

Prevalence of Food Allergy in 137 Latex-Allergic Patients

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ABSTRACT

There have been reports of increased prevalence of certain food allergies in patients with Type I latex allergy (LA). A detailed food allergy history was obtained from 137 patients with LA. Latex allergy was defined by positive history of IgE mediated reactions to contact with latex and positive skin prick test to latex and/or positive in vitro test (AlaSTAT and/or Pharmacia CAP). Food allergy was diagnosed by a convincing history of possible IgE mediated symptoms occurring within 60 minutes of ingestion. We identified 49 potential allergic reactions to foods in 29 (21.1%) patients. Foods responsible for these reactions include banana 9 (18.3%), avocado 8 (16.3%), shellfish 6 (12.2%), fish 4 (8.1%), kiwi 6 (12.2%), tomato 3 (6.1%), watermelon, peach, carrot 2 (4.1%) each, and apple, chestnut, cherry, coconut, apricot, strawberry, loquat, one (2.0%) each. Reactions to foods included local mouth irritation, angioedema, urticaria, asthma, nausea, vomiting, diarrhea, rhinitis, or anaphylaxis. Our study confirms the earlier reports of increased prevalence of food allergies in patients with LA. We also report increased prevalence of shellfish and fish allergy not previously reported. The nature of cross reacting epitopes or independent sensitization between latex and these foods is not clear. (Allergy and Asthma Proc 20:95-97, 1999)

Type I allergy to natural rubber is a problem that is increasingly being recognized worldwide. Several case reports and studies of groups of patients with latex allergy (LA)¹⁻³ have confirmed the increased prevalence of clinical food allergy to various foods. The foods most commonly causing clinical symptoms in patients with LA in-

clude banana, avocado, chestnut, kiwi, but increasingly, other foods, i.e., melons, apple, peach, potato, tomato, and celery causing allergic reactions in LA patients have been reported in the literature.¹⁻⁸ The purpose of our study was to determine the prevalence and clinical manifestations of food allergy in patients with LA.

MATERIALS AND METHODS

One hundred thirty-seven patients with diagnosis of Type I LA completed a questionnaire about symptoms of food allergy followed by a telephone interview for detailed descriptions of food related symptoms. The majority of patients with latex allergy were health care workers and females.

LA was diagnosed by a history of immunoglobulin E (IgE) mediated symptoms on exposure to latex and a positive skin prick test (SPT) with latex extract and/or detection of specific IgE to latex by in vitro analysis.

SPTs for latex were performed with raw latex and glove extracts as previously described.⁹ In vitro analysis of serum for the detection of specific IgE to latex was done by using two FDA approved tests, AlaSTAT (Diagnostic Products Corp., Los Angeles, CA) and CAP (Pharmacia Biotech., Uppsala, Sweden). The test was defined positive if the result was Class I or higher with one or both assays.

Food allergy was defined as a convincing history of clinical symptoms occurring within 60 minutes of ingestion of the offending food, suggesting IgE mediation. A confirmatory positive skin prick test or in vitro test was not required for our diagnosing a food allergy. SPTs for foods, when available, were performed with commercial food extracts. When available, serum samples were analyzed for the specific IgE to offending food using AlaSTAT or ImmunoCAP (Pharmacia & Upjohn, Kalamazoo, MI).

RESULTS

Forty-nine potential IgE mediated reactions to foods were diagnosed in 29 (21.1%) patients with LA. Immediate reactions to foods involved banana in 9 cases

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(18.3%), avocado 8 (16.3%), shellfish 6 (12.2%), fish 4 (8.1%), kiwi 6 (12.2%), tomato 3 (6.1%), watermelon, peach, carrot 2 (4.1%) each, and chestnut, apple, cherry, coconut, apricot, strawberry, loquat one (2.0%) each. SPTs with commercial extracts were available for 24 foods. SPTs were positive to 17 foods causing symptoms. In seven reactions to foods, SPTs were negative to the offending food. Specific IgE to the foods causing symptoms were available for 15 foods and were positive for eight foods causing clinical symptoms. Clinical reactions to foods included itchy mouth 21, angioedema 17, urticaria 14, asthma 8, nausea, vomiting, and diarrhea 8, rhinitis one, and anaphylaxis one (Table I).

In 11 patients, food allergy preceded LA whereas, in 12 patients, it followed LA. Five patients who had pre-existing food allergies developed sensitivity to new foods after acquisition of LA. All of these five patients had pre-existing allergy to shellfish or fish and, after acquisition of LA, developed new food allergies. In four of these patients, new allergies were to foods commonly reported previously, i.e., banana, avocado, kiwi, chestnut, watermelon, and tomato. One patient who had a long standing allergy to whitefish and banana developed new allergy to salmon after acquisition of LA (Table II). New food allergies developed from <1 year to 4 years after latex sensitization. In one patient, food and latex allergies developed simultaneously. Fourteen patients had multiple food allergies by clinical symptoms. SPTs to 17 foods causing symptoms were positive. Specific IgE antibodies to the eight offending foods causing symptoms were detected by in vitro analysis.

DISCUSSION

In the last 10–15 years, Type I LA has been increasingly recognized in certain groups especially health care and rubber industry workers and children with spina bifida.

TABLE I

Clinical Symptoms of Food Allergy in Latex-Allergic Patients

Type of Reaction	Number of Reactions	Foods Involved#
Itchy mouth	21	Bn, Ki, Av, To, Wa, Ca, Ap, Pe
Angioedema	17	Bn, Av, Ki, To, Ar, F, SF
Urticaria	14	Bn, Av, Ki, To, Co, St, F, SF
Asthma	8	Bn, Av, Pe, Ch, Ct
N/V/D*	8	Bn, Ap, Pe, To, F, SF
Rhinitis	1	Bn
Anaphylaxis	1	Lo

*Nausea, Vomiting, Diarrhea

#Ap, Apple; Ar, Apricot; Av, Avocado; Bn, Banana; Ca, Carrot; Ch, Cherry; Co, coconut; Ct, Chestnut; F, Fish; Ki, Kiwi; Lo, Loquat; Pe, Peach; SF, Shellfish; St, Strawberry; To, Tomato; Wa, Watermelon.

TABLE II

Relationship of Onset of Food and Latex Allergy in Patients with Pre-existing Food Allergy

Patient No.	FA Before LA* (Duration Years of FA)	LA Duration (Years)	FA After LA (Duration Years of FA)
1	Tuna (>20)	9	Avocado (<1)
2	Shellfish (20)	3	Banana (2)
3	Halibut (>20)	7	Kiwi (4) Tomato (4)
4	Shrimp (>20)	12	Chestnut (4) Watermelon (4)
5	Whitefish (>20) Banana (15)	10	Salmon (2)

*FA, food allergy; LA, latex allergy.

Clinical food allergy is increasingly being recognized in patients with LA.

We report a prevalence of 21% of food allergy in patients with LA. This number is less than reported previously in some studies, 52% by Blanco et al.¹ 36% by Beezhold et al.,² and 42% by Brehler et al.³ One major problem with food allergy studies is lack of consensus on definitions. We used a strict criteria of including only those reactions occurring within 60 minutes of food ingestion, suggesting possible IgE mediated mechanism. Previous studies have not described the time between ingestion of food and onset of reaction. Also, some studies³ have included nonspecific reactions, i.e., malaise, as a symptom of food allergy, which is not universally accepted. The drawback of our definition of food allergy is that it is based solely on the convincing history, and confirmatory positive in vitro or SPTs were not available in all cases, which may have over estimated the prevalence. The prevalence of food allergy is not known in the general population. In the United States, it has been estimated that 6–8% of infants and 1.5% of adults have true food allergy.¹⁰ All previous studies,^{1–3} including this report, demonstrate an increased prevalence of food allergy in LA patients.

Double blind, placebo-controlled food challenge (DBPCFC) is considered the gold standard for the diagnosis of food allergy.¹¹ Neither our study nor most of the previous studies of food allergies in LA patients have confirmed the convincing food allergy histories with DBPCFC, which may result in much lower prevalence of food allergy in LA patients. Apart from time and effort and reservations on the part of patient and physician if the reaction to food has been life threatening, there are other limitations to DBPCFC. In patients whose food allergy symptoms are limited to oral contact sensitivity, use of commercially available desiccated food capsules will not elicit the symptoms because of lack of contact with the oral mucosa. In LA patients, oral contact sensitivity is often the only symptom making this capsule challenge problematic. The amount of food eliciting symptoms and a broad spectrum of clinical manifestations

of food allergy further complicates making a definite diagnosis. Using open challenge, single blind challenge, or labial challenge may be helpful in certain situations to confirm symptoms reported by patients.

We report increased prevalence of crustacean (12%) and fish (8%) allergy in LA patients not previously reported. Interestingly, five patients who had pre-existing food allergy and, after latex sensitization had acquired new food allergies, were all crustacean- or fish-allergic. To date, there is no evidence of presence of any cross-reactivity between latex and crustacean or fish. Shellfish and fish allergens have not been extensively studied. Only codfish major allergen *Gad c I*, a parvalbumin and shrimp major allergens, Antigen II, *pen a I*, *Pen i I* analogous to tropomyosin have been identified. Generally, it is thought that cross-reactivity occurs between fruits that belong to closely related families, but a report by Arruda et al.¹² describes a new family, *calcynins*, which not only include major inhalant allergens from dog, cockroach, and mouse, but also β -lactoglobulin, a major cow milk allergen. Whether similar kinds of families, including allergens from latex and shellfish and fish, exists is not known at present. Cross inhibition studies to investigate this possibility are needed. We also report two other foods, coconut and loquat, causing food allergy in LA patients not previously reported.

The presence of cross-reactive IgE antibodies to latex and various foods has been shown by cross-inhibition studies.^{1,3,13-15} The nature of shared epitopes of latex and various foods is not known. Several possible culprits have been suggested by recent studies. Plant lysozymes belong to a family of proteins called defense related proteins, which protect plants from pathogen attack. A 27 KD protein with lysozyme activity has been reported in latex.¹⁶ Presence of lysozyme activity in avocado,¹⁷ fig,¹⁸ and papaya¹⁹ fruits known to cause allergic reactions in LA patients have been described. Further studies to determine whether these lysozymes have common antigenic determinants may help explain some of these cross-reactivities. Other enzymes that are present in various plants may also act as common antigens. Hev b 7, a 46 KD allergenic protein, has 60% homology with patatin, a protein found in potato and tomato, and may be the responsible common antigen.² Profilins is a class of proteins present in plants of diverse species including *Hevea brasiliensis*.^{20,21} These proteins are not only present in pollens but also roots, leaves, and fruits of plants, thus expanding the spectrum of allergic manifestations depending on how a susceptible person comes in contact with these antigens. These proteins are usually heat labile, therefore causing symptoms when ingested raw, as occurs commonly in LA patients with food allergies. Some of these proteins have structural similarities and have IgE binding and induce histamine release from basophils and may account for cross-reactivity, although profilins are not a major allergen in any single plant.²²

Our study confirms the increased prevalence of food allergy in LA patients as reported earlier. We also report increased prevalence of shellfish and fish allergy in this

group not previously reported, although from our data, we cannot conclude that these food allergens are relevant cross-reacting allergens due to shared epitopes. The increased prevalence of fish and shellfish allergy may simply reflect their increased prevalence in adults.

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