

# Reduction of Allergic Skin Responses and Serum Allergen-Specific IgE and IgE-Inducing Cytokines by Drinking Deep-Sea Water in Patients with Allergic Rhinitis

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## Key Words

Deep-sea water · Allergic rhinitis · Immunoglobulin E · Skin prick test · Interleukin 4 · Interleukin 13 · Interleukin 18

## Abstract

Deep-sea water intake reduces allergic skin responses and serum levels of total IgE, Japanese cedar pollen-specific IgE, interleukin (IL)-4, IL-6, IL-13, and IL-18 in patients with allergic rhinitis, while distilled water intake fails to do so.

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## Verminderung allergischer Hautreaktionen bei Patienten mit allergischer Rhinitis nach der Einnahme von Tiefseewasser

Die Einnahme von Tiefseewasser vermindert bei Patienten mit allergischer Rhinitis, welche auf japanische Zedernpollen allergisch sind, allergische Hautreaktionen, den Gesamt-IgE-Wert, das japanische Zedernpollen-spezifische IgE, Interleukin (IL)-4, IL-6, IL-13 sowie IL-18. Im Gegensatz dazu hat destilliertes Wasser keine derartigen Eigenschaften.

## Réduction des manifestations allergiques par ingestion d'eau de mer de grande profondeur

L'ingestion d'eau de mer provenant de grandes profondeurs réduit les réactions allergiques cutanées, le taux d'IgE totale, le taux d'IgE spécifique au pollen de cèdre du Japon, le taux d'interleukine-4, -6, -13 et -18 chez les patients souffrant de rhinite allergique déclenchée par le pollen de cèdre du Japon. L'eau distillée, par contre, ne possède pas ces propriétés.

Deep-sea water (Amami no Mizu Hardness 1000, Ako Kasei Co. Ltd), which was obtained at 344 m depth and refined, contained Mg as well as other minerals. 500 ml of it contained Mg (100.0 mg), Na (37.0 mg), Ca (35.5 mg), K (34.5 mg) and other trace minerals (Zn: 2.0 µg, Cu: 2.2 µg, I: 4.5 µg, P: 4.5 µg, Se: 0.2 µg). We have previously reported that drinking this deep-sea water in healthy volunteers significantly decreases both whole blood flow time and blood pressure [1]. It has also been reported that Mg concentrations were significantly lower in erythrocytes in asthmatic patients as compared with a control group [2]. In Mg-deficient rats, plasma levels of histamine, substance P and interleukin (IL)-6 were elevated [3, 4]. Therefore, we hypothesize that intake of Mg-rich water may alleviate allergic responses. Here, we have studied the effect of drinking deep-sea water on in vivo and in vitro allergic responses in patients with allergic rhinitis.

After obtaining informed consent, 50 patients with allergic rhinitis (age 22–50 years), who are allergic to Japanese cedar pollen, were recruited. They were free from any medication for 7 days before the study. One group (13 women and 12 men; mean age, 33 years) drank deep-sea water (Amami no Mizu Hardness 1000) 500 ml/day for 3 weeks, and a control group (13 women and 12 men; mean age, 34 years) drank distilled water 500 ml/day for 3 weeks. At baseline and after 3 weeks, skin prick tests were performed by using commercial Japanese cedar pollen extract and wheal diameters were measured [5]. Simultaneously, serum levels of total IgE, Japanese cedar pollen-specific IgE, IL-4, IL-6, IL-13, IL-18 and interferon-γ (IFN-γ) were determined [6, 7].

Table 1. Effect of drinking deep-sea water on allergic responses in patients with allergic rhinitis

	Deep-sea water (n = 25)			Distilled water (n = 25)		
	baseline	3 weeks	p	baseline	3 weeks	p
<i>Skin wheal responses, mm</i>						
Japanes cedar pollen	7.6±0.08	4.1±0.04	<0.01	7.5±0.07	7.4±0.07	NS
Control	0.0±0.00	0.0±0.00	NS	0.0±0.00	0.0±0.00	NS
<i>Serum</i>						
Total IgE, UI/ml	363±8.8	156.3±4.1	<0.01	341.3±8.5	343.6±8.7	NS
JCP-specific IgE, UA/ml	62.8±5.7	31.4±3.7	<0.01	61.4±5.3	62.6±5.9	NS
IL-4, pg/ml	15.3±0.1	5.9±0.1	<0.01	14.8±0.1	14.2±0.1	NS
IL-6, pg/ml	10.7±0.2	4.1±0.1	<0.01	10.3±0.2	10.6±0.2	NS
IL-13, pg/ml	9.9±0.1	5.5±0.1	<0.01	9.6±0.1	9.4±0.1	NS
IL-18, pg/ml	8.0±0.1	5.0±0.1	<0.01	8.3±0.1	8.5±0.1	NS
IFN-γ, pg/ml	30.5±0.3	27.2±0.2	NS	28.7±0.3	28.1±0.3	NS

Values are the mean ± SEM. JCP-specific IgE = Japanese cedar pollen-specific IgE.

As shown in table 1, the wheal responses to Japanese cedar pollen were significantly reduced after drinking deep-sea water, while they were unchanged after drinking distilled water. Moreover, serum levels of total IgE and Japanese pollen-specific IgE were also reduced. It has been reported that IL-4, IL-6, IL-13 and IL-18 enhance IgE production while IFN-γ inhibits it [4, 5]. Serum levels of IL-4, IL-6, IL-13 and IL-18, but not IFN-γ, were reduced after drinking deep-sea water, while they were unaffected by drinking distilled water (table 1).

These results suggest that deep-sea water intake reduces allergen-induced wheal responses and decreases serum total and allergen-specific IgE levels by reduction of production of IgE-inducing cytokines. Therefore, deep-sea water may be useful in treating allergic diseases such as allergic rhinitis. The detailed mechanisms of the reduction of allergic responses are currently under investigation.

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## Editor's Note

The rationale of the study is surprising, but recent scientific literature has already reported some observations on the influence of sea water on inflammatory mediators such as IL-8 [Tabary et al.: *Eur Respir J* 2001;18:661–666].