
Systemic allergic reaction following ingestion of undeclared peanut flour in a peanut-sensitive woman

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Background: Although peanuts and peanut butter are well recognized as food allergens, few reports describe allergic reactions associated with eating peanut flour.

Objective: To describe an allergic reaction that occurred in a peanut-sensitive woman who ate undeclared peanut flour that was part of a flavor ingredient contained in a dry soup mixture, and to estimate the amount of peanut protein the patient ingested.

Methods: The patient was interviewed, medical records from her emergency room visit were reviewed, and the manufacturer of the soup mix was investigated to ascertain the proportion of the soup mix constituted by the undeclared peanut flour.

Results: Minutes after ingesting the soup, a 33-year-old woman experienced a systemic allergic reaction. She was treated successfully in the emergency room with intravenous fluids, corticosteroids, and diphenhydramine. Investigation of the soup manufacturer revealed that undeclared peanut flour was a component of a flavoring ingredient in the soup. Based on the concentration of peanut flour in the flavoring, we estimated the patient ate approximately 45 mg of peanut protein.

Conclusions: Inadvertent ingestion of peanut flour by peanut-sensitive individuals may lead to systemic allergic reactions.

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INTRODUCTION

Peanuts are believed to be one of the leading causes of food allergic reactions in the United States today,^{1,2} and the prevalence of peanut allergy is thought to be increasing in the US³ and in Britain.⁴ This is significant because peanut-allergic individuals who unknowingly eat peanut-containing foods may experience fatal or nearly fatal reactions.^{4–6}

Although a specific food item is often identified as the source of peanut allergen in reports of persons experiencing peanut-related allergic reactions, less information is available regarding the formulation of peanuts present in the implicated product. Presumably, most instances of peanut-re-

lated allergic reactions involve consumption of parts of the peanut kernels (cotyledons) or peanut butter. A study of the allergenicity of various peanut products using the radioallergosorbent test inhibition assay reported that peanut oil and hydrolyzed peanut protein were not allergenic and flour extract made from peanut hulls was slightly allergenic.⁷ In contrast, allergenicity was demonstrated for eight flours made from peanut kernels, as well as for products containing raw or roasted peanuts or peanut butter.⁷

Peanut flour is used in a wide array of foods, including breads and bakery goods, breakfast cereal flakes, meat patties, snack foods, beverages, ice creams, soups, spreads and frostings, and textured vegetable protein ingredients.⁸ We describe an allergic reaction in a peanut-sensitive woman who became ill shortly after consuming a reconstituted dry pea soup product that contained undeclared peanut flour in a flavoring ingredient. The illness came

to the attention of the US Food and Drug Administration (FDA) during a routine FDA inspection of the manufacturer of the food product months after the illness occurred. Because no product from the implicated lot was available for laboratory testing from either the manufacturer or the consumer when the FDA learned of the illness, we estimated the amount of peanut protein the patient consumed on the basis of the quantity of soup ingested and the type and amount of peanut flour reported by the manufacturer to be present in the flavoring. There is little published information describing allergic reactions following peanut flour ingestion or the quantity of ingested peanut protein associated with such allergic reactions.

METHODS

We interviewed the patient and reviewed medical records linked to her episode of illness. To estimate the amount of peanut protein ingested by the patient, we contacted the manufacturer of the soup and the manufacturer of the flavoring to obtain details regarding the quantity and type of peanut flour incorporated into the dry soup mix.

RESULTS

Case Report

The 33-year old woman described here reported a lifelong history of allergy to peanuts, walnuts, and pecans. Inadvertent ingestion of these items in the past led to allergic reactions of varying intensity depending on the amount of nut eaten. Prior to the present episode, the most severe reaction she ever had occurred 16 years earlier shortly after eating cake containing a raspberry

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blend that had been cooked in peanut sauce; her face became swollen and her fingers and face turned blue, prompting her to seek treatment in an emergency room. In several instances in which she recognized that she had just eaten peanuts or walnuts, she reportedly spat the food out but nevertheless experienced lip swelling and itching of the throat. She also reports getting welts on her face if her husband kisses her there after having recently eaten a peanut butter sandwich.

In December 1995, the patient experienced a systemic allergic reaction after eating about a quarter of the contents of a single-serve container of dry split pea soup that she had reconstituted with water to approximately 10 fluid ounces. Her previous meal was three hours earlier. Prior to eating the soup, the patient read the product ingredient label, which listed the following: dehydrated vegetables (split peas, potatoes, onions, carrots, garlic, celery), yeast extract, salt, spices, and natural smoke flavor. The product expiration date was January 1997.

Within minutes after ingesting the soup, the patient experienced a sensation of her throat closing and difficulty swallowing. She developed difficulty breathing, chest tightness, pruritus of the hands and face, facial swelling, hives, and a rash over her entire body. Prior to arriving at an emergency room, she experienced abdominal discomfort, nausea, and an episode of emesis.

The patient took two puffs of Primatene Mist when she experienced chest tightness and difficult breathing. This provided some relief, but upon arrival in the emergency room she was flushed and complained of hives and mild abdominal discomfort. On physical examination, the patient was afebrile, had a blood pressure of 148/90, pulse 86 beats per minute, and a respiratory rate of 20 breaths per minute. She had bright red urticaria from head to toes. The oropharynx was without swelling. No wheezes, rhonchi, or rales were auscultated. The remainder of the examination was normal.

The patient was treated with intravenous fluids, corticosteroids, and diphenhydramine. She felt symptomatically improved over the next half hour and was discharged to home with instructions to consult with her physician and to obtain self-injectable epinephrine for possible future use. One month after her illness, the patient learned from the manufacturer of the soup that peanut flour was a component of the flavoring ingredient. The soup manufacturer discontinued the use of the peanut flour-containing flavoring, withdrew undistributed product, and alerted consumers through the Food Allergy Network, a nonprofit organization that monitors adverse reactions to foods.

ESTIMATED AMOUNT OF PEANUT PROTEIN INGESTED

The manufacturer of the dry split pea soup mix reported that of the 1,358.3 lb of dry soup mix, 47.3 lb consisted of the flavoring ingredient, and approximately 30% of the flavoring ingredient was partially defatted peanut flour. A single-serving container of dry soup mix weighing 58 g, therefore, contained about 603 mg of peanut flour. The proportion of peanut flour composed of protein varies from approximately 60% for fully defatted peanut flour to 30% for partially defatted flour.^{8,9} Assuming 30% of the peanut flour in the dry soup mix was protein, each single-serving soup mix container contained approximately 181 mg of peanut protein. Given that about one quarter of the contents of a single-serve container of soup mix was consumed, we estimate that the patient ingested approximately 45 mg of peanut protein.

DISCUSSION

Several factors suggest that peanut flour contained in the soup flavoring ingredient was responsible for triggering the symptoms in the patient described here. First, the soup was the only food consumed immediately prior to onset of symptoms, and the flavoring was the only ingredient in the soup known to contain peanut components.

The only other food consumed by the patient earlier that day had been eaten three hours previously, and she was asymptomatic until she ate the soup. Additionally, the patient, having experienced peanut-associated allergic reactions previously in her life, recognized the symptoms as the kind produced by the ingestion of peanuts. This prompted her to call the manufacturer of the soup to investigate the possibility that peanuts were included in the ingredients, even though peanuts were not listed on the soup's ingredient list. Finally, the plausibility of peanut flour acting as the allergen in this patient's illness is supported by a previous study that used the radioallergosorbent test inhibition assay to show the *in vitro* allergenicity of eight peanut flours prepared from the cotyledons of the peanut.⁷

Ample evidence suggests that minute amounts of ingested peanut are sufficient to trigger clinically apparent allergic reactions, including fatal or nearly fatal reactions. For example, Ewan⁴ reported that a "trace" amount of ingested peanut produced severe laryngeal edema and respiratory arrest in a 31-year-old man. Fatal peanut-induced anaphylaxis has been described in patients following consumption of two bites of chili containing peanut butter, one peanut-containing cookie, or a single bite of a peanut-containing cake.⁶ Additionally, peanut-sensitive individuals have reportedly experienced generalized hives or wheezing simply by being near peanuts¹⁰ or present when a peanut butter-containing jar was opened.¹¹

The potential for peanuts to be consumed unknowingly by peanut-allergic individuals is facilitated by several factors. First, peanuts or peanut butter is used in a wide array of commercial products. For example, more than 60% of the "nuts" used in candies in the United States are peanuts; no other flavor ingredient, except chocolate, is used as broadly in confections.⁸ Additionally, insufficient product labeling or mislabeling can obscure the presence of peanuts. Finally, food items that are not intended to include peanuts

may contain peanuts as a result of contamination during the manufacturing process, particularly in processing plants in which production switches from one food product to another.^{11,12}

The patient described here reported taking inhaled epinephrine when she experienced chest tightness at home. Medical records from her visit to the emergency room, however, indicate that epinephrine was omitted from the treatment regimen; this was confirmed in our interview of the patient. Inhaled epinephrine, with or without oral antihistamines, is not appropriate as a single therapeutic agent in moderate or severe anaphylaxis.⁶ In a report summarizing fatal and nearly fatal anaphylactic reactions to food in children and adolescents, Sampson et al⁵ underscore the beneficial role of parenteral epinephrine. In that study, there were no deaths among patients who received epinephrine before severe respiratory symptoms developed, whereas all the patients with nonfatal reactions received epinephrine before or within five minutes of the development of severe symptoms. Food-allergic persons should be provided with epinephrine-containing syringes and instructed how to self-administer epinephrine at the first sign of allergic reaction.⁶

The Food, Drug, and Cosmetic Act requires, in virtually all cases, a complete listing of all the ingredients of a food. One important exemption, however, is that spices, flavorings, and colorings may be declared collectively without naming each ingredient.¹³ Episodes of illness such as the one described here, ie, the occurrence of an

allergic reaction linked to ingesting undeclared peanut flour present in a flavoring, have prompted the FDA to consider requiring the declaration of known allergens in spices, flavors, and colors.¹⁴ There is strong biologic justification for this requirement in view of mounting evidence that minute amounts of food allergens are capable of causing fatal or nearly fatal reactions in sensitive individuals. At the same time, it is critical that food manufacturers take all steps necessary to eliminate occurrences of cross contamination whereby recognized food allergens, such as peanuts, eggs, tree nuts, etc, are inadvertently introduced into products that are not intended to contain such allergens. In the meantime, the FDA continues to assist food manufacturers in expediting recalls related to undeclared allergens in foods. For example, during fiscal year 1995, the FDA assisted in 60 recalls of food products resulting from the presence of undeclared allergens; 46 of the recalled products contained undeclared egg (37 of these were in chocolate candies manufactured by one company), 6 undeclared peanut, and the remaining 8 undeclared tree nuts or milk.

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