

Hypersensitivity to latex, chestnut, and banana

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The incidence of latex-allergic patients is probably higher than suspected. A spectrum of IgE-dependent allergic reactions to latex products including urticaria, rhinitis, asthma, angioedema, and life-threatening anaphylaxis has been increasingly reported in recent years. We describe three patients with rubber hypersensitivity and allergy to fruit (banana and chestnut). Immediate positive responses were obtained in prick tests with latex, banana, and chestnut extracts. Histamine release was positive and specific IgE antibodies to all three extracts were detected by fluorescence radioimmunoassay. In the RAST-inhibition studies, the extract of latex inhibited the binding of chestnut and banana, but chestnut and banana extracts did not inhibit the binding of latex. These results suggest a sensitivity to cross-reacting antigens in latex allergy associated with allergy to certain fruits.

INTRODUCTION

Natural rubber, a highly processed product derived from the milky sap (or latex) of the tree *Hevea brasiliensis*, has been associated with delayed hypersensitivity reactions to additives and stabilizers employed in the manufacturing process. In 1979, Nutter¹ reported the first case of contact urticaria of the immediate type attributed to the latex in rubber gloves. In 1984, Turjanmaa et al² described two cases of IgE-mediated anaphylactic reactions caused by surgical gloves. Since then, numerous case reports have appeared describing immediate hypersensitivity reactions to natural rubber products.³⁻¹⁰ Recently, the simultaneous occurrence of latex glove allergy and allergy to fruits—particularly banana, chestnuts, and avocado—has been documented.¹¹⁻¹⁴ The association of these uncommon allergies appears to be due to a sensitivity to cross-reacting antigens.¹² We report here three cases of latex allergy in patients with histories of immediate-type allergy to banana and chestnut.

MATERIALS AND METHODS

CASE REPORTS

Case 1. A 30-year-old woman had a 5-year history of seasonal rhinoconjunctivitis. At the age of 27 she developed a severe reaction with facial and glottic edema after ingestion of fresh banana (a fruit previously well tolerated) that required urgent treatment with epinephrine and hydrocortisone. At the age of 29 she developed similar manifestations after eating chestnut. Her rubber allergy was noted 2 months ago when she experienced itching of the lips, angioedema, and dysphonia after blowing up a rubber balloon. Further, contact with rubber gloves also induced edema of the eyelids and ears with itching and urticaria on the hands, arms, and neck.

Case 2. A 28-year-old woman had had atopic eczema and allergic rhinoconjunctivitis since childhood. She complained of two episodes of perioral and palpebral edema with dysphonia and dysphagia induced by banana and chestnut intake that required admission to the emergency room on both occasions. One month before attending our clinic, edema of the lips and tongue occurred during a dental visit at which the dentist used rubber gloves.

Case 3. A 56-year-old female nurse had a severe anaphylactic-type reaction characterized by facial angioedema, dysphonia, and cardi-

ovascular collapse associated with wearing surgical gloves. At the age of 46 she had experienced a similar reaction a few minutes after eating chestnut. She had no allergy to bananas.

Skin tests. Skin prick tests were performed with eluates (20 mg/mL wt/vol) from incubation solutions of three different latex surgical gloves: low-latex content gloves pretreated with ethylene oxide (Prosanitas, S.A., Spain) (no. 1), latex gloves pretreated with gamma radiation (Baxter Healthcare Corporation, USA) (no. 2), and latex gloves pretreated with ethylene oxide (Travenol Laboratories SA, Lessines, Belgium) (no. 3). Skin prick testing was also performed with a battery of commercially available common inhalant and food allergenic extracts (milk, cereals, fish, vegetables, and dried and fresh fruit including chestnut and banana) (Dome-Hollister-Stier, Spain) with histamine phosphate (10 mg/mL) and physiologic saline as positive and negative controls, respectively. Wheals were measured 15 and 30 minutes later. The reaction was graded as positive if it was larger (4+) or the same size (3+) as that of histamine. The same tests were performed on 15 atopic and 15 nonatopic healthy individuals who served as controls.

Patch tests were performed with 25 common allergens from the International Contact Dermatitis Re-

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search Group including the rubber additives thiuram mix, mercapto mix and PPD mix, and 4 cm² rubber pieces of the various latex gloves. They were read at 15 minutes and 46 and 96 hours.

Immunologic tests. The natural latex from *H. brasiliensis* provided by the manufacturer (Syntex Latino, S.A., Barcelona, Spain) was diluted 1:10 (vol/vol) in sodium carbonate-bicarbonate buffer (0.1 mol/L, pH 9.6). After centrifuging at 1000 g for ten minutes, the supernatant was filtered through a 0.45- μ m filter (Nucleopore Corporation, Syrfil-MF, USA). Banana and chestnut extracts were prepared from crushed fruits by centrifugation at 1000 g for 30 minutes and filtration of the supernatant through a 0.45- μ m filter (Nucleopore Corporation, Syrfil-MF, USA). The power of the crushed unshelled nut was defatted with acetone and diluted 1:10 (vol/vol) in phosphate buffer saline (PBS) prior to centrifugation. The protein content was 0.75 mg/mL for banana extract and 1 mg/mL for chestnut and latex extracts (Bio-Rad, Munich, Germany).

Total IgE concentration in sera of patients was determined by a Phad-eyzm IgE PRIST (Pharmacia, Uppsala, Sweden). Specific IgE antibodies to ethylene oxide, *H. brasiliensis*, and banana extracts were determined by fluorescence enzyme immunoassay (FEIA) according to the manufacturer's instructions (Pharmacia, Uppsala, Sweden) and expressing the results in PRU/mL. We used CNBr-activated cellulose disks from Pharmacia for the chestnut assay (RAST).

Histamine release was carried out using an automated fluorimetric method¹⁵ with serially diluted (1:5, 1:15, 1:125, 1:625 vol/vol) latex, banana, and chestnut antigen extracts. Any result higher than 10% release was considered positive.

A radioallergosorbent test (RAST) was performed in an attempt to establish an immunochemical basis for the skin-cross reactivity ob-

served between latex, chestnut, and banana. RAST-inhibition studies were performed by adding 25 μ L of serially diluted in PBS (1:1, 1:10, 1:100, 1:1000, vol/vol) latex, chestnut or banana antigenic extracts to each corresponding well along with 50 μ L of pooled sera from the three patients. We first performed RAST-inhibition with the common aller-

gens *Dermatophagoides pteronyssinus* and birch pollen.

RESULTS

All three patients showed positive responses in the prick tests with eluates from two types of latex gloves (nos. 2 and 3) as well as banana and chestnut extracts. In contrast, the low-latex content gloves

Table 1. Results of in Vivo and in Vitro Tests in Three Patients with Latex Allergy and Allergy to Fruit (banana, chestnut)

Test	First Patient	Second Patient	Third Patient
Prick testing			
Glove no. 1	—	—	—
Glove no. 2	4+	4+	3+
Glove no. 3	4+	4+	3+
Chestnut extract	4+	4+	3+
Banana extract	4+	4+	4+
Patch testing			
Standard ICDRG*	—	—	—
Rubber pieces	—	—	—
Total IgE, IU/mL	343	1116	12
Specific IgE, PRU/mL			
Latex	17	17.5	3.1
Banana	1.45	0.8	0.4
Chestnut	3	1	0.
Ethylene oxide	<0.35	<0.35	<0.35
Histamine release, %			
Latex	35	46	57
Banana	31	26	37
Chestnut	37	50	21

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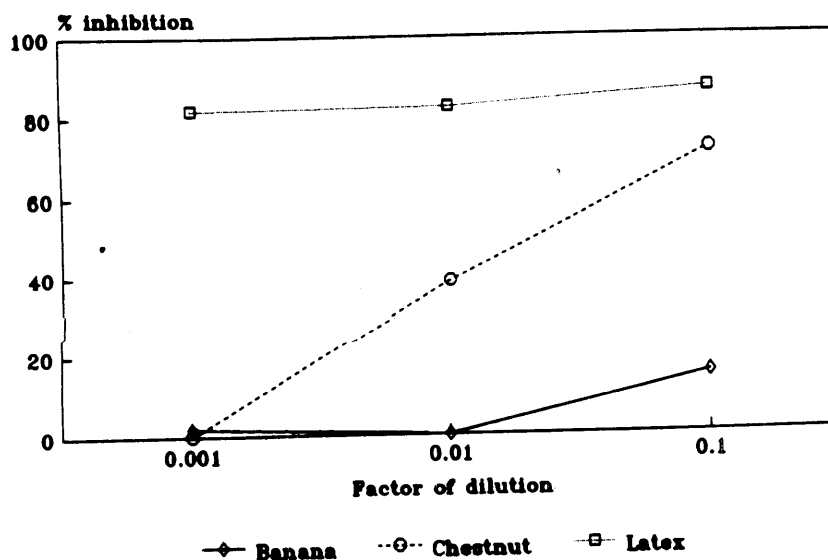


Figure 1. RAST inhibition of chestnut RAST by banana and latex extracts.

were negative (no. 1). All control subjects skin tested to surgical latex gloves, banana and chestnut extracts were nonreactive. Skin tests were positive to graminaceae mix in patient 1, and graminaceae mix and olive pollen in patient 2. All patients had negative patch tests to 25 standard reagents including the rubber additives at both immediate and delayed readings. Patch tests to rubber pieces of surgical gloves were also negative.

Specific IgE antibodies to *H. brasiliensis*, banana, and chestnut extracts were found in the patients' sera by FEIA and RAST techniques. No specific IgE to ethylene oxide was detected. The histamine release was positive in all three patients and negative in controls.

Results of in vivo and in vitro tests are shown in Table 1.

In our RAST system, the extract of latex inhibited the binding of both chestnut (Fig 1) and banana (Fig 2). Chestnut and banana extracts moderately inhibited each other, although they did not inhibit the binding of latex (Fig 3).

DISCUSSION

The increasing number of reports of type I reactions to latex is worthy of attention. Recent episodes of fatal and life-threatening anaphylaxis¹⁶⁻²⁰ have made the identification of the antigens responsible for these reactions even more urgent. Patients with type I rubber hypersensitivity appear to have IgE specific for *H. brasiliensis* proteins that persist in the final product,^{21,22} perhaps in amounts as much as 2% by weight. *Hevea brasiliensis* latex contains several identified and characterized proteins, such as hevein (5 kD), prenyltransferase (38 kD), and rubber elongation factor (14 kD). There is some disagreement regarding the molecular weight of the important antigens,^{3,23-25} probably due to the different source materials used²⁶ as well as the heterogeneity of the human immune response to these proteins.

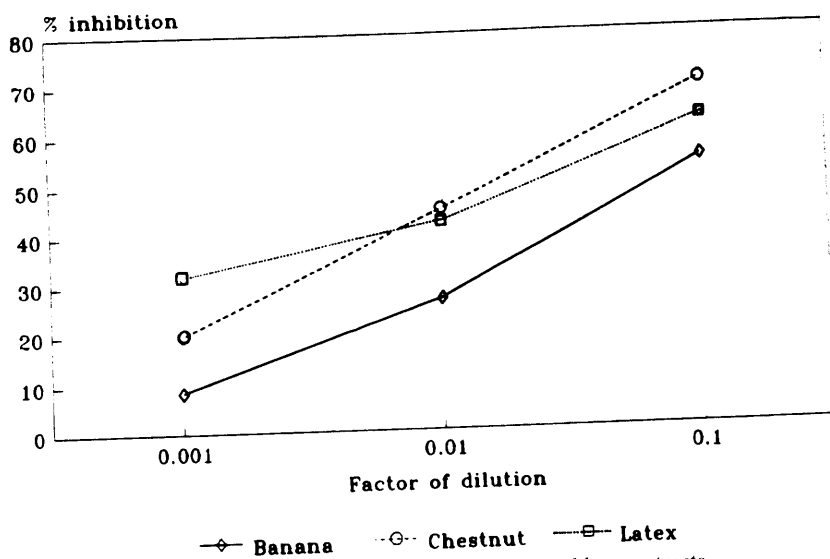


Figure 2. RAST inhibition of banana RAST by chestnut and latex extracts.

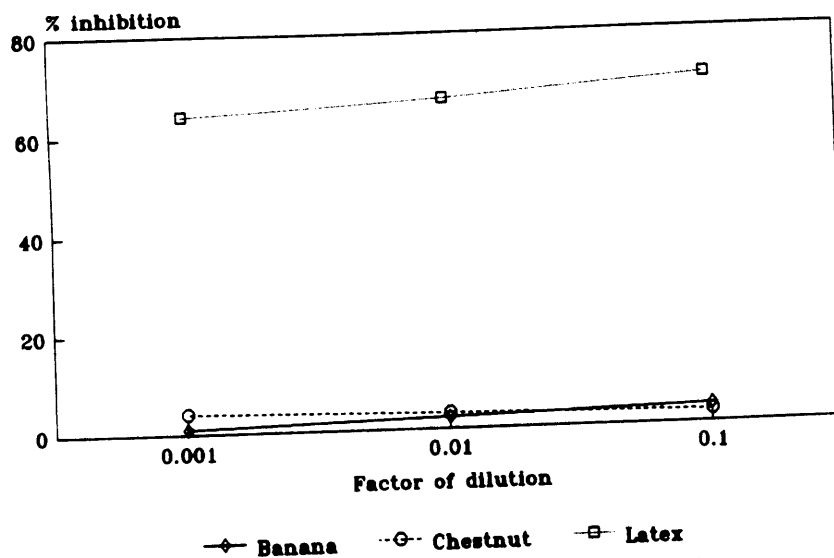


Figure 3. RAST inhibition of latex RAST by banana and chestnut extracts.

An IgE-mediated allergy to latex and banana and/or chestnut was demonstrated in these three patients by history of anaphylactic reactions, skin testing, histamine release, and elevated specific IgE antibodies. Further, an association between latex allergy and allergy to fruit was supported by RAST inhibition tests. In the cases reported by Charpin et al²⁷ and M'Raihi et al¹² the extract of banana inhibited the binding of latex, whereas in the patient de-

scribed by Lavaud et al¹³ no cross-reactivity could be demonstrated between latex extract and banana and avocado disks. In our patients, latex extract inhibited the binding of either chestnut or banana suggesting the existence of common allergens in latex and fruit. Many foods contain natural latex products. Although banana (*Musa paradisiaca* of the family *Musaceae*) and chestnut (*Castanea sativa* of the family *Fagaceae*) are of different

families, natural latexes could cross-react.

In summary, latex allergy should be excluded in patients with allergy to banana and chestnut who are scheduled for clinical procedures where rubber gloves could be used. Patients with a history of allergic reactions to latex should be aware of the potential for severe allergy to certain fruit.

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