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## ADVANCES IN THE TREATMENT OF PEANUT ALLERGY: A CASE REPORT

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□ **Abstract—Background: Peanut allergies affect 1.5% of children. The majority of reactions to peanuts are mild, but peanut allergy is also the most common cause of fatal anaphylactic reactions to food. Case Report: The purpose of this case report was to describe a 1-year old boy who developed difficulty breathing after eating a peanut food product. The boy was taken immediately by his mother to an Emergency Department, exhibiting severe respiratory distress. After speaking to the child's mother, the emergency physician (EP) realized that the wheezing was due to a peanut food allergy. The child's respiratory symptoms responded within 10 min to bronchodilatator inhalation. The EP gave the mother educational information regarding the management of asthma and the proper use of metered dose inhalers with spacer devices. The EP referred the child to a clinical allergist who specializes in the management of food allergies. The diagnosis was made by skin prick testing as well as in vitro measurement of peanut-specific immunoglobulin E. Conclusion: The allergist explained that the mainstay of management of peanut allergy is avoidance of the allergenic food. Patient education involved teaching the mother to avoid high-risk situations such as dinner with family members who are not informed about the child's allergy to peanuts, encouraging the child to wear a Medic Alert Bracelet, and teaching the family and child to recognize early symptoms of allergic reactions and to manage an anaphylactic reaction, including the use of self-injectable epinephrine, as well as activating emergency services.** © 2011 Elsevier Inc.

□ **Keywords—peanut allergy; fatal anaphylactic reaction; asthma attack; inhaled corticosteroids; skin prick testing; peanut-specific immunoglobulin E**

### INTRODUCTION

In 2000, our team of scientists and physicians reported the dangers of cornstarch on examination and surgical gloves that could cause a severe allergic reaction (1). We found that health care workers are at high risk for this allergy due to occupational exposure to cornstarch on latex. In this article, we discuss in detail the treatment and prevention of latex allergies in the hospital setting.

In the present article, we report the case of a child with a potentially life-threatening reaction to peanuts who was treated successfully by an Emergency Physician (EP) with the help of a clinical allergist and immunologist. Furthermore, we discuss the management and prevention of peanut allergies as well as research advances that will hopefully suppress or eliminate the allergic reaction to peanuts. This article includes three parts: 1) an overview of the frequency and life-threatening consequences of peanut allergies; 2) A case report of a child with a potentially life-threatening reaction to peanuts who was treated successfully by an EP with the

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help of a clinical allergist and immunologist; and 3) a discussion of research advances in the management of peanut allergies that hopefully will suppress or eliminate the allergic reaction to peanuts.

Peanut allergies affect 1.5% of children. Peanut allergy also has an early onset that can precipitate severe allergic reactions (2,3). Tree nut allergies are common and persistent (4–6). Allergy to cashew nuts is increasingly recognized in clinical practice (7). Management of nut allergy should include a risk assessment to provide specific avoidance advice as well as emergency medical care (8). Factors that might influence the severity of future reactions include the following: 1) age of patient, 2) severity of worst reaction to date, and 3) the amount of nut that caused the reaction (9). The type of nut that caused the worst reaction to date may also indicate an increased risk. The majority of reactions to peanuts are mild, but peanut allergy is also the most common of fatal anaphylactic reactions to food (9).

## CASE REPORT

While shopping in a grocery store with her 1-year-old son, a mother was offered samples of a new food product containing peanuts. Not realizing that her son was allergic to peanuts, she put the peanut food sample in his mouth. Her son began to cry a few minutes after consuming the food. He then developed redness and swelling in his cheeks that was associated with some difficulty breathing. It was fortuitous that a nurse was shopping in the same grocery store and recognized immediately the potentially severe allergic reaction. She took the mother and child to an Emergency Department (ED) that was only two blocks from the grocery store. The child was seen and examined by an EP, who quickly recognized that the child exhibited wheezing that was confirmed by auscultation of the child's chest. The child had stable vital signs and no evidence of cardiovascular symptoms or cutaneous findings that suggested an allergic reaction. His respiratory symptoms responded within 10 min to bronchodilatator administration (albuterol sulfate [PROVENTIL® HFA; Schering-Plough Corporation, Kenilworth, NJ]; 2.5 mg was diluted with 0.9% saline to a final volume of 3 mL) and nebulization. The EP gave the mother education information regarding the management of respiratory symptoms and proper use of metered dose inhalers with spacer devices. Because the mother informed the EP that the respiratory symptoms occurred immediately after eating a peanut, the EP referred the mother and child to a clinical allergist in the same hospital. The mother took her son immediately to the allergist, who specializes in the management of food allergies (10).

Skin prick testing was performed by the skin prick test method using commercial extract (Hollister-Steri Laboratories, LLC, Spokane, WA) (11). In this child's case, the skin prick test wheal diameter was 8 mm. Sporik et al. reported a skin prick test wheal diameter of $\geq$ 8 mm to be 100% specific in predicting positive challenges to peanut allergies in children attending an Allergy Clinic in Melbourne, Australia (12). Skin prick testing of the patient was combined with in vitro measurement of peanut-specific immunoglobulin E (IgE). The child had a peanut-specific IgE level of 15 kU/L. Sampson and Ho found that this specific IgE level had a $>$ 95% predicted value for a positive challenge in a study of children with atopic dermatitis (13).

The mainstay of management of the patient's peanut allergy focused on prevention by avoidance of allergenic food. This avoidance of allergenic foods required extensive education of the parents, family members, and their caregivers about the proper reading of packaged food labels. New labeling legislation that came into effect during the past year in the United States and Europe has made this task simpler by mandating clear labeling and enforcing ingredients statements on packaged food labels and declaring information related to the presence of possible allergenic residues from processing other foods by the same food manufacturing company (14).

Patient education also involved teaching to avoid high-risk situations such as dinner with uninformed family members or friends who do not know about the boy's peanut allergy, encouraging this child to wear a Medic Alert Bracelet, and teaching the family and the child to recognize early symptoms of allergic reactions and to manage an anaphylactic reaction, including the use of self-injectable epinephrine with an Epinephrine Auto-Injector (EpiPen®; Dey L.P., Napa, CA), as well as activating emergency services (15). A good resource for educational materials is the Food Allergy and Anaphylaxis Network in the United States.

Due to the development of respiratory symptoms that were thought to be related to peanuts, the child was given a monoclonal antibody against IgE, approved for use in patients with moderate-to-severe persistent allergic respiratory symptoms. This therapy proved to be useful as adjuvant to allergen avoidance and may prove to be helpful against other food allergies in the same individual.

## DISCUSSION

Despite educational efforts to prevent peanut allergic reaction, significant reactions continue to occur. Fortunately, various therapies for IgE-mediated allergies are being explored and will be used either in conjunction

with allergen avoidance or to replace it altogether. These include the following therapies: 1) anti-IgE therapy, 2) immunotherapy, and 3) traditional Chinese herbal medicine. The pharmacological purposes of the anti-IgE therapy are to neutralize IgE and to inhibit its production to attenuate type I hypersensitivity reactions (16). The therapy is based on humanized IgG1 antibodies that bind to free IgE and to membrane-bound IgE on B cells, but not to IgE bound by the high-affinity IgE.Fc receptors on basophils and mast cells or by the low-affinity IgE.Fc receptors on B cells. After nearly 20 years since their use began, therapeutic anti-IgE antibodies (anti-IgE) have been studied in about 30 Phase II and III clinical trials with many allergy indications, and a lead antibody, omalizumab, has been approved for treating patients (12 years and older) with moderate-to-severe allergic asthma. Anti-IgE has confirmed the roles of IgE in the pathogenesis of asthma and helped define the concept "allergic asthma" in clinical practice. It has been shown to be safe and efficacious in treating pediatric allergic asthma and treating allergic rhinitis and is being investigated for treating peanut allergy, atopic dermatitis, latex allergy, and others. It has potential for use in combination with specific and rush immunotherapy for increased safety and efficacy. Anti-IgE thus seems to provide a prophylactic and therapeutic option for moderate to severe cases of many allergic diseases and conditions in which IgE plays a significant role.

Given the high incidence of systemic reactions using standard subcutaneous immunotherapy for IgE-mediated peanut allergy, oral immunotherapy has been investigated as an alternative over the past few years, with variable results. Recent investigations have been encouraging, demonstrating its safety and efficacy in increasing tolerance to the food allergies. A randomized, double-blind placebo-controlled study using the sublingual administration of hazelnut extract demonstrated effectiveness with minimal systemic reactions (17).

More randomized studies on oral immunotherapy are needed to determine the optimal starting and maintenance doses and titration schedules that would provide an efficacious and safe therapy in the shortest period of time. Long-term efficacy has yet to be determined.

In 2001, a Chinese herbal formula, food allergy herbal formula I, containing a mixture of 11 herbs believed to contain anti-allergenic properties, was tested in a murine model of peanut anaphylaxis, and was found to block peanut-induced anaphylaxis and reduce peanut-specific IgE levels and systemic T helper type II cytokines (18). More recently, a more simplified formula, food allergy herbal formula II, containing nine of the original 11 herbs, was tested in the same murine model, and was found to be equally safe and effective (19). Clinical trials using this formula in patients with peanut allergy must be initiated to test its safety and efficacy in humans. Although the past few years have been marked by major research advances in potential therapies, the mainstay of therapy for IgE-mediated food allergy remains avoidance of the offending foods.

## CONCLUSIONS

It is important to emphasize that one-third of the patients allergic to peanuts have allergies to other tree nuts and should be tested for allergies to all types of tree nuts (20). Children under 5 years of age who are allergic to peanuts should avoid all nuts, as they may develop sensitivity to them. Children from families with histories of allergies and atopy, or those who exhibit milk or egg allergies early in life, should avoid peanuts at a young age. In addition, it has been well documented that there is a low incidence of referral of children to allergists for comprehensive care (21). Finally, it is important that prescriptions for self-injectable epinephrine be given to all patients presenting to EDs with anaphylactic reactions to food.

## REFERENCES


1. Jackson EM, Arnette JA, Martin ML, Tahir WM, Frost-Arner L, Edlich RF. A global inventory of hospitals using powder-free gloves: a search for principled medical leadership. J Emerg Med 2000;18:241–6.
2. Grundy J, Matthews S, Bateman B, Dean T, Arshad S. Rising prevalence of allergy to peanut in children: data from 2 sequential cohorts. J Allergy Clin Immunol 2002;110:784–9.
3. Bock SA, Atkins FM. The natural history of peanut allergy. J Allergy Clin Immunol 1989;83:900–4.
4. Fleischer D, Conover-Walker M, Matsui E, Wood R. The natural history of tree nut allergy. J Allergy Clin Immunol 2005;116:1087–93.
5. Sicherer S, Burks W, Sampson H. Clinical features of acute allergic reactions to peanut and tree nuts in children. Pediatrics 1998;102:e6.
6. Ewan P. Clinical study of peanut and nut allergy in 62 consecutive patients: new features and associations. BMJ 1996;312:1074–8.
7. Clark AT, Anagnostou K, Ewan PW. Cashew nut causes more severe reactions than peanut: case-matched comparison in 141 children. Allergy 2007;62:913–6.
8. Ewan P, Clark A. Efficacy of a management plan based on severity assessment in longitudinal and case controlled studies of 747 children with nut allergy: proposal for good practice. Clin Exp Allergy 2005;35:751–6.
9. Bock S, Munoz-Furlong A, Sampson H. Fatalities due to anaphylactic reactions to foods. J Allergy Clin Immunol 2001;107:191–3.
10. Stone KD. Advances in pediatric allergy. Curr Opin Pediatr 2004;16:571–8.
11. Sampson HA. Food allergy. Part 2: diagnosis and management. J Allergy Clin Immunol 1999;103:981–9.
12. Sporik R, Hill DJ, Hosking CS. Specificity of allergen skin testing in predicting positive open food challenges to milk, egg and peanut in children. Clin Exp Allergy 2000;30:1540–6.
13. Sampson HA, Ho DG. Relationship between food-specific IgE concentrations and the risk of positive food challenges in

children and adolescents. J Allergy Clin Immunol 1997;100: 444–51.
14. Taylor SL, Hefle SL. Food allergen labeling in the USA and Europe. Curr Opin Allergy Clin Immunol 2006;6:186–90.
15. Sicherer SH, Sampson HA. Food allergy. J Allergy Clin Immunol 2006;117(2 Suppl):S470–5.
16. Chang TW, Wu PC, Hsu CL, Hung AF. Anti-IgE antibodies for the treatment of IgE-mediated allergic diseases. Adv Immunol 2007; 93:63–119.
17. Enrique E, Pineda F, Malek T, et al. Sublingual immunotherapy for hazelnut food allergy: a randomized, double-blind, placebo-controlled study with a standardized hazelnut extract. J Allergy Clin Immunol 2005;116(5):1073–9.
18. Li XM, Zhang TF, Huang CK, et al. Food allergy herbal formula-1 (FAHF-1) blocks peanut-induced anaphylaxis in a murine model. J Allergy Clin Immunol 2001;108:639–46.
19. Srivastava KD, Kattan JD, Zou ZM, et al. The Chinese herbal medicine formula FAHF-2 completely blocks anaphylactic reactions in a murine model of peanut allergy. J Allergy Clin Immunol 2005;115:171–8.
20. Fleischer DM. The natural history of peanut and tree nut allergy. Curr Allergy Asthma Rep 2007;7:175–81.
21. Ewan PW, Clark AT. Efficacy of a management plan based on severity assessment in longitudinal and case-controlled studies of 747 children with nut allergy: proposal for good practice. Clin Exp Allergy 2005;35:751–6.