

**Produce-induced contact
urticaria and dermatitis:
Solanaceae and Alliaceae**

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Contact urticaria may account for
~30% of occupational allergic con-
tact dermatoses in Finland (1). Food
handlers are especially prone to these
urticarial wheal and flare responses

(1–3), with numerous problematic foods described (4).

Case Report

A 48-year-old, atopic (eczema and asthma history), female supermarket produce manager presented with a 10-year history of urticarial lesions affecting, but not limited to, her palms, flexor surfaces of forearms, and antecubital fossae. Grocery store produce workers in San Francisco constantly pack, unpack, shelve, and sort fruits and vegetables on their work shift, leading to extensive arm and forearm exposure. Over time, oral contact with certain produce items also elicited reactions on her.

Initially, the urticarial reactions were localized to her arms and exacerbated by occupational exposure. Later, oral and occupational skin contact would trigger more widespread urticaria affecting the face, neck, and chest, with bronchospasm, gastrointestinal discomfort, and hypotension. These reactions resulted in self-administration of subcutaneous epinephrine and numerous emergency room visits for treatment of the immediate-type signs and symptoms. She developed disabling anxiety, refusing to leave her home, and consuming a vegetable-free diet. She also had a 20-year history of mild eczema, and this worsened in severity and extended after the urticarial attacks developed.

She underwent both open application and prick testing on the volar forearms with 26 items, consisting primarily of fresh produce (leaf, flesh, and peel), condiments, and occupational material (broccoli box container) (Fig. 1). These items, selected by the patient, consisted of products that produced self-described possible allergic responses and allergic responses to which she was exposed but unsure of allergic potential. In open application and prick testing, no positive (histamine) control was used but a negative saline control was administered.

There was no reaction to any item in open application testing. Eleven produce items resulted in prick test reactions (≥ 1 cm wheal and flare reactions) (Fig. 1). One week later, repeat open and prick testing of positives (from first exposure) confirmed the results. Although only one negative control was used to exclude false positives, a volunteer control subject exhibited no open or prick test



Fig. 1. Wheal-and-flare reactions after prick testing with various produce materials and condiments on bilateral volar forearms.

responses to identical materials on his volar forearm. Closed patch testing with the vegetables, read at 2 and 4 days, was negative, indicating the absence of delayed-type hypersensitivity.

Discussion

Our patient demonstrated signs of immunological contact urticaria, an immediate immunoglobulin E-mediated reaction ranging from a pruritic, localized wheal and flare to generalized urticaria and anaphylaxis (5). She also described an orally induced food intolerance, suggesting both oropharyngeal and cutaneous responses to problematic agents, termed 'food contact hypersensitivity syndrome' (6).

We propose two hypotheses for this patient's symptoms: (i) cutaneous and systemic concomitant sensitization to numerous produce items; and (ii) initial sensitization to allergen(s) found in certain produce items with subsequent sensitization to other produce items, resulting from cross-reactivity between (initial) allergens and related allergens (in other produce items). In either scenario, her atopy may have served as a predisposing factor (3, 7).

Strangely, this patient did not react to produce items on open exposure. However, many patients with immunological contact urticaria are not sufficiently sensitive to have a wheal and flare reaction on single exposure on normal skin. Our greatest experience with this phenomenon is in latex protein hypersensitivity, where we noted similar negatives in

immunological contact urticaria to latex. (8) Less-sensitive individuals react only on prick testing or when tested on dermatitic skin (9). Open exposure at our clinic may not have adequately replicated the constant generalized exposure she received at work. Furthermore, despite a history of eczema, inflamed skin was not seen by us and, therefore, we could not apply produce to dermatitic skin.

In our patient, eliciting substances included tomato, green bell pepper, jalapeño, chive, red leaf lettuce, serrano pepper, pasilla pepper, leek, red bell pepper, garlic, and yellow onion. Of note, most (10/11) belong to one of the two families: Solanaceae or Alliaceae. Produce-induced contact urticaria confined to just two families is unreported (Table 1), although contact urticaria is documented as occurring to several of these substances individually (4, 6, 9–12). Table 2 lists vegetables, from six distinct families, which did not elicit a reaction.

Cross-reactivity is seen in many contact urticaria reactions – sensitization to one protein may result in responses to similar proteins (5).

Table 1. Produce that elicited reactivity in our patient, divided by family^a

Solanaceae	Alliaceae
Tomato	Garlic
Red bell pepper	Yellow onion
Green bell pepper	Green onion (Chive)
Serrano pepper	Leek
Jalapeno	
Pasilla pepper	

^aTen problematic foods fit neatly into two families.

Table 2. Produce that did not elicit reactivity in our patient, divided by family^a

Asparagaceae	Asteraceae	Cucurbitaceae	Amaranthaceae	Apiaceae	Piperaceae
Asparagus (top) Asparagus (bottom)	Green leaf lettuce	European cucumber	Red chard Green chard	Cilantro	Black pepper

^aVegetables from six distinct families did not elicit reactions in this patient.

Cross-reactivity within Alliaceae (garlic, onion, and chive) has been described (3, 13, 14), but it is not undocumented between Alliaceae and Solanaceae. Certain known (11) or unknown allergens of garlic (diallyl disulfide, allicin) and onion (allyl isothiocyanate) may have structurally related counterparts in peppers and tomatoes (members of Solanaceae).

Cross-reactivity of plant and fruit allergens may occur when homology exists between pathogenesis-related proteins or proteins with known biological functions. Bet v 1, a pathogenesis-related protein, has homologues in apple (Mal d 1), cherry (Pru av 1), apricot (Pru ar 1), pear (Pyr c 1), celery (Api g 1), carrot (Dau c 1), parsley (pcPR0), and potato (pSTH). Proteins with known biological functions, like profilins in the cytoskeleton, may also be homologous in numerous fruit and plant species (15).

Cross-reactivity between plant families Solanaceae and Alliaceae, possibly the first recorded case, may explain this patient's symptoms.

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