Preventing Peanut Allergy

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The rising prevalence of food allergy and specifically peanut allergy has had significant implications for affected patients, families, and society. The current standard of care remains strict avoidance and the use of emergency medications for accidental ingestions. There is recent evidence-based information to suggest that one approach to preventing peanut allergy lies in early introduction of peanut. This represents a paradigm shift from previous recommendations and has led to updated guidelines in the United States, Europe, and Australasia on the introduction of potentially allergenic foods in the infant diet. This new approach to prevention has some practical obstacles and challenges associated with its implementation. There is also growing interest in the role of maintaining a healthy skin barrier in prevention of sensitization and food allergy. Other approaches, including pro- and prebiotics, prenatal maternal dietary avoidance, breastfeeding, and the use of specific formulas, have not shown reproducibly favorable results. As children with peanut allergy are unlikely to outgrow their food allergy, early oral immunotherapy in those with established peanut allergy is being investigated with the hopes of altering the natural history of an otherwise lifelong disease.

Keywords: food allergy, peanut allergy, early introduction, atopic dermatitis

Introduction

IN THE UNITED STATES and other Western countries, the prevalence of food allergy has been on the rise, and estimates suggest that up to 8% of children may be affected.¹ Approximately 1.5% to 3% of children suffer from peanut allergy.² Prevalence of peanut allergy in Asian countries is significantly lower than in the West, perhaps due, in part, to dietary differences such as cooking methods, cultural preferences, infant weaning practices, and volume of allergen.^{2,3} Peanuts in Asian cuisine are typically boiled or fried, which induce lower allergenicity compared to roasting, which is more common in Western diets.⁴ Although fatalities related to food allergy are uncommon, anaphylactic and fatal reactions are most frequently due to peanut.^{5,6} Food allergy can negatively impact a child's quality of life given the central role that food plays in our society. These challenges also negatively affect the parents and families of children with food allergy due to increased anxiety regarding accidental exposure. Food allergy-related bullying occurs frequently and further contributes to the reduced quality of life of children with food allergy.⁷ Unfortunately, compared to milk and egg allergy where the majority of children will outgrow these allergies, only 21.5% of children will outgrow peanut allergy.⁸

The financial burden to both society and families with children with food allergy is also significant.^{9,10} In 2013, the

estimated overall economic burden of food allergy was estimated to be \$24.8 billion annually due to direct costs such as emergency room visits, hospitalizations, office visits, medications, and indirect costs, such as lost wages. The cost of food allergy has been dramatically highlighted by debate over the rising cost of epinephrine auto-injectors. Families must also pay for special and/or separate foods for children with food allergy.

Given the overall financial and psychosocial burden of food allergy, significant research has been devoted to the prevention of food allergy. This review summarizes recent advances in our understanding of peanut allergy prevention. The current best evidence-based approach involves early introduction of peanut between 4 and 11 months of age, which represents a paradigm shift within the last few years. We will also review the role of preventing and adequately treating atopic dermatitis, pro- and prebiotics, breastfeeding, and special maternal diets on preventing food allergy, although these topics are more focused on the prevention of food allergy in general and are not peanut specific.

Evolution of Our Understanding of the Impact of Delayed Versus Early Introduction of Peanut on the Development of Allergy

Previous guidelines from the American Academy of Pediatrics (AAP) in 2000 recommended a delayed introduction

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of peanut for high-risk infants who had a family history of allergic disease.¹¹ The AAP recommended that peanuts be avoided until at least 3 years of age. Despite these recommendations, the prevalence of peanut allergy continued to rise. Several studies documented an actual increase in the incidence of food allergy after guidelines recommended delayed introduction of potentially allergenic foods.^{12,13} Updated guidelines from the AAP in 2008 advised that the introduction of peanut and other commonly allergenic foods do not need to be delayed, although the guidelines did not proactively recommend early introduction of peanut in high-risk infants.¹⁴

More recent studies have provided convincing evidence that early rather than delayed introduction provides protection against peanut allergy. In 2008, a study reported that peanut allergy was rare among Jewish children in Israel compared to Jewish children in the United Kingdom.¹³ In the United Kingdom, 1.85% of Jewish schoolchildren had peanut allergy compared to just 0.17% of Jewish schoolchildren in Israel ($P < 0.001$) with an adjusted risk ratio (RR) of 9.8 [95% confidence interval (CI): 3.1–30.5]. It was recognized that children in Israel were introduced to peanut in infancy, while children in the United Kingdom were not introduced to peanut until after the first year of life. These data informed a prospective interventional trial called the Learning Early About Peanut Allergy (LEAP) study.¹⁵

The LEAP study was a landmark, randomized, open-label controlled trial in a single center in the United Kingdom. The authors recruited 640 infants between the ages of 4 and 11 months of age at high risk for peanut allergy, which was defined as having severe eczema and/or egg allergy. Patients with a skin prick test (SPT) wheal size of >4 mm were excluded due to concern that the infant already had a clinical peanut allergy. Infants were stratified into two cohorts determined by whether they were presensitized to peanut based on SPT (1–4 mm wheal) or not (0 mm wheal) before randomization. The infants were randomized to either the consumption or avoidance of peanut until 60 months of age. Parents in the consumption group were advised to feed their infants a total of 6 g of peanut protein per week divided over at least three meals. Infants randomized to the avoidance group were advised to strictly avoid all peanuts until age 5 years.

Of the 530 infants who were not presensitized to peanut, 1.9% of infants in the consumption group developed peanut allergy by 60 months compared to 13.7% of infants in the avoidance group ($P < 0.001$). Of the 98 infants who were presensitized to peanut, 10.6% of infants in the consumption group developed peanut allergy by 60 months compared to 35.3% of infants in the avoidance group ($P = 0.004$). There were no differences in serious adverse events between the groups. Furthermore, the authors found that early consumption modulated the immune response. Infants in the consumption group had higher levels of the protective peanut-specific IgG4 levels, while infants in the avoidance group were more likely to have higher titers of peanut specific IgE (sIgE). The LEAP study provided strong clinical and immunologic evidence that early introduction of peanuts in infancy is associated with the induction of oral tolerance of peanut.

The protective effects of early introduction of peanut were further supported by the follow-up to the LEAP study, LEAP-On (the *Effect of Avoidance on Peanut Allergy After Early Peanut Consumption*), published in 2016.¹⁶ This trial evaluated the effect of 12 months of peanut avoidance among the children who had participated in the initial LEAP

trial. They found that after 12 months of avoidance (between 60 and 72 months of age), there was no significant increase in peanut allergy in those patients who had initially been assigned to consume peanuts in the initial trial. At the end of this trial, they found that peanut allergy was significantly higher in the peanut avoidance group compared to the consumption group at 18.6% versus 4.8% ($P < 0.001$). In addition, they found that patients in the original consumption group were less likely to have high levels of Ara h2 or peanut sIgE.

While the LEAP studies provided prospective data, which led to the dramatic change in guidelines for the early introduction of peanut in high-risk infants, questions remained about the introduction of peanut for the general population. A 2016 study called the Enquiring About Tolerance study evaluated the early introduction of six allergenic foods, including peanut, for the general population.¹⁷ The study randomized 1,303 infants to either early introduction of peanut, cooked egg, cow's milk, sesame, whitefish, and wheat starting at 3 months of age or standard introduction at 6 months of age. The prevalence of food allergy was evaluated between 1 and 3 years of age. This study was limited by low adherence (42.8%) in the early-introduction group compared to 92.9% adherence in the standard-introduction group. Although there were no statistically significant differences in their intention-to-treat analysis of the development of food allergy to at least one of these six foods (7.1% with standard introduction versus 5.6% in early introduction; $P = 0.32$), there was a statistically significant difference in the rate of food allergy in the per protocol analysis (7.3% with standard introduction versus 2.4% with early introduction; $P = 0.01$), suggesting that this strategy may be effective if closely adhered to. Furthermore, a statistically significant difference was found when looking at the rate of peanut allergy with 0% of patients in the early introduction group developing peanut allergy compared to 2.5% of the standard introduction group ($P = 0.003$). The dose-response analysis showed that patients who consumed at least 2 g per week of peanut protein were less likely to develop peanut allergy than those who consumed less.

International Response to the LEAP Study Results

The LEAP study data present a paradigm shift in the field of food allergy. Based on this study, a consensus communication from multiple allergy societies around the world was published in 2015 supporting an allergy evaluation and introduction of peanut between 4 and 11 months of age in high-risk infants.¹⁸ The World Health Organization continues to recommend that infants should be exclusively breastfed for 6 months before they start receiving complementary foods.¹⁹ Concerns have been raised that in low-income countries, where the rate of food allergies is low and the incidence of infection and malnutrition is high, the benefits of exclusive breastfeeding outweigh the potential benefit of early introduction of solids.²⁰

In 2017, the National Institute of Allergy and Infectious Diseases (NIAID) in the United States published an update to the guidelines for the prevention of peanut allergy.²¹ The Guidelines define three groups of infants, stratified by risk, with variable recommendations for testing and introduction of peanut in each group.

1. For the first group of high-risk infants with severe eczema and/or egg allergy, the NIAID recommends early introduction of peanut between 4 and 6 months of age and strongly recommends considering skin or blood testing for peanut-sIgE before introduction. The guidelines allow for serum peanut-sIgE testing by primary care physicians and dermatologists when prompt referral to an Allergy specialist is not possible, to minimize delays in introducing peanut. Food allergy IgE panels, which include other foods in addition to peanut, are not recommended because of their poor positive predictive value. If peanut-sIgE is >0.35 kU/L, then further evaluation by an allergy specialist is recommended.
2. For the second group of infants with mild-to-moderate eczema, who are at lower risk for the development of peanut allergy, the NIAID guidelines recommend early introduction of peanut around 6 months of age without testing.
3. For the third group of low-risk infants without eczema or any food allergy, the NIAID recommends that “age-appropriate peanut-containing foods [should be] freely introduced in the diet together with other solid foods and in accordance with family preferences and cultural practices.”

In Europe, the guidelines now mirror the LEAP study criteria more directly than the US guidelines, recommending that “infants at high risk of peanut allergy (those with severe eczema, egg allergy, or both) should have peanut introduced between 4 and 11 months, following evaluation by an appropriately trained specialist.”²²

The Australasian Society of Clinical Immunology and Allergy simplified the guidelines further by recommending that “all babies should be given foods that may cause a food allergy, including peanut, in an age appropriate form in the first 12 months” without testing or evaluation by a specialist before introduction. The guidelines go on to specify that “this includes babies with severe eczema, babies with another food allergy, or babies who have a first degree relative with food allergy, even though they may have a higher chance of developing food allergy.”²³

A recent consensus statement from the Asia Pacific Association of Pediatric Allergy, Respiriology and Immunology reviewed the incidence of peanut and other food allergies in Asian countries and concluded that the incidence of peanut allergy is relatively low compared to rates in Western countries.³ Therefore, the recommendation to pursue early introduction of peanut into the diets of high-risk infants with severe eczema was limited to countries such as Japan, where the prevalence of peanut allergy is high. It was also noted that there are few studies evaluating the positive predictive values of skin and blood sIgE testing in Asian populations. Referral to allergy specialists for these high-risk infants was strongly recommended if the country’s healthcare infrastructure allowed ready access to specialists and if early introduction of allergenic foods is desired by the family. If ready access to allergy specialists is not available, then in-clinic oral food challenges by primary care physicians is recommended for early introduction of allergenic foods in high-risk infants, without skin or blood testing.

Several studies have reanalyzed data on the early introduction of peanut in various cohorts with regards to the guidelines based on the LEAP study criteria. A reanalysis of the LEAP data itself suggested that there was no real benefit

in starting peanut between age 4 and 6 months compared to later in the first year of life.²⁴ An analysis of data from the HealthNuts study cohort ($n=5,276$) of 1-year-old infants concluded that screening all infants at risk of peanut allergy would yield a significantly high cost and challenging logistics for a population.²⁵ The authors of that study note that selecting high-risk infants for screening would still miss 23% of peanut allergy cases and that there were no life-threatening events among either low- or high-risk infants to whom peanut was introduced at home in the first year of life. Further consideration of the implications of the current updated guidelines on parents, physicians, and society needs to be undertaken.

Challenges with Implementing the New Guidelines

The LEAP findings and the resulting new recommendations are exciting given their potential for reducing the prevalence of peanut allergy in countries with a relatively high prevalence of food allergy, but difficulties and barriers exist in their implementation. Especially in resource-constrained countries, the benefits of exclusive breastfeeding for at least 6 months may outweigh the potential benefit, for a small subset of the population, of early introduction of peanut.

In countries where the risk of peanut allergy is substantial, such as in the United States, Europe, and Australia, a major hurdle to implementing new guidelines on infant feeding is that parents and pediatricians have for years been taught to delay the introduction of allergenic foods, and now, an opposite message is being given. There needs to be a shift in parent guidance about early feeding practices, and public and medical education to do this will be critically necessary. Further difficulty derives from how the recommendations are not uniform across the world, and especially in the United States, not entirely simple—the pediatrician needs to remember how exactly the three risk groups are defined, and what needs to be done with each group. Furthermore, the distinction between severe eczema versus nonsevere can be subjective, egg allergy can sometimes be subtle and even overlooked, other risk factors are not addressed, such as having an older sibling with nut allergy or having a food allergy other than egg. Finally, the guidance to introduce peanut in an “age-appropriate form and in accordance with family preferences and cultural practices” is somewhat vague and ambiguous and leaves a lot open for interpretation.

There are also challenges for the allergist who is evaluating the child. These include the following:

1. Since the time window needed for an allergy evaluation of a high-risk infant is narrow (4–6 months of age, as per NIAID guidelines), the family needs relatively rapid access to the allergist. Busy allergy practices with a long new-patient wait time, or delays sometimes seen with referrals in highly managed healthcare systems, may make it hard to get the evaluation done within the recommended time frame. If an oral food challenge is required based on the results of testing, the delay of introduction may be even longer.
2. The peanut skin-testing result (dictating whether peanut is introduced or not) puts considerable importance on a procedure that has inherent variability. A few mm smaller or larger in wheal size can make a big difference in the

recommendation given to the family. In addition, the need to screen high-risk children has been questioned since the sensitivity and specificity of *in vitro* and *in vivo* testing are fraught with difficulties.²⁶

3. Oral food challenges, sometimes needed to prove the presence of true peanut allergy, are often challenging to perform in this young age group due to developmental and behavioral factors. A recent Work Group Report from the Adverse Reactions to Food Committee of the AAAAI provides guidance on conducting an oral food challenge to peanut in an infant.²⁷
4. The actual administration of peanut to an infant by the parent at home is not always a simple task. The recommended amount of 4 g of peanut flour, or 2 teaspoons of peanut butter, to be ingested 3 times per week, can be a sizable amount of peanut, and rejected by the child. The same is true for Bamba sticks, where 21 sticks are needed for each recommended feed. Although this dose was proven effective in the LEAP study, there have not been dose-response studies evaluating lower quantities or different frequencies of dosing.

Two commercial products have become available in the United States: Hello Peanut™ and My Peanut™. Hello Peanut (www.hello-peanut.com) is a powder blend of peanut and sprouted oats put into an individual packet that is then sprinkled or mixed in to stage 1 foods. My Peanut (www.my-peanut.com) is a mixture of applesauce and peanut put into a pouch that is ready to directly feed the child; the company also offers a pouch containing seven tree nuts and peanut for tree nut allergy prevention. The cost for these individual packets or pouches is in the range of \$1.50–\$2.50. This is to be compared with buying bulk peanut flour, or peanut butter powder, that works out to be 10–20 cents per serving.

5. Since siblings of a child with peanut allergy are approximately sevenfold more likely to have peanut allergy,²⁸ the need to have peanut in the house to feed the infant sibling increases the chance of accidental exposure for the child with peanut allergy. This creates a dilemma for parents wanting to do the best for all their children. One potential solution is to feed the infant peanut outside the home when the older sibling is not present, although the logistics may be difficult for a parent to arrange.

Other Potential Interventions

In addition to the timing of introducing potentially allergenic complementary foods, research has focused on other strategies for preventing peanut allergy, with less robust results.

Role of atopic dermatitis and environmental exposure

Children who have defects in their skin barrier are at increased risk for developing food allergy.^{29,30} Many children with peanut allergy have a history of atopic dermatitis.^{31,32} Sensitization to peanut allergen can occur through a defective skin barrier, which may lead the immune system to develop an allergic T_H2 type response.^{33–35}

Environmental exposure to peanut was found to increase the odds of sensitization to peanut and likely peanut allergy, in highly atopic children.³⁶ The effect on sensitization was most pronounced among children with atopic dermatitis

with an odds ratio of 1.97 (95% CI: 1.26–3.09); children with severe atopic dermatitis were at the greatest risk for sensitization with an odds ratio of 2.41 (95% CI: 1.3–4.47). The effect on confirmed peanut allergy was also more pronounced in children with atopic dermatitis with an odds ratio of 2.34 (95% CI: 1.31–4.18).

Further evidence that environmental exposure may lead to peanut allergy is supported by data from the Avon Longitudinal Study of Parents and Children showing that the use of skin products that contained peanut oil was statistically significantly associated with peanut allergy with an odds ratio of 6.8 (95% CI: 1.4–32.9).³⁰ In this study, peanut oil-containing skin preparations were used largely for the treatment of dry or inflammatory skin conditions, including eczema and diaper rash. It is theorized that there are low levels of peanut protein in peanut oil that may lead to sensitization when applied to inflamed skin.

As atopic dermatitis is a risk factor for the development of food allergy,³⁷ there is interest in whether atopic dermatitis itself can be prevented. A prospective, randomized controlled trial evaluated the efficacy of daily application of a moisturizing agent in preventing atopic dermatitis/eczema in those with a family history of atopic dermatitis/eczema. Thirty-two percent fewer infants who received daily moisturizing in the first 32 weeks of life had atopic dermatitis/eczema compared to infants in the control group ($P=0.012$).³⁸ Although there was no statistically significant effect on sensitization based on egg white sIgE, the rate of sensitization was higher in infants who had eczema/atopic dermatitis compared to infants without eczema/atopic dermatitis with an odds ratio of 2.86 (95% CI: 1.22–6.73).

This early evidence that reducing environmental and topical exposure to peanut protein, especially in infants with eczema, and focusing on good skin care to control or minimize atopic dermatitis, may help reduce the risk of developing peanut allergy is an area of ongoing and future investigation.

Probiotics

There has been significant interest in the role of the microbiome in the development of atopic disorders. The focus has shifted from the hygiene hypothesis to the microbial hypothesis³⁹ with an interest in how gut flora affects the development of food allergy. Probiotics have been postulated to play a preventative role by maintaining normal commensal gut flora. Results of studies evaluating probiotics as a means to prevent food hypersensitivity, however, have been mixed.

A 2010 randomized, double-blind placebo-controlled trial evaluated the effect of perinatal probiotics on preventing atopic sensitization and allergic disease during the first 2 years of life.⁴⁰ Four hundred fifteen pregnant women from the general population were randomized to receive either milk with probiotics (*Lactobacillus rhamnosus* GG, *L. acidophilus* La-5, and *Bifidobacterium animalis* subsp. *Lactis* Bb-12) or placebo starting at 36 weeks gestation until 3 months after birth. Results showed that children of mothers assigned to the probiotic group were less likely to have atopic dermatitis compared to placebo with an odds ratio of 0.51 ($P=0.013$; 95% CI: 0.3–0.87). There was no effect on allergic sensitization to environmental or food allergens, including cow's milk, hen's egg, codfish, hazelnut, and peanut. However, given that atopic dermatitis may be a risk factor for the development of food allergies, as previously

discussed, efforts at preventing atopic dermatitis may still have a role in the prevention of food allergies.

A meta-analysis published in 2016 evaluated the effect of probiotic supplementation on food hypersensitivity and atopy. This analysis included 9 trials and 1,506 children. A statistically significant reduction in atopic sensitization was found when pregnant mothers received probiotics in addition to the infant receiving probiotics after birth (RR: 0.77; 95% CI: 0.61–0.98). No such protective effect was seen when probiotics were only given prenatally or only postnatally.⁴¹

More research is needed before a recommendation can be made regarding the use of probiotics in the maternal or infant diets to protect against the development of peanut allergy.

Prebiotics

Similar to probiotics, prebiotics have been evaluated for their potential effect to promote a healthy gut microbiome and potential to prevent atopy. Prebiotics are indigestible oligosaccharides that stimulate the growth of bacteria in the gut. A 2013 Cochrane Review evaluated the effect of prebiotics on the development of atopic disorders.⁴² This meta-analysis included 4 studies and 1,218 children. Although food allergy was not specifically analyzed, a statistically significant decrease was noted in the prevalence of eczema among infants who received prebiotics (RR: 0.68; 95% CI: 0.48–0.97), with a number needed to benefit of 25. As with probiotics, further study is warranted before making any firm statements about the role of prebiotics in food, or specifically peanut allergy prevention.

Maternal avoidance

Some studies have suggested that infants are more likely to develop peanut allergy if their mothers consumed peanut prenatally.⁴³ More recent work has shown that the development of peanut allergy is not related to maternal ingestion of peanut during pregnancy or while breastfeeding.³⁰ Current guidelines focus on a well-balanced, nutritious maternal diet and do not recommend any maternal dietary restrictions during pregnancy.^{14,44}

Breastfeeding

Although breastfeeding has many beneficial effects for both the mother and the infant, studies on whether breastfeeding plays a protective role in the prevention of allergies have shown mixed results. Breastfeeding studies have largely focused on the prevention of asthma and atopic dermatitis. While some earlier studies suggested a potentially protective effect of breastfeeding on the development of food allergy,⁴⁵ more recent studies have not demonstrated this.

A 2015 cohort study from Denmark found no statistically significant association between the length of time for which infants were exclusively breastfed with allergic sensitization to food or aeroallergens, or allergic disorders.⁴⁶ Children were tested for sensitization for the first 6 years of life and evaluated for allergic conditions for the first 7 years of life.

A 2015 meta-analysis on breastfeeding evaluated 13 studies, which assessed the relationship between breastfeeding and the incidence of food allergy.⁴⁷ No association was found between breastfeeding and the development of food allergy. It was noted that the studies were limited by high heterogeneity and low accuracy since the data from

most studies relied on parental report of food allergy. This meta-analysis also evaluated 42 articles which studied the link between breastfeeding and the development of eczema and did find that exclusive breastfeeding for 3–4 months was associated with a decreased risk of eczema in children 2 years of age and younger.

Exclusive breastfeeding for 4–6 months may help reduce the risk of atopy but the data remain heterogeneous and contradictory and do not clearly support breastfeeding as a significant way of preventing peanut allergy.

Specific formulas

Formulas with hydrolyzed proteins or amino acids are used in formula-fed children with cow's milk allergy. Hypoallergenic formulas can be either partially or extensively hydrolyzed, and contain predominately casein or whey milk proteins. There has been interest in whether these hydrolyzed formulas might be used to prevent atopic conditions such as eczema and food allergy, specifically cow's milk allergy. Overall, most studies have not supported the use of hydrolyzed formula over exclusive breastfeeding in preventing food allergy.⁴⁸

In the randomized, double-blind German Infant Nutritional Intervention study, a large cohort of 2,252 newborns from atopic families was randomized to receive cow's milk formula or one of three hydrolyzed formulas (partially or extensively hydrolyzed whey formula or extensively hydrolyzed casein formula) when breastfeeding was insufficient. At 6 years of age, there was a statistically significant reduction in the risk of atopy, especially atopic eczema, in infants fed partially hydrolyzed whey formula [0.79 (95% CI: 0.64–0.97)], or extensively hydrolyzed casein formula [0.80 (95% CI: 0.69–0.93)], compared to cow's milk formula.⁴⁹ Although there was no specific reduction in the incidence of food allergy, *per se*, the reduced risk of atopic dermatitis may affect the incidence of food allergy in larger population studies.

More research is needed before a hypoallergenic formula can be routinely recommended as a means of preventing peanut allergy.

Early treatment of peanut allergy

Unlike milk and egg allergies, the majority of children who develop a peanut allergy are unlikely to outgrow this food allergy and will have lifelong disease. Given this, significant research in interventional therapies for the treatment of food allergy has been directed at peanut allergy. Oral immunotherapy (OIT) has shown promising efficacy in the research setting, although limited in some patients by tolerability of treatment, and by the finding that discontinuation of therapy quickly leads to loss of protection. Most research studies and clinical experience with this type of therapy has been with older children and young adults rather than infants. A recent systematic review and meta-analysis of immunotherapy for food allergy published by the European Academy of Allergy and Clinical Immunology discusses the current data on food immunotherapy.⁵⁰

Given that the immune system undergoes rapid development and maturation from birth, immunotherapy may have a more pronounced impact on young children compared to older children and adults. Recently, a study evaluated the effect of OIT on young children aged 9–36 months with peanut allergy.⁵¹ Patients were randomized to receive maintenance

doses of either 300 or 3,000 mg of peanut protein for 3 years after initial buildup. Sustained unresponsiveness was measured at 4 weeks after discontinuation of OIT. It was found that 85% of children in the 300 mg arm and 71% of children in the 3,000 mg arm were able to achieve sustained unresponsiveness. This study showed higher rates of sustained unresponsiveness at a lower maintenance dose than that seen with older children and adults. Oral and epicutaneous treatments for peanut allergy are under evaluation and will likely obtain Food and Drug Administration approval within the next couple of years. Long-term follow-up studies will need to evaluate whether early immunotherapy may be an effective tool to prevent lifelong peanut allergy.

Conclusion

The current best evidence-based approach for preventing peanut allergy in countries with a relatively high prevalence of peanut allergy is the early introduction of peanut in high-risk infants. Other approaches have been evaluated in the hope of preventing food allergy in general. As an impaired skin barrier may contribute to sensitization and the subsequent development of food allergy, there is also interest in preventing atopic dermatitis as a means to hopefully prevent food allergy, although this link has not been directly proven. Additional strategies, including probiotics, maternal restriction diets, breastfeeding, and the use of specific formulas, have shown variable results, and more research is needed. Research is ongoing to study the effect of immunomodulation with early OIT in young children that may prevent peanut allergy from remaining a lifelong disease.

Authors' Contributions

Dr. Chen wrote the first draft of the paper and reviewed all subsequent drafts. Drs. Welch and Laubach critically revised the article for important intellectual content. All authors gave approval of the final published version.

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