

Hypersensitivity reaction to kiwi fruit (Chinese gooseberry, *Actinidia chinensis*)

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This report describes a hypersensitivity reaction to kiwi fruit in a patient who developed moderately severe generalized symptoms after handling the fruit. A search of the literature did not reveal any previous reference to kiwi-fruit sensitivity. It is suggested that IgE antibody is an important factor in the reaction. (J ALLERGY CLIN IMMUNOL 68:235, 1981.)

Acute hypersensitivity reaction to food allergens is a fairly common problem that is often seen in the allergist's office. Some of the common food allergens that cause sudden and explosive allergic reactions include nuts, seeds, fish, egg, and artificial food additives. I recently had an opportunity to see and evaluate a patient who had experienced several systemic reactions to kiwi fruit, a food substance not usually associated with allergic reaction.

CASE REPORT

The patient was a 53-yr-old white woman who was first seen in March 1974 because of sneezing and wheezing when exposed to cats. Intradermal skin testing at that time revealed marked four-plus reactions to cat dander, dog dander, and house dust. She was not seen again until January 1981 for evaluation of her present problem. While on vacation in Florida in December 1980, she was peeling and slicing kiwi fruit for a salad. Within 15 min she began to experience itchy eyes, hives on her hands, itching of her ears, and difficulty in breathing associated with wheezing in the chest area. She took two Sinutabs and within 2 hr the symptoms began to subside.

On January 5, 1981, the patient again handled kiwi fruit. Within 15 min she experienced the symptoms associated with the first episode, but more severe. She said that her head and throat "closed up." She took antihistamine (Benadryl) and within 1 hr had almost complete resolution of her symptoms except for some eyelid puffiness. She was seen in

our office on January 6, 1981. She had eaten kiwi fruit in the previous 2 or 3 yr without reaction but had never prepared it. The last time she recalled ingesting kiwi was on December 17, 1980, approximately 5 days before her first explosive reaction. She had not ingested kiwi fruit at the time of these two episodes.

METHODS

Kiwi fruit was purchased and two extracts were prepared. One extract consisted of the reddish-brown, hairy, outer covering of the fruit, and the second consisted of the remainder of the fruit, soft greenish pulp with many small, dark purple, edible seeds.

The extracts were made by grinding up the material and extracting each with Saline Allergy Diluent from Allergy Laboratories of Ohio (Columbus, Ohio). Five milliliters of extracting fluid were used for every gram of raw fruit (a 1:5 dilution ratio). The extracts were periodically stirred and were left overnight in a refrigerator. The next day they were filtered, and the filtrate was sterilized with a sterile millipore Seitz filtering device.

The patient was scratch tested with the following aqueous allergens: dog dander (1:50; Hollister-Stier), cat dander (1:50; Hollister-Stier), kiwi fruit skin (1:5), and kiwi fruit pulp (1:5).

The results are shown in Table I.

Blood was drawn under sterile conditions and allowed to clot. The blood sample was then centrifuged, and the serum was removed and refrigerated. Ten days later, several passive-transfer sites were injected intradermally into a volunteer recipient. After 48 hr these sites were challenged, along with parallel control sites, with diluent, kiwi, and papain (Fig. 1, Table II).

An attempt was made to determine whether the kiwi fruit antigen was a nonspecific irritant and capable of performing as a nonimmunogenic mast-cell degranulator. Ten normal nonallergic (by history) individuals and 10 symptomatic allergic individuals (grass-pollen related) were skin tested

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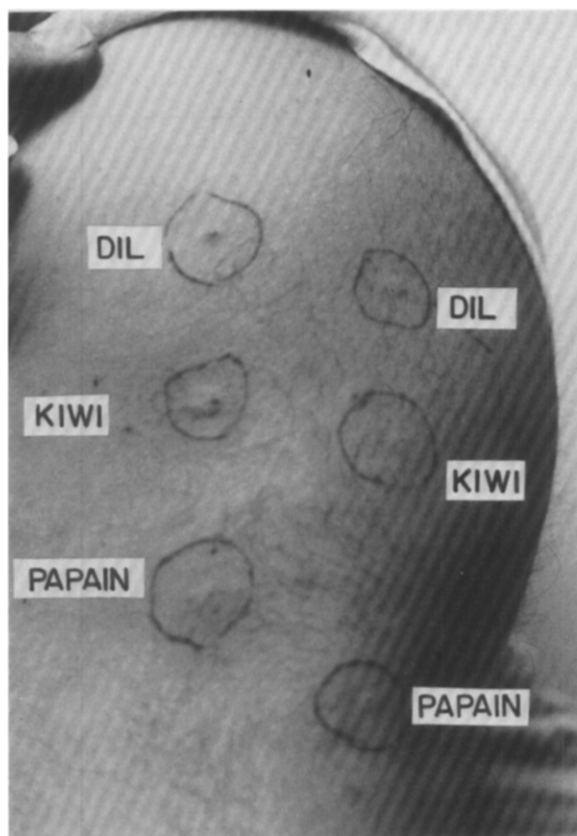


FIG. 1. Dramatic response to passive-transfer testing of kiwi antigen (fruit pulp). Unprepared control sites are on the right. *DIL*, Diluent.

with diluent, kiwi fruit pulp (1:5, scratch), and kiwi fruit pulp (1:1000, intradermal).

The results are summarized in Table III.

RESULTS

Table I shows the results of the scratch testing on the patient's forearm. The two-plus reactions were each approximately 10 mm in diameter, and the three-plus reactions were between 12 and 15 mm with pseudopods. The reactions to cat and dog dander took approximately 10 to 15 min to develop, whereas the kiwi antigen began to evoke a positive reaction consisting of itching, swelling, and redness within 5 min. The patient began to experience a tickling sensation of her throat during the scratch-test procedure. The patient was given 4 mg of Chlor-Trimeton orally and 0.2 ml of epinephrine subcutaneously. The symptoms began to subside within 10 to 15 min. She experienced no further difficulty and was asymptomatic 2 hr after her visit.

Fig. 1 shows the results of passive-transfer testing and the dramatic response to kiwi antigen (fruit pulp)

TABLE I

Antigens	Results
Diluent	Negative
Dog dander 1:50	2+
Cat dander 1:50	3+
Kiwi skin 1:5	3+
Kiwi fruit pulp 1:5	2+

TABLE II

Antigen	Passive-transfer site	Recipient controls*
Saline diluent	Negative	Negative
Kiwi fruit 1:1000	2+	Negative
Papain 1:1000	Negative	Negative

*No test sites were prepared for controls.

on the transfer sites (Table II). Papain was used as an antigen because the kiwi has proteolytic enzymatic properties similar to those of papain, a product derived from the papaya fruit.

Table III demonstrates that the material used was nonirritating and did not cause any nonspecific skin reactions in the limited series of 20 individuals tested.

DISCUSSION

Kiwi fruit¹⁻³ (botanical classification *Actinidia chinensis*) thrives along the Yangtze River valley in China. It was exported to New Zealand in the early 1900s and was commonly referred to as "Chinese gooseberry." A great many varieties have since been developed from the original line of seed. The plant grows as a tall vinelike structure, often attaining heights of 30 ft. It is unisexual and requires both a male and female plant for fertilization and fruit production. It needs a long, frost-free growing season of at least 235 days. The fruit has a proteolytic enzyme, actinidin,⁴ which may be used as a meat tenderizer in the same way as papain from the papaya fruit.

When New Zealand began exporting the fruit, the name was changed to kiwi to more closely identify it with the kiwi bird, the New Zealand national emblem. It is now grown in southern California, southern Texas, and parts of Florida. It is a rich source of vitamin C, and its main food use is in salads and desserts where it provides both decorative and substantive effects.

This study demonstrates a case of hypersensitivity to an uncommon food allergen, but as cultivation, importation, and consumption of kiwi increase, more

TABLE III

	Diluent (phenol-saline)	Kiwi 1:5 (scratch)	Kiwi 1:1000 (intradermal)
Normal-nonallergic (10 patients)	Negative	Negative	Negative
Allergic* (10 patients)	Negative	Negative	Negative

*Grass-pollen related.

such cases may be seen. Scratch testing and passive-transfer testing reveal that reactions to kiwi fall into the category of immediate hypersensitivity, most likely IgE mediated.

REFERENCES

1. de Zachs RL: Kiwi fruit. *Horticulture* **57**:52, 1979.
2. Simmons AE: Growing unusual fruit. New York, 1972, Walker & Co., pp. 83-84.

3. Astridge SJ: Cultivars of Chinese gooseberry (*Actinidia chinensis*) in New Zealand. *Econ Botany* **29**:357, 1975.
4. Carne A, Moore CH: Amino acid sequence of the tryptic peptides from actinidin, a proteolytic enzyme from the fruit of the *Actinidia chinensis*. *Biochem J* **173**:78, 1978.