

Clinical Notes

A case of oral immunotherapy for peach allergy sensitized to Pru p 7

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Recently, researchers found that the gibberellin-regulated protein (GRP), Pru p 7, induces systemic allergic reactions as a component of peach allergy.¹ Specifically, Pru p 7 is mainly associated with severe anaphylaxis in Japanese patients with peach allergy, although lipid transfer protein (LTP), Pru p 3, is not.^{2,3} However, no published reports have described the administration of oral immunotherapy (OIT) to patients sensitized to Pru p 7. Here, we report a case that demonstrates the potential effectiveness of OIT for peach allergy with Pru p 7 sensitization.

A 10-year-old boy ingested a school lunch containing almost 10 g of canned yellow peaches. Following this, he exercised for 20 min. He then developed an anaphylactic reaction. Upon arrival at the hospital, he received an intramuscular injection of adrenaline. A few months later, he underwent a blood examination, a skin-prick test (SPT), and an initial open provocation test. The serum allergen-specific IgE (sIgE) level was measured using ImmunoCAP® (Thermo Fisher Scientific, Uppsala, Sweden). The crude peach-sIgE level was found to be 6.69 U_A/mL and the Pru p 7-sIgE was 33.4 U_A/mL, although the Pru p 3-sIgE was <0.1 U_A/mL. The mean wheal size induced by the SPT with a raw peach pulp was 5.0 mm. He was not performed SPT with peach peels which is rich of Pru p 3. A basophil activation test (BAT), conducted using a peach (BML, Inc., Tokyo, Japan), revealed an upregulation of CD203c expression on the basophils relative to the positive control.

In August, the patient was subjected to an initial open provocation test using half of a peeled raw peach with exercise on a treadmill. After 90 min, he developed urticaria and swelling of the head, face, neck, and thighs. The reaction was deemed systemic and a peach allergy sensitized to Pru p 7 was diagnosed. After obtaining written informed consent

from the parents to initiate OIT with peaches, therapy was initiated.

Oral immunotherapy consisted of the daily ingestion of 1 g of raw or canned peaches. At that time, it was unclear how much the allergen was denatured during the canning process. The patient therefore started OIT using raw peaches. However, in the season when raw peaches were unavailable, he used canned peaches that were known to be positive for SPT. The subsequent doses were consumed once daily at home. During a build-up period, the dose was increased from 1 g to one-third of a whole peach. The patient then began a maintenance period, during which he continued to ingest one-third of a peach pulp for 3 years at a frequency that decreased every few months from every day to every other day, once every 3 days, and finally once or twice per week. During OIT, the patient did not exhibit local or systemic adverse reactions, including oropharyngeal symptoms. Table 1 presents the sequential changes in the peach-sIgE and Pru p 7-sIgE concentrations, BAT results, and SPT wheal size.

Four years later, in August, the patient was subjected to a second open-provocation test using pulp from one raw peach, followed by exercise. The test result was negative, and the patient was allowed to ingest peach pulp freely thereafter. He has not presented with allergic symptoms for 2 years.

This is the first report to suggest the potential efficacy of OIT for a patient with a peach allergy sensitized to Pru p 7, as demonstrated by our ability to increase the threshold required to elicit an allergic response. Moreover, we demonstrated decreases in the peach-sIgE and Pru p 7-sIgE concentrations, SPT wheal size, and basophil response to peach antigens. During OIT, the biomarkers SPT and BAT decrease in severity at approximately 6 months after initiation, whereas the IgE levels decrease after approximately 12 months,⁴ consistent with our observations.

This analysis had some limitations. First, we could not clarify whether the patient's course was naturally occurring or a consequence of therapy. However, immunological changes in the BAT, SPT, and IgE parameters suggested the efficacy of OIT in our case. Second, we performed open provocation tests rather than double-blind placebo-controlled food challenge.

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Table 1 Course of blood markers and skin prick test

Year, Month	X, Aug. [†]	X +1, Jun.	X +1, Oct.	X +2, May	X +3, Mar.	X +4, Aug.
Total IgE (IU/mL)	622	805	697	710	915	1,682
Peach sIgE (U _A /mL) [‡]	6.69	8.2	7.07	6.56	1.79	2.3
Pru p 1 sIgE (U _A /mL) [‡]		<0.1				
Pru p 3 sIgE (U _A /mL) [‡]		<0.1				
Pru p 4 sIgE (U _A /mL) [‡]		0.762				
Pru p 7 sIgE (U _A /mL) [‡]	-	33.4	19.8	24.9	17.1	20.3
Japanese cedar pollen sIgE (U _A /mL) [‡]	-	303	186	207	177	141
Alder pollen sIgE (U _A /mL) [‡]		0.65	0.41	0.22	0.29	0.61
BAT (peach 200 µg/mL; %) [§]	44.5	13.9	3.4	-	-	-
BAT (peach 1,000 µg/mL; %) [§]	-	-	-	-	-	5.0
Raw peach SPT (mm)	5.0	4.0	-	-	3.0	2.5

BAT, basophil activation test; SPT, skin prick test.

[†]Before initiating oral immunotherapy.

[‡]Allergen specific-IgE values were measured using the ImmunoCAP system (Thermo Fisher Scientific, Uppsala, Sweden).

[§]The basophil activation test was conducted using BML, which detected an upregulation of CD203c expression.

^{||}The skin prick test was performed using the prick-to-prick method and a bifurcated needle (Allergy Laboratories of Ohio, Columbus, OH, USA).

Still, as Pru p 7 is considered a more common sensitizing agent than LTP in Japan,² we believe that it is important to investigate the effectiveness of OIT for Pru p 7 in the future.

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Disclosure

The authors declare no conflict of interest.

Author contributions

Y.K. wrote the manuscript. All authors collected clinical data. T.F., F.T., A.S., and O.N. gave technical support and conceptual advice. All authors read and approved the final manuscript.

Ethical consideration

Written informed consent for this report was obtained from the parents of the case subject.

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