Peanut allergy is one of the most common food allergies in children, with increasing prevalence over time. The dual-allergen exposure hypothesis now supports transcutaneous sensitization to peanut as a likely pathophysiologic mechanism for peanut allergy development. As a result, there is emerging evidence that early peanut introduction has a role in peanut allergy prevention. Current first-line diagnostic tests for peanut allergy have limited specificity, which may be enhanced with emerging tools such as component-resolved diagnostics. Although management of peanut allergy includes avoidance and carrying an epinephrine autoinjector, risk of fatal anaphylaxis is extremely low, and there is minimal risk related to cutaneous or inhalational exposure. Quality of life in children with peanut allergy requires significant focus. Moving forward, oral and epicutaneous immunotherapy are emerging and exciting tools that may have a role to play in desensitization to peanut.

Peanut allergy is one of the most common food allergies in childhood, with a dramatic increase over the past few decades in various parts of the Western world. Currently, peanut allergy is thought to affect 1% to 3% of children. Peanut allergy is often lifelong and carries a significant daily burden that adversely affects quality of life (QoL). As a result, prevention of peanut allergy, as well as accurate diagnosis and management of peanut allergy, is essential. Our goal for this narrative review is to discuss the latest evidence about peanut allergy prevention as well as advances and ongoing controversies in peanut allergy diagnosis, management, and therapy.

MECHANISMS UNDERLYING THE DEVELOPMENT OF PEANUT ALLERGY

There are genetic and environmental contributors to the development of peanut allergy. Peanut allergy is more common in children with an immediate family member who is peanut allergic, and genetic polymorphisms are increasingly being linked to the development of peanut allergy. Although studies vary, heritability of peanut allergy has been estimated at up to 81.6%. There are racial differences associated with the prevalence of peanut allergy, although studies differ in results, and boys appear more likely to develop peanut allergy than girls. Studies have supported a role for vitamin D deficiency and hygiene in the development of peanut allergy. For example, an observational study of 5276 1-year-old infants in Australia found that vitamin D insufficiency increased the risk of peanut allergy 11-fold. Higher latitudes have been associated with higher rates of both food allergy and anaphylaxis. It is thought that with increased hygiene (and hence, decreased microbial exposure) there are altered immunoregulatory responses that skew toward an allergic response.
An exciting development in understanding the causal mechanisms of peanut allergy is the proposal of the dual-allergen exposure hypothesis, which postulates that allergic sensitization to peanut (as well as other allergenic foods) occurs through cutaneous exposure, especially in children with an impaired skin barrier such as atopic dermatitis. In contrast, ingestion of allergenic foods (oral or gastrointestinal exposure) promotes immune tolerance.

Mutations of the FLG gene (FLG is involved in skin-barrier integrity and water retention) have been linked with atopic dermatitis development, with null FLG alleles associated with early, persistent atopic dermatitis as well as increased risk of other atopic conditions, including food allergy. In addition, an association between atopic dermatitis, peanut exposure, and peanut allergy has been documented in multiple large studies. For example, a birth cohort study of 13 971 children revealed that application of peanut oil–containing creams onto the surface of infants with atopic dermatitis was significantly associated with the development of peanut allergy (odds ratio 6.8; 95% confidence interval [CI]: 1.4–32.9). In contrast, no association was noted between the development of peanut allergy and the use of creams not containing peanut oil (because the oil was not placed on the eczematous skin of the infant) or the use of breast creams containing peanut oil.

Finally, there is an intricate interaction between genetic and environmental factors such as delayed ingestion of peanut. For example, the increased risk of peanut allergy that has been documented in siblings of children with peanut allergy, although initially thought to be due to inherent genetic susceptibility, has more recently been shown to be, at least partly, related to the environmental effect of avoidance of peanuts in siblings of children with peanut allergy.

**PEANUT ALLERGY PREVENTION**

In the past several years, in keeping with the dual-allergen exposure hypothesis, evidence has emerged that early ingestion of peanut has a role in the prevention of peanut allergy. In 2008, an observational study revealed a 10-fold higher prevalence of peanut allergy among Jewish school-aged children in the United Kingdom compared with Jewish school-aged children in Israel (P < .001), with the major difference between the populations being age at introduction of peanuts. Peanut was introduced more commonly in the first year of life and fed more regularly as part of the diet in Israel than in the United Kingdom. In 2015, the Learning Early About Peanut Allergy (LEAP) trial, a randomized controlled trial of 640 infants at risk for peanut allergy due to severe eczema and/or egg allergy, provided high-level evidence that early ingestion of peanut (between 4 and 11 months of age) reduces the risk of peanut allergy (P = .009).

After publication of the LEAP study, an expert panel convened by the National Institute of Allergy and Infectious Diseases released a guideline on the prevention of peanut allergy in the United States recommending that in infants with severe eczema and/or egg allergy, infant-safe forms of peanut should be introduced as early as 4 to 6 months of age after peanut allergy screening tests. The guideline defines severe eczema as "persistent or frequently recurring eczema with typical morphology and distribution assessed as severe by a health care provider and requiring frequent need for prescription-strength topical corticosteroids, calcineurin inhibitors, or other anti-inflammatory agents despite appropriate use of emollients." This guideline recommends that infants with mild eczema receive peanut at ∼6 months of age. Other international guidance has followed suit, suggesting that peanut be introduced, or not delayed, in higher-risk infants between 4 and 6 months of age, although the definition of an infant at high risk varies between guidelines.

Some uncertainties about the role of early peanut ingestion as a means of allergy prevention remain. The necessary amount of peanut ingested, as well as the required frequency of peanut ingestion, is not known. The benefit of early ingestion in lower-risk infants is also uncertain. It remains controversial whether high-risk infants should have screening SPTs to peanut or serum peanut-specific immunoglobulin E (IgE) testing before peanut introduction, and screening criteria may be susceptible to a variety of pitfalls, including high false-positive rates and concern of a screening creep.

Although the National Institute of Allergy and Infectious Diseases guideline recommends that infants with severe eczema and/or egg
**PEANUT ALLERGY DIAGNOSIS**

The most important test in the diagnosis of peanut allergy is the clinical history.1 Symptoms, such as urticaria, may be due to either allergy or other causes such as a viral infection or facial contact irritation. In addition, allergic reactions or chronic symptoms, such as eczema or abdominal pain, may be attributed erroneously to peanut. These concerns can be addressed by a thorough medical history. First-line peanut allergy testing includes either SPT or serum peanut-specific IgE measurement. SPT involves the introduction of a peanut allergen into the epidermis by using standardized extracts and a device to scratch or puncture the skin.2 A wheal or flare indicates sensitization to peanut. Serum peanut-specific IgE measurement identifies IgE antibodies to peanut.29

Both tests are highly sensitive, with a sensitivity of >90% for SPT and 70% to 90% for peanut-specific IgE.30,31 As a result, both tests are useful for ruling out peanut allergy. However, neither test correlates well with reaction severity.29 In addition, the specificity of either test is between 50% and 60%,32 and the positive predictive value varies on the basis of the pretest probability of allergy (such as atopic history of the child and the likelihood of allergy based on clinical history). In various studies, up to 80% to 100% of atopic children could tolerate foods to which they were sensitized, illustrating how misleading it is to overly rely on SPT or specific IgE for diagnosis.33,34

Although 95% positive predictive values for allergic reactions to peanut have been determined for both SPT (wheal > 8 mm) and specific IgE (>34 kU/L in the absence of a history),35 these numbers vary between studies and vary on the basis of the age of the population studied. In addition, it has been noted that sensitization to foods in children who are not food allergic is a relatively normal phenomenon.34 As stated in a recent review, “the greatest source of misdiagnosis in food allergy might well be the lack of appreciation that a positive test result (sensitization) does not equate with allergy.”21 This again speaks to the value of a medical history to provide context (pretest probability) for test selection and interpretation.

The limitations of first-line allergy testing are well illustrated in the case of a younger sibling of a child who is peanut allergic. Previous observational studies, some that relied on allergy testing (either SPT or peanut-specific IgE), noted an approximate sevenfold increased risk of peanut allergy in siblings of children who were peanut allergic.3,14 However, recent nested data of 2834 children from a food allergy cohort that correlated sensitization with clinical history revealed a fourfold higher rate of clinically irrelevant sensitization (ie, positive allergy test results in the absence of a history of reaction) than true food allergy among siblings of children who were food allergic.36 As a result, the authors concluded that preemptive testing for food allergy is unjustified for siblings.

However, preemptive testing may have a role when the risk of peanut allergy is high in an unexposed infant or child. For example, in the LEAP trial, 17% in the avoidance group enrolled with severe eczema and/or egg allergy had peanut allergy at study end. Because any potential increased risk of peanut allergy in the younger sibling of child who is a peanut allergic largely appears to be a consequence of delayed ingestion or introduction, a balanced and practical approach for most is, first, counseling about the safety of home introduction for young siblings if done early enough (eg, ~6 months of age). If, despite counseling, the family remains hesitant to introduce at home, then preemptive testing, followed by observed ingestion if results are positive, would be indicated.15

A medically supervised peanut oral food challenge (OFC) is the current diagnostic gold standard and involves ingestion of incremental amounts of peanut under supervision.29 However, the OFC is time intensive, can cause anaphylaxis that could be dangerous, and is resource intensive, with long wait lists for patients.28 As a result, there is a need for better diagnostic tests for peanut allergy.

An improved specific IgE test is component-resolved diagnostic testing (CRD), which measures the IgE antibody toward specific allergenic protein components within peanut rather than the usual mixture of peanut allergens. The 6 commercially available proteins that can be measured are Ara h 1, Ara h 2, Ara h 3, Ara h 6, Ara h 8, and Ara h 9 (Table 1). The significant components associated with peanut allergy (Ara h 1, Ara h 2, Ara h 3, and Ara h 6) are seed-storage proteins and are stable to heating.37 In some studies, Ara h 2-specific IgE has been the most predictive of clinical allergy,38 and a correlation has been noted (the higher the level of Ara h 2, the more likely there is clinical peanut allergy).39 Testing for Ara h 2 may be particularly valuable in some circumstances (such as an unclear history or an intermediate SPT or peanut-specific IgE in a child sensitized to pollen). Ara h 2 provides extra diagnostic information and is useful in stratifying which children are eligible for an OFC.40 For example,
likelihood of future anaphylaxis is low
monosensitized to Ara h 8, the concurrent pollen allergies; if they are not have a history of a severe reaction potentially useful in children who do component testing would be
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in general, that is not stable to heating and is In contrast, Ara h 8 is a labile protein
lead to a diagnosis of persisting and Ara h 2 results, this would likely suggest a hypothetical case of a 13-year-old who had a cutaneous reaction to peanut as a toddler and then developed a pollen allergy as he became older. If there was a combination of highly positive SPT and Ara h 2 results, this would likely lead to a diagnosis of persisting peanut allergy.

In contrast, Ara h 8 is a labile protein that is not stable to heating and is a birch homolog. In general, sensitization to Ara h 8 (especially if there is no sensitization to Ara h 2) suggests either a milder phenotype of peanut allergy or a lack of clinical peanut allergy, especially if the patient is pollen allergic. Often, these patients demonstrate sensitization to peanut due to birch cross-reactivity, and the risk of a systemic reaction to peanut in these children is low. A representative study revealed that Ara h 8 sensitization, in the absence of sensitization to Ara h 1, Ara h 2, and Ara h 3, in 144 children indicated tolerance to peanut in almost all cases. As a result, Ara h 8 component testing would be potentially useful in children who do not have a history of a severe reaction to peanut, especially if they have concurrent pollen allergies; if they are monosensitized to Ara h 8, the likelihood of future anaphylaxis is low because studies have revealed symptoms to be almost exclusively mild in this case. Considering the previous hypothetical example, if component testing had instead revealed monosensitization to Ara h 8, this would likely indicate mild (or no) reaction to peanut and would help determine if the patient was eligible for an OFC (and, if no or mild reactivity, carrying an epinephrine autoinjector would not be necessary). However, if cost is a consideration, a low Ara h 2 result alone is likely sufficient information to determine OFC eligibility.

There are remaining uncertainties with CRD, such as the 95% positive predictive values for Ara h 2 (a variety of cutoffs have been described in the literature), the role of other peanut components, and whether sensitization to certain components, such as Ara h 2 and Ara h 6, can predict severity of peanut allergy. There is regional variability regarding immune responses against these components as well. For example, Ara h 9 plays an important role in peanut allergy in patients from the Mediterranean region. In general, CRD will have the highest utility in specific situations: when there has been a mild reaction or lack of recent reaction in the context of peanut sensitization and especially if there is concurrent pollen sensitization, which may indicate a milder phenotype of peanut allergy. CRD may help stratify peanut allergy severity as well. It may play less of a role in preschool-aged children who are not sensitized to pollen or in children with a convincing history of a systemic reaction to peanut and very high positive SPT and/or specific IgE results.

There are several other emerging tests that may play an increasing role over the next several years in the diagnosis of peanut allergy. The basophil activation test measures basophil activation to peanut protein (offering the potential to greatly reduce the need to offer OFCs) and has been shown in some studies to predict clinical peanut allergy, as well as peanut allergy severity, although, at present, it is largely a research tool because of the requirement for freshly collected blood, the lack of standardization, and cost. Other tests with similar possible utility include the mast cell activation test and the histamine release assays, which are also predominantly research tools at this time. An emerging test that has the potential to diagnose peanut allergy with greater accuracy and predict prognosis, severity, and response to peanut immunotherapy is peptide assays such as the Lumix-based peptide assay, which measures IgE binding to linear epitopes of peanut protein. At present, this remains a research tool as well.

A test that is uniformly recommended against by multiple international societies, including the American Academy of Allergy, Asthma, and Immunology and the Canadian Society of Allergy and Clinical Immunology is immunoglobulin G testing to peanut, which is a normal finding in children without food allergy and is, in fact, a measure of tolerance and exposure to peanut (eg, in peanut immunotherapy clinical

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<tr>
<th>Component</th>
<th>Protein Type</th>
<th>Clinical Significance</th>
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<tr>
<td>Ara h 1</td>
<td>Seed-storage protein</td>
<td>Major peanut allergen</td>
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<tr>
<td>Ara h 2</td>
<td>Seed-storage protein</td>
<td>Major peanut allergen; component most predictive of clinical peanut allergy</td>
</tr>
<tr>
<td>Ara h 3</td>
<td>Seed-storage protein</td>
<td>Major peanut allergen</td>
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<tr>
<td>Ara h 4</td>
<td>Isoform of Ara h 3</td>
<td>Potential major peanut allergen</td>
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<tr>
<td>Ara h 6</td>
<td>Seed-storage protein</td>
<td>Major peanut allergen</td>
</tr>
<tr>
<td>Ara h 8</td>
<td>Birch pollen homolog</td>
<td>Labile protein; not usually associated with severe reactions; associated with pollen sensitization</td>
</tr>
<tr>
<td>Ara h 9</td>
<td>Lipid-transfer protein</td>
<td>Stable protein; associated with more-severe symptoms in Mediterranean region; associated with peach allergy</td>
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trials) and not a measure of an adverse food reaction.44,45

MANAGEMENT

Many people are involved in the day-to-day management of peanut allergy in children, including family, close contacts, schools, restaurants, and the food industry, among others.5 Some of these management issues are highlighted in Table 2.

Peanut bans and other policies to reduce exposure in schools remain controversial.47 It has been shown that peanut residue in school environments is low and typically unlikely to result in a reaction48 and that peanut-free policies have not significantly reduced the rate of accidental peanut exposures at schools because there is likely some peanut exposure despite the policy.49 However, accidental exposures at school do occur,50 and this policy may have value especially in younger children, when accidental ingestion is more likely.47 Of interest, a recent retrospective study of peanut-free policies and the rate of epinephrine administration in Massachusetts public schools revealed that although policies restricting peanuts from home being served in schools or policies for peanut-free classrooms did not affect epinephrine administration rates, schools with peanut-free tables, compared with those without, had lower rates of epinephrine administration \((P = .009)\).51

A more pressing issue is the documented systemic lack of school preparedness to treat allergic reactions, with disparities noted in staff training and policies around epinephrine administration.52,53 A lack of preparedness has also been noted in restaurants, where the majority of staff have no food allergy training.54 Families could be counseled to discuss the child’s peanut allergy with staff at schools and restaurants as well as be counseled to carry a written emergency plan and an epinephrine autoinjector at all times. In addition, preparation for mealtimes outside of the home, where there may be cross-contact, could be recommended.

There are misconceptions around precautionary labeling among food allergic families. In both Canada and the United States, although it is mandatory to label products containing peanuts, families of children who are food allergic are often unaware that precautionary labeling (ie, “may contain”) is unregulated and that there is no correlation between the amount of peanut present in a manufactured product and the type of precautionary label used (such as “may contain peanut” versus “manufactured in a facility that also processes peanut.”).55 Improved guidance is required to help peanut allergic families purchase foods safely while minimizing unnecessary food avoidances because peanut allergy can cause nutritional issues in children.56

Standard management in children who are peanut allergic includes counseling on avoidance of peanut ingestion and carrying an epinephrine autoinjector at all times. Although antihistamines are often used as first-line therapy in peanut reactions, they are only effective in controlling cutaneous symptoms such as urticaria.57 The only life-saving measure in an acute food allergic reaction is epinephrine because it has a vasoconstrictive effect that alleviates laryngeal edema, supports circulation with chronotropic and inotropic effects and breathing with bronchodilation effects, and additionally may reduce the release of inflammatory mediators from mast cells.58 Intramuscular epinephrine should always be used as first-line therapy in a systemic reaction to peanut. Epinephrine autoinjectors are often underused, and studies have revealed a delay in, or lack of, epinephrine administration to be associated with increased risk of mortality.29

Despite the need for ongoing vigilance, there is also paradoxically increasing recognition that the likelihood of mortality due to anaphylaxis is exceedingly rare. In fact, the risk of fatality in the general population due to food-induced anaphylaxis is approximately equivalent to death by being struck by lightning (\(∼1:10\) million ratio).59 For children living with peanut allergy, the major impact of allergy on their lives is the day-to-day impact on QoL. Studies of children with peanut allergy reveal significant impact on QoL, including overall QoL, health-related QoL, QoL in school, and emotional QoL, as well as increased separation anxiety.60 The impact of peanut allergy on QoL has been noted to be significantly higher than the impact of other chronic childhood diseases such as rheumatologic disease and insulin-dependent diabetes mellitus.61,62 Regular social activities in childhood are significantly disrupted because of peanut allergy, including field trips, play dates, parties, sleepovers, and other social events.53 In addition to the social isolation that children with

<table>
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<th>Management Priorities</th>
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<tr>
<td>Strict avoidance of peanut, including discussion of precautionary labeling</td>
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<tr>
<td>Availability of epinephrine autoinjector at all times, including review of signs and symptoms of anaphylaxis</td>
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<tr>
<td>Train family about hidden ingredients and cross-contact</td>
</tr>
<tr>
<td>Discuss food ingestion outside of the home, including at restaurants, at school, and while traveling</td>
</tr>
<tr>
<td>Screen for QoL, bullying, and anxiety related to peanut allergy</td>
</tr>
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</table>

Resources on management of peanut allergy in children include refs 1 and 46.
peanut allergy feel, up to 50% of children also report bullying due to their food allergy.64 Anxiety and impact on QoL in children with food allergy is largely related to concern of an accidental exposure that could result in a life-threatening reaction.60 There can be concern that exposures in the absence of ingestion, such as cutaneous or inhalational exposures, could result in a life-threatening reaction to peanut. However, this is extremely unlikely. Multiple studies have revealed minimal or no reaction to peanut through either inhalational or cutaneous routes.48,65,66 A recent narrative review revealed minimal or no reaction to peanut through either inhalational or cutaneous exposures, even with ingestion, small amounts of peanut are often tolerated, highlighting the phenotypic variability in severity among children who are peanut allergic. Some studies have been focused on clinical-threshold doses above which a certain percentage of children with peanut allergy would react, termed eliciting dose (ED). For example, ED05 would be a dose of peanut at which 5% of children with peanut allergy would react. A recent multicenter study of 518 children given a single-dose OFC of 1.5 mg peanut protein (6 mg whole peanut; ~1% of a peanut kernel) revealed a low rate of reactivity (2.1%; 95% CI: 0.6%–3.4%), with all reactions being mild.68 Ara h 2-specific IgE levels were not associated with objective reactions to peanut. In another study, it was noted that up to 50% of children with peanut allergy did not react until the fourth or fifth dose of peanut on OFCs, termed “low-dose-tolerant, high-dose-mild” children with peanut allergy.69 In this study, Ara h 2–specific IgE levels appeared to differ between groups, but the sample size was too small for analysis. This increased phenotypic variability of peanut allergy should be considered in the context of avoidance of precautionary labeling, activity restriction, and, often, social isolation in children with peanut allergy. Further research is required to determine if component testing will help identify those who are low-dose tolerant and high-dose mild. Further studies are required before ED can be considered in counseling individuals with peanut allergy on management.

Further research is required into low-dose–tolerant, high-dose–mild reactors as well as strategies to identify which children are more likely to have a phenotypically mild peanut allergy (eg, broadly offering low single-dose OFCs may improve QoL in many children who are peanut allergic). In the interim, it is imperative that physicians are aware of the dramatic impact peanut allergy can have on QoL and that they screen for it as part of peanut allergy management because food allergy–specific instruments for assessing QoL have recently become available.63 Management of peanut allergy should be focused on prevention of ingestion and school preparedness to treat reactions, with reassurance provided that inhalational or cutaneous exposure is unlikely to cause a reaction.

EMERGING THERAPIES

Immunotherapy to peanut is emerging as an exciting treatment of peanut allergy and involves administration of increasing doses of peanut to children who are peanut allergic, with the goal of allowing safe and ongoing exposure to peanut. The majority of research thus far is focused on oral immunotherapy (OIT) (ingestion of peanut) and epicutaneous immunotherapy (EPIT) (peanut patch on the surface of the skin).70 Thus far, immunotherapy has primarily been offered in a research setting, although OIT is increasingly offered within community allergy practices as well.71 Studies on peanut OIT in children have revealed it to be effective in desensitization (ie, eating peanut safely while on peanut OIT), with rates between 67% and 92%.72–76 For example, a study of 40 toddlers aged 9 to 36 months with suspected peanut allergy who were randomly assigned to receive low-dose (300 mg of peanut protein) or high-dose (3000 mg of peanut protein) peanut OIT over a median of 29 months revealed an 85% desensitization rate in the low-dose group and a 76% desensitization rate in the high-dose group.73 The impact of peanut OIT on sustained unresponsiveness (SU) (the ability to ingest peanut once stopping OIT) is less clear, although studies with this outcome in children are promising, with rates of SU between 58% and 78%.73,74 The outcome of SU is more variable because it is not based on a standardized time after finishing OIT; for example, SU outcomes in pediatric peanut OIT studies have been at 2, 74 4,73 and 874 weeks after completion of OIT. A recent meta-analysis and systematic review of the use of food allergen immunotherapy revealed efficacy with desensitization but did not confirm a benefit for SU, although the meta-analysis included pediatric and adult patients, and the authors did not look specifically at peanut.70

A limitation of peanut OIT is the high rate of adverse events associated with this treatment, although, in general, the adverse events are mild (such as mild cutaneous or gastrointestinal symptoms).70 There can be anaphylaxis with peanut OIT, although, in studies thus far, this rate tends to be much lower in preschool-aged children than in school-aged children and older.73,77,78 Reactions
are more common with cofactors, such as viral infection or exercise, and can occur even once at maintenance dosing.\textsuperscript{71} There is also the risk of eosinophilic esophagitis (estimated at 2.7%, although lower in toddlers), which, in general, tends to resolve with discontinuation of peanut OIT.\textsuperscript{78,79} A recent meta-analysis and systematic review of peanut OIT revealed that OIT (versus no OIT) increased anaphylaxis risk and epinephrine use and did not improve QoL.\textsuperscript{80} However, this meta-analysis did not include preschool-aged children, and emerging real-world data have revealed different safety outcomes according to age, with rates of epinephrine use between 14.5% and 23% in school-aged children and older, compared with 4% in preschool-aged children. Also, QoL outcomes were only available for a minority of the subjects included in the meta-analysis, making it difficult for the reader to arrive at any conclusions about QoL.\textsuperscript{71,75,76}

There remain ongoing controversies with peanut OIT. There are arguments for and against its use outside of a research setting.\textsuperscript{69} It is unclear what contributes to drop-out rates over time and whether OIT long-term will alter anaphylaxis frequency rates. Further long-term data on the safety of OIT, its role in SU, and its role in modulating immune pathways are required. Common adverse events, although usually mild, must be weighed against the ability to increase threshold tolerance to peanut. Drop-out rates may be lower in preschool-aged children because OIT is well before long-standing aversion and anxiety become entrenched.\textsuperscript{78}

EPIT is also emerging as a therapy in children who are peanut allergic and has been described to have potentially better adherence and safety profiles than OIT.\textsuperscript{81} However, the treatment response thus far has been more modest than that of peanut OIT.\textsuperscript{81} A recent phase III study of 356 children with peanut allergy revealed that daily peanut-patch therapy for 12 months resulted in a 21.7% (95% CI: 12.4\%–29.8\%) better response (response was defined as tolerating a much higher dose of peanut at the OFC after EPIT) compared with a placebo, which was...
statistically significant ($P < .001$) but did not meet the prespecified lower bound of the CI threshold.\textsuperscript{82} EPIT in general only caused local skin reactions, although the rate of these patch-site reactions was high in both active and placebo groups.\textsuperscript{81,82}

Other emerging therapies that are being studied include sublingual immunotherapy, the use of Chinese herbal formula, DNA vaccines, and adjuvant-enhanced immunotherapy.\textsuperscript{83}

**CONCLUSIONS**

There have been exciting developments in the field of peanut allergy prevention, with early peanut ingestion demonstrating a strong preventive role in infants at risk. In Table 3, we summarize advances and limitations and/or ongoing controversies in the field. Current first-line diagnostic tools for peanut allergy have good sensitivity but limited specificity, which may be enhanced with component-resolved diagnostic tools, especially under certain clinical circumstances. Management of peanut allergy requires avoidance and carrying of an epinephrine autoinjector. However, the risk of fatality due to anaphylaxis is extremely low, and there is minimal risk associated with cutaneous or inhalational exposure. The focus of ongoing management should be on improving QoL. Immunotherapy is emerging as an exciting tool to desensitize children with peanut allergy, although its role in SU is less clear.

**ABBREVIATIONS**

CI: confidence interval  
CRD: component-resolved diagnostic testing  
ED: eliciting dose  
EPIT: epicutaneous immunotherapy  
IgE: immunoglobulin E  
LEAP: Learning Early About Peanut Allergy  
OFC: oral food challenge  
OIT: oral immunotherapy  
QoL: quality of life  
SPT: skin prick test or testing  
SU: sustained unresponsiveness

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**POTENTIAL CONFLICT OF INTEREST:** Dr Abrams is a member of the scientific advisory board for Food Allergy Canada. Dr Chan has received research support from DBV Technologies, has been a member of advisory boards for Pfizer, Pedipharm, Leo Pharma, and Kaleo; is a member of the scientific advisory board for Food Allergy Canada; and was an expert panel and coordinating committee member of the National Institute of Allergy and Infectious Diseases–sponsored guidelines for peanut allergy prevention. Dr Sicherer reports royalty payments from UpToDate and from Johns Hopkins University Press; grants to his institution from the National Institute of Allergy and Infectious Diseases, from Food Allergy Research and Education, and from HAL Allergy; and personal fees from the American Academy of Allergy, Asthma, and Immunology outside of the submitted work. He was an expert panel and coordinating committee member of the National Institute of Allergy and Infectious Diseases–sponsored guidelines for peanut allergy prevention.

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Peanut Allergy: New Advances and Ongoing Controversies
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