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An unexpected cause of anaphylaxis: potato

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Summary

Immediate reactions against contact to raw potato has been reported in adults with generally being in the form of an oral contact dermatitis or contact urticaria, but it may also manifest as rhinitis symptoms, wheezing or even anaphylaxis. Cooked or raw potato allergy has been rarely reported in children as some is being immediate and others being late reactions, and it usually results from ingestion. Herein, we report two cases with a background of allergic diseases developed anaphylaxis one with cooked potato and the other one with raw potato.

Introduction

It is estimated that 5% of young children are affected by food allergy with increasing prevalence. Food-induced allergic reactions account from diversity of symptoms and disorders including the skin, gastrointestinal and respiratory tracts which can be ascribed to IgE-mediated and non-IgE-mediated mechanisms (1). Foods have a pathogenic role in a subset of children with atopic dermatitis (AD) and asthma (1). Allergy to cow's milk, eggs, and cereal is more widespread in atopic infants and younger children (2). However, it is considered that allergy to potato is uncommon in contrast to above-mentioned foods. As in Western countries, white potato (*Solanum tuberosum*) is a very common ingredient in the diet of Turkey. Its cooked form is introduced in the child's diet generally around the age of 4 to 6 months as one of the first solids foods (3). In children, allergy to

cooked form has been reported, including both immediate and late severe reactions, and even with anaphylaxis (3,4). In the literature, allergic reaction against to raw form has also been reported in the children (5,6). Here, we presented two cases with anaphylaxis against cooked and raw potato.

Case report

Case 1

An 11-months old boy presented to our clinic with flushing and swelling at cheeks and lips, ocular itching and erythema, nasal itching, sneezing and cough. In his history, it was found that raw potato was given to alleviate discomfort during eruption; followed by allergic reaction against raw potato. It was also seen that the parents described presence of atopic derma-

titis lesions since he was 2 months old. No reaction was expressed when fed by cooked potato and/or after maternal potato ingestion or feeding by foods containing potato. No atopia or allergic disorder was present in the family history. In physical examination, eczematous lesions were observed at cheeks, flexural sides of upper and lower extremities. No abnormal finding was observed in systemic examination. Laboratory test revealed absolute eosinophil count of $270/\text{mm}^3$, percent eosinophil of 4.5%, total IgE of 38 IU and serum potato specific IgE 4.92 kU/L. We applied a test panel with aeroallergens and food allergens including: Dermatophagoides pteronyssinus, Dermatophagoides farinae, Alternaria alternata, cow's milk, walnuts, hazelnuts, peanuts, sesame seeds, wheat, egg whites, tuna fish, soybean bean and histamine (10 mg/ml of histamine phosphate) as positive and 0.9% sterile saline as negative controls. Standardized extracts (Stallergenes; Antony, France) were used, and SPTs were evaluated 15 min after application and were considered positive if the mean wheal diameter was ≥ 3 mm compared with the negative control. As a result, we found SPT positivity against walnut 6 x 6 mm and egg white 8 x 7 mm. In prick-to-prick test using raw potato, the patient was found to be sensitive against raw potato 10 x 12 mm, histamine 5 x 6 mm (**figure 1**). In the provocation test using potato, flushing and induration was detected after contact of raw potato to lips (**figure 2**). Egg, walnut and raw potato was eliminated from his diet. No latex allergy was detected. The

family was counseled about potential allergic disorders such as pollen allergy, allergic rhinitis and asthma.

Case 2

A 3-years old boy presented to our clinic with cough, wheezing and dyspnea over 5-10 days of each month within previous year. It was found that the patient presented to emergency department in all episodes and received inhaler salbutamol therapy during these episodes. The parents described cough, abdominal pain and vomiting were developed after consumption of cooked potato for the first when he was one year old. It was found out that father and grandfather had asthma. No abnormal finding was detected in the physical examination. Laboratory test revealed absolute eosinophil count of $540/\text{mm}^3$, percent eosinophil of 4.5%, total IgE 80 IU and serum potato specific IgE 125 kU/L. Skin testing was done with a standard test panel for aeroallergens (7) and food allergens including: Dermatophagoides pteronyssinus, Dermatophagoides farinae, cat, dog, Alternaria alternata, Cladosporium herbarum, Cynodon dactylon, grassmix, treesmix, composite, cockroach and cow's milk, walnuts, hazelnuts, peanuts, sesame seeds, wheat, egg whites, tuna fish and soybean. No sensitivity to inhaler and food allergens was detected in the skin prick test. Skin testing to fresh and cooked potato by prick to prick method was found to be markedly positive respectively 10 x 12 mm and 8 x 7 mm (**figure 3**).

Figure 1 - Positive results to raw potato (3) and positive control (histamine, 2) in prick by prick. The tests with latex (4) and physiologic saline (1) are negative.



Figure 2 - Positive raw potato challenge (labial and face edema, erythema).

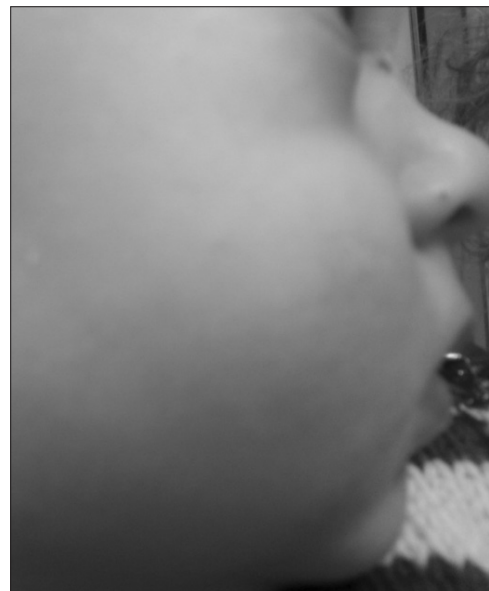


Figure 3 - Positive results to raw potato (4), cooked potato (3) and positive control (histamine, 2) in prick by prick. The tests with latex (5) and physiologic saline (1) are negative.

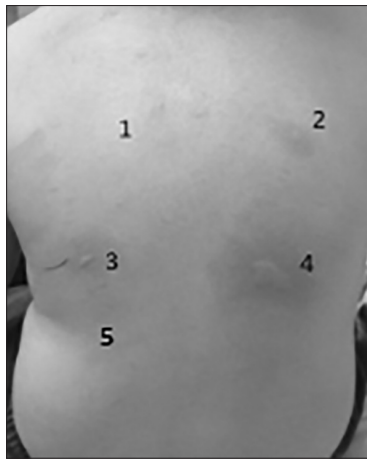


Figure 4 - Positive raw potato challenge (labial edema, erythema and induration).



In the provocation test using raw potato, flushing and induration was detected after contact of raw potato to lips (**figure 4**). In the first step of provocation test using cooked potato, nausea and mild abdominal pain were observed and the test was discontinued as the parents declined to continue. No latex sensitivity was detected. Potato was eliminated from his diet. Asthma therapy was prescribed. Regular follow-up was scheduled for potential pollen allergy.

Discussion

The vast majority of anaphylaxis cases in children are related with food, especially cow milk and eggs. Although potato is widely consumed in our region as in Europe, adverse reactions to potato are unusual. Both cooked and raw form of potato can cause allergies. In adults, allergy to raw potato is generally considered as a manifestation of oral allergy syndrome in patients with pollen allergy. It is particularly observed in housewives, who experience itching, rhinoconjunctivitis, and, in some cases, asthma or even anaphylaxis during the peeling of potatoes (8). However, allergy to cooked potato have only been reported in children so far and it has been reported that allergy to cooked potato may involve both immediate and late severe reactions, and even anaphylaxis (3,4,9,10). Potato related anaphylaxis is rare. Monti et al. (11) reported an 8-month-old patient developing anaphylaxis with cooked potato, while Beausole et al. (12) described a 4 year old patient developing anaphylaxis with raw potato. In the study by De Swert et al. (3) 36 cases with potato allergy were evaluated, three of which were admitted with clinical features of anaphylaxis. Symptoms of anaphylaxis were observed after contact to raw and cooked potato in our cases.

In a previous study declared that AD was the most common clinical feature present with potato allergy (3,9,13). De Swert et al. (5) evaluated children with potato allergy, all patients had atopic dermatitis. In another study by De Swert et al. (10) it was found that all subjects apart from one with potato allergy had eczema. In the study by Majamaa et al. (4) in which skin testing, oral challenge responses to potato and the occurrence of immunoglobulin E antibodies to patatin (Sol t 1) were evaluated in infants, it was found that all patients had atopic dermatitis. In another study, it was reported that there was AD in 33 of 40 patients.

Respiratory symptoms (wheeze / rhinitis) were the second most common symptom. Foods rarely cause respiratory symptoms. In the study by De Swert et al. (3) it was found that there was wheezing / rhinitis in 40% of those patients with potato allergy. A case report by Quirce et al. (8) reported two housewives in whom asthma findings developed after handling raw potato.

Thus far, five potato allergens have been defined; the glycoprotein "patatin" (Sol-t-1) is the most important of these that shows a significant homology with a latex allergen, leading to the possibility of cross-reaction (4,14,15). Patatin is considered to be a heat-labile allergen. In addition, 4 IgE-binding potato proteins (cathepsin D-, cysteine-, and aspartic protease inhibitors) were identified and designated as Sol t 2, Sol t 3.0101, Sol t 3.0102, and Sol t 4, belonging to the family of soybean trypsin inhibitors (Kunitz type) by Seppälä et al. (14). Although patatin is considered to be a heat-labile allergen, it has been shown that its IgE interaction is strongly influenced by other potato proteins in terms of heat lability (16). The development of symptoms in

some patients with only raw potato or unprocessed potato or after oral intake, can be attributed to heat-labile potato proteins, which are unstable in the presence of digestive enzymes and gastric acid or lose their allergenic properties after cooking (3). Reaction with raw potato is observed in the presence of a reaction against patatin usually in the form of erythema and urticaria. There are different allergens expressing cross-reaction with potato. Potato is one of the foods implicated in the latex-fruit syndrome, and it has been questioned whether latex sensitization precedes or follows the onset of food allergy (14,15). Latex sensitivity was not detected in our patient. Others important allergens include birch pollen and grass pollen. In our patient, follow-up was scheduled for the development of seasonal allergic rhinitis and pollen sensitivity. Here, we aimed to emphasize potato allergy, a rare entity, and to remind potential disorders that could develop with or after potato allergy.

References

1. Sicherer HS, Sampson HA. Food allergy. *J Allergy Clin Immunol.* 2010;125(2Suppl2):116-25.
2. Rona RJ, Keil T, Summers C, Gislason D, Zuidmeer L, Sodergren E, Sigurdardottir ST, Lindner T, Goldhahn K, Dahlstrom J, McBride D, Madsen C. The prevalence of food allergy: a meta-analysis. *J Allergy Clin Immunol.* 2007;120(3):638-46.
3. De Swert LF, Cadot P, Ceuppens JL. Diagnosis and natural course of allergy to cooked potatoes in children. *Allergy.* 2007;62(7):750-7.
4. Majamaa H, Seppälä U, Paluoso T, Turjanmaa K, Kalkkinen N, Reunala T. Positive skin and oral challenges to potato and occurrence of immunoglobulin E antibodies to patatin (Sol t 1) in infants with atopic dermatitis. *Pediatr Allergy Immunol.* 2001;12(5):283-8.
5. Beausoleil JL, Spergel JM, Pawlowski NA. Anaphylaxis to raw potato. *Ann Allergy Asthma Immunol.* 2001;86(1):68-70.
6. Delgado J, Castillo R, Quiralte J, Blanco C, Carrillo T. Contact urticaria in a child from raw potato. *Contact Dermatitis.* 1996;35(3):179-80.
7. Şahiner UM, Civelek E, Yavuz ST, Büyüktiryaki AB, Tuncer A, Şekerel BE. Skin prick testing to aeroallergen extracts: what is the optimal panel in children and adolescents in Turkey? *Int Arch Allergy Immunol.* 2012;157(4):391-8.
8. Quirce S, Díez Gómez ML, Hinojosa M, Cuevas M, Ureña V, Rivas MF, Puyana J, Cuesta J, Losada E. Housewives with raw potato-induced bronchial asthma. *Allergy.* 1989;44(8):532-6.
9. Castells MC, Pascual C, Martin Esteban M, Ojeda JA. Allergy to white potato. *J Allergy Clin Immunol.* 1986;78(6):1110-4.
10. De Swert LFA, Cadot P, Ceuppens JL. Allergy to cooked potatoes in infants and young children: a cause of severe, chronic allergic disease. *J Allergy Clin Immunol.* 2002;110(3):524-35.
11. Monti G, Viola S, Tarasco V, Lupica MM, Cosentino V, Castagno E. A case of severe allergic reaction to cooked potato. *Acta Paediatr.* 2011;100(11):e236-8.
12. Beausoleil JL, Spergel JM, Pawlowski NA. Anaphylaxis to raw potato. *Ann Allergy Asthma Immunol.* 2001; 86(1):68-70.
13. Dogru M, Ozmen S, Bostanci I, Keles S. Clinical Features of Potato sensitivity in Children with Allergic Disease. *Clin Ter.* 2015;166(1):12-5.
14. Seppälä U, Palosuo T, Seppälä U, Kalkkinen N, Ylitalo L, Reunala T, Turjanmaa K, Reunala T. IgE reactivity to patatin-like latex allergen, Hev b 7, and to patatin of potato tuber, Sol t 1, in adults and children allergic to natural rubber latex. *Allergy.* 2000;55(3):266-73.
15. Schmidt MH, Raulf-Heimsoth M, Posch A. Evaluation of patatin as a major cross-reactive allergen in latex-induced potato allergy. *Ann Allergy Asthma Immunol.* 2002;89(6):613-8.
16. Koppelman SJ, van Koningsveld GA, Knulst AC, Gruppen H, Pigman IG, de Jongh HH. Effect of heat-induced aggregation on the IgE binding of patatin (Sol t 1) is dominated by other potato proteins. *J Agric Food Chem.* 2002;50(6):1562-8.