

An update on food allergy

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Purpose of review

The present review serves to address food allergy, which is a common problem encountered by the general pediatrician. Between 4 and 6% of US children have an allergic reaction to at least one food, and the prevalence of some food allergies appears to be increasing.

Recent findings

A combination of genetic influences, characteristics of food antigen processing, and timing of food introduction may influence the development of food allergy. Avoidance of highly allergenic foods beyond 4–6 months may not be effective at preventing the development of food allergy in most children, and the effect of specific early introduction of allergenic foods is being investigated. Oral immunotherapy is under investigation but may be limited in future use by several factors, including a significant rate of allergic reactions.

Summary

Current management of food allergy focuses on accurate diagnosis, appropriate counseling regarding strict allergen avoidance with review of available educational resources, emergency preparedness, instruction on the use of self-injectable epinephrine, and ongoing surveillance for the possible development of tolerance.

Keywords

avoidance, diagnosis, food allergy, oral immunotherapy, prevention, treatment

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Introduction

Recent research has provided new insights into the prevalence, pathophysiology, prevention, diagnosis, and management of food allergies. Future studies will be expected to provide greater clarity regarding prevention of food allergies as well as the role of desensitization and the induction of tolerance; however, present management relies on accurate diagnosis, strict avoidance of food allergens, and emergency preparedness strategies to deal with accidental exposures and reactions.

Prevalence

Adverse food reactions may include both food intolerances as well as food allergies. Food allergies are immunologically mediated phenomena that may involve immediate or delayed symptoms, commonly classified as IgE or non-IgE-mediated reactions. Food allergies affect approximately 4–6% of US children, with milk, egg, peanut, and nut allergies accounting for the majority of food-associated allergic reactions during childhood [1,2].

When evaluated in 1987, the prevalence of cow's milk, egg, peanut, and soy allergies was approximately 2.5, 1.5,

0.5, and 0.5%, respectively [3]. In October 2008, the National Center for Health Statistics under the Centers for Disease Control and Prevention released a report indicating an 18% increase over the previous decade in self-reported childhood food allergy. In this report, approximately 3 million children under 18 years of age (3.9%) were reported to have a food allergy [4].

This self-reported prevalence of food allergy is, in general, lower than the rate of skin test sensitization. This was seen with allergy skin tests that were performed during the third National Health and Nutrition Examination Survey (NHANES III), conducted in the United States from 1988 to 1994. In this survey of 10 508 persons 6–59 years of age, the prevalence of sensitization (positive prick skin test) to peanut was 8.6% [5], more than double the rate of self-reported food allergy.

Recently, a longitudinal Swedish population-based birth cohort was used to reevaluate phenotypes of food hypersensitivity in children up to 8 years of age. Among 3104 children evaluated, an increase in the prevalence of peanut and tree nut allergy was observed, whereas the rate of reactions to milk, egg, fish, and wheat appeared decreased. The risk of food allergies was increased in

children with histories of asthma, eczema, or allergic rhinitis [6•].

Regional differences in peanut allergy prevalence have been documented and may raise questions about prevention of peanut allergy by differing cultural practices. For example, Du Toit *et al.* [7••] recently published results from a survey using a clinically validated questionnaire to explore the prevalence of peanut allergy in Jewish schoolchildren (5171 in the UK and 5615 in Israel). A second validated questionnaire assessed peanut consumption and weaning in Jewish infants (77 in UK and 99 in Israel). The prevalence of peanut allergy in the UK was 1.85%, whereas that in Israel was just 0.17% ($P < 0.001$). The adjusted risk ratio for peanut allergy between the countries was 9.8 [95% confidence interval (CI) 3.1–30.5] after adjusting for atopy. Surprisingly, peanut was introduced earlier in Israel than in the UK (median monthly consumption for peanut in Israeli infants aged 8–14 months, 7.1 g vs. 0 g in the UK, $P < 0.001$), suggesting that early introduction of peanut into the diet may be protective. The results of these cohort observations need to be viewed with caution as the groups were not randomized. However, the current Learning Early About Peanut Allergy (LEAP) study is recruiting patients to further evaluate this question in a randomized prospective trial. The study plans to enroll 480 children between the ages of 4 and 10 months, and each child will be randomly assigned to peanut avoidance or consumption [8].

In a recent report from the Rochester Epidemiology Project, the etiology and incidence of anaphylaxis were described. The adjusted incidence rate of anaphylaxis was 49.8 (95% CI 45.0–54.5) per 100 000 person-years. Rates were highest for ages 0–19 years (70 per 100 000 person-years), and food accounted for 33.2% of reactions. In the United States, the incidence of anaphylaxis appears to be increasing, with food allergy now accounting for 50 000 anaphylactic reactions each year [9]. This represents a significant increase from the annual incident rate of 30 000 cases per year in 1999 [10]. Food-associated anaphylaxis is responsible for at least 200 deaths each year [10]. From 2004 to 2006, there were an average of 9537 hospital discharges per year related to food allergy among children 0–17 years of age [4].

Hospitalizations for pediatric anaphylaxis were recently evaluated by Lin *et al.* [11•] using a statewide administrative database (1990 through 2006) in New York State. Anaphylaxis hospitalization rates increased by more than four-fold in patients younger than 20 years. Food anaphylaxis was the predominant cause, and peanut was the most common food allergen. De Silva *et al.* [12•] also recently evaluated the cause of childhood anaphylaxis over a 5-year period in children presenting to the

Emergency Department at the Royal Children's Hospital in Melbourne, Australia. One hundred and twenty-three cases of anaphylaxis were evaluated and one fatality was recorded. The median age of presentation was 2.4 years. Most reactions occurred in the home (48%), and food was the most common trigger (85%). Peanut (18%) and cashew (13%) were the most common causes of anaphylaxis. The median time from exposure to reaction was 10 min, and the median time to the onset of therapy was 40 min. Respiratory features were the chief presenting feature in 97% of cases, and 17% of children had experienced anaphylaxis previously.

These recent studies of anaphylaxis highlight characteristics that remain relatively unchanged from a seminal report in 1992 by Sampson *et al.* [13]. In their case series of fatal or near-fatal anaphylactic reactions to foods, six children and adolescents who died of anaphylactic reactions to foods and seven others who nearly died and required intubation were identified. Twelve of the 13 patients had asthma that was well controlled, and all had known food allergies but had unknowingly ingested the foods responsible for the reactions. The reactions occurred to peanuts (four patients), nuts (six patients), eggs (one patient), and milk (two patients).

Although peanut allergy tends to persist throughout life, patients with cow's milk or egg allergies may have a higher chance of eventually tolerating these foods or 'outgrowing' their allergy. Although previous evidence had suggested that approximately 80% of children might outgrow milk and egg allergies in the first 5 years of life [3], more recent data suggest patients may have more persistent milk or egg allergies. Skripak *et al.* [14] reported on a retrospective cohort of 807 children with IgE-mediated cow's milk allergy. Challenging conventional wisdom, rates of resolution were only 19% by 4 years of age, 42% by 8 years, 64% by 12 years, and 79% by 16 years. Patients with persistent allergy had higher levels of sensitization by specific IgE testing, as well as allergic comorbidities including asthma and allergic rhinitis. Using a similar study design, this same group reported a cohort of egg allergic children who also had a lower rate of tolerance than previously assumed. By 4 years of age, only 4% of children had outgrown their egg allergy (12% by age 6 years, 37% by age 10 years, and 68% by age 16 years) [15].

Pathophysiology

The process by which a food becomes identified as an allergen is incompletely understood. This process is thought to involve a break in normal immune tolerance to food proteins. The reason that allergy develops in particular individuals likely relates to genetic influences as well as dietary patterns and methods of food antigen

preparation. This last year, Burks *et al.* [16**] presented an excellent review of emerging conceptual frameworks that may explain the balance between tolerance and allergy. In their review, the authors highlight that in most individuals, the vast majority of ingested proteins are tolerated through suppression of cellular or humoral responses. This process of oral tolerance involves signaling on multiple levels of the immune response cascade, including activities by antigen-presenting cells, dendritic cells, and regulatory T cells. The oral route of exposure may actually tend to favor the induction of tolerance, whereas transcutaneous exposure may favor the development of allergic responses. This may explain the observation by Lack *et al.* [17] in 2003 that the incidence of peanut allergy was higher in infants exposed to skin products containing peanut oil in the UK. In this study, the use of peanut-oil-containing moisturizing creams to treat conditions such as diaper rash, dry skin, and eczema was identified as a significant predictor for the development of clinical peanut allergy.

In another excellent review recently published, Burks [18*] described the role of antigen processing in promoting allergic responses. It has previously been reported that preparing peanuts for consumption by roasting (as opposed to boiling) causes peanut proteins to be significantly more allergenic [19]. This observation likely explains the discrepant prevalence of allergy between differing geographic regions, despite similar rates of overall peanut consumption. For example, in China, where peanuts are boiled, the prevalence of peanut allergy is generally thought to be low despite high consumption of this food. This is in contrast to the United States, where peanut allergy prevalence is much higher, and, accordingly, the ingestion of roasted peanuts is much more common [20].

In contrast to studies with peanut allergen, recent studies with milk allergen highlight the fact that not all allergens behave in similar fashion during processing. For example, though heating may increase allergenicity of peanut, it appears to have the opposite effect in some milk allergic patients. In the last year, Nowak-Węgrzyn *et al.* [21*] proposed a new classification schema of IgE-mediated cow's milk allergy, placing milk allergic patients into two subgroups. The investigators hypothesized that one subgroup of milk allergic patients would be able to tolerate heated milk products, but that the other subgroup would react to heated as well as unheated milk products. They therefore studied 100 previously milk allergic children (median age 7.5 years; range 2.1–17.3 years) who underwent heated milk challenges. Of these, 68% tolerated heated milk (but if challenged, reacted to unheated milk), 23% reacted to heated milk (and were therefore not subjected to the unheated milk challenge), and 9% tolerated both the heated milk and unheated milk

challenges (i.e., they were no longer allergic). The patients who tolerated the heated milk preparation tended to have 'milder' milk allergy: any reactions they had after their unheated milk challenges tended to be mild, and their skin test positivity was less.

The investigators concluded that there are at least two different phenotypes of IgE-mediated milk allergy in children. The first type of patient is able to tolerate heated milk products and is more likely to outgrow their allergy, whereas the second type cannot even tolerate heated milk products and is less likely to outgrow their allergy.

Non-IgE-mediated food allergy has also been addressed recently, and, in particular, eosinophilic esophagitis has been an emerging concern. In October 2007, the American Gastroenterological Association Institute and North American Society of Pediatric Gastroenterology, Hepatology, and Nutrition published a systematic review of eosinophilic esophagitis in children and adults with consensus recommendations for diagnosis and treatment. Eosinophilic esophagitis is characterized by symptoms including but not restricted to food impaction and dysphagia in adults and feeding intolerance and gastroesophageal reflux disease (GERD) symptoms in children; at least 15 eosinophils/high powered field on esophageal biopsy; and exclusion of other disorders associated with similar clinical, histological, or endoscopic features, especially GERD. Appropriate treatments include dietary approaches based upon elimination of exposure to identified food allergens or the use of topical corticosteroids [22].

One approach to delivering topical corticosteroids to the esophagus involves having the patient swallow fluticasone from a metered dose inhaler (as opposed to inhaling the drug). Recently, Schaefer *et al.* [23*] compared treatment with oral prednisone to topical fluticasone in 80 children with eosinophilic esophagitis. Patients were randomized to receive oral prednisone or swallowed fluticasone for 4 weeks, followed by an 8-week weaning protocol. Histological improvement was seen in 94% of each patient group. In the prednisone group, 87.5% of patients demonstrated clinical improvement, and, in the fluticasone group, 90% of patients reported improvement; however, symptom relapse occurred by week 24 in 45% of patients (no difference between treatment groups). Esophageal candidal overgrowth was seen in 40% of the prednisone group and 15% of the patients receiving fluticasone. The study highlighted the utility of using swallowed doses of inhaled corticosteroids as well as the relapsing nature of the disease.

The food protein-induced enterocolitis syndrome (FPIES) is a severe cell-mediated form of food allergy that presents in infancy and early childhood. Classically,

FPIES presents with delayed onset vomiting, diarrhea, and lethargy/dehydration. Symptoms are often severe and may prompt sepsis evaluations [24]. Recently, Mehr *et al.* [25•] identified rice as an emerging allergen provoking this syndrome in a retrospective study of Australian children. In this analysis, 14 children presented with 26 episodes of rice FPIES, compared with 17 children presenting with 30 episodes of cow's milk or soy FPIES. Rice caused more episodes of FPIES before a correct diagnosis was made and was responsible for more severe reactions with a higher rate of intravenous fluid resuscitation (43 vs. 17%) when compared to reactions caused by cow's milk/soy. The study highlights the emerging importance of rice as a possible cause of FPIES.

Prevention

Although preliminary recommendations intended to prevent food allergy had suggested delayed introduction of highly allergenic foods such as peanut, recent evidence has questioned this conventional wisdom. In the United States, the American Academy of Pediatrics, and, in the UK, the Department of Health had recommended avoidance of peanut until 3 years of age [26] [though recently this American Academy of Pediatrics (AAP) recommendation has changed [27•]]. In a recent report evaluating the effectiveness of these previous policies, Hourihane *et al.* [28] reported on a cohort of 1072 mother–child pairs representing a first school cohort (2003–2005) to have been conceived following the UK 1998 food allergen prevention advice. Sixty percent of mothers reduced or stopped consuming peanuts while pregnant. However, the prevalence of peanut allergy did not decrease – 1.8% of the children evaluated were peanut allergic. In addition to this study of the impact of a national policy on food allergy prevention, evidence from several other investigations using differing study designs has questioned the benefit of delayed food introduction in allergy prevention. These studies have called into question the conventional wisdom of early life food allergen avoidance and are outlined below.

In one of the earlier studies to investigate the impact of avoidance strategies in food allergy, Zeiger and Heller [29] reported results of a prospective, randomized, controlled study of food allergen avoidance in 1995. In the prophylactic treatment group, mothers avoided cow's milk, egg, and peanut during the last trimester of pregnancy and lactation, and infants avoided cow's milk until age 1 year (casein hydrolysate supplementation before age 1 year), egg until age 2 years, and peanut and fish until age 3 years. The control group received encouragement of breastfeeding without specific food allergen avoidance. Although a significant reduction in food allergy and milk sensitization was noted before 2 years of age, at 7 years of age, there was no difference between groups in food

allergy, atopic dermatitis, allergic rhinitis, asthma, aero-allergen sensitization, or any atopic disease. Challenging these findings in the last year was a longitudinal birth cohort by Willers *et al.* [30•] in which mothers who recalled eating more peanut or nut had children with a greater risk of wheezing at 8 years of age [odds ratio (OR) 1.42; 95% CI 1.06–1.89 for daily vs. rare consumption of nut products]. In this cohort, there was no association between reported maternal ingestion of vegetable, fish, egg, milk, or milk products and the risk of wheezing.

Zutavern *et al.* [31•] reported in the Influences of Life-style-Related Factors on the Immune System and the Development of Allergies in Childhood (LISA) prospective birth cohort that delayed introduction of solids past 4–6 months was not associated with a decreased odds of asthma, allergic rhinitis, or sensitization to food or inhalant allergen at 6 years of age. In fact, in this birth cohort of 2073 children followed up to 6 years of age, food sensitization was more frequent in children introduced to solids later. Because this was a cohort study without the benefit of randomization, the results may be confounded by reverse causation – a phenomenon in which patients at the greatest risk for food allergy are more likely to adopt an intervention to mitigate the risk of allergy (resulting in a situation in which the mitigation strategy is more frequently adopted by patients in a higher stratum of risk). The KOALA birth cohort evaluated 2558 children followed until 2 years of age and, as in the LISA study, found a greater delay in the introduction of cow's milk and other foods was not associated with a decreased risk of atopic disease. Instead, greater delay in introduction of cow's milk products was associated with a higher risk of eczema and atopic disease [32•].

On balance, the above-mentioned studies do not support the routine use of early life food allergen avoidance. Therefore, this accumulating evidence has recently led to a significant change in recommendations from the AAP. These recommendations give very clear, practical guidance for pediatricians regarding food introduction practices as they pertain to food allergy prevention. In a clinical report on the effects of early nutritional interventions on the development of atopic disease, the AAP concluded that evidence does not support a major role for maternal dietary restrictions during pregnancy or lactation; breast feeding for 4 months prevents or delays atopic dermatitis, cow's milk allergy, and wheezing in early childhood; in high-risk infants not exclusively breast fed for 4–6 months, hydrolyzed formula may delay or prevent atopic dermatitis; and there is little evidence that delaying complementary foods beyond 4–6 months prevents atopic disease [27•].

These recommendations represent a significant paradigm shift in the prevention of atopic disease; however, they

remain interim advice as much of the evidence on which they are based is derived from prospective cohort evaluations that may be biased by reverse causation. The above-mentioned LEAP study will likely provide additional understanding of the rapidly evolving area of food allergy prevention [8].

Diagnosis

The diagnosis of food allergy or intolerance relies heavily on the clinical history. Testing for both IgE and non-IgE-mediated food allergy remains confirmatory, with the gold standard being double-blind, placebo-controlled food challenge. More commonly used in the specialty clinic are supervised open-graded food challenges, which are reserved for patients in whom clinical history and confirmatory testing is inconclusive. By careful review of the clinical history, adverse food reactions may be classified as food intolerance, food aversion, suspected IgE-mediated food allergy, or suspected non-IgE-mediated food allergy [1]. Testing for IgE-mediated food allergy may entail prick skin testing to suspected allergens or measurement of food allergen-specific IgE [radioallergo-sorbent test (RAST) testing]. Although prick skin testing is the more sensitive method, accurate diagnosis often relies on a combination of these methods [18[•]].

Skin testing involves placement of small amounts of food allergen extract followed by pricking of the skin with a standardized device and concomitant placement of acceptable positive and negative controls. The method involves some discomfort and requires a cooperative patient. This testing is usually performed by a physician with specialized training in food allergy such as a board-certified pediatric allergist. Sporik *et al.* [33] demonstrated the specificity of skin testing in the diagnosis of cow's milk, peanut, and egg allergy in 467 children undergoing 555 challenges over a 9-year period (339 were challenged to milk, 121 to egg, and 95 to peanut). For each food, it was possible to identify a skin test wheal diameter at and above which negative food challenges did not occur: 8 mm for milk, 7 mm for egg, and 8 mm for peanut. Positive reactions were still noted in patients who had negative skin tests with a wheal diameter of 0 mm. In children of less than 2 years of age, lower predictive thresholds have been demonstrated for these allergens (6 mm for milk, 5 mm for egg, and 4 mm for peanut)[34].

Specific IgE (RAST) testing is complicated by variability in technology employed by various commercial laboratories that may yield widely differing results. Williams *et al.* [35] observed extensive variability among different laboratories performing specific IgE testing, with some laboratories unable to detect serial dilutions of the same sample. In their study, the Pharmacia ImmunoCAP RAST commercial system used by two different laboratories

performed nearly as well as the ideal standard. Importantly, the Pharmacia ImmunoCAP RAST system has been extensively studied, and predictive cut-off values suggestive of allergy or tolerance have been published [36]. It is also important to note that neither specific IgE level nor degree of skin test reactivity predicts reaction severity and that reactions may still occur despite negative tests for sensitization. Recently, Maloney *et al.* [37[•]] again validated the utility of Pharmacia ImmunoCAP RAST testing in the evaluation of food allergy in 324 patients referred for evaluation of suspected peanut or tree nut allergies.

Atopy patch testing may be employed for non-IgE-mediated food allergies. Limited data suggest this method, which involves placement of food allergens against the skin under an adhesive covering, has some utility in predicting reactions to specific foods in eosinophilic esophagitis [38] and FPIES [39]. The use of patch testing for these disorders remains controversial, as earlier studies on these disorders with atopy patch testing have not been easily reproduced.

Office-supervised food challenges remain a widely used technique in patients in which the diagnosis remains uncertain after careful evaluation using the clinical history and testing for food sensitization. In carefully selected patients, office-supervised challenges appear safe but should only be conducted in a setting equipped to treat life-threatening anaphylaxis that may result from the procedure. This should preferably be done by a board-certified allergist. Mankad *et al.* [40] recently examined the safety of open food challenges administered in an office setting through a retrospective review of medical records. All challenges were administered in a university-based pediatric allergy clinic. Reactions occurred in 40 of 150 challenges and food-specific IgE levels did not correlate with severity. Upper respiratory symptoms were noted in 38% of reactions, cutaneous reactions occurred in 68%, and gastrointestinal symptoms in 45% of positive challenges. No patients received epinephrine or required hospitalization. The authors concluded that open food challenges in the proper office setting are safe for selected patients based on clinical history and evaluation of sensitization.

Management

Following accurate diagnosis, the foundation of food allergy management is strict and careful avoidance of relative food allergens. Avoidance involves vigilance and attention to cross contamination of foods as well as potential cross-reactive allergens. For example, in the above-mentioned recent study by Maloney *et al.* [37[•]] evaluating peanut and nut sensitization, cross-sensitization between peanut and nuts was found in 86% of patients

(i.e., the patients tested positive for both). As well, 34% had a documented coallergy (i.e., they had demonstrated clinical reactivity to both).

Although most dangerous reactions occur by ingestion of food allergens, exposures may occur through other routes. One common challenge for food allergic patients involves airline travel. Comstock *et al.* [41•] recently characterized reaction to foods experienced by passengers aboard commercial airplanes by telephone questionnaires administered to individuals in a peanut, nut, and seed allergy registry. Nearly 9% of individuals reported allergic reactions to food while on airplanes. Peanuts accounted for most reactions, and half of these reactions occurred while in flight.

Studies suggest that counseling and comanagement with a specialist in pediatric food allergy is effective in decreasing the risk of reexposure. Recently, Clark and Ewan [42•] prospectively evaluated the effectiveness of an allergist's management plan in children with peanut/nut allergy, showing that specialist involvement can be valuable in decreasing subsequent reactions. Because reexposures are likely to occur, in addition to avoidance education, patients and families must be educated in early recognition and treatment of food allergic reactions resulting from accidental exposures.

A key point in emergency management is making sure that injectable epinephrine is always on hand for use in the event of accidental exposure and subsequent reactions and that patients and their families are educated on its proper use. Recently, the Section on Allergy and Immunology of the American Academy of Pediatrics highlighted the importance of self-injectable epinephrine for the first-aid management of anaphylaxis [43]. In addition to office-based education on food allergen avoidance and the importance of emergency treatment, physicians can direct patients toward additional educational resources, such as the Food Allergy and Anaphylaxis Network (www.foodallergy.org).

Some children with food allergies will experience remission characterized by the spontaneous development of tolerance to known food allergens. As mentioned above, recent evidence suggests tolerance may not develop as rapidly as previously suggested [14,15], so periodic surveillance of food allergen sensitizations (in the form of repeat testing) can be important in identifying this subgroup of patients.

Future directions

Several recent advances have provided a great deal of excitement in the field of food allergy. Many of these developments focus on the potential role of immuno-

modulation of food allergic responses by oral desensitization or tolerance induction. Recently, Skripak *et al.* [44••] evaluated 20 children (6–17 years of age) in a randomized double-blind evaluation of cow's milk oral immunotherapy. After oral immunotherapy, the median threshold dose required to trigger a reaction increased in patients receiving active treatment (active: threshold dose increased from 0.4 to 5 g of milk protein; placebo: no change from 0.4 g, $P=0.003$); however, reactions occurred in every patient. Although reactions were generally mild, four patients received epinephrine. Reactions continued to be sporadic even during maintenance treatment.

In a separate evaluation of immunologic changes associated with ingestion of extensively heated egg in 117 egg allergic children, tolerance of baked egg was associated with lower skin prick test sensitivity. Of concern was the observation that some baked egg reactions were severe, and 18% of patients reacting to baked egg received epinephrine [45••]. One recent preliminary study suggested oral immunotherapy may also be effective in children with peanut allergy; however, only four patients were evaluated, and one required epinephrine during the study [46•]. Other investigators have recently presented data in abstract form that suggests efficacy of peanut oral immunotherapy in decreasing clinical reactivity to peanut challenge [47•,48•].

The reaction severity observed in these early trials, however, suggests caution and emphasizes that such approaches remain investigational. Challenges to the clinical use of these therapies will include reducing variability in food extract preparations, determining proper dosing regimens, and minimizing the frequency and severity of allergic reactions during therapy. Future studies are also likely to explore whether these procedures are associated with ongoing clinical tolerance.

Conclusion

Food allergies affect 4–6% of children and are a common cause of childhood anaphylaxis. Recent research highlights the scope of the problem and suggests that some food allergies may be more persistent than previously thought. Although recent evidence suggests that dietary manipulation by specific allergen avoidance beyond 4–6 months may not prevent the development of food allergies, conclusive evidence on whether early or late introduction is helpful or harmful remains elusive. At this point, however, from an allergy prevention standpoint, there is no compelling evidence to recommend delaying the introduction of any foods beyond the age of 6 months. The results of the Learning Early About Peanut Allergy (LEAP) study will likely provide greater clarity to this question.

The clinical history is central to the diagnosis of food allergy with further testing for sensitization by prick skin testing or Pharmacia ImmunoCAP RAST testing. Once the diagnosis is secure, management of food allergy focuses on careful avoidance education and emergency preparedness with ongoing follow-up to address educational needs and evaluate for the possible development of tolerance. New strategies using oral desensitization or tolerance induction are being tested, but the significant rate of allergic reactions in clinical trials emphasizes that these approaches remain investigational. Therefore, clinical management still focuses on strict food allergen avoidance.

References and recommended reading

Papers of particular interest, published within the annual period of review, have been highlighted as:

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Additional references related to this topic can also be found in the Current World Literature section in this issue (pp. 000–000).

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