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# Anaphylaxis induced by lentils

Dimitrios Kalogeromitros, MD; Melina Armenaka, MD; Ioannis Galatas, MD; Olga Capellou, MD; and Alexandra Katsarou, MD

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**Background:** The legume food family is large and includes peanut and soybean, two of the most frequent causes of food allergy. Literature on type I hypersensitivity to lentils, also a legume, is scarce.

**Objective:** To describe a child with repeated anaphylactic reactions related to lentils.

**Methods:** Skin prick tests with both commercial and cooked extracts and serum-specific IgE measured by CAP-RIA were used to identify specific IgE antibodies to various legumes.

**Results:** An 8-year-old girl suffered four episodes of anaphylaxis related to lentils from ages 3 to 7 years. The first three involved ingestion of cooked lentils and each time smaller amounts induced symptoms. The fourth episode occurred with inhalation exposure to cooking lentil soup. Subsequently, she presented with contact urticaria from raw chickpeas and an anaphylactic reaction after ingestion of cooked chickpeas.

Prick tests showed strongly positive reactions to lentil and chickpea and weaker positive reactions to peanut, pea, soybean, and white bean. CAP-RIA was class 6 to lentil; class 5 to peanut, pea, and soybean; class 4 to white bean, and class 0 to green bean.

**Conclusion:** Severe type I hypersensitivity to lentils occurred in this patient and was associated with clinically relevant hypersensitivity to chickpeas. Prick tests and CAP-RIA demonstrated multiple positive reactions to other legumes.

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## INTRODUCTION

Lentils belong to the legume (Leguminosae) family, a large botanical family that also includes peanut, soybean, green beans, garden peas, chickpeas, white beans, kidney beans, black-eyed beans, and carob (Table 1). Peanut and soybean are best known as causes of anaphylactic reactions in children with food allergy.<sup>2,3</sup> Cross-allergenicity among the legumes has been well described, but symptomatic hypersensitivity to more than one legume is considered uncommon.<sup>2-4</sup>

We report the clinical and immunologic study of a child who had repeated systemic hypersensitivity reactions af-

ter ingestion of lentils. This patient subsequently presented with clinical hypersensitivity to chickpeas.

## CASE REPORT

An 8-year-old girl was referred for evaluation of recurrent episodes of anaphylaxis related to lentils. The first episode was at age 3. Her mother camouflaged lentils by mashing approximately 4 tsp into a sauce over meat because twice before she had refused to eat more than a taste of lentil soup. She ate this meal and 20 minutes later suffered abdominal pain, nausea, vomiting, and at 40 minutes diarrhea. She was taken to a local hospital where gastroenteritis was diagnosed. Two months later, she ate 2 spoonfuls of lentil soup and in 10 minutes developed angioedema of the lips, intense abdominal pain, and at 20 minutes, diarrhea. The girl was rushed to the

local hospital where she was treated for anaphylaxis and strict avoidance of lentils was advised.

For the next 2 years, lentils were not cooked or eaten at home and the patient was symptom-free. The mother then cooked lentil soup for the rest of the family, and the patient licked the spoon used to stir the soup. Within 15 minutes she suffered lip angioedema, intense itching of the palms and soles, and abdominal pain. She was taken to the hospital and given epinephrine, fluids, and intravenous steroids to which she responded well. One year later, at age 7 years, she was visiting a friend and sat in the kitchen where lentil soup was cooking. She did not ingest any lentils but, within 30 minutes developed an itchy throat, cough, intense headache, and nausea. She immediately left the house and en route to the hospital symptoms resolved.

Three months later, she was playing with a bowl that contained raw chickpeas soaking overnight in water at room temperature. As her hands were in the water, erythema and puritus of the hands developed. After vigorous hand washing under tap water, symptoms fully resolved in 30 minutes. One month later, ten minutes after eating cooked chickpeas she suffered facial erythema, general puritus, and abdominal pain. En route to the hospital, angioedema of the lips and face developed. She responded to treatment with epinephrine, fluids, and intravenous steroids. Prior to this last episode she had eaten cooked chickpeas without problems.

The personal and family history was otherwise negative for asthma, rhinitis, or eczema. The physical examination was normal except for dermatographism. There was no history of reaction to other foods.

A complete blood count showed 12% eosinophils. Total serum IgE was

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Allergy Section, Department of Dermatology, University of Athens A Sygros Hospital, Athens, Greece.

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Table 1. The Leguminosae Food Family

| Beans                                           | Other                                    |
|-------------------------------------------------|------------------------------------------|
| Black gram ( <i>Phaseolus mungo</i> )           | Carob ( <i>Ceratonia siliqua</i> )       |
| Green, French ( <i>Phaseolus vulgaris</i> )     | Cowpea ( <i>Vigna unguiculata</i> )      |
| Green, runner ( <i>Phaseolus coccineus</i> )    | Faba or broad bean ( <i>Vicia faba</i> ) |
| Kidney ( <i>Phaseolus vulgaris</i> )            | Guar, guar gum                           |
| Lima ( <i>Phaseolus lunatus</i> )               | Lupins ( <i>Lupinus albus</i> )          |
| White ( <i>Phaseolus vulgaris</i> )             | Tragacanth                               |
| Chickpea or garbanzo ( <i>Cicer arietinum</i> ) |                                          |
| Lentil ( <i>Lens culinaris</i> )                |                                          |
| Pea, green ( <i>Pisum sativum</i> )             |                                          |
| Peanut ( <i>Arachis hypogaea</i> )              |                                          |
| Soybean ( <i>Glycine max</i> )                  |                                          |

elevated at 752 IU/mL. Serum total complement, C3, C4, IgA, IgG, anti-echinococcal antibodies, and stool cultures were normal or negative.

## MATERIALS AND METHODS

### Skin prick tests

Prick tests were carried out using two commercial extracts of the following legumes (LoFarma, Italy and Allergopharma, Germany): lentil, peanut, pea, soybean, and white bean. Histamine and buffered saline were used as positive and negative controls. Because a commercial extract for chickpea is not available, prick tests were also performed with freshly cooked chickpeas, lentils, peas and white beans. Each legume was boiled in water in the usual manner, without adding other ingredients. The cooked and drained beans were then blended individually in 5 mL of normal saline. Ten chickpeas, ten white beans, ten peas, and 40 len-

tils were used. The sediment was allowed to settle out of each freshly cooked "extract." Prick tests using a drop of the liquid were done in duplicate. As controls, two siblings and both parents underwent prick testing with freshly cooked and commercial legumes.

In addition, skin prick tests with a panel of common inhalant allergens were performed (including olive, cypress, oak, willow, poplar, Parietaria, mugwort, ragweed, plantain, Chenopodium, grass mix, *D. pteronyssinus*, and *D. farinae*) (Dome-Hollister Stier, France).

All wheal and flare reactions were traced at 20 minutes onto transparent tape. The reaction size was measured 1:1 with planimetry and expressed as cm<sup>2</sup>. For the freshly cooked extracts, the mean of two measurements was used.

### Specific IgE antibodies

In vitro specific IgE antibodies to len-

tils, pea, peanut, soybean, white bean, and green (French) bean was determined by CAP-RIA. (Specialty Laboratory: Laboratoire Cerba, France). Chickpea was unavailable. A CAP score of 3.5 Ku/L (class 3) or greater was considered positive.

## RESULTS

Skin prick tests to the inhalant allergens were negative. Reactions to home cooked lentil and chickpea and to commercial lentil extracts were intensely positive with pseudopods. The other legumes caused smaller immediate positive reactions. Wheal and flare sizes to the legumes are shown in Table 2. Histamine elicited a 0.86 cm<sup>2</sup> wheal and a 7.6 cm<sup>2</sup> flare. No reactions to legumes were seen in the controls. Specific IgE by CAP-RIA was class 6 to lentil, class 5 for peanut, pea and soy, class 4 for white bean, and class 0 (negative) for green bean (Table 2).

## DISCUSSION

The Mediterranean diet is rich in beans, praised for their high fiber, protein content, and low price. Lentil soup is a standard meal in Greece, especially in the fall and winter. Chickpeas are eaten boiled in water or as a soup.

To investigate the prevalence of lentil allergy in our region, we spoke with colleagues at two long-standing, well-established pediatric allergy departments. Not more than five cases of immediate hypersensitivity to lentils

Table 2. Results of Prick Tests to Legumes with Commercial and Cooked Bean Extracts Expressed as Wheal/Flare Size (cm<sup>2</sup>) and Corresponding CAP-RIA

| Test        | Legume    |           |           |           |           |            |            |
|-------------|-----------|-----------|-----------|-----------|-----------|------------|------------|
|             | Lentil    | Chickpea  | Peanut    | Pea       | Soy       | White bean | Green bean |
| Prick test* |           |           |           |           |           |            |            |
| Cooked bean | 2.05/8.80 | 2.25/7.60 | ND        | 1.30/7.15 | ND        | 0.95/5.45  | ND         |
| Commercial  |           |           |           |           |           |            |            |
| #1          | 1.60/7.80 | ND†       | 1.05/6.75 | 0.75/5.35 | 0.60/5.50 | 0.70/4.80  | ND         |
| #2          | ND        | ND        | 1.20/6.95 | 0.45/4.60 | 0.55/6.20 | 0.55/5.20  | ND         |
| CAP-RIA†    |           |           |           |           |           |            |            |
| Class       | 6         | ND        | 5         | 5         | 5         | 4          | 0          |
| Ku/L        | >100      | ND        | 75        | 89        | 70        | 34         | <0.1       |

\* Histamine wheal/flare size was 0.86/7.6 cm<sup>2</sup>.

† Class 0 = <0.3 KU/L, Class 1 = 0.3–0.7 KU/L, Class 2 = 0.7–3.5 KU/L, Class 3 = 3.5–17.5 KU/L, Class 4 = 17.5–50 KU/L, Class 5 = 50–100 KU/L, and Class 6 = >100 KU/L.

‡ ND = not done.

were recalled. They occurred in young children (<5 years), and clinical allergy reportedly resolved after a number of years. Chickpea allergy alone or in association with lentil allergy was not known.

We could find very few reports in the English language on allergy to lentils or chickpeas. Fries reported a case of severe hypersensitivity to lentil, peanut, and pea.<sup>5</sup> A recent report from Spain by Martin and coworkers described an adult with bronchial asthma and rhinitis since childhood after ingestion of cooked lentils and chickpeas.<sup>6</sup> The same symptoms also occurred when inhaling the steam of cooking lentils and chickpeas.

Inhalation reactions to cooking legumes are considered rare. Our patient had an allergic reaction after inhalation of fumes from cooking lentils that included cough, itching throat, and nausea. In the patient described by Martin et al asthma due to inhalation was documented by positive bronchial challenge using heated extracts of chickpea and lentil.<sup>6</sup> This suggests that these legumes contain heat-stable allergens. In another case, a housewife had rhinoconjunctivitis and asthma on exposure to the vapor of boiling green beans, although she could eat cooked green beans without problems.<sup>7</sup>

In addition, our patient had another unusual presentation. She presented with a contact urticaria-type reaction to soaked raw chickpeas, before developing the anaphylactic reaction. Contact urticaria from hand contact with raw green bean<sup>7</sup> and runner bean<sup>8</sup> has been described.

The patient we presented had positive reactions by prick tests and CAP-RIA to all the legumes tested, except green bean. Allergenic cross-reactivity of foods has been recently reviewed.<sup>9</sup> Cross-reactivity has been well reported in the legume botanical family and has been implicated in multiple false positive results on prick tests and RAST.<sup>2-4,6,10</sup> A large wheal size on food prick testing has been associated with a positive oral food challenge,<sup>2</sup> and a recent study measuring specific

IgE by CAP showed a correlation between high levels and symptomatic food allergy to certain foods such as peanut, milk, egg and fish.<sup>10</sup> Although large reactions may be helpful in predicting clinically relevant food allergy, they cannot be relied on to make a diagnosis of food allergy except when there is a clear history of immediate hypersensitivity, as in the case we have presented.

A double-blind placebo-controlled oral food challenge (DBPCFC) is considered the gold standard for diagnosing food allergy. It was not done in this child because of the repeated systemic reactions she had experienced and the concern of the parents.

Actual clinical allergy to more than one member of the legume family is considered rare.<sup>2-4</sup> This is based mostly on studies of peanut allergic individuals using DBPCFC. For example, Bernhisel-Broadbent and Sampson found that only two (5%) of 41 children who had positive DBPCFCs to peanut were also challenge positive to another legume (soy).<sup>2</sup> Most of the children they studied had a positive skin test or RAST to two or more legumes. Although monosensitivity appears to be the rule, exceptions include cases of clinical hypersensitivity to peanut and peas<sup>5,11</sup> and to peanut, peas, and lupine.<sup>12</sup>

Allergy to grass pollen has been reported to be associated with peanut allergy and may reflect cross-reactivity between food allergens and pollen allergens.<sup>13</sup> The prick skin test to grasses was positive in the adult with respiratory allergy to lentil and chickpea reported by Martin et al,<sup>6</sup> but negative in this child.

In summary, this case is of interest because it demonstrated anaphylaxis to cooked lentils and it is the second reported case of combined clinical allergy to lentil and chickpeas.

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*Request for reprints should be addressed to:*  
Dr D Kalogeromitros  
Allergy Section  
A Sygros Hospital  
5, Ionos Dragoumi St  
Athens 161-21  
Greece