

## Serum IgE Immune Response After the Exposure to Korean Ginseng

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**Abstract**—To assess a potential relationship of Korean ginseng to allergic reactions, the effect of Korean ginseng on the total IgE in serum as an allergologic parameter was investigated in humans. Serum total IgE levels were measured in 8 subjects who have been taking ginseng for more than 5 years, 4 subjects of weak constitution, 10 newly hired workers in the ginseng processing industry and 7 normal subjects unexposed to Korean ginseng as control group. Blood samples were taken before and after the exposure to Korean ginseng. Total IgE levels after the exposure to Korean ginseng were not significantly different from those before the exposure within each group. And also, the IgE levels of control subjects were not significantly different compared with those of other groups. These results suggest that the exposure to Korean ginseng dose not affect significantly the IgE immune response of the subjects.

**Key words**—*Panax ginseng*, Araliaceae, total IgE, antigenicity, allergy

### Introduction

Korean ginseng, *Panax ginseng* C.A. Meyer, is an herbal root that has been used both as a tonic and as a medicine against various diseases for centuries in the Orient, and numerous articles have been written concerning its medicinal properties.<sup>1-4)</sup> Especially, Two acidic polysaccharides from Korean ginseng, ginsenan S-IA and ginsenan S-IIA, showed remarkable phagocytosis activity and pronounced anti-complementary activity.<sup>5)</sup> The ethanol-insoluble fraction from Korean ginseng showed antitumor effects as an immunomodulator.<sup>6)</sup> Oral administration of ginsenoside Rh<sub>2</sub> has been known to inhibit on the growth of human ovarian cancer cells in nude mice.<sup>7)</sup> Polyacetylenic alcohol, panaxytriol, from Korean ginseng has been reported to potentiate cytotoxicity of mitomycin C.<sup>8)</sup> However, Korean ginseng has also been described to be capable of causing adverse effects,<sup>9,10)</sup> even these reports have been proved to be of little scientific value.<sup>11)</sup>

Some plant-derived materials have been described to cause allergic responses in atopic and non-atopic subjects.<sup>12-15)</sup> Recently, it has been reported that the root-dust of *Pfaffia paniculata*, known as Brazil ginseng, caused occupational asthma.<sup>16)</sup> Brazil ginseng has been used both as a tonic and for anti-diabetic purposes as a folk medicine. Collected in Brazil, it has some of the properties of the Korean ginseng.<sup>17,18)</sup> In many allergic cases due to plant materials including asthma caused by Brazil ginseng, an immediate type I IgE-mediated hypersensitivity mechanism has been implicated.<sup>16)</sup>

The type I or anaphylactic reactions are mediated by IgE in humans. The main targets of this type of reaction are the gastrointestinal tract (food allergies), the skin (urticaria and atopic dermatitis), the respiratory system (rhinitis and asthma), and the vasculature (anaphylactic shock). These responses tend to occur quickly after rechallenge with an antigen to which the individual has been sensitized and are termed immediate hypersensitivity.<sup>19)</sup>

Therefore, relating to an immediate type I IgE-mediated hypersensitivity, the present study conce-

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rns the total IgE responses in sera of volunteers after the exposure to Korean ginseng.

## Materials and Methods

### 1. Clinical trials

The subjects were volunteered to enter the study after informed consent. Subjects of each group were selected on the following criteria. The group I consisted of normal subjects unexposed to Korean ginseng, whereas group II consisted of subjects who have been taking ginseng continuously for more than 5 years. The group III consisted of subjects of weak constitution and group IV consisted of newly hired workers in the ginseng processing industry. Characteristics of the groups studied are summarized in Table 1. For the exposure to Korean ginseng, the subjects of groups I, II and III were administered p.o. 3 times a day for 3 days with red ginseng capsule (Korean red ginseng powder capsule, 2 g, Korea Tobacco & Ginseng Corp.), whereas workers of group IV were participated in the process of washing of fresh ginseng for 2 months.

Clinical haematologic characteristics were assessed before and after the exposure to Korean ginseng for the basal evaluation of the health condition of subjects studied. Clinical haematologic parameters determined were as follows; white blood cell count, red blood cell count, hemoglobin content, hematocrit, platelet count. It was confirmed that the exposure to Korean ginseng had no effect on these haematologic parameters of the subjects as shown in Table 2. Determinations of total IgE levels in serum were performed before and after the exposure to Korean ginseng.

### 2. Laboratory methods

Blood was collected into tubes without coagulant for total IgE measurement and into tubes containing potassium EDTA for blood cell count.

The serum total IgE levels were determined by immunoradiometric assay (IRMA) total IgE kit (Radim, Italy), which is a solid-phase, two-site IRMA. The sensitivity of IRMA total IgE kit is 1 IU/ml. The serum was separated from whole blood cell samples by centrifugation on the day of collection and was kept frozen at  $-20^{\circ}\text{C}$  until assay. All as-

**Table 1.** Characteristics of the subjects studied

Group	No. of subjects	Age (yr)		Sex	
		Range	Mean	M	F
I Control subjects	7	24~41	30.2	5	2
II Subjects who have been taking ginseng for more than 5 years	8	29~48	39.1	6	2
III Subjects of weak constitution	4	23~54	39.0	3	1
IV Newly hired workers in the ginseng processing industry	10	24~48	36.5	0	10

**Table 2.** Characteristics of cellular elements in blood tested before and after exposure to Korean ginseng

Group	Exposure to Korean ginseng	WBC count ( $\times 10^9/l$ )	RBC count* ( $\times 10^{12}/l$ )	Hemoglobin content* (g/dl)	Hematocrit* (%)	Platelet count ( $\times 10^6/l$ )
I	before	6.4 $\pm$ 0.6	5.10 $\pm$ 0.14	16.8 $\pm$ 0.7	48 $\pm$ 2	256 $\pm$ 21
	after	6.3 $\pm$ 0.4	5.00 $\pm$ 0.08	16.2 $\pm$ 0.4	47 $\pm$ 1	260 $\pm$ 15
II	before	6.0 $\pm$ 0.5	4.76 $\pm$ 0.18	15.7 $\pm$ 0.7	45 $\pm$ 2	195 $\pm$ 30
	after	6.5 $\pm$ 0.9	4.76 $\pm$ 0.19	16.0 $\pm$ 0.8	44 $\pm$ 2	226 $\pm$ 16
III	before	7.4 $\pm$ 1.3	4.87 $\pm$ 0.39	15.9 $\pm$ 1.5	45 $\pm$ 4	251 $\pm$ 14
	after	6.5 $\pm$ 0.8	4.87 $\pm$ 0.36	15.9 $\pm$ 1.3	45 $\pm$ 4	221 $\pm$ 33
IV	before	6.3 $\pm$ 0.7	4.50 $\pm$ 0.26	12.8 $\pm$ 0.4	38 $\pm$ 1	260 $\pm$ 10
	after	6.5 $\pm$ 0.4	4.32 $\pm$ 0.09	12.6 $\pm$ 0.4	38 $\pm$ 1	274 $\pm$ 9

Values represent the Mean  $\pm$  SEM.

\*Values for RBC count, hemoglobin content and hematocrit are from men subjects for group I, II and III, and from women subjects for group IV.

says were done in duplicate, and the average of the pair was used for statistical analysis. Whenever the IgE level exceeded the linear portion of the standard curve, the sample was diluted and retested.

### 3. Statistical analysis

For statistical analysis of the data, paired t-test was used. P values of less than 0.05 were considered statistically significant.

## Results and Discussion

The effect of Korean ginseng on the serum total IgE reactivity in volunteers was investigated to evaluate the antigenic potential of Korean ginseng relating to an immediate hypersensitivity. In humans, immediate hypersensitivity responses are mediated by IgE.

To evaluate the effect of ginseng on the IgE-mediated immunologic responses, firstly, results of serum total IgE levels before ginseng exposure in volunteers were compared to those after ginseng exposure within each group. Total IgE levels of each group after the exposure to Korean ginseng were not significantly different from those in respective group before the exposure (Figs. 1, 2 and 3).

To investigate the effects of long-term administration of ginseng on IgE levels, results from group I were compared to those from group II and IV (Figs. 1 and 3). The subjects of group II, before entering the study, had been taking various preparations of Korean ginseng such as powder, liquid extract, tablets, or capsules continuously for at least 5 years. Subjects of group IV were exposed occupationally to fresh ginseng for 2 months during the study. There was no significant difference in the IgE levels between the subjects of group II or group IV and control subjects before and after the scheduled exposure of ginseng (Figs. 1 and 3). These results indicate that long-term administration of Korean ginseng is expected not to produce appreciably the IgE immune response. And also, it might be considered that total IgE levels of the subjects were not significantly affected by any kind of Korean ginseng such as fresh ginseng itself, or processed white or red ginseng preparations.

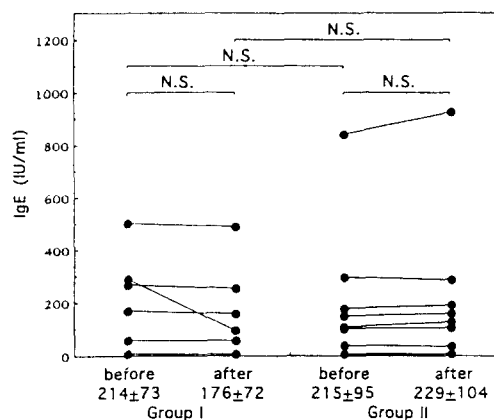


Fig. 1. Total IgE levels in serum after 3-day oral administration of red ginseng in subjects who has been taking ginseng for more than 5 years compared with control subjects.

N.S.: Not significant

Values represent the Mean  $\pm$  SEM.

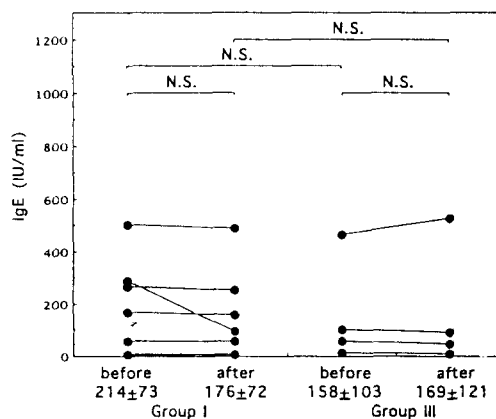


Fig. 2. Total IgE levels in serum after 3-day oral administration of red ginseng in subjects of weak constitution compared with control subjects.

N.S.: Not significant

Values represent the Mean  $\pm$  SEM.

It has been known that plants containing more than one component may exhibit different biological activities, depending on the route of administration.<sup>14)</sup> Ginseng was administered orally in groups I, II and III, whereas workers of group IV were exposed to ginseng by skin contact. The results of our experiment indicate that ginseng dose not produce the IgE-mediated immune responses when ginseng gain access to the body by the gastrointestinal tract or

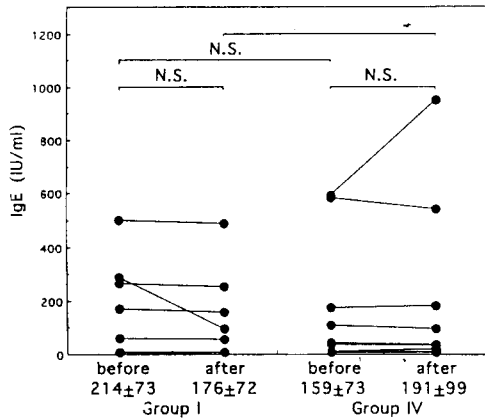


Fig. 3. Total IgE levels in serum after 2-month occupational exposure of fresh ginseng in workers compared with control subjects.

N.S.: Not significant

Values represent the Mean ± SEM.

through skin.

Sera from some subjects contained high levels of serum IgE before entering the study; however, the IgE response to ginseng treatment was not so affected by the initial high levels of IgE of them, except one. One case with increased IgE after the exposure to ginseng was found among the occupationally exposed workers, but there was no significant difference between the means of IgE levels in that group before and after the exposure to fresh ginseng (Fig. 3). For detailed understanding of immunological response of this subject, further research is needed, relating to allergen-specific serum IgE antibodies to ginseng and/or any other allergologic parameter. Clinical methods for detecting chemical-mediated hypersensitivity in humans commonly utilize skin testing.<sup>20)</sup> But, as an alternative to actual challenge with a suspected allergen, the individual can be evaluated for the presence of allergen-specific serum IgE antibodies in a radioallergosorbent test (RAST).<sup>21)</sup> In most cases, there is a good correlation between positive RAST results, positive skin test results, and clinical symptoms of allergy.<sup>22)</sup>

Referring to the study linking Brazil ginseng to occupational asthma,<sup>16)</sup> their results demonstrated that no IgE reactivity with Korean ginseng was detectable in patient's serum suffering from occupa-

tional asthma caused by Brazil ginseng and an extract of Korean ginseng was unable to inhibit IgE reactivity with Brazil ginseng. This lack of cross-reactivity is not surprising because of the lack of cross taxonomic relation between both types of ginseng. Brazil ginseng (*Pfaffia paniculata*) belongs to the Amaranthaceae family, whereas the Korean ginseng (*Panax ginseng*) belongs to the Araliaceae family, which is included in a very distant phylogenetic group.<sup>15)</sup>

From these results, the exposure to Korean ginseng dose not produce significantly the IgE immune response of the human subjects. This finding may support the lack of antigenic potential of Korean ginseng, especially, in relation to an IgE-mediated immunologic mechanism, and this is consistent with the conclusion of our in vivo antigenicity studies using guinea pigs.<sup>23,24)</sup> In the studies, the antigenicity of Korean ginseng was evaluated in guinea pigs using the assay procedures such as active systemic anaphylaxis, active cutaneous anaphylaxis, passive cutaneous anaphylaxis and passive hemagglutination. From the studies, aqueous extracts of fresh ginseng or red ginseng were considered not to possess antigenic properties in guinea pigs.

In summary, oral administration of ginseng or occupational exposure to ginseng was considered not to induce IgE-mediated immune response in humans. This finding may support that the potential of Korean ginseng to induce and elicit the type I allergic hypersensitivity responses is very unlikely.

## 요 약

고려인삼이 알러지 반응에 미치는 영향을 검토하기 위하여 알러지 지표인 혈청중의 총 IgE를 인삼 장기 복용자, 허약체질자, 수삼 세척 처리 공정에 참여하는 근로자를 대상으로 측정하였다. 정상대조군, 인삼 장기 복용자군, 허약체질자군은 홍삼분 캡셀 복용 전후에, 수삼 세척 처리 공정 참여 근로자는 세척 처리 공정 참여 전후에 각각 채혈하여 혈청 총 면역글로부린 E를 비교하였다. 각 군에 대하여 홍삼분 캡셀 복용 또는 세척 처리 공정 참여 후에 총 IgE 농도의 유의적 변화가 관찰되지 않았으며, 군간에도 대조군과 비교시 유의적 변화가 관찰되지 않았다. 따라서 본

실험조건에서는 고려인삼은 IgE 면역 반응에 유의적 영향을 미치지 않는것으로 사료되며, 이러한 결과로부터 고려인삼은 즉시형 과민반응을 유발할 가능성이 낮은 것으로 시사된다.

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