

Short communication

Latex allergy in fruit-allergic patients

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The purpose of this study was to investigate the prevalence of latex allergy in fruit-allergic patients, and to assess its clinical significance. Fifty-seven fruit-allergic patients and 50 non-fruit-allergic atopic patient controls were studied. All patients were questioned about conventional immediate symptoms after contact with latex products. Patients also underwent skin prick testing and determination of specific serum IgE to latex, as well as a screening test for environmental allergens. Immunologic latex sensitization occurred in 49/57 (85.9%) fruit-allergic patients, who showed a positive STP and/or CAP to latex, but in only two controls ($P < 0.001$). Six out of 57 (10.5%) fruit-allergic patients suffered from clinically relevant latex allergy. Symptoms included contact urticaria, angioedema, conjunctivitis, generalized urticaria, and moderate anaphylactic reactions. No control reported symptoms with latex products ($P = 0.052$). In all patients, clinical symptoms to fruits preceded a history of latex allergy. The fruits most associated were melon, peach, and banana. From our data, we conclude that there is a potential for allergic reactions to latex in patients with allergy to fruit. All patients with fruit allergy should be screened for individual risk of latex allergy.

The prevalence of latex allergy (LA) is high in certain risk groups. These include health-care workers (prevalence ranging from 2.8 to 10.7%) (1, 2), rubber-industry workers (3.7–8%) (3), and patients who undergo frequent surgical procedures, such as children with spina bifida and urogenital abnormalities (18–37%) (4–7). The common feature among these groups is a high degree of exposure to natural rubber. The risk also appears to be higher among atopic subjects, but it is not yet clear whether fruit-allergic patients (FAP) constitute an independent risk group. Several surveys have reported clinical and immunochemical cross-reactivity between latex and certain fruits belonging to botanically unrelated classes (8–13). An important number of fruits and other vegetables have been incorporated within the “syndrome”, suggesting that cases are not confined to a reduced subgroup. It is of interest, therefore, to find out whether FAP in themselves form a group at risk of latex sensitization. We report here on the prevalence of latex sensitivity, with and without clinical manifestations, in FAP without occupational exposure to latex.

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Material and methods

Patients and controls

Fifty-seven consecutive patients (age range 6–56 years, mean 21.5, 36 female, 21 male) with clinical history of fruit allergy were entered into this study. Allergy to fruits was documented by a clinical history of oropharyngeal symptoms (oral allergy syndrome [OAS]), asthma, rhinitis, urticaria, digestive problems, or anaphylaxis after ingestion of a specific fruit or vegetable. Only consistent clinical histories with skin prick test (SPT) and/or specific IgE positive to fruit were considered, and symptoms of allergy occurred soon (less than 1 h) after ingestion. Table 1 shows the fruits involved and the number of patients reacting to each of them. Patients in a well-defined risk group of LA (health-care workers, rubber-industry workers, patients with more than five surgical procedures, and children with spina bifida) were excluded.

The control population comprised 50 non-food-allergic atopic patients (age range 5–50 years, mean age 20.3, 54% female) who came consecutively to our hospital. Atopy was defined by a positive

Table 1. Prevalence of sensitivity and clinical reactions to latex among fruit-allergic patients

Food	No. of positive SPTs and/or CAP among patients	Symptomatic sensitivity
Muskmelon (n=33)	30/33 (90.9%)	3/30 (10%)
Peach (n=18)	17/18 (94.4%)	3/17 (17.6%)
Watermelon (n=11)	11 (100%)	2/11 (18.1%)
Banana (n=11)	11/11 (100%)	3/11 (27.3%)
Almond (n=8)	6/8 (75%)	2/6 (33.3%)
Cherry (n=7)	5/7 (71.4%)	1/5 (20%)
Tomato (n=6)	6/6 (100%)	0
Apple (n=6)	4/6 (66.6%)	0
Kiwi (n=6)	3/6 (50%)	0
Pear (n=5)	4/5 (80%)	1/4 (25%)
Hazelnut (n=5)	3/5 (60%)	1/3 (33.3%)
Sunflower seeds (n=5)	4/5 (80%)	1/4 (25%)
Walnut (n=4)	4/4 (100%)	1/4 (25%)
Peanut (n=4)	3/4 (75%)	0
Orange (n=4)	3/4 (75%)	0
Strawberry (n=3)	3/3 (100%)	0
Fig (n=2)	2/2	0
Grape (n=1)	1/1	1/1
Avocado (n=1)	1/1	1/1
Pistachio (n=1)	1/1	1/1
Chestnut (n=1)	1/1	1/1
Blackberry (n=1)	1/1	1/1
Potato (n=1)	1/1	0
Lettuce (n=1)	1/1	0
Pineapple (n=1)	0	0
Total fruit-allergic patients (n=57)	49/57 (85.9%)	6/49 (12.3%)
Control atopic patients (n=50)	2/50 ($P<0.001$)	0 ($P=0.052$)

personal history of rhinoconjunctivitis, asthma, or atopic dermatitis, and documentation of at least one positive SPT to a panel of common inhalant allergens, including pollen from grass, weeds (*Parietaria*, *Artemisia*, *Rumex*, *Plantago*, and *Chenopodium*), and trees (*Olea europaea*); mites (*Dermatophagoides pteronyssinus* and *D. farinae*); molds (*Alternaria*, *Cladosporium*, and *Aspergillus*); and cat and dog epithelia (Abelló SA, Spain).

All 107 patients were questioned about conventional immediate symptoms after contact with latex products (surgical and household gloves, enema kits, catheters, dental cofferdams, toy ballons, condoms, baby pacifiers, etc.).

Skin testing

In all 107 patients (those allergic to food and controls), SPTs were carried out on the volar surface of the forearm with the pneumoallergens and a standardized commercial latex allergen (Stallergènes SA, Fresnes, France). Further prick to prick testing was performed with natural fruits, as described by Dreborg & Foucard (14), on patients who displayed symptoms to these foods; briefly, a standardized lancet was pricked into fresh fruits and immediately thereafter into the skin. Both a positive (histamine 10 mg/ml) and negative (saline solution in 50% glycerol) control were included. Results were graded according to the EAACI guidelines (15).

Measurement of specific IgE levels

Specific IgE to latex (in all patients) and fruits (in patients with clinical evidence of fruit allergy) were determined by the Pharmacia CAP System (Pharmacia, Uppsala, Sweden). Values of >0.35 kU/l were considered positive.

Statistical methods

The chi-square test was used for differences between proportions of both groups (FAP and controls). The Mann-Whitney nonparametric *U*-test was used for comparisons between groups of serum samples. Values of $P<0.05$ were considered significant.

Results

Sensitization to latex

Immunologic latex sensitization in FAP occurred commonly, 49/57 (85.9%) of subjects reacting with a positive STP and/or CAP to latex (females 57%), but only 2/50 (4%) of the atopic control subjects ($P<0.001$) (Table 1). According to the presence of specific IgE in serum, 48/57 (84%) were sensitized to latex (specific IgE ranging from 0.41 to 14.9 kU/l). SPT was positive in 40/57 (70%) FAP. Nine patients were STP negative, but had specific IgE to latex, while only one patient was STP positive, but CAP negative. Thus, the commercial SPT extract was less sensitive than CAP. All the FAP were atopic in terms of clinical sensitization to common pneumoallergens. There were no occupational differences between the groups.

All the patients who had had problems with food previously reported to be associated with LA, such as banana, avocado, tomato, or chestnut, were sensitized to latex. Muskmelon was the food most commonly implicated in clinical reactions (33/49); in this group, 90.9% were sensitized to latex. However, conclusions about individual fruits cannot be drawn, because most patients were sensitized to several fruits.

Clinically relevant allergy to latex

In the FAP with immunologic latex sensitization, six patients (12.2%) had a clear history of reactions to latex (100% females). Table 2 shows the symptoms and the relation with latex products. Specific IgE to latex was not significantly higher in the group of symptomatic patients than in the group of nonsymptomatic ($P=0.23$) (Fig. 1). Since only six symptomatic patients were studied, a general conclusion cannot be drawn.

Table 2. Data of fruit-allergic patients with clinical symptoms from latex

Patient no.	Sex (F/M)	Age (years)	Symptoms caused by		STP ¹ (mm) Latex	CAP ² Latex	Atopy	Occupation
			Latex	Fruit				
1	F	55	Gloves: CU, C	Peach: AE, OAS, R Sunflower seeds: AN, OAS Pistachio: GU, AE, OAS	5	1.63	RC: Grass Olive Weeds	Cleaner
2	F	34	Gloves: AN	Peach: AN Pear: AN Almond: OAS Chestnut: OAS Mulberry: OAS	8	12	RC: Olive Weeds	Housewife
3	F	16	Gloves: CU	Banana: GU	7	0.98	RC: Grass Olive Weeds	Student
4	F	19	Gloves: CU, AE Balloon: AE	Muskmelon: OAS Watermelon: OAS Banana: OAS	8	3.20	RC: Grass Olive Weeds	Student
5	F	36	Condoms: CU, GU	Muskmelon: OAS Watermelon: OAS	Neg.	2.90	RC, A: Grass Olive Weeds	Housewife
6	F	30	Dental procedure: AN	Peach: AN Cherry: AN Muskmelon: AN Banana: AN Avocado: AN Hazelnut: OAS Apple: OAS Grape: OAS Almond: OAS Walnut: OAS	10	12	RC, A: Grass Olive Weeds	Secretary

¹Wheal diameters; ²kU/l. AE: angioedema; AN: anaphylaxis; CU: contact urticaria; GU: generalized urticaria; R: rhinitis; A: asthma; C: conjunctivitis; OAS: oral allergy syndrome; Neg.: negative.

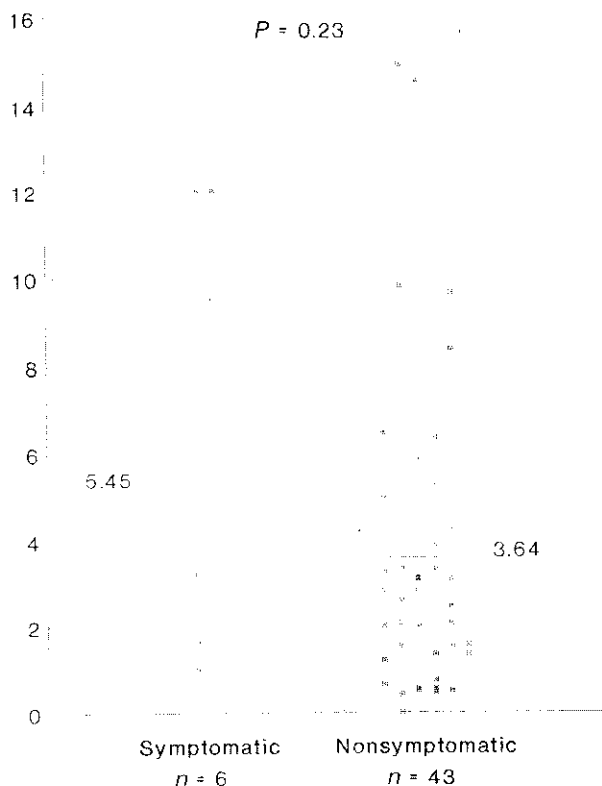


Fig. 1. Specific IgE to latex (kU/l) in symptomatic ($n=6$) and nonsymptomatic ($n=43$) patients. Bars represent median values.

In all patients, the clinical symptoms to fruits preceded the history of LA. OAS or urticaria was observed in almost all patients, and these disorders were sometimes associated with anaphylaxis (in 3/6 patients). In relation to this, it is significant that among the patients with asymptomatic sensitization to latex, only 2/43 (4%) had anaphylactic reactions to fruits ($P<0.01$).

None of the 50 atopic control subjects reported typical clinical symptoms after contact with latex products. The difference between the fruit-allergic group and the control group was almost significant ($P=0.052$). Two patient controls had a positive CAP (0.50 and 0.62 kU/l) and negative STPs to latex without history of latex-associated reactions.

Discussion

In this study, we examined the prevalence of LA in FAP. We found a rate of sensitization to latex of 85.9% in this group. The proportion was significantly greater than that among the controls (non-fruit-allergic atopic patients). The data indicate that simultaneous sensitization to latex and fruits is common. The prevalence of type I LA in the general population is believed to be less than 1% (16, 17). Recently, a serologic screening study has been performed in unselected blood donors, and the prevalence of latex-specific IgE antibodies was

as high as 6.4% (18). In atopic populations, the frequency seems to be higher (3–9.5%) (17, 19). However, many FAP, although sensitized to latex, did not report symptoms on contact with latex products. Clinical symptoms to latex occurred in 6/57 (10.5%) patients with allergy to fruits. This proportion was almost statistically significantly greater than that among the controls ($P=0.052$).

Among the FAP, the symptomatic latex-allergic population was predominantly female, but in our series this cannot be explained by jobs of different risk. The repeated exposure of women to household gloves may be the reason. Other authors have reported a similar prevalence in women (20–22).

The explanation of the high prevalence of sensitization to latex in FAP does not include extensive exposure to natural rubber, because patients who might have been in a well-defined risk group of LA were excluded. Latex is an antigenically complex material, and several protein allergens have been identified in natural rubber latex with structural homology to other plant (fruit) proteins, such as hevein (23), hevamine (24), a 46-kDa protein – homology with patatin – (13), and profilins (25). The cross-reactivity of multiple proteins or the existence of panallergens helps to explain the surprisingly high level of latex reactivity in FAP. However, these allergens, shared by latex and fruits, have not been fully identified, and the clinically significant allergens are unknown.

Immunoblot inhibition has demonstrated cross-reacting IgE antibodies to several proteins in latex and banana (26). All investigations have suggested that *in vitro* cross-reactivity is partial. LA has also been reported to be associated with allergy to other foods such as avocado, kiwi, fig, peach, plum, chestnut, peanut, tomato, papaya, and potato (8–13, 27), and our data suggest the existence of allergens common to other fruits such as muskmelon. Certainly, epitopes or the latex proteins themselves must be widespread in fruits, and not limited to a few fruits. Follow-up studies are needed to identify these fruits. If these fruits are identified, a different prevalence of LA may appear, depending on the food habits of a population.

It was interesting that symptomatic food allergy preceded the development of latex reactions, probably as a consequence of primary sensitization to fruit, rather than a response to the latex allergen itself. These findings suggest that a pre-existing fruit allergy could be an additional risk factor for clinical allergy to latex. Continued follow-up of patients with asymptomatic sensitivity to latex should clarify the significance of their positive tests. One could speculate that clinical symptoms may occur in the future in some of the sensitized patients. Thus, at the moment, we feel it appropri-

ate to consider that any patient allergic to fruit is at risk of latex sensitivity. Moreover, the possibility exists that different at-risk patient populations may produce IgE that recognize distinct latex peptides (28), but the clinical repercussions of this are unknown. It is possible that fruit/latex allergens have little clinical relevance, although our findings indicate that patients with fruit allergy react more frequently to latex than controls ($P=0.052$).

It was also of interest that clinical sensitization to latex was associated with systemic anaphylaxis to fruits. Patients with particularly anaphylactic reactions to fruits perhaps have more probability of clinical sensitization to latex than FAP with milder symptoms. For general conclusions about this, an increased number of patients would be required.

In conclusion, FAP exhibit the potential for allergic reactions to latex. We recommend a careful history of LA in all fruit-allergic patients. Skin tests and CAP with latex would identify the risk of allergic reactions.

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