginseng saponins (40 mg/kg) were given orally to rats from day zero to twenty. TCDD was dissolved in acetone/dimethylsulfoxide/corn oil (9:1:790, v/v) and intraperitoneally administered to rats at a single dose of 50 ug/kg on the day seven.

*HPLC analysis*

Saponin fraction from *Panax ginseng* or *Panax quinquefolium* was dissolved in methanol and injected to HPLC system equipped with Lichrosorb $NH_2$ column (Merck, Germany). Mobile phase was accomplished in a linear gradient of solvent A [acetonitrile/water/isopropyl alcohol (80/5/15)] and solvent B [acetonitrile/water/isopropyl alcohol (70/30/15)]. Mixing ratio of solvent B was 10 % at the start and increased to 100 % in 45 minutes. Flow rate of mobile phase was 0.8 ml/min.

## Results and Discussion

Saponin fractions of *Panax ginseng* C.A.Meyer (Korean ginseng) and *Panax quinquefolium* (American ginseng) were lyophilized, dissolved in water and given par oral to Spague Dawley rats for

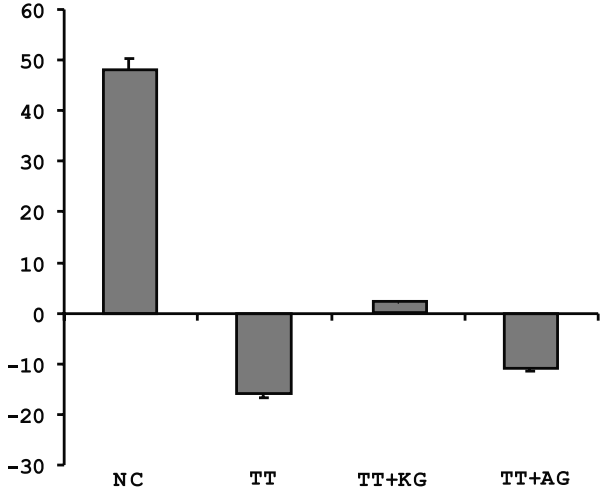
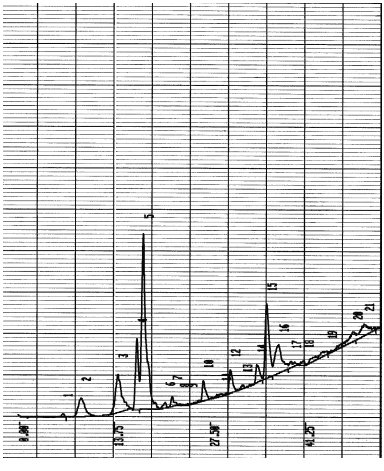



**Figure 1.** Effect of saponin fraction on change of body weights

Body weights were determined at the start day and two weeks after the TCDD administration to Sprague-Dawley rats. Represented digits designated change of body weights during the two weeks. NC: normal control; TT: 50 ug/kg TCDD-treated; TT+KG: 50 ug/kg TCDD plus 40 mg/kg saponin fraction from Korean ginseng-treated; TT+AG: 50 ug/kg TCDD plus 40 mg/kg saponin fraction from American ginseng-treated.

a



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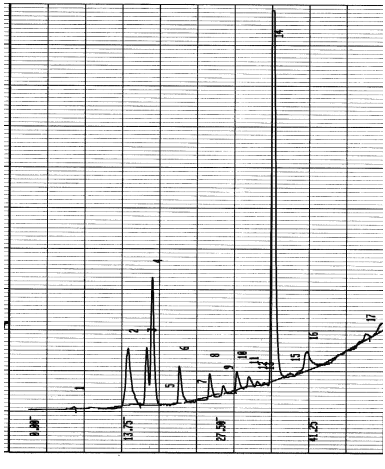

**Figure 2.** HPLC analysis of saponins from *Panax ginseng* (a) and *Panax quinquefolium* (b)

twenty-one days. Single administration of TCDD was done intraperitoneally on the seventh day of experiment. At a dose of 50 ug/kg, TCDD administration induced a loss of body weight whereas normal rats gained forty-eight grams of body weight (Fig. 1). Administration of saponin fraction from *Panax ginseng* (40 mg/kg) effectively mitigated the TCDD-induced weight loss whereas administration of saponin fraction from *Panax quinquefolium* (40 mg/kg) was ineffective. HPLC analysis of saponins from *Panax ginseng* and *Panax quinquefolium* revealed marked differences between the two. *Panax ginseng* contained high percentile of $Rg_3$ which had been produced from heat-labile ginsenosides in the process of hot water extraction of ginseng roots (Fig. 2a). Ratio of $Rg_3$ to $Rb_1$ in *Panax ginseng* was about three but the ratio from *Panax quinquefolium* was less than a quarter. Additionally, ginsenoside $Rh_1$ was absent in *Panax quinquefolium* whereas evidently present in *Panax ginseng* (Fig. 2b). Thus, it is assumed that differential effects of ginseng species against TCDD-induced wasting might be mediated by their differential compositions of saponins.

**Acknowledgments**

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**References**

1. Seefeld MD, Corbett SW, Keesey RE and Peterson RE (1984) Toxicol. Appl. Pharmacol. 73, 311.
2. Seefeld MD and Peterson RE (1984) Toxicol. Appl. Pharmacol. 74, 214.
3. Christian BJ, Inhorn SL and Peterson RE (1986) Toxicol. Appl. Pharmacol. 82, 239.