

Green bean hypersensitivity: An occupational allergy in a homemaker

Juan Manuel Igea, PhD [\[MEDLINE LOOKUP\]](#)

Montserrat Fernandez, MD [\[MEDLINE LOOKUP\]](#)

Santiago Quirce, PhD [\[MEDLINE LOOKUP\]](#)

Belen de la Hoz, MD [\[MEDLINE LOOKUP\]](#)

Maria Luz Diez Gomez, MD [\[MEDLINE LOOKUP\]](#)

- *Madrid, Spain*

Sections

- [Abstract](#)
- [Allergen Extracts](#)
- [Results](#)
- [Discussion](#)
- [References](#)
- [Publishing and Reprint Information](#)
- [Articles with References to this Article](#)

Abstract

[TOP](#)

As a member of the legume family, the green bean is frequently associated with food allergy. However, allergic reactions caused by skin contact or by inhalation of vapors from boiling legumes are rare. This article presents a case of occupational asthma in a homemaker; symptoms occurred during preparation and cooking of raw green beans. Skin prick, rub, and bronchial provocation tests were performed on the patient. In vitro tests were done with the serum samples of the patient and 10 control subjects (5 atopic and 5 nonatopic). Test results indicate that the patient has type I hypersensitivity to raw green bean antigen(s). This case is of interest because it demonstrates that a food allergen, when inhaled, can induce respiratory symptoms in sensitized patients and may even be the source of primary sensitization. (J ALLERGY CLIN IMMUNOL 1994;94:33-5.)

Key words: [Green bean](#), [occupational asthma](#), [contact urticaria](#), [inhalation](#)

The green bean is a vegetable belonging to the legume family. This includes widely consumed species, which are among foods more frequently involved in food allergy, mainly in children.¹ In spite of the frequency of legume sensitization, cases of allergic reaction caused by inhalation or contact with legumes have rarely been reported.^{2,3}

We have had the opportunity to study a rare case of occupational asthma in a homemaker, who experienced rhinoconjunctivitis, asthma attacks, and contact urticaria while trimming raw green beans or inhaling vapor from boiling green beans. She was able to eat and touch cooked green beans without any ill effect and

showed no reactivity to any other foods. She was 39 years old, had been diagnosed as having grass pollen–induced asthma, and had a positive family history of atopy.

Results of clinical examination, blood tests, urinalysis, chest x-ray films, and spirometry were all normal. Total IgE was 176 IU/ml (4.8 to 160 IU/ml). Results of prick tests with a battery of commercially available common inhalants and food allergens were all negative except for those with grass pollen.

Allergen Extracts

We prepared a dialyzed 20% wt/vol green bean extract for the in vivo study. For this purpose, 20 gm of raw green beans was dissolved in 100 ml of phosphate-buffered saline at laboratory temperature. After it was stirred for 60 minutes and passed through filter paper, the solution was dialyzed in phosphate-buffered saline for 24 hours (only molecules larger than 10 kd are retained) and then passed through a 0.22 µm Millipore filter (Millipore Corp., Bedford, Mass.) for sterilization. Part of this solution was heated at 75° C for 30 minutes. Ten-fold dilutions were made for skin and inhalation tests.

In vitro studies were also performed with a raw “green bean juice,” which was passed through a filter paper and then through the same Millipore filter described previously; this extract was not heated. It contained 150 mg protein per liter (Bio-Rad, Munich, Germany). In comparison with the green bean extract for the in vivo study, this extract was not diluted in order to obtain a higher concentration.

Results

The result of the skin prick test with raw green beans was positive, but negative with boiled green beans. Rub test with the green beans on the patient's forearm elicited wheals and pruritus within 10 minutes. Results of skin prick tests with the bean extracts (heated and raw) were both positive, although the resultant wheal from the heated extracts was smaller (■Table I).

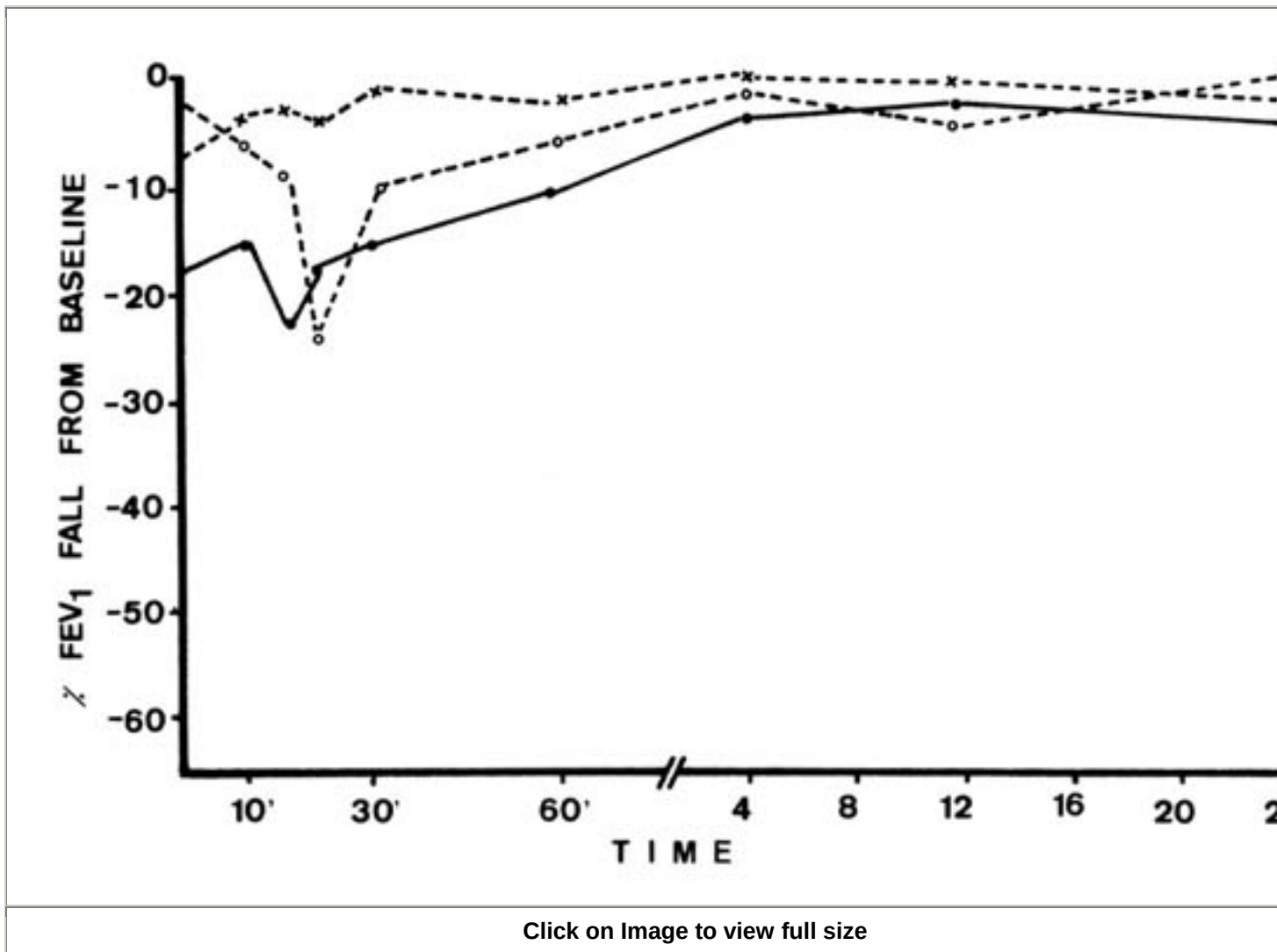
TABLE I. Size (greater diameter) of the wheal response obtained in the prick tests with green bean and chickling pea

Prick tests	Results
Raw green bean	9 mm
Raw green bean extract	9 mm
Heated green bean extract	4 mm
Boiled green bean	Negative
Chickling extract	4 mm

A nonspecific bronchial provocation test with methacholine revealed a provocative concentration causing a 20% fall in forced expiratory volume in 1 second of 0.43 mg/ml.

The result of the standardized specific bronchial provocation test, as previously described,³ with both green bean extracts was positive and immediate. No late reactions were observed. Preinhalation of cromolyn (40 mg) inhibited the response to both extracts (■Fig. 1).

FIG. 1. Bronchial provocation tests with the 0.2% green bean extract (open circles with broken line) and the heated 20% green bean extract (solid circles with broken line; the same tests after cromolyn inhalation (x----x)).



The basophil histamine release test results^{4,5} with different concentrations of the "juice" extract were strongly positive (50%); the spontaneous release value for the patient was 6%. Blood samples from five normal subjects elicited histamine release values with this extract that were under 8%.

The patient's specific IgE against raw green bean extract was measured by means of RAST. Nitrocellulose paper discs were incubated with the raw green bean juice for 24 hours at room temperature, and the RAST technique of the manufacturer was followed (Pharmacia, Uppsala, Sweden); the buffer used was phosphate-buffered saline. The patient's serum registered 9310 cpm versus 263 cpm for normal serum, reflecting an arbitrary value of 6.5 Phadebas RAST units per milliliter.

Results of the same in vivo and in vitro tests performed with five atopic and five nonatopic control subjects were all negative.

Finally, we performed skin prick tests with other pollen (birch, mugwort, ragweed), vegetables, and fruits: legumes (soy, broad bean, bean, chickpea, pea, lentil, chickling pea, peanut), Umbeliferae (celery, carrot), Solanaceae (tomato, potato, pepper), Rosaceae (apple, pear, peach), Cruciferae (turnip), Betulaceae (hazelnut), and Juglandaceae (walnut). All results were negative, except for results with bean and chickling pea (Table I).

Discussion

The positive prick test results with the green bean, as well as the positive histamine release test result and the demonstration of green bean-specific IgE antibodies by RAST in the patient's serum, strongly suggest that the patient has type I hypersensitivity to raw green bean antigen(s). Moreover, the patient's bronchial response after specific bronchial provocation indicated that this antigen is the causative factor for the attacks described. Standard bronchial provocation studies have not been previously reported for this allergen.

The observed symptoms of contact urticaria caused by green beans are very likely due to the same immunologic mechanism.

The green bean allergen may be heat-labile, but perhaps high-temperature heating for a longer period of time is required for complete denaturation. This would explain the clinical symptoms experienced by the patient when exposed to the vapor from boiling green beans and the positivity of the skin test and bronchial provocation test responses to the heated extract, although the skin prick test response to boiled green beans was negative; probably, the boiling vapor carries green bean allergens in small particles, which are not heated enough to completely abolish their allergenic activity. Also, it would explain, at least in part, the lack of symptoms when green beans were eaten (always cooked); and because only skin and respiratory mucosa came in contact with the nondenatured allergen, those are the only systems prone to showing allergic symptoms.

On the other hand, the patient had positive skin prick test results to other legumes, although she tolerated ingestion and contact without problems. This is consistent with the findings of other authors^{6,7} who rarely demonstrate clinically relevant cross-reactivity among legumes, in spite of the frequent positivity of the prick test results and in vitro findings.

We consider our case of interest, both from the food allergy and the occupational asthma points of view, because it demonstrates that a food allergen in aerosol form can induce respiratory symptoms in sensitized patients and may even be the source of the primary sensitization.

We thank Teresa Sanchez, Francisca Jaime, and M. Dolores Esteban, for laboratory assistance, and Pablo Muguerza, MD, for his advice in translating.

References

1. Kemp AS, Mellis CM, Barnett D. Skin test, RAST and clinical reactions to peanut allergens in children. *Clin Allergy* 1985;15:73-8.
2. Bush RK. Immediate and late onset asthma from occupational exposure to soybean dust. *Clin Allergy* 1977;7:369-73.
3. Valdivieso R, Quirce S, Sainz T. Bronchial asthma caused by lathyrus sativus flour. *Allergy* 1988;43:536-9.
4. Siraganian RP. An automated continuous flow system for the extraction and fluorometric analysis of histamine. *Anal Biochem* 1974;57:383-94.
5. Moneo I, Botello A, Hinojosa M, Alcover R. Nuevos avances en la determinación de histamina automatizada. *Allergol Immunopathol* 1980;(suppl 7):311-5.
6. Bernhisel-Broadbent J, Sampson HA. Cross-allergenicity in the legume botanical family in children with food hypersensitivity. *J ALLERGY CLIN IMMUNOL* 1989;83:435-40.
7. Bernhisel-Broadbent J, Taylor S, Sampson HA. Cross-allergenicity in the legume botanical family in children with food hypersensitivity. II. Laboratory correlates. *J ALLERGY CLIN IMMUNOL* 1989;84:701-9.

Publishing and Reprint Information

- *From Servicio de Alergia, Hospital Ramon y Cajal, Madrid.*
- *Received for publication March 17, 1993.*
- *Revised Aug. 30, 1993;*
- *Accepted for publication Sept. 13, 1993.*
- *Reprint requests: J. M. Igea, PhD, Clinica Alergoasma, c/Toro, 21, 37002 Salamanca, Spain.*
- *Copyright © 1994 by Mosby—Year Book, Inc.*
- 0091-6749 \$3.00 + 0 **1/1/55423**

Articles with References to this Article

This article is referenced by these articles:

The US Peanut and Tree Nut Allergy Registry: Characteristics of reactions in schools and day care

Journal of Pediatrics, The

April 2001 • Volume 138 • Number 4

Scott H. Sicherer, MD, Terrence J. Furlong, MS, Jennifer DeSimone, Hugh A. Sampson, MD

Self-reported allergic reactions to peanut on commercial airliners

Journal of Allergy and Clinical Immunology, The

July 1999 • Volume 104 • Number 1

Scott H. Sicherer, MD^a, Terrence J. Furlong, MS^b, Jennifer DeSimone, ^b, Hugh A. Sampson, MD^a