

Self-reported allergic reactions to peanut on commercial airliners

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Background: Allergic reactions to food occurring on commercial airlines have not been systematically characterized.

Objective: We sought to describe the clinical characteristics of allergic reactions to peanuts on airplanes.

Methods: Participants in the National Registry of Peanut and Tree Nut Allergy who indicated an allergic reaction while on a commercial airliner were interviewed by telephone.

Results: Sixty-two of 3704 National Registry of Peanut and Tree Nut Allergy participants indicated a reaction on an airplane; 42 of 48 patients or parental surrogates contacted confirmed the reaction began on the airplane (median age of affected subject, 2 years; range, 6 months to 50 years). Of these, 35 reacted to peanuts (4 were uncertain of exposure) and 7 to tree nuts, although 3 of these 7 reacted to substances that may have also contained peanut. Exposures occurred by ingestion (20 subjects), skin contact (8 subjects), and inhalation (14 subjects). Reactions generally occurred within 10 minutes of exposure (32 of 42 subjects), and reaction severity correlated with exposure route (ingestion > inhalation > skin). The causal food was generally served by the airline (37 of 42 subjects). Medications were given in flight to 19 patients (epinephrine to 5) and to an additional 14 at landing/gate return (including epinephrine to 1 and intravenous medication to 2), totaling 79% treated. Flight crews were notified in 33% of reactions. During inhalation reactions as a result of peanut allergy, greater than 25 passengers were estimated to be eating peanuts at the time of the reaction. Initial symptoms generally involved the upper airway, with progression to the skin or further lower respiratory reactions (no gastrointestinal symptoms).

Conclusions: Allergic reactions to peanuts and tree nuts caused by accidental ingestion, skin contact, or inhalation occur during commercial flights, but airline personnel are usually not notified. Reactions can be severe, requiring medications, including epinephrine. (*J Allergy Clin Immunol* 1999;103:186-9.)

Key words: Food allergy, peanut, tree nut, airplane

Abbreviations used

PAR: National Registry of Peanut and Tree Nut Allergy
TN: Tree nut

Allergic reactions to peanuts are potentially severe,¹⁻³ sensitivity is usually long-lasting,^{4,5} and reactions caused by accidental exposures are common.^{3,4} There are a few anecdotal reports about reactions to casual skin contact or inhalation of peanut allergen.⁶⁻¹⁰ Attention has been drawn to potential allergic reactions on commercial airliners because peanuts are often served as snacks on commercial airliners, and peanut allergen is detectable in airplane filtering systems.¹¹

We identified subjects from the National Registry of Peanut and Tree Nut Allergy (PAR)¹² who self-reported allergic reactions to peanut or tree nut (TN) while aboard commercial airliners. We contacted these individuals or parental surrogates to review the reactions and here report the clinical characteristics of these reactions.

METHODS

At the time of this study, there were 3704 persons registered in the PAR database.¹² Briefly, this is a database maintained in conjunction with the Food Allergy Network containing the results of surveys returned by individuals (or parental surrogates) with self-reported peanut/TN allergy. The registrants were recruited through members of the Food Allergy Network and through questionnaires given to patients from physicians. Registrants selected for this study had recorded "airplane/airport" under the category of "other" as the location of their allergic reactions. Participants were contacted by telephone and interviewed by using a standard questionnaire to obtain more information about their reactions and allergy history. Informed consent was obtained from all participants, and the study was approved by the Mount Sinai and Johns Hopkins Institutional Review Boards.

Reaction severity was graded as follows: Severe—hypotension, significant involvement of 3 organ systems, or wheezing with hives, edema, or diarrhea/vomiting; moderate—wheezing alone or significant involvement of 2 organ systems; mild—significant skin or gastrointestinal symptoms alone or in combination with mild symptoms in other systems; and minimal—any combination of mild symptoms. Symptoms considered to be significant include hives, hypotension, loss of consciousness, dyspnea, vomiting, diarrhea, throat tightness, coughing, and wheezing; and symptoms considered mild include erythema/flushing, pruritus, conjunctivitis, abdominal pain, nasal congestion, itchy throat, and sneezing.

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Received for publication Jan 21, 1999; revised Feb 22, 1999; accepted for publication Feb 23, 1999.

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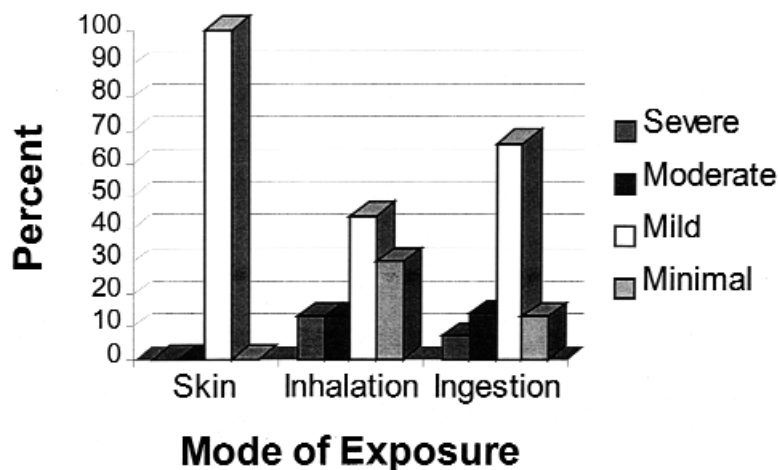


FIG 1. Percent of subjects with minimal, mild, moderate, or severe reactions to peanut for each exposure route (skin contact, 7 subjects; inhalation, 14 subjects; and ingestion, 14 subjects). Within each exposure group, the number of subjects having reactions totals 100%.

TABLE I. Characteristics of subjects with allergic reactions to peanut

Mode of exposure	No. of subjects	Age (y)*	Time from exposure to reaction (min)*	Initial organ system affected	Eventual organ system affected†	Evidence of allergy to peanut‡	History of asthma
Skin contact	7	1.5 (0.75-2)	1 (1-180)	s-7	s-7	IgE 6, Hist 1	2
Inhalation	14	3 (0.75-50)	10 (5-40)	s-7, r-7	s-8, r-8	IgE 12, Hist 1	7
Ingestion	14	1.5 (0.5-40)	5 (1-60)	s-10, r-2, g-2	s-13, r-3, g-2	IgE 12, Hist 2	8

s, Skin; r, respiratory, including rhinitis/conjunctival pruritus; g, gastrointestinal; Hist, history of an acute reaction.

*Median (range).

†Cumulative number affected.

‡Peanut-specific gE levels determined by skin prick test or RAST.

RESULTS

Study population

Sixty-two PAR subjects recorded “airplane” or “airport” under the category of “other location” for an allergic reaction. Of these, 48 were successfully contacted (77%); 14 were unable to be contacted after multiple attempts (moved/wrong numbers, 3; unreturned calls, 11). Six of the 48 contacted actually had their reactions in the airport before boarding the plane and were not interviewed further, leaving 42 subjects in whom more details were obtained. The median age of allergic subjects was 2 years (mean, 5.9 years; range, 6 months to 50 years). The young age of affected subjects reflects the general population of the PAR (median, 5 years; range, 9 months to 81 years). Thirty-one subjects were male. Twenty-one (50%) had a history of asthma. Reactions were triggered by peanuts for 35 subjects, although 4 of these were not certain but believed that peanuts probably caused the reaction. The 7 remaining subjects had reactions to a variety of baked products with TNs: 2 to almond, 1 to almond and pecan, 3 to unspecified “nuts” that may have included peanut, and 1 to mango, which this person considered to be a nut. The 7 subjects with

reactions to food other than peanut had reactions caused by ingestion of the causal food.

The flight crew was notified about 14 of the 42 reactions (33%). Five reactions were severe, 4 were moderate, 26 were mild, and 7 were minimal. Medication was given in flight to 19 subjects and after landing to 14 (7 at the airport, 2 in a hospital, and 5 after returning home). Six subjects received epinephrine (5 in flight), 28 received antihistamines, 2 received albuterol, 1 received oxygen, 1 received steroids, and 2 received intravenous medications. Thirty-five subjects had subsequent flights and modified their plans to ensure their safety as follows: 17 notified airlines in advance, 27 carried their own medications, 30 brought their own food, and 1 traveled with only airlines not serving the causal food.

Reactions to peanut

The characteristics of the 35 subjects reacting to peanut are shown in Table I. All but 2 of the subjects were children, again reflecting the age of the subjects registered in the PAR. Reactions occurred generally within minutes after exposure, and the initial symptoms coincided with the mode of exposure (ie, skin symptoms for skin contact and respiratory symptoms for inhalation

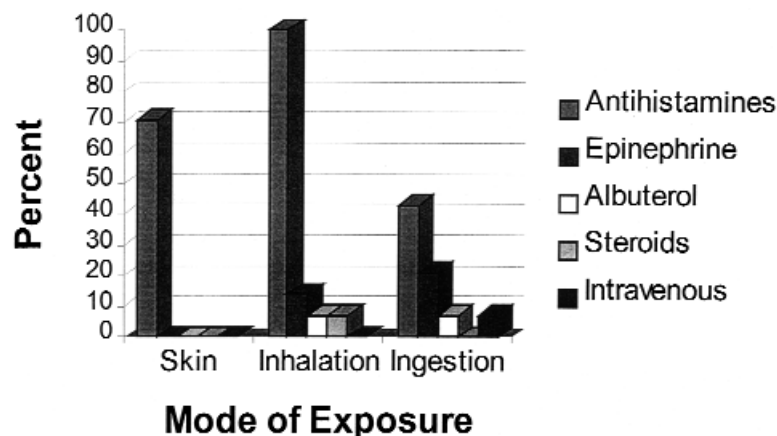


FIG 2. Percent of subjects receiving particular medications by mode of exposure to peanut.

contact). In all but 3 cases, peanuts were served by the airline. These reactions represented a first reaction to peanut for 5 of those subjects who were exposed by skin contact, 1 exposed by inhalation, and 10 exposed by ingestion. Skin contact was usually by peanut particles left on seats. Almost all of the subjects had confirmation of IgE to peanut by RAST or skin prick tests. Four were not tested but had several previous and/or subsequent reactions to peanut exposure with severe reactions.

The severity of the reactions is shown in Fig 1, and the medications given are shown in Fig 2. In general, reactions were more severe, and medications were required more often, when exposure was by ingestion. Epinephrine and diphenhydramine given in flight were supplied and administered by the patient or the patient's parent.

Inhalation reactions to peanut

Four of the 14 subjects reacting by inhalation indicated that they were not certain but that they suspected that peanut was the cause of the reaction. For 1 of these 4 subjects, the reaction was severe and treated with epinephrine, but began 40 minutes after the peanuts were served to everyone on the flight; for another, a severe reaction treated with epinephrine occurred 20 minutes after boarding, but peanuts had not been served; and for a third, a mild reaction occurred 20 minutes into flight, but peanuts had not been served. For these latter 2 patients, aged 3 years and 20 months, respectively, the family assumed the reaction was caused by peanut fumes left from previous flights. For all of the remaining subjects, reactions occurred when peanuts were served to over 25 passengers. There was only 1 adult in the group (age, 50 years).

DISCUSSION

Although commonly discussed in the public press, there is limited scientific literature describing allergic reactions to peanut on commercial airlines caused by airborne peanut allergen. One group noted that peanut allergen was detectable in the filtering systems in commercial

airliners,¹¹ confirming that the allergen can become airborne in this setting. There are several published case reports of acute allergic reactions to airborne food particles, such as string bean,¹³ lentil,¹⁴ meats,¹⁵ and seafood,¹⁶⁻¹⁸ usually during cooking or occupational exposure. There are also a few reports concerning peanut reactions to inhalational or casual exposure⁶⁻⁹ but only 1 case report of an inhalation reaction to peanuts on a commercial airline, which resulted in rhinitis and asthma in an adult with peanut allergy.¹⁰ In this report we have described the clinical characteristics of allergic reactions to peanuts and TNs on commercial airlines among 42 of 3704 subjects registered in the PAR.¹² Thirty-five of these subjects reported reactions to peanuts, with 14 reactions caused by inhalation of peanut allergen.

Because the allergic reactions were self-reported, there is the possibility that they do not represent true peanut-allergic reactions. Either another allergen or irritant could have caused reactions, or the reactions may not have been true allergic reactions. The authors are aware of anecdotal reports, typically involving adults or teenagers who experience trouble breathing and heart racing and relate these anxiety reactions to peanut exposure. Indeed, for 3 patients described above who felt that their reactions were "probably" caused by peanut allergen inhalation, the timing of the reaction or degree of exposure was not very convincing. However, there are several characteristics applicable to the remaining 11 inhalation reactions that suggest that these were true allergic reactions to inhaled peanut allergen. First, all but 1 of the subjects were young children, making anxiety reactions less likely. Furthermore, the pattern and timing of reactions were consistent with an inhalation reaction because these reactions generally began with mild respiratory symptoms shortly after large numbers of peanuts were consumed. The types of symptoms (congestion, rhinorrhea, conjunctival pruritus, wheezing, erythema, and lack of gastrointestinal symptoms) were consistent with IgE-mediated reactions and typical of what might be seen, for example, when a patient allergic to cats enters a room with a cat.¹⁹ Lastly, almost all of the subjects were

tested, and all of these had peanut-specific IgE antibody.

This study could not address the prevalence of allergic reactions to peanuts on commercial airliners. The PAR database consists primarily of children (only 11% over age 18 years), and because most airline passengers are adults, the study does not reflect the average passenger. About 1% of the subjects in the PAR, clearly a selected group, described reactions on commercial airliners, and only a fraction of these were caused by inhalation. There may have been underreporting because subjects for this study had to specifically write in "airline/airplane" under a category of "other" for location of their reaction. Although the number of registrants with similar exposures is not known, it may be deduced that even among this highly allergic group, reactions to peanut inhalation on airliners are uncommon and generally not severe. Clearly, the reactions are underreported (33%) to the airlines.

Although the authors are aware of patients, both adults and children, describing severe reactions to inhalation of peanut allergen on airlines resulting in severe symptoms, most of the inhalation reactions described here were not life-threatening. However, when one considers the whole group experiencing acute allergic reactions by ingestion and inhalation to peanuts or TNs while on commercial airliners, the importance of exercising caution and having emergency medication available becomes apparent.

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