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Food anaphylaxis due to boiled beetroot

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PII: S2213-2198(20)30467-0

DOI: <https://doi.org/10.1016/j.jaip.2020.04.066>

Reference: JAIP 2857

To appear in: *The Journal of Allergy and Clinical Immunology: In Practice*

Received Date: 13 April 2020

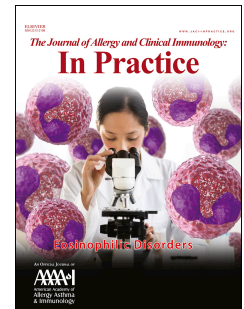
Revised Date: 27 April 2020

Accepted Date: 28 April 2020

Please cite this article as: El-Hosni M, Montejo JM, Schuler CF IV, Food anaphylaxis due to boiled beetroot, *The Journal of Allergy and Clinical Immunology: In Practice* (2020), doi: <https://doi.org/10.1016/j.jaip.2020.04.066>.

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Title Page

Title: Food anaphylaxis due to boiled beetroot

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Sources of funding: No funding was used in the preparation of this manuscript. Dr. Schuler does receive salary support from the Mary H. Weiser Food Allergy Center.

Conflict of Interest: The authors have no conflicts of interest to report.

Word Count: 1027

Clinical Implications

To the best of our knowledge, this is the first report of food anaphylaxis involving beetroot supported by positive skin allergy testing, and the second reported case of food anaphylaxis to beetroot reported. The findings highlight beetroot as a potential food allergen and give rationale for using a cooked, rather than raw, form of the food for skin testing.

Allergy to beetroot (*Beta vulgaris*) is rare. Most reports link rhinoconjunctivitis or asthma symptoms to beetroot pollen exposure (1). One case of food anaphylaxis attributed to beetroot has been reported, but did not demonstrate skin prick sensitivity to beetroot (2). Here we present a case of food anaphylaxis attributed to beetroot ingestion supported by evidence of beetroot hypersensitivity on skin testing.

A 22-month old female with no history of food allergy was referred for evaluation of anaphylaxis following ingestion of boiled beetroot.

At age 20 months, the patient ate eggs, toast with butter, a “rice crispy” treat, peanut butter, and a piece of beetroot (*Beta vulgaris* subspecies *vulgaris*) boiled in water with salt. She had previously routinely tolerated all of these foods except for beetroot, which she had never ingested. Immediately after eating the beetroot, she experienced 4 episodes of emesis, followed by flushing and urticaria on the chest within 15 minutes of ingestion. The patient’s symptoms progressed to crying, drooling, and hoarseness, and she then developed cough, wheezing, and shortness of breath. She was immediately taken to the emergency room where she was noted to be in distress with tachycardia and diffuse urticaria. A tryptase level was not drawn. She received intramuscular epinephrine, dexamethasone, and diphenhydramine with full resolution of symptoms.

The patient was seen in our food allergy clinic two months later. Since the episode she had tolerated all of the foods ingested at the time of the prior reaction except for beetroot. She was known to tolerate a broad diet including cow’s milk, hen’s egg, grains including wheat and rice, soy, peanut, tree nuts, various fruits and vegetables, chickpea, and sesame. She had no history of allergic rhinitis, asthma, atopic dermatitis, drug allergy, latex sensitivity, or hymenoptera exposure. Family history revealed asthma in the patient’s mother, but no family members with food allergy or other atopic disease.

Beet extract for skin testing is not commercially available in our practice location. Thus, skin prick-to-prick testing was performed with fresh and boiled beetroot. This was negative to raw beetroot. Skin prick test to boiled beetroot was positive, with a 3 mm wheal and 10 mm flare; the negative control showed a 0 mm wheal and 0 mm flare, and the positive histamine control showed a 4 mm wheal and 15 mm flare. Skin prick testing was also negative to tragacanth gum (a key ingredient in the rice treat she had eaten). The patient’s family was advised to avoid all forms of beet ingestion, educated on key food allergy topics, and armed with an epinephrine auto-injector.

A second episode of anaphylaxis occurred at age 23 months. The patient was at a restaurant and ingested salad greens dressed with beetroot juice. She immediately developed diffuse hives and received diphenhydramine. She then developed dyspnea, and epinephrine was administered. She was taken to the emergency room, where she vomited. A tryptase level was not drawn. She received another dose of intramuscular epinephrine as well as diphenhydramine, dexamethasone, and famotidine, with full resolution of symptoms.

She returned to the food allergy clinic 2 months later. Skin testing to raw gold beet and sugar beet varieties was negative. Serum-specific IgE testing to sugar beet and beetroot were both negative (<0.35 kU/L). A formal oral food challenge was not pursued because of the patient’s second anaphylaxis episode on beetroot exposure. While the patient has not eaten other members of the

Amaranthaceae family, such as spinach or quinoa, she is not specifically avoiding these either. The patient is now 32 months old and has had no additional anaphylaxis episodes while avoiding all forms of beetroot.

Reports of allergic reactions to beet and closely related plants mostly involve rhinitis or asthma symptoms, rather than food allergy. Some reports describe rhinoconjunctivitis and asthma exacerbations in the context of boiling Swiss Chard, a very close relative of beetroot, with evidence of serum specific-IgE to beetroot present in one case (3, 4). Other reports describe occupational asthma and rhinitis in the context of beet cultivation going back nearly 100 years (1, 5, 6), as well as allergic rhinitis and contact dermatitis in one patient working in a beet seed nursery (7).

There is one other case reported of food anaphylaxis to beetroot in an adolescent, confirmed with a positive oral challenge to boiled beetroot; in that case, there was no evidence of sensitization on skin prick or serum specific testing to beetroot [2]. In our patient's case, the history is consistent with two occurrences of anaphylaxis on beetroot exposure. Skin prick testing was positive to boiled beet, but skin prick testing was negative for raw beetroot varieties and there was no evidence of serologic beetroot specific IgE.

While many food processing actions are thought to reduce allergenicity, in some cases, food cooking or processing can increase the allergenicity of the food. It is thought that some forms of cooking may produce a neoallergen by exposing previously "hidden" amino acid sequences (8). Neoallergen generation has been described with both pecans and wheat in particular (9). In this case, the clear difference between skin test result for raw versus boiled beetroot supports the possibility of a neoallergen as the cause of this patient's food anaphylaxis.

Furthermore, this case shows the importance of thorough history-taking in food allergy. Testing to raw beetroot alone in this case may not have given a diagnosis as readily. A thorough history in food allergy is critical, including a focus on how the food in question was cooked or processed. This may lead the allergist to more specific or targeted testing, as in this case.

In summary, beetroot can serve as a food allergen. Boiling may impact the allergenicity and skin test reactivity of this food. In patients with likely food anaphylaxis not explained by a more common food allergen, beetroot is a possible cause.

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