

Cucumber Anaphylaxis in a Latex-Sensitized Patient

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■ Abstract

We report the case of a 76-year-old woman who experienced dizziness, vomiting, dyspnea, thoracic erythema, and vaginal itching within 5 minutes of eating cucumber. She had been diagnosed 3 months earlier with papaya urticaria and latex sensitization. The results of skin prick tests were positive for cucumber, watermelon, papaya, and latex and negative for melon and profilin extracts. ImmunoCAP for latex-specific serum immunoglobulin (Ig) E was positive. Cucumber-specific serum IgE was negative. Immunoblot analysis using patient serum revealed a 30- to 32-kDa protein band in the cucumber (peel) and papaya extracts. Immunoblot inhibition with latex extract demonstrated inhibition of the band in both extracts. Immunoblot inhibition with cucumber-papaya and papaya-cucumber revealed inhibition of the same band in the cucumber and papaya extracts, respectively.

We present a case of IgE-mediated allergy to cucumber and papaya. Our results strongly suggest that the allergen(s) implicated are associated with latex sensitization. To our knowledge, this is the first report of cucumber-latex and cucumber-papaya cross-reactivity.

Key words: Cucumber allergy. Latex. Cross-reactivity. Anaphylaxis. Papaya.

■ Resumen

Se presenta el caso de una mujer de 76 años con anafilaxia a los 5 minutos tras ingesta de pepino. Tres meses antes había sido diagnosticada de urticaria por papaya y sensibilización a látex. Las pruebas cutáneas con pepino, sandía, papaya y látex resultaron positivas. La IgE específica sérica (ImmunoCAP) fue positiva para látex y negativa frente a pepino. En los extractos de pepino (piel) y papaya se identificó una banda proteica de 30 a 32 kDa que reconocía mediante IgE el suero de la paciente. Los estudios de inmunoblot-inhibición mostraron la inhibición completa de la banda de reconocimiento en el pepino y papaya por el látex, y también por papaya y pepino respectivamente. Se ha demostrado alergia por hipersensibilidad tipo I frente a pepino, papaya y látex. El alérgeno implicado parece ser el mismo en los tres vegetales. Se trata de la primera descripción de reactividad cruzada látex-pepino y pepino-papaya

Palabras clave: Alergia a pepino. Látex. Reactividad cruzada. Anafilaxia. Papaya.

Introduction

Plants are a frequent cause of food allergy, which is affecting increasing numbers of people [1]. Cucumber (*Cucumis sativus*) belongs to the Cucurbitaceae family, which also includes melon, watermelon, squash, and pumpkin.

Case Description

We report the case of a 76-year-old woman who was admitted to our Allergy Department due to dizziness, vomiting, dyspnea, thoracic erythema, and vaginal itching within 5 minutes of ingesting an incompletely peeled

cucumber. She was attended in the emergency room for hypotension (60/40 mmHg) and hypoxia (SpO₂ 85%) and received oxygen, fluid therapy, corticosteroids, antihistamines, and antiemetics and was admitted to hospital for a few days to ensure a complete recovery. Three months before, the patient had presented an episode of papaya urticaria and the workup for this reaction revealed sensitization to latex. She had never presented symptoms with other plant foods (except papaya), including cucumber-related fruits (melon, watermelon), or with latex products. After the reaction to papaya, she was advised to avoid exposure to latex and to follow a diet that did not contain foods that cross-reacted with latex (chestnut, banana, kiwi, avocado).

The patient had no history of allergic rhinitis, asthma, or atopic eczema and had undergone 1 operation (knee intervention). In her youth, she worked as chemical engraver for 10 years, using latex gloves occasionally. She had not habitually used latex in her daily life and had not presented symptoms after occasional contact with latex.

Her family history was negative for atopic diseases.

An allergy study was conducted after obtaining her informed consent.

Skin prick tests (SPT) were performed with a standard commercial battery of inhalants (pollen, dust mite, molds, animal dander), melon, banana, kiwi, profilin, and latex. We carried out SPT (prick-by-prick) with fresh foods (cucumber, tomato, watermelon, squash, pumpkin, chestnut, and avocado). Saline solution (0.9%) and histamine (10 mg/mL) were used as negative and positive controls, respectively. Wheal and flare diameters were measured after 15 minutes. SPT was considered positive if the wheal diameter was greater than 3 mm when compared with the negative control.

Testing for serum tryptase and serum total immunoglobulin (Ig) E was performed. We determined specific IgE for cucumber, papaya, banana, latex, Bet v 2 (birch profilin), papain, and bromelain (ImmunoCAP technique, Phadia, Uppsala, Sweden) and specific IgE for Hev b 1 (latex elongation factor), Hev b 5 (latex acid protein), Hev b 6 (latex prohevein), Hev b 8 (latex profilin), Prs a 1 and Cas s 5 (avocado and chestnut chitinase), Mal d 4 (apple profilin), Pru p 3 (peach lipid transfer protein) (ADVIA-Centaur, Siemens Medical Solutions Diagnostics) (Table).

As allergy to cucumber has not been previously described in patients sensitized to latex, we performed immunoblot studies using in-house cucumber (peel and pulp) and papaya extracts (10% w/v). Commercial extracts were used for natural latex and melon (ALK-Abelló, Madrid, Spain).

An allergy workup revealed a negative SPT result with a commercial battery of inhalant allergens. SPT with commercial latex, banana, and kiwi extracts were positive and negative for melon and profilin extracts. Prick-by-prick results for cucumber (peel and pulp), tomato, papaya, watermelon, squash, pumpkin, chestnut, and avocado were positive (Table).

The baseline serum tryptase level was 1.62 µg/L and total serum IgE was 226 kU_A/L.

The immunoblot for cucumber peel extract showed 1 IgE-binding band of 30 kDa. No IgE-binding bands were detected in the cucumber pulp extract immunoblot. Immunoblotting showed an IgE-binding band of approximately 32 kDa for

Table. Levels of Specific Immunoglobulin E in the Patient's Serum and SPT With Wheal Size

Food/Allergen (Molecular Weight)	Specific Immunoglobulin E, kU _A /L	Skin Prick Test, mm
Cucumber	<0.35	10 (peel) 5 (pulp)
Papaya	0.49	14
Latex	>100	55 pseudopods
Bet v 2 (15 kDa)	<0.35	–
Mal d 4 (14.4 kDa)	0.01	–
Prs a 1 + Cas s 5 (32 kDa)	0.20	–
Pru p 3 (9 kDa)	0.00	–
Hev b 1 (14.6/58 kDa)	0.41	–
Hev b 5 (16 kDa)	12.44	–
Hev b 6 (20/4.7 kDa)	12.41	–
Hev b 8 (14 kDa)	0.02	–
Papain	0.00	–
Bromelain	0.00	–
Banana	0.76	8
Chestnut	–	9
Avocado	–	7
Kiwi	–	7
Watermelon	–	7
Melon	–	0
Squash	–	7
Pumpkin	–	6
Tomato	–	7
Profilin	–	0
Saline solution, 0.9%	–	0
Histamine, 10 mg/mL	–	9

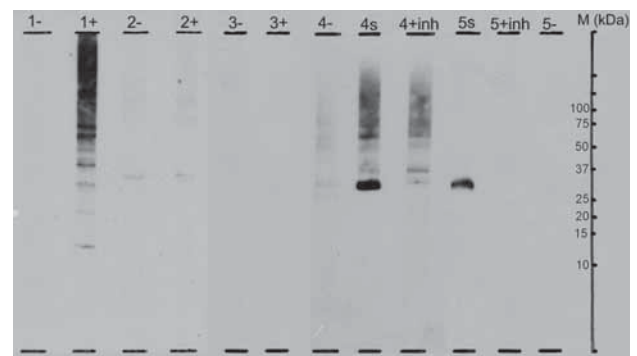


Figure 1. Immunoblot and immunoblot inhibition with cucumber-latex and papaya-latex. Lane 1–, latex extract + buffer; lane 1+, latex extract + patient's serum; lane 2–, melon extract + buffer; lane 2+, melon extract + patient's serum; lane 3–, cucumber extract (pulp) + buffer; lane 3+, cucumber extract (pulp) + patient's serum; lane 4–, cucumber extract (peel) + buffer (negative control); lane 4s, cucumber extract (peel) + patient's serum; lane 4+inh, cucumber extract (peel) + patient's serum preincubated with latex extract; lane 5s, papaya extract + patient's serum; lane 5+inh, papaya extract + patient's serum preincubated with latex extract; lane 5–, papaya extract + buffer (negative control).

the papaya extract and several IgE bands for the latex extract. Serum did not recognize any IgE-binding bands in the melon extract.

Cross-reactivity between latex, cucumber, and papaya

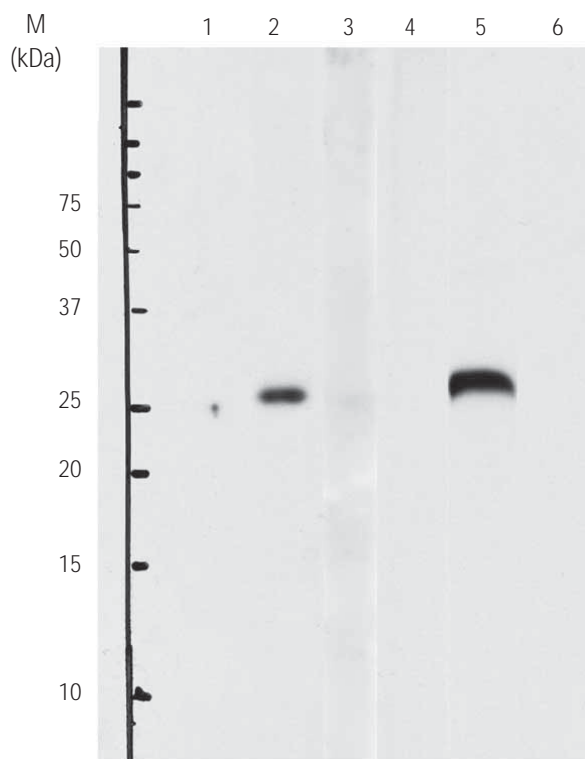


Figure 2. Immunoblot inhibition with cucumber-papaya and papaya-cucumber. Lane 1, cucumber extract + buffer (negative control); lane 2, cucumber extract + patient's serum; lane 3: cucumber extract + patient's serum preincubated with papaya extract; lane 4, papaya extract + buffer (negative control); lane 5, papaya extract + patient's serum; lane 6, papaya extract + patient's serum preincubated with cucumber extract.

was assessed by immunoblot inhibition, which revealed inhibition of the 30- to 32-kDa IgE-binding protein band of cucumber peel and papaya extracts with the latex extract (Figure 1). Immunoblot inhibition with cucumber-papaya and papaya-cucumber revealed inhibition of this protein band in the cucumber and papaya extracts, respectively (Figure 2). However, neither cucumber nor papaya conclusively inhibited binding of serum to any of the latex allergens. An attempt was made to inhibit the latex allergens Hev b 5 and Hev b 6 with papaya and cucumber extracts by enzyme immunoassay (ADVIA Centaur), but the results were inconclusive, possibly because of interference from whole extracts (which contain sugars and pigments).

Regarding latex tolerance, when papaya urticaria and latex sensitization were diagnosed, the patient did not report symptoms after contact with latex. During the early follow-up period, she developed symptoms after accidental contact with latex (itching and wheals) and she had a very positive SPT result to latex extract; therefore, latex hypersensitivity was diagnosed, and no other latex exposure tests were performed.

The patient had a positive SPT result to chestnut, banana, kiwi, and avocado, all of which are associated with anaphylaxis in the latex-fruit syndrome. She did not habitually eat these

foods and, therefore, was advised to avoid them. This was not the case with tomato, a vegetable that the patient tolerates and eats daily, despite a positive SPT result.

Our patient tolerated fruits belonging to the cucumber family (watermelon, melon, squash, and pumpkin). She had a positive SPT result to watermelon, squash, and pumpkin, but all tests were negative for melon. As the patient did not habitually eat watermelon or melon (seasonal fruits) and rejected a challenge test with these fruits, she was advised to avoid both. She tolerates squash and pumpkin.

Discussion

Few publications analyze severe allergic reactions to cucumber or cross-reactivity with latex or other vegetables. Jordan-Wagner et al [2] described patients with cucumber oral allergy syndrome, laryngeal edema, and anaphylaxis. Cross-reactivity between cucumber and taxonomically related foods (watermelon) and taxonomically unrelated foods (celery, carrot) was confirmed, with the implication of a 15-kDa common protein corresponding to profilin [2].

We present the case of a patient who experienced cucumber anaphylaxis, papaya urticaria, and latex hypersensitivity. The patient had a positive SPT result to cucumber, and sodium dodecyl sulfate-polyacrylic gel electrophoresis (SDS-PAGE) revealed a 30- to 32-kDa IgE-binding protein band in the cucumber (peel). She also had a positive SPT result to watermelon, squash, and pumpkin, although all tests were negative for melon (including immunoblot). The patient had an allergy to papaya that was confirmed with a positive SPT, serum specific IgE, and immunoblot.

Hypersensitivity to latex was established based on the positive SPT result, latex-specific IgE, and positive immunoblot result. Tolerance to latex was not assessed, because the patient developed symptoms after accidental latex contact (itching and wheals) during the follow-up period.

In the immunoblot inhibition, the 30- to 32-kDa protein band recognized in the cucumber and papaya extracts was inhibited with latex extract in both cases, confirming latex-papaya and latex-cucumber cross-reactivity. In addition, immunoblot inhibition with cucumber-papaya and papaya-cucumber demonstrated cucumber-papaya cross-reactivity. Although cross-reactivity between latex and papaya has been described elsewhere [3,4], our results confirm for the first time latex-cucumber and cucumber-papaya cross-reaction. The cucumber and papaya extracts did not conclusively inhibit binding of serum to any of the latex allergens. One possible explanation is that cross-reactivity between these plants is caused by epitopes rather than complete allergens [5]. Another possible explanation is that IgE binds to latex allergens with high affinity; therefore, it is difficult to inhibit binding with papaya and cucumber.

It was not possible to identify the protein from the SDS-PAGE band (Coomassie stain), since it was not clear which protein band corresponded to the allergen involved.

Cross-reactivity between latex and vegetables is mainly due to the similarity of latex hevein with the N-terminal domain of type I chitinases, a protein found in avocado, chestnut, banana,

papaya, beans, and other plant foods [3,4,6-8]. In our case, the serum presented Hev b 6-specific IgE. Other allergens recognized by serum in the latex extract were Hev b 1 and Hev b 5, although their molecular weight was not close to 30 to 32 kDa. Depending on the molecular weight of the IgE-binding protein, hevein may be involved in latex-cucumber and latex-papaya cross-reactivity through cucumber-papaya-specific type I chitinase. Despite incomplete homology with chestnuts and avocado type I chitinase, the presence of hevein could explain cucumber-papaya cross-reactivity. We cannot rule out the involvement of an acid protein dimer or an unknown protein. Negative results to profilin, LTP, papain, and bromelain ruled out the involvement of these panallergens in this case.

In the natural history of latex–fruit syndrome, latex allergy precedes food hypersensitivity in most patients, although the opposite is also observed. It is sometimes difficult to establish the chronological sequence.

While our patient's first reaction was to papaya, at the time this allergy was diagnosed, the patient was already sensitized to latex. In this case, it is difficult to establish the primary sensitizer, because the hypersensitivity reaction to latex and papaya was diagnosed at the same time, and the patient subsequently presented cucumber anaphylaxis. The most likely chronology could be latex sensitization followed by papaya allergy. Primary sensitization to papaya could not be ruled out.

Acknowledgments

The case report was presented as a poster entitled "Cucumber Allergy: A New Plant-derived Food with Cross-reactivity to Latex", at the 28th Congress of the European Academy of Allergology and Clinical Immunology, Warszawa, Poland, June 6-10, 2009.

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