

Eggplant anaphylaxis in a patient with latex allergy

To the Editor:

Eggplant (*Solanum melongena*) is a widely planted and consumed vegetable and rarely causes allergic reactions. To the best of our knowledge, only one case of eggplant flower pollen allergy has been reported.¹ Latex allergy is a well-known and important allergic disease, especially among health care workers. An important feature of latex allergy is the patient's cross-reactivity to various fruits and vegetables, such as potato, tomato, avocado, and banana, which is often called latex-fruit syndrome.²

We report on a patient with latex allergy who experienced anaphylaxis after ingesting boiled eggplant. Neither anaphylaxis to eggplant itself nor latex-fruit syndrome involving eggplant has been reported previously in the literature.

A 27-year-old female doctor, who had systemic contact urticaria to latex gloves and mild seasonal allergic rhinitis, experienced symptoms of a generalized itching sensation, dyspnea, dizziness, vomiting, nausea, abdominal pain, diarrhea, and rash over the whole body immediately after intake of boiled eggplant. She was treated with subcutaneous epinephrine, intravenous corticosteroids, and antihistamines, which caused most of her symptoms to subside within several hours.

She underwent skin prick tests (SPTs) with 42 common inhalant allergens (Skin Prick Test Solutions; Allergopharma, Reinbek, Germany). Histamine (1 mg/mL) was used for the positive control, and saline (0.9%) was used for the negative control. A positive test result indicates that the wheal size of each allergen is not smaller than that elicited by the positive control. She was sensitive to house dust mite (*Dermatophagoides pteronyssinus* and *Dermatophagoides farinae*), cat dander, and latex. SPT responses to fresh and boiled eggplant extract were also positive (wheal diameters of 8 mm and 14 mm, respectively; histamine, 4 mm; saline, 0 mm).

Fresh and boiled (1 hour at 100°C) eggplants were ground up and extracted into PBS (pH 7.5) 1:5 wt/vol with 1.5 mmol/L EDTA, followed by centrifugation at 3500 rpm for 1 hour at 4°C. The mixture was stirred for 2 hours at 4°C with 80% ammonium sulfate. The supernatant was dialyzed (molecular weight cutoff, >3500 d; Spectrapor; Spectrum Medical Industries, Inc, Los Angeles, Calif) at 4°C for 24 hours against distilled water, centrifuged at 7000 rpm for 30 minutes at 4°C, and filtered through a 0.45-µm filter (Millipore Corp, Bedford, Mass). The total protein concentrations of each extract measured by using the method of Bradford were 158.5 ± 2.8 µg/mL and 310.2 ± 10.6 µg/mL. Finally, the material was lyophilized and stored at -20°C, which was used for ELISA and immunoblot analysis. For SPTs, the 1:5 wt/vol

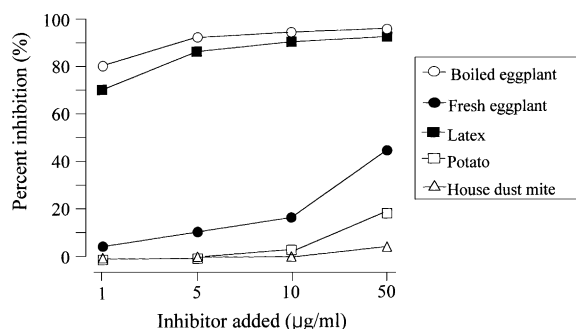


FIG 1. Results of boiled eggplant ELISA inhibition with addition of boiled eggplant, fresh eggplant, latex, potato, and house dust mite antigens as inhibitors.

extract was mixed with an equal amount of glycerine ($\geq 99.5\%$; Sigma Aldrich, St Louis, Mo).

Specific IgE antibodies directed against fresh and boiled eggplant were detected by means of ELISA. The absorbance value of the patient's serum was significantly higher than those of pooled sera from 10 atopic volunteers (fresh eggplant, 0.354 ± 0.011 ; boiled eggplant, 0.511 ± 0.015 ; control, 0.080 ± 0.008). Competitive ELISA inhibition tests were performed to determine the specificity of IgE binding to fresh and boiled eggplant antigen and the allergenic cross-reactivity to latex antigen.³ Significant inhibition was noted with boiled eggplant antigen and latex antigen and, to a lesser degree, with fresh eggplant antigen, but inhibition with house dust mite antigen and potato antigen were minimal (Fig 1). To identify specific IgE-binding antigens, we performed SDS-PAGE and immunoblot analysis (Fig 2). In the Coomassie brilliant blue staining after gel electrophoresis with each eggplant extract, we detected 7 protein bands (2 bands between 22 and 36 kd, 1 band at 36 kd, 2 bands between 36 and 50 kd, 1 band between 50 and 64 kd, and 1 band near 98 kd). In the immunoblot analysis Der f 2 (kindly donated from Dr Cho in Seoul National University) was loaded as a positive control. As a negative control, pooled sera from 10 atopic volunteers were added for immunoblotting. Three IgE-binding proteins were identified from fresh and boiled eggplant extract (1 protein band between 22 and 36 kd, 1 band near 36 kd, and 1 band between 36 and 50 kd). Coincidentally, one IgE-binding latex protein was detected between 22 and 36 kd.

Exposure to pollens of the Solanum subfamily, such as tomato, potato, and eggplant, has been reported to cause asthma, rhinoconjunctivitis, and urticaria in gardeners through an IgE-mediated mechanism.^{1,4} Cosensitization to Solanum subfamily vegetables has been reported,⁵ in which tomato and potato allergens were cross-reactive with some latex antigens (ie, the latex fruit syndrome).⁶⁻⁸

In ELISA inhibition testing significant inhibition was noted with the addition of latex and boiled eggplant.

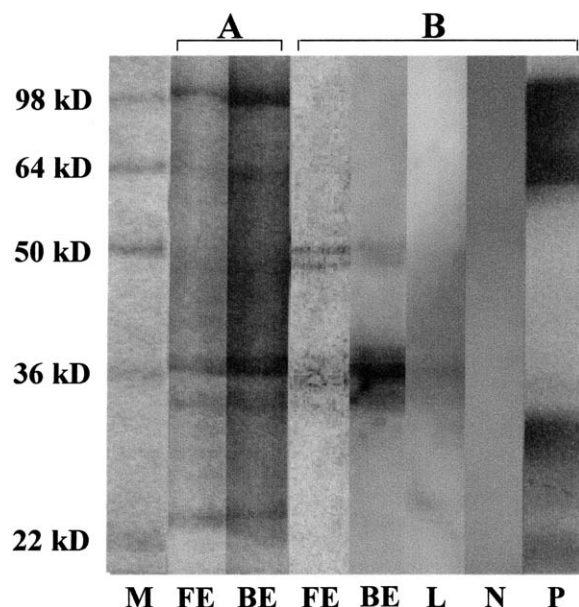


FIG 2. Identification of IgE-binding components with patient serum. Staining with Coomassie brilliant blue on gel electrophoresis (**A**) and IgE immunoblot (**B**) is shown. *M*, Marker; *FE*, 300 µg of fresh eggplant extract; *BE*, 300 µg of boiled eggplant extract; *L*, 125 µg of latex; *N*, boiled eggplant with pooled sera (*n* = 10) as a negative control; *P*, 100 µg of Der f 2 as a positive control.

Partial inhibition of fresh eggplant might come from lower antigenicity of the extract, as seen consistently in SPTs, ELISAs, and Western blotting, and therefore one might presume that thermal processing can modify the antigenicity of eggplant.

We identified one IgE-binding component with the same molecular weight (1 protein band between 22 and 36 kD) from eggplant and latex that is a candidate allergen to reveal cross-reactivity, as are some vegetables of the *Solanum* subfamily. However, the IgE-binding components of eggplant exhibit no cross-reactivity with potato (*Solanum tuberosum*).

We report, for the first time, that eggplant itself contains allergens in amounts that can elicit a specific IgE-mediated response in susceptible individuals and that eggplant allergens have cross-reactivity with some latex antigens.

Jaechun Lee, MD^a

You Sook Cho, MD^a

So Yeon Park, MD^a

Chang-Keun Lee, MD^a

Bin Yoo, MD^a

Hee-Bom Moon, MD^a

Hae-Sim Park, MD^b

^aDivision of Allergy and Rheumatology

Asan Medical Center

University of Ulsan, College of Medicine

388-1 Poongnap-2dong, Songpa-gu

Seoul, Korea

^bAjou University School of Medicine

Suwon, Korea

REFERENCES

1. Gil M, Hogendijk S, Hauser C. Allergy to eggplant flower pollen. *Allergy* 2002;57:652.
2. Blanco C, Carrillo T, Castillo R, Quiralte J, Cuevas M. Latex allergy: clinical features and cross-reactivity with fruits. *Ann Allergy* 1994;73:309-14.
3. Kim SS, Park HS, Kim HY, Lee SK, Nahm DH. Anaphylaxis caused by the new ant, *Pachycondyla chinensis*: demonstration of specific IgE and IgE-binding components. *J Allergy Clin Immunol* 2001;107:1095-9.
4. Sastre J. Occupational asthma due to different spices. *Allergy* 1996;51:117-20.
5. Reche M, Pascual CY, Vicente J, Caballero T, Martin-Munoz F, Sanchez S, et al. Tomato allergy in children and young adults: cross-reactivity with latex and potato. *Allergy* 2001;56:1197-201.
6. Seppala U, Palosuo T, Kalkkinen N, Yliralo L, Reunala T, Turjanmaa K, et al. IgE reactivity to patatin-like latex allergen, Hev b 7, and to patatin of potato tuber, Sol t 1, in adults and children allergic to natural rubber latex. *Allergy* 2000;55:266-73.
7. Seppala U, Alenius H, Turjanmaa K, Reunala T, Palosuo T, Kalkkinen N. Identification of patatin as a novel allergen for children with positive skin prick test responses to raw potato. *J Allergy Clin Immunol* 1999;103:165-71.
8. Tucke J, Posch A, Baur X, Rieger C, Raulf-Heimsoth M. Latex type I sensitization and allergy in children with atopic dermatitis. Evaluation of cross-reactivity to some foods. *Pediatr Allergy Immunol* 1999;10:160-7. doi:10.1016/j.jaci.2004.01.565

Combination of CC16, GSTM1, and GSTT1 genetic polymorphisms is associated with asthma

To the Editor:

Several studies indicated that oxidative stress impairs pulmonary function and can lead to asthma.^{1,2} Genome-wide searches and candidate gene approaches have identified many genes and regions that potentially influence asthma susceptibility.³⁻⁵

It is reported that glutathione S-transferases (GSTs) modulate reactive oxygen species (ROS) levels.⁶ There are well-defined genetic polymorphisms named *GSTM1-0* and *GSTT1-0* in the *GSTM1* and *GSTT1* genes, respectively, that are null alleles that result in nonfunctional protein. There is not as much information on the relationship between null genotypes of *GSTM1* and *GSTT1* and asthma.^{3,4} It has been shown that the null genotypes of *GSTM1* and *GSTT1* are associated with asthma.⁴ However, other studies did not replicate this association.³

CC16 is a 16-kD homodimeric protein secreted in large amounts in airways by the nonciliated bronchiolar Clara cells. CC16 has an important role in inflammation and immune modulation.⁷ Nucleotide sequence analysis of exon 1 of the gene revealed a nucleotide substitution from A to G at position 38 in the 5' promoter region. This substitution is strongly associated with asthma in a population of Australian children.⁵ However, studies on populations of Japanese and British adults did not replicate these associations.⁸ Taken together, the association between genetic polymorphisms of *GSTM1*, *GSTT1*, and *CC16* and susceptibility to asthma is still an open question. Therefore the present study was performed.

This case-control study consisted of 85 patients (58 female and 27 male patients) with asthma (mean ± SD