

Case report

Bronchial asthma induced by chick pea and lentil

Martin JA, Compaired JA, de la Hoz B, Quirce S, Alonso MD, Igea JM, Losada E. Bronchial asthma induced by chick pea and lentil. *Allergy* 1992; 47: 185-187.

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Allergic reactions to legumes through inhalation have rarely been described. We report the case of a 20-year-old man who experienced asthmatic attacks when exposed to the steam from cooking either chick pea or lentil. Type I hypersensitivity to the antigens in these legumes was demonstrated by means of immediate skin reactivity, histamine release tests, RAST and RAST inhibition. Specific bronchial challenges with the heated (75° for 30 min) extracts of chick pea and lentil elicited isolated immediate responses.

Key words: bronchial asthma; bronchial provocation test; legumes; food allergy.

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Accepted for publication 10 July 1991

The legumes, chick pea (*Cicer arietinum*) and lentil (*Lens culinaris*), are common dietary items in Spain and other Mediterranean countries, where they are consumed after being cooked in boiling water.

Several members of the legume family have been causatively incriminated in immediate hypersensitivity reactions, the vast majority of reports describing reactions resulting from their ingestion. Allergic reactions due to the inhalation of legumes in a dust form have been described (4, 9). To the best of our knowledge, there are no reports on elicitation of asthma by cooking steam of legumes.

Case report

A 20-year-old non-smoking man with a 5-year history of hay fever and mild asthma in springtime was studied in our department. For many years he had noted the abrupt onset of rhinorrhea, coughing and shortness of breath when exposed to steam from cooking either chick peas or lentils. The attacks were self-limited, finishing a few minutes after exposure, and happened at any time of the year. The same symptoms were elicited by the ingestion of these legumes, which he had avoided since childhood. He was able to eat peanuts, peas and green beans without any ill effect and showed no reactivity to any other foods.

Clinical examination was normal. White blood cell count was 6260/ml with 200 eosinophils/ml. Total IgE was 436 IU/ml. Chest X-ray was normal. A spirometry revealed a FEV₁ of 100% and a FVC of 110% of predicted.

We prepared extracts of 5 legumes: chick pea, lentil, green bean (*Phaseolus vulgaris*), pea (*Pisum sativum*) and peanut (*Arachis hypogaea*). Two grams of the legume were dissolved in 20 ml of phosphate buffered saline (PBS, pH 7.3) at laboratory temperature. After stirring for 60 min and passing it through a filter paper, the solution was dialysed in PBS for 24 h and then passed through a Millipore filter (Millipore Corp., Bedford, Mass.) for sterilization and had a final concentration of 1:10 w/v. A part of the chick pea and lentil extracts was heated (75° for 30 min). Ten-fold dilutions were made for the study.

Skin prick tests (SPT) with the legume extracts were all strongly positive. A positive reaction in SPT was defined as a wheal ≥ 3 mm larger than the negative control wheal. The wheal size induced by the heated extracts of chick pea and lentil was similar to that obtained with the cold extracts. SPT with a battery of common inhalants which included grass, olive, *D. pteronyssinus*, *Alternaria tenuis*, *Aspergillus fumigatus* and cat and dog epithelia (Bencard, Worthing, UK) were all negative except for grass pollen. The histamine release test with an automated

fluorometric method according to Siraganian (8) with the modifications previously described (7) with different concentrations of the chick pea, lentil and peanut extracts was positive (release of 10% or higher). The *in vitro* IgE binding of the legumes was measured following the RAST technique, using our own-made legume discs obtained by coupling nitrocellulose paper discs with our legume extracts. The RAST assay was carried out incubating our legume-nitrocellulose discs with 50 μ l of the patient's serum for 3 h at room temperature. The discs were then washed three times with PBS 0.1% Tween 20. Afterwards 50 μ l of ^{125} -I labeled anti-IgE (Pharmacia Diagnostics, Uppsala, Sweden) were added and incubated for 18 h at room temperature. The washing steps were repeated and discs were read on a gamma counter. RAST values were as follows: chick pea 12200 cpm, lentil 10350 cpm, peanut 9700 cpm, green bean 8800 cpm, and pea 5050 cpm, which were equivalent to 6.6, 5.9, 5.5, 4.8 and 2.3 arbitrary PRU/ml respectively. Positive RAST values were also found when the heated extracts of chick pea (10650 cpm) and lentil (10000 cpm) were used. RAST inhibition was performed using the chick pea discs as solid phase and PBS as negative control. A marked inhibition of the RAST for chick pea was obtained with all 5 legume extracts. The relative inhibitory potency of the extracts was chick pea > lentil > peanut > pea > green bean.

The non-specific bronchial provocation test (BPT) with methacholine revealed a PC_{20} of 7.8 mg/ml. Specific BPT with the heated extracts of chick pea (1:100 w/v) and lentil (1:10 w/v), performed as previously described (9), elicited isolated immediate responses with a fall in FEV_1 of 28% and 35%, respectively, from basal values (Fig. 1).

The same *in vivo* and *in vitro* tests performed in 5 atopic and 5 non-atopic controls were all negative.

Discussion

The patient in our study experienced episodes of rhinitis and asthma due to the inhalation of airborne particles spread in the process of boiling either chick pea or lentil. A type I hypersensitivity to both chick pea and lentil in our patient is strongly suggested by the positivity of SPT and the histamine release tests with both extracts, and by the demonstration of specific IgE antibodies to chick pea and lentil by RAST in the patient's serum. The immediate responses obtained after specific bronchial challenges indicate that chick pea and lentil, acting as true aeroallergens, might be causative factors for the attacks described. No late reaction occurred after the bronchial provocation tests. There are no previous reports of standardized bronchial challenges with these allergens.

The allergens in chick pea and lentil have not yet been well characterized. The positivity of SPT, RAST and BPT with the heated extracts in our study indicate that they might be heat-resistant (75° for 30 min), which is in accordance with previous reports (5). The co-occurrence of grass pollinosis and sensitivity to legumes has been previously observed (6). The mechanism by which this association occurs is yet not known, but it has been suggested that either a cross-reacting IgE to common antigens or the presence of lectins could be responsible.

Although extensive immunological cross-reactivity among the legumes has been demonstrated in different studies (1, 3), clinically relevant cross-reactivity within this food group was rarely found in a recent study (2) in which chick pea and lentil were not included. In our patient we found *in vivo* (SPT and BPT) and *in vitro* (RAST and RAST inhibition) cross-reactivity between chick pea and lentil. It appears possible that the prevalence of multiple food allergy within the legume group might vary according to the dietary habits of a given population. Further studies are required to clarify this question.

Acknowledgements

We thank Teresa Sanchez, Francisca Jaime and M. Dolores Esteban for laboratory assistance.

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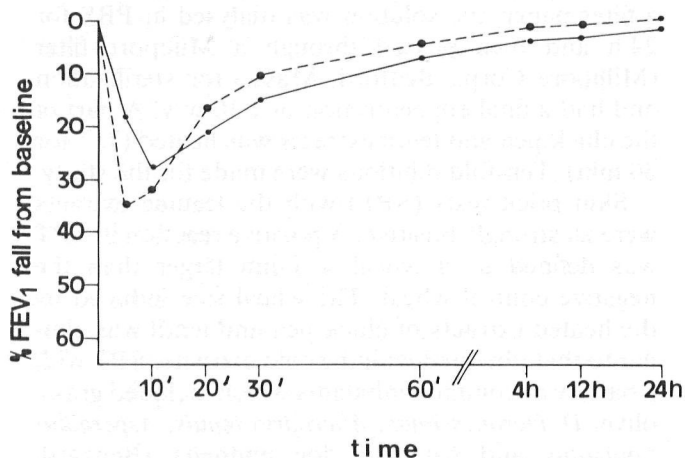


Fig. 1. Bronchial provocation tests with the heated extracts of chick pea (—•—) and lentil (---•---).

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