

Apple desensitization in two patients with PR-10 proteins allergy

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PR-10 proteins belong to pathogenesis-related (PR) proteins and consist in Bet v 1 homologous (proteins that have an aminoacid sequence homology with the allergen Bet v 1 from birch pollen) induced in stress conditions (1).

Bet v 1 is the major allergen of birch and about 50–70% of birch pollen allergic patients, usually after respiratory sensitization, report symptoms after ingestion of fruits and vegetables, as tree nuts, kiwi, soybean and belonging to *Rosaceae* family (apple, pear, peach, plum, apricot, almond) and *Apiaceae* family (celery, carrot, fennel).

PR-10 proteins are randomly distributed in pulp and peel (2) and they are labile to heat, oxidation, extraction procedures and pepsin

digestion (3); therefore, PR-10 allergic patients mostly experience local reactions in the oropharyngeal mucosa (*oral allergy syndrome-OAS*) after eating fresh foods, while they currently tolerate heat-processed foods as commercial fruit juices.

We describe the case of two birch pollen allergic patients, a 13-year-old boy (patient 1) and a 42-year-old man (patient 2), with OAS after eating some fruits and vegetables that have been undergone to apple desensitization.

Patient 1 referred oropharyngeal itching and lip angioedema after eating apple, cherry, kiwi, peach and hazelnut. Patient 2, with history of rhinoconjunctivitis and asthma from March to June, presented throat constriction, oropharyngeal itching, cough and oral ulcers after ingestion of apple, cherry, peach, plum, carrot, fennel, walnut, almond and hazelnut.

Skin prick tests (SPT) to pollens (grass pollen, *parietaria*, olive tree, cypress, mugwort, birch, beech tree, hazel tree, oak, linden and pine), latex and some fruits (apple, cherry, kiwi, peach, hazelnut, peanut, banana, pear, walnut, soybean, fennel and carrot) were performed.

Moreover, we tested patients also for LTP and profilin: SPT (Alk-Abellò, Milan, Italy) and specific IgE (UniCAP, Phadia, Uppsala, Sweden) were negative in both.

Patient 1 had positive SPT to apple, cherry, kiwi, hazelnut, birch and specific IgE only to apple

(1.9 kU/l), birch (26.2 kU/l) and Bet v 1 (29.9 kU/l).

He underwent double-blind placebo-control food challenge (DBPCFC) with hazelnut and Stark apple, which resulted positive (oropharyngeal itching and throat-ache that receded spontaneously). DBPCFCs with other culprit fruits were not performed because the patient had had recent reactions.

Then, he underwent an oral desensitization treatment with a mix of the most consumed four apple varieties (Stark, Golden, Fuji, Smith) in Italy, without side-effects. (Table 1) (4).

At the end of the treatment, the patient underwent DBPCFCs with those four apple varieties, with other apple varieties (Reineta, Morgenduft and Annurca), hazelnut, kiwi, peach and cherry. Challenges were negative for all foods with the exception of hazelnut that elicited throat constriction, cough and dysphonia.

Patient 2 had positive SPT to *parietaria*, cypress, birch, beech tree, hazel tree, oak, linden, pine, apple, cherry, peach, carrot, fennel, soybean, hazelnut, peanut and walnut, and specific IgE were positive to birch (11.1 kU/l), hazel tree (21.2 kU/l), beech tree (6.90 kU/l), oak (5.89 kU/l), apple (2.65 kU/l) and Bet v 1 (23.2 kU/l).

He underwent DBPCFCs with Stark apple, fennel, carrot and walnut that resulted positive (cough and oral itching) only for apple and fennel.

We attempt an apple desensitization treatment in 2 patient with Bet v 1 allergy and oral allergy syndrome.

Table 1 Protocol of four apple (Fuji, Smith, Golden, Stark) varieties desensitization treatment

Dilution	Days	Initial dose (once a day)	Final dose (once a day)	Increasing dose every 3 days
1 drop of apple solution (1 g/ml)* in 100 ml of water	1–9	1 drop	60 drops	
10 drops of apple solution (1 g/ml)* in 100 ml of water	10–18	1 drop	60 drops	
10 drops of apple solution (1 g/ml)* in 10 ml of water	19–27	1 drop	60 drops	
100 drops of apple solution (1 g/ml)* in 10 ml of water	28–45	1 drop	4 ml	
Apple-mix shake	46–78	1 g	5 g	0.5
	79–99	6 g	12 g	1
	100–111	12 g	20 g	2
	112–120	23 g	29 g	3
	121–129	33 g	41 g	4
	130–138	46 g	56 g	5
	139–147	62 g	76 g	6
	148–186	76 g	206 g	10

*(12.5 g of each apple varieties in 100 ml of water).

Therefore, patient 2 underwent the same oral desensitization treatment without side-effects. (Table 1).

At the end of the treatment, he underwent DBPCFCs with those four apple varieties and fennel that were negative.

In this case report, we tried to evaluate the effectiveness of food desensitization in patient with PR-10 proteins sensitization. At the end of the treatment, patients showed tolerance to both several apple varieties and other PR-10 cross-reacting foods. Could apple desensitization have a potential therapeutic role to induce a tolerance to other foods in PR-10 proteins allergic patients?

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