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Editorial

Peanut anaphylaxis

Excavations in South America indicate that peanuts of the genus *Arachia* were cultivated 2000 to 3000 BC. By 2000 AD, their growth had spread to the continents of Africa, Asia, and North America.¹ In the United States the demand for peanuts jumped sharply in the late 1800s, largely because of the taste acquired by northern soldiers during the Civil War. This demand has increased steadily ever since that time. The United States is now one of the largest commercial producers of peanuts in the world, with the 1989 crop estimated at 4.03 billion pounds (U. S. Department of Agriculture). Today one half the peanut crop in the United States is consumed as peanut butter, 20% is sold for use as table peanuts, 16% is used in candy and bake goods, and the remainder is processed into oil.¹

The demand for peanuts in the United States was markedly enhanced around the turn of the century when its value as an easily digestible source of protein was recognized. Now many pregnant women and lactating mothers supplement their diets with generous portions of peanut butter, and most children in the United States are exposed to their first "peanut butter cracker" by their second or third birthday. In the study of newborn infants by Zeiger et al.,² all 185 infants in the control group and 80% of 103 babies in the prophylactic group were exposed to peanut by 2 years

Abbreviation used

DBPCFC: Double-blind, placebo-controlled food challenge

of age. It is estimated that the average American now ingests 8 pounds of peanuts or peanut products annually.¹ With this rise in the popularity of the peanut has come increasing reports of anaphylactic reactions to peanuts.

One of the first cases of peanut allergy recorded in the medical literature was mentioned only incidentally in an article by Blackfan in 1920.³ Five years later, Duke⁴ reported a case of a young girl who developed wheezing after the ingestion of one half a peanut. Today the peanut is one of the leading causes (if not the leading cause) of food-allergic reactions in the United States. In three centers conducting DBPCFCs in children, peanut was one of the three most common causes of positive reactions (Table I).^{5,6} In an American study of adults,⁷ 2/10 patients experienced allergic reactions to peanut, whereas in an Italian study,⁸ 0/10 adults reacted to peanut.

Although peanuts are one of the most common foods leading to positive challenges in studies of American children, these figures do not accurately reflect the scope of the problem. Unlike the often "soft signs" of egg, milk, soy, and wheat hypersensitivity in chronic disorders (e.g., atopic dermatitis, asthma, and gastroenteropathies), allergic reactions to peanuts are generally very acute and dramatic. Consequently, many parents are aware of their child's problem and do not seek medical help. In adults in which food

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TABLE I. Results of DBPCFCs in children at three university centers*

	JHU	NJH	UA
Total patients studied	262	480	71
Positive challenge to			
Egg	119 (45%) [†]	62 (13%)	13 (18%)
Peanut	36 (14%)	59 (12%)	12 (17%)
Milk	75 (28%)	57 (12%)	6 (8%)

JHU, The Johns Hopkins University, NJH, National Jewish Center for Immunology and Respiratory Medicine (Denver, Colo.); UA, University of Arkansas (Fayetteville, Ark.)

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[†]Percentage of patients studied that were documented allergic to peanut.

hypersensitivities appear to play less of a role in chronic disorders, even fewer peanut-sensitive patients would tend to seek medical help. Therefore, the true prevalence of peanut allergy in the population is unknown.

Several host and environmental factors combine to make peanut allergy a major problem in the United States. As indicated earlier, peanuts, generally in the form of peanut butter, are introduced into the American diet at a very young age. In The Johns Hopkins series, the median age of the patients when the first reaction to peanut occurred, as determined by "convincing history" or positive DBPCFC, was not significantly different from reaction to egg (peanut: median age, 3.9 years; range, 5 months to 21 years; egg: median age, 3.3 years; range, 9 months to 25 years). A "convincing history" was considered an anaphylactic reaction that occurred within 1 hour of an isolated ingestion of a food that required emergency therapy by a physician and that occurred within the past 3 years. Several children 3 years of age or younger reacted to peanut during the DBPCFC, which was the first known exposure to peanut, indicating that they had been sensitized in utero, by breast feeding, or by an unknown exposure. Unlike other food sensitivities in children, long-term follow-up studies (up to 14 years) indicate that peanut hypersensitivity is rarely "outgrown."^{9, 10} In addition, "life-threatening" allergic reactions to peanuts are more common than with other foods (excluding true nuts and seafood; these data are even less complete). In The Johns Hopkins series, 17/36 peanut-allergic patients were not challenged to peanut because of a convincing history of life-threatening anaphylaxis, whereas only 5/119 egg-allergic patients and 4/75 milk-allergic patients were not challenged to the allergen implicated. In addition, 21% of patients experienced significant wheezing after a DBPCFC to peanut compared to 8% of patients after challenges to egg.

The increasing use of peanut products in our food supply also has served to aggravate the problem of peanut allergy. In the follow-up study of peanut allergy by Bock and Atkins,¹⁰ one half (16/32) the children had accidentally ingested peanut in the year before follow-up, and only 8/32 patients had managed to avoid peanuts completely from the time of their initial diagnosis. In two reports of five fatal anaphylactic reactions to peanuts^{11, 12} and three cases known to the author, all patients unknowingly ingested food containing peanut protein (e.g., in chili sauce, in baked goods, etc.). As pointed out in the article by Keating et al. in this issue of the JOURNAL,¹³ new products not readily recognizable as peanut protein are being introduced into the American diet, such as peanuts which are deffavored, reffavored, and pressed to be sold as almonds, walnuts, etc.

Another important question raised in the article by Keating et al.¹³ is the quantity of peanut antigen necessary to provoke an allergic response. In a study reported by Walzer,¹⁴ the investigator was able to induce a wheal-and-flare reaction at a passively sensitized skin site with an intravenous injection of the protein nitrogen equivalent of 1/44,000 of one peanut kernel. In our series with children, we have had several children develop allergic reactions (cutaneous and gastrointestinal) from contacting residual peanut butter on counters or tables wiped clean of visible material. One patient developed wheezing and urticaria after a jar of peanut butter was opened in front of him, similar to a case reported by Fries.¹¹ With DBPCFC, 50 to 100 mg of peanut protein has elicited allergic symptoms in some children. However, it should be remembered that the most sensitive patients, those patients experiencing life-threatening anaphylaxis, were not challenged. Although occasional incidents of allergic reactions to peanut oil are reported, a study of 10 peanut-allergic adults failed to demonstrate any reactivity.¹⁵ Some alleged reactions to peanut oil probably can be attributed to the presence

of other food protein in oil used for frying (e.g., fish and other seafood). However, some caution may still be necessary. To be 95% certain that 95% of peanut-allergic patients will not react to peanut oil, 58 individuals would have to be challenged to peanut oil with no reactions (table of confidence bounds for population failure rate).

The assay described by Keating et al.¹³ will provide a new level of sophistication in the study of peanut hypersensitivity. The ability to quantitate contaminating amounts of peanut protein in various foods should help answer questions regarding threshold exposure levels in highly allergic patients. In addition, this test should allow food manufacturers to monitor food products that have the potential to be contaminated with peanut protein. Contamination of products with other food proteins occurs more frequently than previously appreciated. We recently investigated three reactions in milk-allergic patients ingesting "nonmilk" products and found significant levels of contaminating milk protein with the use of a sensitive inhibition enzyme-linked immunoassay.¹⁶ Only with the availability of tests, such as that described in this issue of the JOURNAL,¹³ will we start to understand the many mysteries of food allergy.

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