Anaphylaxis induced by lentil inhalation

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Summary

Anaphylaxis is a rapid onset serious allergic reaction which may be fatal. Foods are the most common allergens leading to anaphylaxis especially for childhood. Most of the food-induced anaphylactic reactions take place after ingestion of the allergic food and only a few cases exist with anaphylactic reactions induced by inhalation of foods such as peanut, soybean and lupine. The case we present is unusual in that an 8½ -year-old boy developed anaphylaxis with the inhalation of steam from boiling lentils. ***(Asian Pac J Allergy Immunol 2012;30:167-9)***

Key words: *Anaphylaxis, children, inhalation, lentil*

Introduction

Anaphylaxis, characterized by a rapid onset, is the most serious allergic reaction and may be fatal.[1] Foods are amongst the common allergens leading to anaphylaxis, especially in childhood. Peanuts, tree nuts, fish and shellfish are known to be the most common food allergens. Lentils, which are from the legume (Leguminosae) family, are also in this category in countries where the typical Mediterranean diet is followed.[2-4]

Most of the food-induced anaphylactic reactions take place after ingestion of the allergic food and only a few cases exist with anaphylactic reactions induced by inhalation of foods such as peanut, soybean, lupine, fish, shellfish and cereals.[5-7] We present the unusual case of an 8 ½ -year-old boy who developed anaphylaxis as a result of inhalation of steam from boiling lentils which, as far as we know, is the first case reported from Turkey.

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Case Description

An 8½ -year-old boy during a visit to his grandmother suddenly developed conjunctival hyperemia, flushing, face and body erythema, face and eyelids swelling, cough, wheezing, dyspnea and confusion immediately following exposure to steam from boiling lentils. He received medical aid for anaphylaxis consisting of epinephrine, corticosteroids and antihistamines at the emergency department. After this episode of anaphylaxis he was referred to pediatric allergy clinic for further evaluation.

The patient had a history of anaphylactic reactions with similar clinical findings within 30 minutes following the intake of lentil soup when he was 3 years old and after eating chickpea when he was 4 years old. Lentil and chickpea had been removed from his diet since then. When he was 7 years old, just after ingestion of a little amount of pea, he suffered from conjunctival hyperemia, nasal congestion and discharge and had avoided eating pea thereafter. He also had a history of allergic rhino-conjunctivitis in spring since he was 4 years old. His physical examination was normal except for an allergic shiner and Denny-Morgan lines. A complete blood count showed eosinophilia (9.2 %) with a total count of 700/µl. Total immunoglobulin (IgA, G and M) and complement levels were normal. Total serum IgE was 846 IU/ml.

Only the raw and boiled form of chickpea was used during epidermal prick tests. For the rest of the testing with legumes, commercial (Allergopharma, Reinbek, Germany), boiled and raw forms were used. In order to obtain boiled extracts, each legume was boiled in water in the usual manner without the addition of any other ingredients. Epidermal prick tests were positive with lentil, chickpea and pea (Table 1). In addition, his skin prick tests with a panel of common inhalant allergens (including house dust mite, molds, animal dander, and pollens) revealed allergic sensitization to grass and cereal mix. Specific IgE antibodies to lentil and chickpea (CAP-FEIA/ImmunoCAP, Phadia, Uppsala, Sweden) were 16.7 kU_A/L and 10.3 kU_A/L respectively. Since he had experienced anaphylaxis three times, oral challenge tests were not performed with lentil and chickpea.

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Table 1. Results of epidermal prick tests to legumes with commercial and cooked bean extracts expressed as mean wheal/flare size (mm) and corresponding ImmunoCAP.

Test	Legume						
	Red Lentil (w/f)	Green Lentil (w/f)	Chickpea (w/f)	Peanut (w/f)	Pea (w/f)	Soy bean (w/f)	White bean (w/f)
Skin prick test*							
Raw legume	7/11	5/7	4/6	ND	5/7	ND	(-)
Boiled legume	8/10	10/20	5/7	ND	4/5	ND	(-)
Commercial	5/7	5/7	ND‡	(-)	4/5	(-)	ND
ImmunoCAP					ND		ND
Class †	3		3	3		3	
kU_A/L	16.7		10.3	15.3		8.7	
Symptoms	Anaphylaxis both by inhalation and ingestion		Anaphylaxis by ingestion	None	Allergic reactions by ingestion	None	None

ND: Not done; w/f: wheal/flare; * Histamine mean wheal/flare size was 7/12 mm.

† Class 0= <0,35 kU_A/L, Class 1= 0,36-0,70 kU_A/L, Class 2=0,71-3,5 kU_A/L, Class 3=3,51-17,5 kU_A/L, Class 4=17,51-50 kU_A/L, Class 5=51-100 kU_A/L, Class 6=101-200000 kU_A/L.;

Discussion

Here we report a case of anaphylaxis induced by inhalation of steam of boiling lentils. Anaphylactic reactions induced by inhalation of cooking fumes of legumes are considered to be rare. There have been only a few patients reported in the literature that have experienced anaphylaxis by inhalation during childhood.[8]

Up to now, the majority of the cases who were reported to suffer immediate hypersensitivity reactions, such as rhinoconjunctivitis and asthma exacerbations, with the inhalation of lentil and other legumes have been adults.[9,10] Reported cases of hypersensitivity reactions resulting from inhalation of steam containing soy and peanut are more common than those for other legumes[11]. Three pediatric patients were reported to have developed urticaria, oral allergy syndrome and allergic rhinitis after exposure to steam from cooked chick peas and green beans.[12]

Sanchez-Monge et al.[13] sought to purify and characterize the relevant IgE-binding proteins from boiled lentil extracts via the sera of patients who had allergic reactions after lentil ingestion. They studied boiled lentils, assuming that they are ingested after having been heated and this probably caused inactivation and/or modification of the putative allergens. A high similarity was found between one of the most allergenic protein components of boiled lentils and pea provicilins in that study. After the identification of a major lentil allergen len c 1, recently Vereda et al.[14] identified the Ig E binding epitopes of len c 1.

Our patient was born and fed in Turkey where infants usually start to feed with additional foods after 4 to 6 months of age and lentil is traditionally used especially in soups in our country. He had anaphylactic and milder allergic reactions after ingestion of boiled forms of lentil, pea and chickpea. Although he had positive serum spesific IgE for peanut and soybean, he could eat them without any allergic reaction. Serological cross-reactivity among legumes is known to be frequent.[4] Martinez et al.[4] identified a protein band with intense specific IgE binding in the homologous boiled legume extracts of lentil, chickpea and pea. They stated that this allergen is thermostable and remains active in cooked legumes. It was also showed that several extremely resistant immunoreactive proteins still remained even after autoclaving.[15] The history of our patient also supports the hypothesis about the effect of heating on the allergenicity of seeds. Because he also had anaphylactic reaction with the inhalation of the steam from boiled lentils, it seems likely that the allergic protein components of lentils evaporate during the process of boiling, thereby reducing itsallergenic properties.

Allergy to grass pollen has been reported to be associated with peanut allergy and may reflect cross reactivity between food allergens and pollen allergens. Our patient had positive skin tests with

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grass pollen and cereal mix, and also had allergic rhinitis symptoms in spring.

Summary

We present a case of anaphylaxis induced by inhalation of airborne lentil particles in cooking fumes. It is well known that food hypersensitivity can cause anaphylaxis and inhalation of food allergens carried in the air can also provoke rhinitis and asthma.[3,16] However, it is not well known that food antigens carried in cooking fumes can produce anaphylaxis. Further study of this issue will increase our understanding of the mechanisms involved and raise awareness of the problem,pointing to the need to develop protective measures for this phenomenon with the notification of more and more new cases of food hypersensitivity related with non-ingestant route.

Conflict of interest

All of the authors have no conflicts of interest in the manuscript.

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