Infant Peanut Introduction Simplified

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Practice Gaps

1. To reduce the risk of developing peanut allergy in infants, clinicians should be able to advise families of the current recommendations for when, where, and how to introduce peanut into the infant’s diet.

2. Clinicians should recognize infants at high risk for developing peanut allergy and should be able to either appropriately investigate and manage peanut introduction or facilitate a referral to an allergy specialist for further investigations/advice.

Objectives

After completing this article, readers should be able to:

1. Define an infant at risk for developing peanut allergy.
2. Describe recent evidence to support early peanut introduction to infants.
3. Using the updated National Institute of Allergy and Infectious Diseases-sponsored guidelines, advise parents when, where, and how to introduce peanut into their infant’s diet.
4. Identify and refer infants at high risk for developing peanut allergy to an allergy specialist for further education/advice.
5. Discuss challenges to implementation of these guidelines in clinical practice.
6. Use practical tips to make peanut introduction into an infant’s diet easier to accomplish.

INTRODUCTION

Approximately 2% of children in the United States are diagnosed as having a peanut allergy. (1) Anaphylaxis is a known complication of peanut ingestion in afflicted individuals. Although overall mortality due to peanut allergy is low, (2) the fear of a life-threatening anaphylactic reaction is high, contributing to the psychological burden of this condition and affecting quality of life and daily activities for children and their families. (3)(4)(5)(6)(7)

In an attempt to reduce the incidence of peanut allergy, early American Academy of Pediatrics clinical practice guidelines recommended delaying the
introduction of peanut-containing foods until age 3 years. (8) These guidelines were based on expert opinion only, with little evidence to support them. While these guidelines were in force, the incidence of peanut allergy did not change or may have, ironically, increased. After publication of the Learning Early About Peanut Allergy (LEAP) study, (9) the National Institute of Allergy and Infectious Diseases sponsored addendum guidelines for the introduction of peanut in infants. (10) We reviewed and simplified these guidelines in the hopes that a more practical approach will make instructions for peanut introduction easier for families, primary care providers, and pediatricians.

Note that there are also updated general recommendations for early introduction of foods to prevent food allergy. The focus of this review article is peanut introduction. For further information we refer the reader to a more general article on this topic. (11)

DEFINING AN INFANT AT RISK FOR DEVELOPING PEANUT ALLERGY

Infants are considered to be at high risk if they have been diagnosed as having severe eczema or egg allergy. (10) Severe eczema is defined as “persistent or frequently recurring eczema with typical morphology or 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.” (10) Infants are at risk of peanut allergy if they have mild or moderate eczema. (10) Of note, family history of allergy is a risk factor for the development of allergic conditions but is not specific for peanut allergy. A family history of allergy or peanut allergy should not be used to define risk of peanut allergy in infants.

Eczema in infants is identified as a significant risk factor for the development of food allergies. (12) Early cutaneous exposure to food allergens may result in allergic sensitization, whereas early oral consumption of the same food may result in tolerance. (13) The dual-allergen exposure hypothesis (13) proposes that the timing and balance of these routes of exposure to a food will determine the development of food allergy or tolerance.

EVIDENCE SUPPORTING THE EARLY INTRODUCTION OF PEANUT

Using a questionnaire-based survey, the prevalence of peanut allergy was found to be significantly higher in Jewish children in the United Kingdom compared with Jewish children in Israel by a factor of almost 10. (14) The authors of this study proposed that this difference in prevalence was related to earlier and more frequent peanut exposure in the first year of life in infants in Israel compared with infants in the United Kingdom.

The LEAP study reported the results of a UK study of 640 high-risk infants who were either randomized to early (age 4–11 months) or delayed (avoidance until age 5 years) introduction of peanut into their diet. Consuming peanut early and regularly, as in 3 times weekly, reduced the development of peanut allergy by 86% by 5 years of age compared with the group of children who delayed peanut consumption. (9) The LEAP-On study investigated whether children who had consumed peanut in the primary trial would remain protected from peanut allergy after they stopped eating peanut for 12 months. (15) The benefits of early peanut introduction persisted for the 12 months of this study.

PEANUT INTRODUCTION: THE FINER DETAILS

Low-Risk Infants (No Eczema or Food Allergy)

Most infants (approximately 87%) are at low risk. (16) Age-appropriate peanut-containing food can be introduced at home with other solid foods as the family would do normally. Six months of age is a reasonable age if the infant is tolerating other solid foods. See the Table for suggestions on how to prepare peanut-containing foods that are appropriate for this age group. If tolerated, peanut-containing food should be eaten regularly, at least 3 times per week.

At-Risk Infants (Mild-to-Moderate Eczema)

Approximately 12% of all infants are at risk. (16) Age-appropriate peanut-containing food introduction should occur at home around 6 months of age after determining the infant’s ability to tolerate other solid foods. (10) No special evaluation is required. Some care providers may want a physician assessment owing to other factors, such as parental anxiety. The goal of this physician assessment is to reassure the caregiver about the change in the advice about peanut introduction and the safety of giving peanut-containing food at this age at home. If the care provider’s anxiety remains high, a supervised feeding in the office may be appropriate. See the Table for appropriate peanut-containing foods. If tolerated, peanut-containing food should be eaten regularly, at least 3 times per week.

High-Risk Infants (Severe Eczema or Egg Allergy)

Few infants (approximately 0.9% of all infants) are high risk. (16) Special considerations need to be given to this group only. Age-appropriate peanut-containing food should be introduced as early as age 4 to 6 months in
these infants after they demonstrate readiness for solids (Table). (10)

Before peanut introduction, allergy testing to peanut is strongly recommended (Fig). (10) The preferred method is by skin prick testing by a qualified allergist. In vitro measurement of peanut-specific immunoglobulin E (IgE) levels is a reasonable alternative, especially if access to an allergist is limited, so as not to delay peanut introduction. Obtaining specific IgE levels to foods other than peanut is not recommended because random testing has a poor positive predictive value for diagnosis of food allergy. (17) Such testing could lead to misinterpretation, overdiagnosis of food allergy, and unnecessary dietary restrictions of other foods. (10) This is true for all age groups, especially if performed without a specific history of a potential allergic reaction to the food.

If the peanut-specific IgE level is negative, peanut may be introduced at home or by a supervised challenge in the clinical setting depending on the level of caregiver concern. (10) If tolerated, peanut-containing food should be eaten regularly, at least 3 times per week.

If the peanut-specific IgE level is positive, the infant should be referred to an allergy specialist.

The next step in investigation of these infants should be skin prick testing to peanut. Depending on the results of a skin test, home introduction, supervised feeding or a graded food challenge in the allergist’s office, or strict avoidance are appropriate options (Fig). (10)

**OUTCOMES**

**Tolerance**

All children who tolerate peanut should continue eating peanut-containing foods regularly to maintain tolerance. The recommendation is 6 to 7 g of peanut protein per week, divided into 3 or more feedings (see the Table for serving suggestions). (10)

**Peanut Allergy Confirmed**

In infants who have been identified as allergic to peanut after skin testing or oral challenge, strict peanut avoidance and evaluation and management by a specialist are advised (Fig). (10)

**SIMPLE GUIDELINES, BUT PERHAPS NOT SO SIMPLE TO IMPLEMENT**

Since the publication of these new guidelines, several concerns have been raised about their implementation. Care must be taken to not medicalize the feeding of an infant’s

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**TABLE. Typical Peanut-Containing Foods, Their Peanut Protein Content, and Feeding Tips for Infants**

<table>
<thead>
<tr>
<th>Bamba®</th>
<th>Peanut Butter</th>
<th>Peanuts</th>
<th>Peanut Flour or Peanut Butter Powder</th>
</tr>
</thead>
<tbody>
<tr>
<td>Amount containing approximately 2 g of peanut protein</td>
<td>17 g or 2/3 of a 28-g (1-oz) bag or 21 sticks</td>
<td>9–10 g or 2 teaspoons</td>
<td>8 g or ~10 whole peanuts (2½ teaspoons of ground peanuts)</td>
</tr>
<tr>
<td>Feeding tips</td>
<td>• For a smooth texture, mix with warm water (then let cool) or human milk or infant formula and mash well</td>
<td>• For a smooth texture, mix with warm water (then let cool) or human milk or infant formula</td>
<td>• Use the blender to create a powder or paste</td>
</tr>
<tr>
<td></td>
<td>• Pureed or mashed fruit or vegetables can be added</td>
<td>• For older children, mix with pureed or mashed fruit or vegetables or any suitable family foods, such as yogurt or mashed potatoes</td>
<td></td>
</tr>
<tr>
<td></td>
<td>• Older children can be offered sticks of Bamba</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

*Bamba (Osem, Shoham, Israel) is named because it was the product used in the Learning Early About Peanut Allergy trial and, therefore, has known peanut protein content and proven efficacy and safety. Other peanut puff products with similar peanut protein content can be substituted for Bamba.

b Teaspoons and tablespoons are US measures (5 and 15 mL for a level teaspoon and tablespoon, respectively)

first foods. (18) Other experts have expressed concerns over the definition of the at-risk population, the feasibility and implementation of the guidelines, and the potential for unintended consequences from their implementation. (19)(20)

Severity of Eczema May Be Overestimated
The definition of severe eczema may vary depending on the clinician’s or caregiver’s experience. Some infants may be misclassified to the high-risk group, leading to unnecessary screening and specialist referrals. (20)(21) Peanut introduction may be delayed, which may result in a missed opportunity for peanut allergy prevention.

How Relevant Is Egg Allergy in Predicting Risk of Peanut Allergy?
Because egg is not a common food consumed at 4 to 6 months of age, the number of infants diagnosed as having an egg allergy is very low. There is no evidence to date that egg allergy is more of a risk factor for developing peanut allergy in infants than is an allergy to, for example, cow milk, a much more common food allergy in this age group. (22)

Overuse and Misinterpretation of Serum Specific IgE Testing
In clinical practice, use of serum specific IgE testing can result in the over diagnosis of food allergy. (19)(23)

There is a real risk that a positive peanut-specific IgE level could result in infants being misdiagnosed as having peanut allergy. This, in turn, could result in unnecessary delays in the introduction of peanut and possibly other foods.

Inappropriate Screening/Risk of Screening for Multiple Food Allergies
Infants who are not in a high-risk category may undergo screening, specialist referrals, and oral food challenges due to parental anxiety or clinician overcaution. (23) This could have an effect on the number of specialist referrals and costs to the health-care system. Delays in peanut introduction may also occur.

Caregiver pressure and clinician overcaution may also result in some infants being allergy tested for multiple foods. Because of the risk of false-positive results, foods may be inappropriately not given or removed from the child’s diet, leading to loss of tolerance and the development of food allergy. (24)

Current World Health Organization guidelines, (26) as well as many other general pediatric guidelines, (27) recommend exclusive breastfeeding until 6 months of age. The potential
impact of introducing solid food earlier than the recommended age on the benefits of exclusive breastfeeding, as well as on the total duration of breastfeeding, is not known. The potential benefit of early solid food introduction versus potential risk will need to be individualized according to the infant’s risk of developing food allergy. There are no studies to date comparing the introduction of peanut at 4 versus 6 months to see whether one age is better than the other as a means of peanut allergy prevention. (28)

Some Clinicians Will Not Be Comfortable with Infant Oral Food Challenges
Some clinicians will not be comfortable with supervised oral food challenges, especially in infants. (29) For at-risk infants, this rate-limiting step may delay an oral food challenge beyond the 4- to 11-month window and may not provide any benefit of peanut introduction.

Some Caregivers May Not Be Comfortable with the Changed Guidelines
Caregivers may not be aware that the current guidelines recommending early peanut exposure are based on much stronger evidence than the older guidelines that recommended dietary peanut introduction be delayed. Caregivers may remain hesitant and may delay introducing peanut, as well as other solid foods, into their infant’s diet. (30)

The Minimum Amount of Peanut Ingestion to Prevent Allergy Has Not Been Established
The 6 g per week recommendation is based on the LEAP study methods. The rationale for choosing this amount is not clear from the study protocol. It is not known whether a smaller amount less frequently would be as effective.

PRACTICAL TIPS TO HELP WITH GUIDELINE IMPLEMENTATION
Most infants can introduce age-appropriate peanut into their diet with no adverse effects. Because this is a major change in advice during the past 18 years, care providers may need to prepare families for this change. Some helpful suggestions include the following:

• As part of anticipatory guidance during health supervision visits, have a discussion about the change in guidelines about peanut introduction.
• Parents may want to do some independent research on the change in peanut feeding recommendations, so provide them with some helpful websites. See the following for some reasonable caregiver-friendly websites:
  - http://foodallergycanada.ca/2017/01/important-changes-introduction-peanuts-babies/
  - https://preventpeanutallergies.org/
  - http://www.nationalpeanutboard.org/news/5-easy-ideas-to-introduce-peanut-to-infants.htm (although the Peanut Board may not be the first site of choice, there are very reasonable suggestions and easy-to-read instructions about how to give peanut to infants)
• Be cautious about overinterpreting the severity of the infant’s eczema. Many parents will think their infant’s eczema is more severe than it actually is. Of the 13% of infants with eczema, 93% will be mild/moderate and 7% will be severe. Given that most children’s eczema is mild to moderate in severity, no special precautions need to be taken.
• Do not get pressured into checking for food allergy other than peanut with high-risk infants. Whereas the risk of false-negative results is very low, false-positive results can occur. Avoidance of irrelevant foods does not help the family.
• If you plan on performing supervised infant peanut challenges in your clinic, practice mixing the peanut-containing food that will be fed to the infant in advance. Previous knowledge of how to mix the foods will make an actual challenge much easier.
• In the at-risk infant group, reactions will be very rare. As with any procedure that may trigger an allergic reaction, have appropriate treatment available (ie, epinephrine 0.01 mg/kg per dose intramuscularly).
Summary

- To prevent peanut allergy, based on strong research evidence and guidelines, caregivers should introduce age-appropriate peanut at approximately 6 months of age. Most infants can have peanut introduced safely at home and then regular ingestion of peanut several times per week. Delays in accessing specialty care and/or in-office allergy testing should not interfere in this window of opportunity for food allergy prevention.
- Only high-risk infants with severe eczema or egg allergy need in-office testing, medically supervised peanut ingestion, or an oral food challenge. Assistance from an allergist may be needed.
- If an oral food challenge is required, it should ideally be performed as soon as possible.
- Once peanut is introduced and tolerated, peanut should be eaten regularly (eg, 3 times per week) in age-appropriate servings.

References for this article are at http://pedsinreview.aappublications.org/content/40/5/211.
1. A 6-month-old boy is brought to the clinic for a health supervision visit. He is born at term with no perinatal complications. Since he was 1 month of age he was noted to have a diffuse, dry, itchy, and scaly rash over the face and extremities, at which time he was diagnosed as having eczema and was prescribed emollients. Since then he has received several courses of topical corticosteroids due to flare-ups and was diagnosed as having severe eczema. At 2 months of age he was seen in the emergency department with acute upper respiratory tract infection, respiratory distress, and wheezing, for which he was admitted to the hospital for 3 days, received supplemental oxygen, and was discharged on a home nebulizer. Family history is positive for asthma and allergic rhinitis in the father. The mother has a history of mild eczema, and the maternal aunt has peanut allergy. Which one of the following factors places this infant at high risk for developing peanut allergy?
   A. History of asthma in the father.
   B. History of mild eczema in the mother.
   C. History of peanut allergy in maternal aunt.
   D. History of severe eczema in the patient.
   E. History of wheezing in the patient.

2. After completing the history and physical examination, the clinician in the vignette in question 1 provides the family with anticipatory guidance, including continued care for the severe eczema. The clinician also discusses introduction of solid foods. The family inquires about the new recommendations for early introduction of peanut. They are worried about introducing new foods, particularly peanut-containing foods because of the history of allergies. Which one of the following is the next best recommendation for peanut-containing solid food introduction to provide in this patient?
   A. Introduce age-appropriate peanut-containing food at home with other foods now; if tolerated, continue to provide peanut-containing food 3 times a week.
   B. Defer the introduction of peanut-containing food until 5 years of age due to severe eczema.
   C. Obtain a random total serum immunoglobulin E (IgE) level before introducing peanut-containing foods.
   D. Refer the infant to an allergist for allergy testing to peanut by skin prick test before the introduction of peanut-containing food.
   E. Supervised feeding of peanut-containing food in the provider’s office 3 times a week for 1 month to alleviate parental anxiety.

3. A 4-month-old girl with severe eczema is seen in the office for a routine health supervision visit. The family lives in a rural area, and the nearest pediatric allergist is at the University hospital 4 hours away from their home. The pediatrician orders peanut-specific IgE testing to be performed before the 6-month health supervision visit, which turns out to be negative. In providing recommendations for the introduction of peanut-containing foods, which one of the following is the most appropriate next step in the management of this patient?
   A. Defer the introduction of peanut-containing solid foods until the infant can be seen by an allergist for peanut skin testing.
   B. If the introduction of appropriate peanut food is tolerated, peanut-containing food should not be given more frequently than once a month.
   C. Introduce age-appropriate peanut-containing foods at home starting at 6 months of age.
   D. Introduce age-appropriate peanut-containing food in a supervised setting in the office at 6 months of age after premedicating with diphenhydramine.
   E. Repeat the peanut-specific IgE level 2 months after introducing a peanut-containing food challenge.
4. A 6-month-old girl with a history of severe eczema comes to the clinic for follow-up of a positive peanut-specific serum IgE level. Which one of the following is the most appropriate next step to be taken by her pediatrician?
   A. Recommend avoidance of peanut-containing food products for life.
   B. Recommend avoidance of peanut-containing food products until the child is 5 years of age.
   C. Delay the introduction of solid foods and order serum IgE levels to other foods.
   D. Refer the patient to a pediatric allergist for skin testing for peanut.
   E. Repeat the peanut-specific serum IgE levels in 1 month.

5. A 4-month-old boy, exclusively breastfed, is seen in the clinic for a routine health supervision visit. He has been healthy, and there is no history of eczema. The mother asks whether she should start to introduce peanut-containing foods into his diet at this age or wait until he is 6 months old. She is concerned about him developing peanut allergy as the paternal grandmother is allergic to peanut. Which of the following is the most appropriate advice to be given to this mother at this time?
   A. Perform a serum peanut IgE level first if the infant is to be started on peanut-containing foods at age 4 months.
   B. Peanut may not be introduced before 6 months of age due to a positive family history of peanut allergy.
   C. The infant should be referred to an allergist for skin testing first if peanut-containing foods are to be introduced at 4 months of age.
   D. There are no studies performed to date that compare the outcomes with respect to peanut allergy prevention in infants introduced to peanut at 4 vs 6 months of age.
   E. There is no need to introduce peanut-containing foods as long as the patient is breastfeeding and the mother consumes peanut-containing foods.
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