Azuki Bean Allergy in a Japanese Child: a Case Report

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Background: Azuki bean is sometimes a nutritional alternative for those with soybean allergy. Although soybean and peanut are relatively common food allergens, azuki bean allergy has not previously been reported.

Case Report: A 3-year-old male was referred for investigation of suspected azuki bean allergy. He developed urticarial lesions within 30 min after eating an azuki bean product (manju, a sort of Japanese sweet), with a similar episode reported 1 year prior. The total serum immunoglobulin E (IgE) level was 677 IU/mL, with elevated specific IgE antibodies (ImmunoCAP) to soybean, peanut, kidney bean, and pea. Azuki bean specific IgE antibodies are not available, currently. The wheals produced by skin prick test (SPT) were boiled azuki bean without sugar 5 mm, yohkan (a typical Japanese sweet) 8 mm, sweetened azuki bean paste 7 mm, and soybean 4 mm. Double-blind placebo-controlled food challenge (DBPCFC) with azuki bean without sugar induced urticaria after 60 min, which resolved after oral antihistamine administration. He did not develop symptoms after ingestion of control.

Conclusions: This is the first reported case of immediate-type azuki bean allergy, diagnosed by SPT and DBPCFC. Further study such as immunoblotting is needed to elucidate the specific allergenic antigen.

Key words: azuki bean, food allergy, immunoglobulin E, double-blind placebo-controlled food challenge, skin prick test

Abbreviations

IgE: immunoglobulin E

DBPCFC: double-blind placebo-controlled food challenge

rGly m: recombinant *Glycine max*

SPT: skin prick test

Background

The azuki bean (*Vigna angularis*) is thought to have originated in East Asia, and has been eaten in Japan since ancient times. The seed coat of the azuki bean contains polyphenols, including antioxidants such as anthocyanins, rutin, and catechin¹⁾, which have been recommended as a natural means of combating diabetes and obesity²⁾. The Japanese Guideline for Food Allergy recommends other beans as nutritional alternatives for patients with soybean allergy. However, some patients may also develop symptoms of allergy after ingestion of other beans³⁾. The current case study is the first reported

case of immediate-type azuki bean allergy in a Japanese child, which was diagnosed by skin prick test (SPT) and a double-blind placebo-controlled food challenge (DBPCFC).

Case report

A 3-year-old male was referred to our hospital for investigation of suspected azuki bean allergy. He recently developed a few urticarial lesions within 30 min after eating an azuki bean product (manju, a sort of Japanese sweet), and his parents reported a similar episode about 1 year prior. And when he ingested azuki bean, he has been always observed immediate reactions. The urticaria was not associated with symptoms indicating viral infection or other disease. He was otherwise healthy, with no history of atopic dermatitis, asthma, or allergic rhinitis. There was no prior history of allergic reaction to the other ingredients of the azuki bean product, or to other legumes such as black-eyed

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Table-1 Levels of specific IgE (ImmunoCAP)

	Specific IgE (kU _A /l)		Specific IgE (kU _A /l)
House dust mite	1.49	Soybean	42.4
Cedar	40.5	Peanut	9.03
Japanese alder	<0.10	Kidney bean	70.9
Ragweed	0.13	Pea	21.9
Orchard grass	<0.10	rGly m 4	<0.10
Wheat	2.43	rGly m 5	19.6
ω -5 gliadin	< 0.10	rGly m 6	6.74
Gluten	0.48		

Normal range for ImmunoCAP: <0.35 kU_A/l.

Table-2 Skin prick test

	Diameter of wheal (mm)	Diameter of erythema (mm)
Azuki bean paste without sugar	5	8
Yohkan (a typical Japanese sweet)	8	16
Sweetened azuki bean paste	7	15
Black-eyed pea paste without sugar	4	8
Soybean	4	7
Peanut	5	19
Wheat	2	4
Positive control	8	13
Negative control	2	4

Positive control: histamine dihydrochloride (10 mg/ml), negative control: 0.9% normal saline.

pea, soybean, peanut, kidney bean, or pea.

Physical examination showed a healthy child with normal vital signs. Examination of the head and neck, chest, abdomen, and skin were normal. Laboratory examinations showed a white blood cell count of 13,700/ μ l (normal range: 7,000–11,000/ μ l) with 3.5% eosinophils (normal range: 0–8%). Serum total immunoglobulin E (IgE) levels were 677 IU/ml (normal: < 170). Specific IgE (kU_A/l) (ImmunoCAP; Phadia AB, Uppsala, Sweden) showed elevated levels of specific IgE antibodies to soybean (42.4), peanut (9.03), kidney bean (70.9), pea (21.9), recombinant *Glycine max* (rGly m) 5 (19.6), and rGly m 6 (6.74) (normal range: all <0.35 kU_A/l; Table-1). Azuki bean specific IgE antibodies are not available, currently.

SPT was performed using commercially available allergens for soybean, peanut, and wheat (Torii Pharmaceutical Co., Ltd., Tokyo, Japan), as well as boiled azuki bean without sugar, yohkan (a typical Japanese sweet) and sweetened azuki bean paste

(azuki beans and sugar). The wheal for boiled azuki bean without sugar was 5 mm, yohkan 8 mm, sweetened azuki bean paste 7 mm, black-eyed pea paste without sugar 4 mm, soybean 4 mm, peanut 5 mm, and positive control 8 mm (Table-2). A wheal half diameter larger than that of the positive control was considered to indicate a positive test⁴⁾. The boiled azuki bean and azuki bean paste that were utilized in the SPT were azuki bean products of similar cooking method that has been ingested in DBPCFC.

After obtaining written informed consent from the parents, a DBPCFC was performed with azuki bean paste without sugar and black-eyed pea paste without sugar as a control. In view of the possibility of Maillard reaction, DBPCFC was performed using beans without sugar⁵⁾. At 60 min from the start of the DBPCFC, he had facial flushing and urticaria over his left axilla and flank. This was considered to indicate a positive reaction, and oral epinastine hydrochloride was administered. In contrast, he did not develop symptoms after ingestion of the control, and the patient was diagnosed with immediate-type azuki bean allergy based on the DBPCFC. No further symptoms were observed after elimination of azuki beans from his diet.

Discussion

To our knowledge, this is the first reported case of azuki bean allergy. The azuki bean belongs to the *Fabaceae* (legume) family, which also includes the soybean, black-eyed pea, kidney bean, pea, and peanut. Patients with allergy to one food in this family may also have cross-reactivity to other foods in the same family. In our patient, SPT and specific IgE showed elevated reactivity to soybean, pea, peanut, and kidney bean. However, he was able to eat soybeans, black-eyed peas, peas, kidney beans, and peanuts without clinical signs of allergy. As azuki bean specific IgE antibodies are not available, we performed SPT, which was positive. In addition, a DBPCFC induced symptoms of allergy.

As the patient had no history of rhinitis or eczema, he was diagnosed with probable type 1 food allergy caused by previous intestinal tract sensitization^{6) 7)}. A type 2 food allergy associated with hay fever was considered unlikely because the symptoms occurred after ingestion of cooked azuki bean products. The specific antigen causing this allergy

is unknown, and specific antigen testing for azuki bean allergy is not currently available. Previous studies reported that the levels of specific IgE antibodies to rGly m 5 and rGly m 6 were useful indicators for the severity of soybean allergy^{8) 9)}. Although our patient had elevated levels of specific IgE antibodies to rGly m 5 and rGly m 6, he could ingest soybeans without clinical signs of allergy. The azuki bean and soybean might have different antigens that cause cross-reactivity in these examinations, and have involved other components.

This case could not be identified the antigen protein that was included in the azuki bean, also potentially intolerance for the components contained in the azuki bean could not be negative. Further study such as immunoblotting is needed to elucidate the specific allergenic antigen of the azuki bean.

Conclusions

This case is the first reported case of immediate-type azuki bean allergy diagnosed by SPT and DBPCFC in a Japanese child, without clinical allergy reaction to other foods from the *Fabaceae* family. It is important to recognize the possibility of azuki bean allergy, as azuki bean is sometimes recommended as a nutritional alternative for patients with soybean allergy. Further study such as immunoblotting is needed to elucidate the specific allergenic antigen of the azuki bean.

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Conflict of interest

The authors have no conflicts of interest to declare.

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