

**Pediatric Specialists**  
*of Virginia*



# **Up to Date on Food Allergies**

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**Division of Allergy and Immunology**

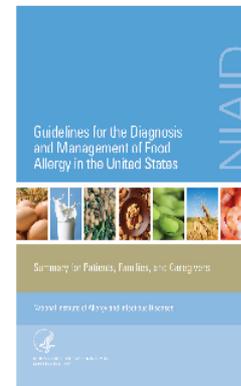
**10/5/18**

# Learning Objectives

- To understand the various **types of food allergies**, based on underlying immunologic mechanisms.
- To learn how to **recognize and diagnose** food allergy.
- To understand the **natural history, prevention and treatment** of food allergies.
- To review **New Guidelines** developed for **early introduction of peanut-containing foods** into the diets of infants at various **risk levels for peanut allergy**.

# Guidelines

- NIH (NIAID)-sponsored guidelines for the diagnosis and management of food allergy
- Developed by expert panel based on comprehensive literature review and expert opinion
- Why?
  - Food allergy (FA) is an important public health problem, increasing in prevalence, without cure
  - Differences in diagnosis and management of FA in different practice settings



This booklet summarizes important information from the U.S. food allergy guidelines to help you start a conversation with your doctor about food allergy.

#### Highlights

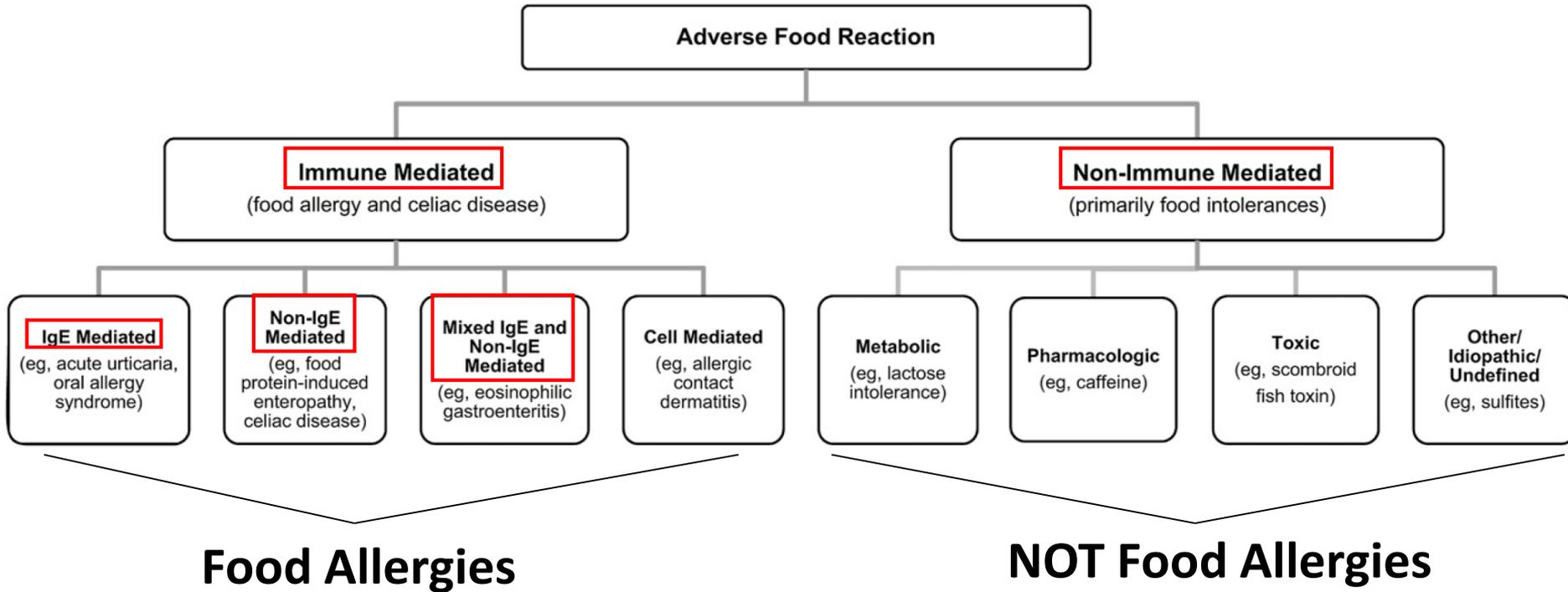
- What food allergy is and what it isn't
- How doctors should diagnose and manage food allergy
- Best way to treat severe allergic reactions to food

NIAID

# What is a food allergy?

- An adverse health effect arising from a specific immune response that occurs reproducibly on exposure to a given food.

# Classification of Adverse Food Reactions



Expert Panel Report. Guidelines for the Diagnosis and Management of Food Allergy in the United States. J Allergy Clin Immunol 2010;126(6):S1-58.

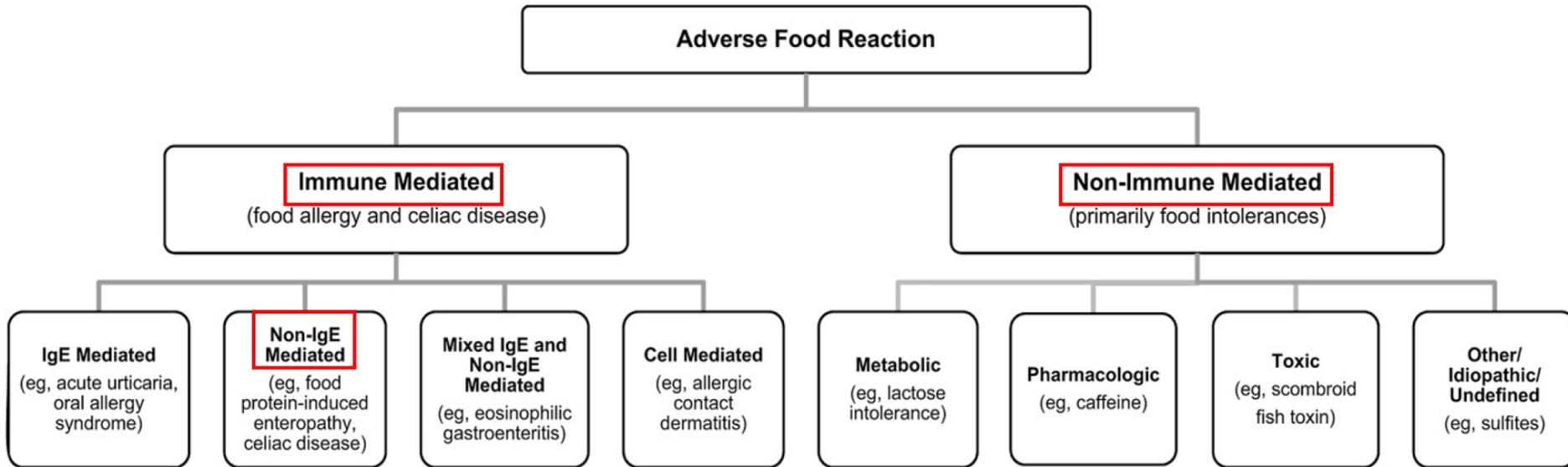
# Clinical Presentation: IgE-mediated Food Allergy

- Skin and mucous membranes
  - Hives, redness and swelling of the face or extremities
  - Itching and swelling of the tongue, lips, mouth and throat
- Gastrointestinal tract
  - Nausea, abdominal pain, vomiting, and diarrhea
- Respiratory system
  - Rhinorrhea, sneezing, coughing, wheezing, and shortness of breath
- Cardiovascular system
  - Hypotension, dizziness, syncope



Courtesy of: <http://www.allergyfacts.org.au/>

# Classification of Adverse Food Reactions



Expert Panel Report. Guidelines for the Diagnosis and Management of Food Allergy in the United States. *J Allergy Clin Immunol* 2010;126(6):S1-58.

# Food protein proctocolitis

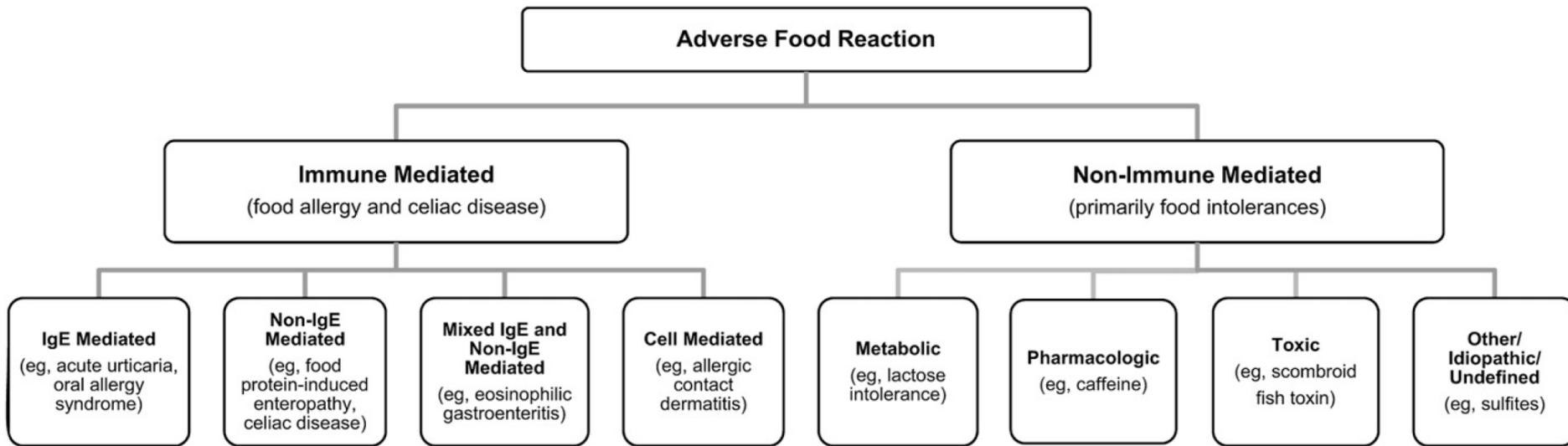
- Symptoms
  - Mucus-laden, bloody stool in infants
- Culprit foods
  - Cow's milk, soy in breastfed infants
- Diagnosis
  - Clinical diagnosis
  - No role for specific IgE testing (given **non-IgE-mediated mechanism**)
- Management
  - Avoidance of culprit food in maternal diet (if breastfeeding) and child's diet
  - If not breastfeeding, use of hypoallergenic formula:
    - Hydrolyzed (80-90% respond) – Alimentum, Nutramigen
    - Elemental amino acid-based – Elecare, Neocate
  - Gradual home introduction of food at 12 months or later to assess resolution
- Prognosis
  - Primarily affects infants
  - Usually resolves by age 1-2 years

# Food Protein Induced Enterocolitis (FPIES)

- Symptoms
  - Chronic exposure: emesis, diarrhea, poor growth, lethargy
  - Re-exposure after restriction: emesis, diarrhea, hypotension 2 hours after ingestion
- Culprit foods
  - Cow's milk, soy, rice, oat
- Diagnosis
  - Clinical diagnosis
  - No role for specific IgE testing (given **non-IgE-mediated mechanism**)
- Management
  - Avoidance of culprit food in child's diet
  - Food challenge in medical setting at 3-4 years to assess resolution
- Prognosis
  - Primarily affects infants
  - Usually resolves by age 3-4 years

Sicherer 2010, J Allergy Clin Immunol 125:S116-25.

# Classification of Adverse Food Reactions



Expert Panel Report. Guidelines for the Diagnosis and Management of Food Allergy in the United States. *J Allergy Clin Immunol* 2010;126(6):S1-58.

# Eosinophilic Esophagitis

- Diagnostic Guidelines
  - Clinical symptoms of esophageal dysfunction
  - $\geq 15$  Eosinophils/high-power field
  - Lack of responsiveness to high-dose proton pump inhibitor (up to 2 mg/kg/day), or Normal pH monitoring of the distal esophagus
- Treatment options
  - Diet:
    - Directed elimination diet (guided by allergy testing)
    - Empiric elimination diet
    - Elemental diet
  - Medical therapy:
    - Topical (swallowed) corticosteroids

Furuta, Liacouras et al. Consensus Recommendations, Gastroenterology 2007.

# Epidemiology

- The prevalence of food allergy is increasing.

# Prevalence of Food Allergy

- Food allergy affects *3 million* children in US
  - 5-8% of young children
  - 3-4% of adolescents and adults
  - Estimated 50,000 children with food allergy in Washington, DC metropolitan area
- Prevalence is *increasing*
  - Rates of peanut allergy more than *doubled* from 1997 to 2008
  - Food allergy prevalence in children increased 18% from 1997 to 2007

Branum 2009, Pediatrics 124:1549-55.

Sicherer 2010, J Allergy Clin Immunol 125:1322-1326.

# Prevalence of Specific Food Allergies

**TABLE I.** Estimated food allergy rates in North America

<b>Prevalence</b>	<b>Infant/child</b>	<b>Adult</b>
Milk	2.5%	0.3%
Egg	1.5%	0.2%
Peanut	1%	0.6%
Tree nuts	0.5%	0.6%
Fish	0.1%	0.4%
Shellfish	0.1%	2%
Wheat, soy	0.4%	0.3%
Sesame	0.1%	0.1%
Overall	5%	3% to 4%

Sicherer 2010 J Allergy Clin Immunol 125:S116-25.

# Natural History

**Food allergy can be outgrown.**

**Likelihood of resolution varies by food.**

# Natural History of IgE-mediated Food Allergy

- Likelihood of resolution is allergen-dependent
- Milk, egg, soy and wheat allergy
  - >80% resolution
  - <50% outgrow by age 6 years
  - Later age of resolution than previously reported
- Peanut, tree nut, fish, and shellfish allergy
  - Less likely to resolve
  - Usually lifelong
    - Peanut: ~20% resolution
    - Tree nuts: ~10% resolution

Fleischer 2007 Curr Allergy Asthma Rep. 7:175-81.  
Skripak 2007 J Allergy Clin Immunol. 120:1172-77.

# Risks

**Food allergic reactions can be fatal.**

**The severity of future allergic reactions is not accurately predicted by past history or allergy test results.**

# Food-induced Anaphylaxis: Prevalence

- Account for estimated 125,000 emergency department (ED) visits each year
  - Most common cause of visits for pediatric anaphylaxis treated in U.S. EDs
- Approximately 150-200 food allergy-related deaths per year in U.S.
  - Risk factors:
    - Delayed administration of epinephrine
    - Adolescents and young adults
    - Asthma
  - Most common foods: peanut, tree nuts and seafood (but also milk, eggs, seeds, and others)

Bock 2007, J Allergy Clin Immunol 199:1016-18.

# Food-induced Anaphylaxis: Common Myths

- Myth: Anaphylaxis always presents with skin symptoms - NO!
  - 20% of anaphylaxis does not present with hives or other skin symptoms
  - 80% of fatal food-induced anaphylaxis were not associated with skin symptoms
- Myth: Prior reactions predict the severity of future reactions – NO!
  - Reactions are unpredictable
  - Severity depends on: sensitivity to food, dose, route, comorbid disease (asthma)

# Diagnosis

History guides suspicion of a food allergy diagnosis.

Tests for food-specific IgE are recommended to assist in diagnosis, but should not be relied upon as a *sole* means to diagnose food allergy.

Food-specific IgE testing has numerous limitations.

# Diagnosis of IgE-mediated food allergy: Testing

- **Skin tests**
  - Skin prick tests (SPT) – assess local IgE response in epidermis
    - Negative predictive value >90%
    - Specificity <100% (false positives possible)
  - Atopy patch tests (APT) – potential utility for non-IgE mediated food allergy, but limited to research currently
- **Serum immunoassays** – assess serum food-specific IgE levels
  - Higher levels correlated with higher likelihood of reaction, but not reaction severity
  - Decrease in levels over time associated with increasing chance of allergy resolution
- **Oral food challenge** – gradual feeding of culprit food under medical supervision
  - Most specific test for food allergy
  - To confirm diagnosis if history and other testing unclear
  - To assess resolution of allergy
- **Elimination Diet**

# Diagnostic tests: Potential Pitfalls

- Positive skin test or serum IgE indicates **sensitization, but *not* necessarily clinical allergy**
  - Screening with indiscriminate panels is *not* informative
  - History guides test selection
  - Tolerated foods generally need *not* be tested
- Skin or serum IgE **tests may be negative despite clinical reactivity**
  - Due to reagent lacking relevant protein or non-IgE-mediated mechanism
  - A convincing history should *not* be ignored

Sicherer 2010 J Allergy Clin Immunol 125:S116-25.

# Diagnostic tests: Children with moderate to severe atopic dermatitis

- Children less than 5 years old be considered for FA evaluation for milk, egg, peanut, wheat, and soy, *if* at least 1 of the following conditions is met:
  - The child has persistent AD despite optimized management and topical therapy, or
  - The child has a reliable history of an immediate reaction after ingestion of a specific food
- Care should be taken to ensure these children are clinically allergic to a food prior to removing it completely from their diet because restrictive diets may be harmful.
  - Food removed should be systematically reintroduced to minimize avoidance of non-allergenic foods

# Prevention

**Breast-feeding is encouraged for all infants.**

**Hydrolyzed infant formulas are suggested for infants “at risk” (parent or sibling with allergic disease).**

**Complementary foods (including potential allergens) are not restricted after 4-6 months of age.**

# Prevention

The NEW ENGLAND JOURNAL of MEDICINE

ORIGINAL ARTICLE

## Randomized Trial of Peanut Consumption in Infants at Risk for Peanut Allergy

George Du Toit, M.B., B.Ch., Graham Roberts, D.M., Peter H. Sayre, M.D., Ph.D.,  
Henry T. Bahnson, M.P.H., Suzana Radulovic, M.D., Alexandra F. Santos, M.D.,  
Helen A. Brough, M.B., B.S., Deborah Phippard, Ph.D., Monica Basting, M.A.,  
Mary Feeney, M.Sc., R.D., Victor Turcanu, M.D., Ph.D.,  
Michelle L. Sever, M.S.P.H., Ph.D., Margarita Gomez Lorenzo, M.D.,  
Marshall Plaut, M.D., and Gideon Lack, M.B., B.Ch., for the LEAP Study Team\*

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# LEAP Study

## (Learning Early About Peanut Allergy)

- Methods
  - Randomly assigned 640 infants with severe eczema, egg allergy or both to consume or avoid peanuts until 60 months of age.
  - Age at least 4 months to 11 months
  - Skin prick test to peanut
    - One group negative to peanut
    - Second group, skin test resulting in 1-4 mm wheal.
    - 5 mm wheal on skin testing-excluded from study.

# LEAP Study

- Infants in consumption group underwent a baseline, open label food challenge
  - If they had a reaction at the challenge were told to avoid peanut and were included in the intention to treat analysis but not in the per-protocol analysis.
- Consumption group
  - 6 grams of peanut protein at least 3 times per week.
    - 3 teaspoons of peanut butter per week
  - Bamba- snack food made from peanut butter and puffed maize.
  - Smooth peanut butter if infant did not like Bamba
- Adherence
  - Validated food frequency questionnaire.
  - Peanut protein levels measured in dust collected from infant's bed 2-4 weeks before the final visit.
- Repeat food challenge at 60 months

# LEAP Study

- Results
  - 530 infants in the intention-to-treat population with negative skin test
    - Prevalence of peanut allergy at 60 months of age
      - 13.7% in avoidance group
      - 1.9 % in the consumption group ( $P < 0.001$ )
      - 86% relative risk reduction
  - 98 infants in the intention to treat population with positive skin test
    - Prevalence of peanut allergy at 60 months of age
      - 35.3% in avoidance group
      - 10.6 % in the consumption group ( $P = 0.004$ )
      - 70% relative risk reduction

# Prevention

- Practice of early peanut introduction is safe and effective in selected high-risk infants.
- First prospective, randomized trial of early peanut intervention.
  - Health care providers should recommend introducing peanut containing products into the diets of “ high-risk” infants early on in life (between 4 and 11 months of age) in countries where peanut allergy is prevalent
  - Delaying peanut can be associated with an increased risk of PA.
  - Infants with severe eczema or egg allergy in the first 4-6 months of age might benefit from seeing an allergist.
    - To diagnose any food allergy
    - Assist in implementing these suggestions regarding the appropriateness of early peanut introduction.
    - Skin test and/or office based food challenge to peanut.

# Guidelines for the prevention of peanut allergy

*Addendum guidelines for the prevention of peanut allergy in the United States: Report of the National Institute of Allergy and Infectious Diseases–sponsored expert panel*

*Alkis Togias, MD, Susan F. Cooper, MSc, Maria L. Acebal, JD, Amal Assa'ad, MD, James R. Baker, MD, Lisa A. Beck, MD, Julie Block, Carol Byrd-Bredbenner, PhD, RD, FAND, Edmond S. Chan, MD, FRCPC, Lawrence F. Eichenfield, MD, David M. Fleischer, MD, George J. Fuchs, MD, Glenn T. Furuta, MD, Matthew J. Greenhawt, MD, MBA, MSc, Ruchi S. Gupta, MD, MPH, Michele Habich, DNP, APN/CNS, CPN, Stacie M. Jones, MD, Kari Keaton, Antonella Muraro, MD, PhD, Marshall Plaut, MD, Lanny J. Rosenwasser, MD, Daniel Rotrosen, MD, Hugh A. Sampson, MD, Lynda C. Schneider, MD, Scott H. Sicherer, MD, Robert Sidbury, MD, MPH, Jonathan Spergel, MD, PhD, David R. Stukus, MD, Carina Venter, PhD, RD, Joshua A. Boyce, MD*

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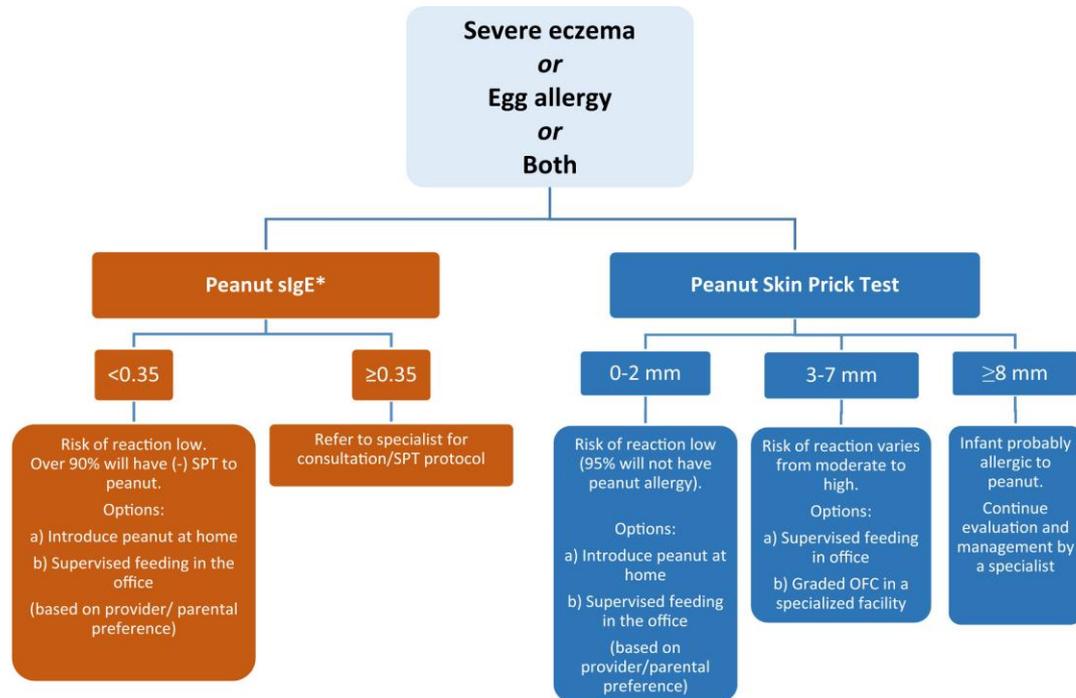
# Definitions

- **Severe eczema-** 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
- **Egg allergy-** history of a reaction to egg and skin prick test of 3 mm or greater with egg white extract or a positive oral egg food challenge.

# Summary

Addendum guideline	Infant criteria	Recommendations	Earliest age of peanut introduction
1	Severe eczema, egg allergy, or both	Strongly consider evaluation by sIgE measurement and/or SPT and, if necessary, an OFC. Based on test results, introduce peanut-containing foods.	4-6 months
2	Mild-to-moderate eczema	Introduce peanut-containing foods	Around 6 months
3	No eczema or any food allergy	Introduce peanut-containing foods	Age appropriate and in accordance with family preferences and cultural practices

# Recommended approach for evaluation of children with severe eczema and or egg allergy before peanut introduction



\* To minimize a delay in peanut introduction for children who may test negative, testing for peanut-specific IgE may be the preferred initial approach in certain health care settings. Food allergen panel testing or the addition of sIgE testing for foods other than peanut is not recommended due to poor positive predictive value.

# Guidelines

- The Expert Panel does not recommend food allergen panel testing or the addition of sIgE testing for foods other than peanut because of their poor positive predictive value, which could lead to misinterpretation, overdiagnosis of food allergy, and unnecessary dietary restrictions
- If the decision is made to introduce dietary peanut based on the recommendations of addendum guideline 1, the total amount of peanut protein to be regularly consumed per week should be approximately 6 to 7 g over 3 or more feedings. (3 teaspoons of peanut butter per week)

# General Instructions

1. Feed your infant only when he or she is healthy; do not do the feeding if he or she has a cold, vomiting, diarrhea, or other illness.
2. Give the first peanut feeding at home and not at a day care facility or restaurant.
3. Make sure at least 1 adult will be able to focus all of his or her attention on the infant, without distractions from other children or household activities.
4. Make sure that you will be able to spend at least 2 hours with your infant after the feeding to watch for any signs of an allergic reaction.

# Feeding your infant

1. Prepare a full portion of one of the peanut-containing foods from the recipe options provided.
2. Offer your infant a small part of the peanut serving on the tip of a spoon.
3. Wait 10 minutes.
4. If there is no allergic reaction after this small taste, then slowly give the remainder of the peanut-containing food at the infant's usual eating speed.

# Symptoms of an allergic reaction. What should I look for?

- Mild symptoms can include:
  - a new rash or a few hives around the mouth or face
- More severe symptoms can include any of the following alone or in combination:
  - lip swelling
  - vomiting
  - widespread hives (welts) over the body
  - face or tongue swelling
  - any difficulty breathing
  - wheeze
  - repetitive coughing
  - change in skin color (pale, blue)
  - sudden tiredness/lethargy/seeming limp
- If you have any concerns about your infant's response to peanut, seek immediate medical attention/call 911

# 4 recipe options

	Bamba	Peanut butter	Peanuts	Peanut flour or peanut butter powder
Amount containing approximately 2 g of peanut protein	17 g or ½ of a 28-g (1-oz) bag or 21 sticks	9-10 g or 2 teaspoons	8 g or ~10 whole peanuts (2½ teaspoons of grounded peanuts)	4 g or 2 teaspoons
Typical serving size	1 bag (28 g)	Spread on a slice of bread or toast (16 g)	2½ teaspoons of ground peanuts (8 g)	No typical serving size
Peanut protein per typical serving	3.2 g	3.4 g	2.1 g	No typical serving size
Feeding tips	For a smooth texture, mix with warm water (then let cool) or breast milk or infant formula and mash well.  Pureed or mashed fruit or vegetables can be added.  Older children can be offered sticks of Bamba.	For a smooth texture, mix with warm water (then let cool) or breast milk or infant formula.  For older children, mix with pureed or mashed fruit or vegetables or any suitable family foods, such as yogurt or mashed potatoes.	Use blender to create a powder or paste.  2-2½ teaspoons of ground peanuts can be added to a portion of yogurt or pureed fruit or savory meal.	Mix with yogurt or apple sauce.

# Case report

- NJ is a 6 month old female seen by me for initial visit in 4/2014 for severe eczema and IgE mediated dairy allergy.
- Presented to clinic with serum IgE testing dated March 28, 2014 negative to milk, corn, soy, pork, beef, chocolate. Wheat 2.04, **peanut 0.65**, egg whole 11.2.
- Skin prick testing done 4/2014; egg 5/10, **peanut 0** and wheat 0.
- Ask mom to try peanut at home because the ST is negative.
- Follows up on 4/2015, did not give peanut, mom scared
- Repeat skin testing; milk 2, egg 2, **peanut 0**, soy 0, wheat 0, chicken 0, turkey 0.
- Mom returns for a follow-up in 8/2015. She finally did give a small amount of peanut at home. Rash around her face each time.
- Repeat blood work: **peanut 10**
- Skin test to peanut **20/25**

# Treatment

**Strict avoidance of food allergens, including reading food labels and avoiding cross-contamination**

**Carrying emergency medications, including 2 epinephrine autoinjectors**

# Food Allergy Action Plan

## Food Allergy Action Plan

Place Student's Picture Here

Name: \_\_\_\_\_ D.O.B.: \_\_\_\_ / \_\_\_\_ / \_\_\_\_

Allergy to: \_\_\_\_\_

Weight: \_\_\_\_\_ lbs. Asthma:  Yes (higher risk for a severe reaction)  No

Extremely reactive to the following foods: \_\_\_\_\_  
**THEREFORE:**  
 If checked, give epinephrine immediately for ANY symptoms if the allergen was *likely* eaten.  
 If checked, give epinephrine immediately if the allergen was *definitely* eaten, even if no symptoms are noted.

**Any SEVERE SYMPTOMS** after suspected or known ingestion:

**One or more** of the following:

LUNG: Short of breath, wheeze, repetitive cough  
 HEART: Pale, blue, faint, weak pulse, dizzy, confused  
 THROAT: Tight, hoarse, trouble breathing/swallowing  
 MOUTH: Obstructive swelling (tongue and/or lips)  
 SKIN: Many hives over body

Or **combination** of symptoms from different body areas:

SKIN: Hives, itchy rashes, swelling (e.g., eyes, lips)  
 GUT: Vomiting, crampy pain



**1. INJECT EPINEPHRINE IMMEDIATELY**

- Call 911
- Begin monitoring (see box below)
- Give additional medications:\*  
 -Antihistamine  
 -Inhaler (bronchodilator) if asthma

\*Antihistamines & inhalers/bronchodilators are not to be depended upon to treat a severe reaction (anaphylaxis). USE EPINEPHRINE.

**MILD SYMPTOMS ONLY:**

MOUTH: Itchy mouth  
 SKIN: A few hives around mouth/face, mild itch  
 GUT: Mild nausea/discomfort



**1. GIVE ANTIHISTAMINE**

- Stay with student; alert healthcare professionals and parent
- If symptoms progress (see above), USE EPINEPHRINE
- Begin monitoring (see box below)

**Medications/Doses**

Epinephrine (brand and dose): \_\_\_\_\_  
 Antihistamine (brand and dose): \_\_\_\_\_  
 Other (e.g., inhaler-bronchodilator if asthmatic): \_\_\_\_\_

**Monitoring**

**Stay with student; alert healthcare professionals and parent.** Tell rescue squad epinephrine was given; request an ambulance with epinephrine. Note time when epinephrine was administered. A second dose of epinephrine can be given 5 minutes or more after the first if symptoms persist or recur. For a severe reaction, consider keeping student lying on back with legs raised. Treat student even if parents cannot be reached. See back/attached for auto-injection technique.

Courtesy of Food Allergy and Anaphylaxis Network,  
<http://www.foodallergy.org>



Parent/Guardian Signature \_\_\_\_\_ Date \_\_\_\_\_ Physician/Healthcare Provider Signature \_\_\_\_\_ Date \_\_\_\_\_

TURN FORM OVER

Form provided courtesy of FAAN ([www.foodallergy.org](http://www.foodallergy.org)) 7/2010

# Food-induced Anaphylaxis: Treatment

- Treatment of anaphylaxis
  - *Immediate treatment with IM epinephrine*
    - Switch from 0.15mg to 0.3 mg at approximately 25kg (55 lbs)
    - Almost no contraindications
    - Failure or delay associated with fatalities
  - Antihistamine (parenteral or oral – liquid, chewable, or dissolvable)
  - Call 911; proceed to Emergency Department
  - Additional measures
    - Repeat epinephrine if symptoms persist or increase after 10-15 minutes
    - Observe for 4-6 hours or longer
    - Provide epinephrine prescription and education
    - Arrange follow-up with PCP and consider consultation with allergist-immunologist

# Thank you. Questions



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