

Food Allergy: Case Studies

Jane Unzeitig, MD, FAAAAI, FACAAI

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Disclosures

None

Learning objectives

- Describe diverse manifestations of food allergy
- Describe prevalence of food allergy
- Explain natural history of food allergy
- Develop rational approach to diagnosis of food allergy
- Explain clinical allergy vs sensitization

Case 1: Jack

- 26 month old ate granola bar. Within 15 min, has hives, then periorbital edema, wheezing
- Seen in ER, Rx IM epinephrine, diphenhydramine, steroid, neb albuterol
- Sent home with Rx for Epi-Pen
- History of eczema, no prior history wheezing; no known prior exposure to peanuts, tree nuts, fish or shellfish



Case 1: Jack

Parents ask about other potential signs of anaphylaxis. These may include:

- a. Atopic dermatitis
 - b. Chronic nasal congestion
 - c. Acute urticaria
- a. Both a and c

Case 1: Jack

- Up to 35% of atopic dermatitis found to have food allergy
- Evaluation indicated in moderate or severe atopic dermatitis or if exacerbation noted when eating certain foods
- Dermatitis improves if food allergy trigger is eliminated



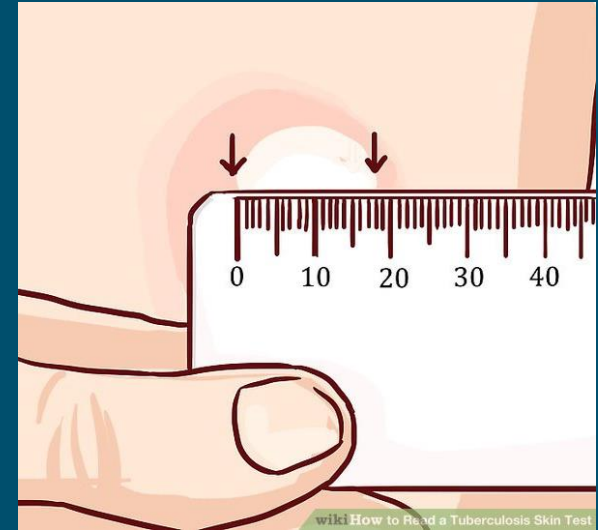
Case 1: Jack

- Jack is referred to an allergist for evaluation
- What is the most appropriate testing?
 - a. Atopy patch testing
 - b. Specific IgE testing or skin prick testing
 - a. Oral food challenge



Allergy Skin Testing

- Skin prick testing : introduction of allergen extracts into the skin
- Positive reaction: wheal
3mm >negative control.
- Negative predictive value > 95%
- Positive predictive value <50%;
therefore, there are many false
positive results.



Interpretation of Allergy Tests

- A positive test alone does not make the diagnosis of clinical food allergy. Rather, it provides evidence of sensitization, i.e., an immunological response.
- If borderline test results or if a false positive or false negative is suspected, perform oral food challenge
- Prevent unjustified food elimination

Case 1: Jack's allergy tests

Skin Prick Tests

Histamine (pos control): 3 mm wheal

Saline (neg control): 0 mm wheal

Peanut: 7 mm wheal

Walnut: 2 mm wheal

Cashew: 3 mm wheal

Almond: 3 mm wheal

Pecan: 2 mm wheal

Hazelnut: 1 mm wheal

Fish: 2 mm wheal

Specific IgE Tests

Peanut: 15 kU/L

Walnut: < 0.35 kU/L

Cashew: < 0.35 kU/L

Almond: < 0.35 kU/L

Pecan: < 0.35 kU/L

Hazelnut: < 0.35 kU/L

Fish: < 0.35 kU/L

What should the parents be advised?

What should you advise the family regarding food avoidance?

- **A: Avoid peanuts**
- **B: Avoid tree nuts**
- **C: Avoid fish**
- **D: A and B**
- **E: A, B, and C**

Jack's parents ask if he will outgrow peanut allergy

- A. All food allergies are life long
- B. Most cases of peanut allergy persist into adulthood but there is a small chance that he will develop tolerance
- C. He is likely to outgrow his peanut allergy

Outgrow = Acquire Tolerance

- Tree nuts: <10%
- Peanuts: <20%
- Eggs: 75% by age 7, especially if ingests as minor ingredient in baked foods
- Milk: >75% by age 5 (most tolerate heated milk products)

Learning Early About Peanut Allergy

LEAP

- LEAP study: introduction of peanut at age 4 months in infants with atopic dermatitis reduces peanut allergy by 80%
- If patient has moderate-severe AD or a food allergy, referral to an allergist recommended before introduction of highly allergenic foods
- Dose: 2 teaspoons of peanut butter three times per week

Case 2: Jill, age 16

History of peanut allergy but does not carry epinephrine. She avoids peanuts. What advice would you give regarding her risk of fatal anaphylaxis?



- A. Adolescents are at a lower risk for fatal anaphylaxis than younger children, but she should still carry her epinephrine autoinjector**
- B. Foods may be unknowingly contaminated with peanuts and therefore epinephrine auto-injector is critical**
- C. Because she is careful in screening for peanut products in food, her risk of anaphylaxis is low**

Management of Anaphylaxis

Which is the proper anticipatory guidance for anaphylaxis?

- a. A dose of anti-histamine can prevent food-induced anaphylaxis
- b. Epinephrine is the primary treatment for anaphylaxis
- c. Fatal anaphylactic reactions occur most often in individuals with unknown food allergy



What instructions regarding epinephrine auto-injector?

- **A. Epinephrine is equally efficacious when given either intramuscularly or subcutaneously**
- **B. Children should be switched from the 0.15 mg dose to the 0.3 mg dose of epinephrine when they reach 20 kg (44 lbs)**
- **C. Epinephrine auto-injectors should be available at all times**

Case 3: Joaquin age 33

After eating bananas, he develops pruritus of lips and tongue, no edema or systemic symptoms. Symptoms resolve with no treatment. No eczema or asthma. He has seasonal allergic rhinitis, controlled with loratadine. What testing is needed?

- A. Skin prick testing for banana
- B. Skin prick testing for pollens
- C. Skin prick testing for banana and pollens
- D. No further testing is needed

Oral Allergy Syndrome

- IgE-mediated reaction from cross-reactivity between proteins present in pollens and fruits and vegetables
- Symptoms do not occur when the fruit or vegetable is cooked.
- Ragweed pollen may have cross reactivity with melons, bananas, and tomatoes.
- Lipid transfer protein in birch and several fruits..

Case 4: Wyatt, age 60



- 38 anaphylactic reactions over 4 years, mainly between 11pm – 2am, many were severe
- Lives in Florida
- Tested for >100 allergens by several MDs
- Blood type B
- Positive test for 1,3 alpha galactose (alpha-gal)

Red Meat Allergy



- Alpha-gal carbohydrate in non-primate mammals
- Lone Star tick saliva primes immune system to react to meat
- Onset hours after ingestion
- Often resolves spontaneously

IgE-Mediated Food Allergy Presentation

Cutaneous

- Flushing, hives, angioedema, eczema

Gastrointestinal

- Abdominal cramping, nausea, vomiting, diarrhea

Respiratory

- Rhinitis, laryngeal edema, wheezing, coughing

Cardiovascular

- Hypotension, tachycardia, arrhythmias

Central Nervous System

- Lightheadedness, syncope

Non IgE-Mediated Food Allergy Presentation

Food Protein-Induced Allergic Proctitis/Proctocolitis

- Gross blood in stool \pm other symptoms, usually well-appearing infant

Food Protein-Induced Enterocolitis Syndrome (FPIES)

- 2-4 hours after ingestion: repetitive projectile vomiting \pm diarrhea that can lead to severe dehydration, onset usually in the 1st year of life

Celiac Disease

- Diarrhea, steatorrhea, malabsorption, abdominal distention, flatulence, \pm nausea & vomiting, failure to thrive, oral ulcers

Routes of Exposure

- Ingestion: most relevant in systemic reactions, severity depends on amount and form of food [raw vs./ cooked]
- Inhalation: possible with foods that have been aerosolized; e.g. steamed milk, cooked fish/shellfish, fried eggs; respiratory symptoms or anaphylaxis with severe allergy (controversial)
- Contact: skin - usually local reactions, such as hives or redness; mucous membranes: in young children skin contact on the hands may lead to mucosal contact by rubbing eyes
- Atopic dermatitis defective barrier may result in sensitization to foods or airborne allergens via the skin

Disorders Not Proven to be Related to Food Allergy

- Migraines
- Behavioral / Developmental disorders
- Arthritis
- Seizures
- Inflammatory bowel disease

Food Additives and Colorings

- Food additives and colorings derived from natural sources that contain proteins may induce allergic reactions.
- Examples: turmeric, annatto seed, and insects (e.g., carmine)
- Chemical additives and colorings [e.g., tartrazine (yellow # 5)] are not likely to cause IgE-mediated food allergy.
- Sulfites are added to foods as preservative, anti-browning agent, or bleaching effect. In sensitive persons, sulfites may induce asthma (though this is *not* a food allergy).

Predictive value of food-specific IgE testing in positive and negative OFC

Food	>95% Positive		~50% Negative	
	slgE, kIU/L	SPT, mm	slgE, kIU/L	SPT, mm
Peanut	≥ 14	≥ 8	≤ 2 , + prior rxn ≤ 5 , no prior rxn	≤ 3
Milk (age <2 yr)	≥ 5	≥ 8	≤ 2	
Milk	≥ 15	≥ 8		
Egg (age <2 yr)	≥ 2	≥ 7	≤ 2	≤ 3
Egg	≥ 7	≥ 8		
Fish	≥ 20	?	?	?

Molecular Diagnosis of Food Allergy

- Major allergens identified in certain foods
- Birch cross-reactive allergens: Ara h 8 in peanut, Cor a 1 in hazelnut-mild oral symptoms or no symptoms upon ingestion, consider challenge
- Storage seed proteins: Ara h 1, 2, 3 in peanut, Cor a 9 and 14 in hazelnut-associated with systemic reactions, recommend strict avoidance, defer challenge

General Principles of Management

- Avoidance of the food allergen
- Ensure nutritional needs for children are met
- Education
- Written individualized healthcare plans (IHP) and emergency action plans (EAP)
- Quick access to emergency medications including self-injectable epinephrine (SIE)

Hypoallergenic Infant Formulas for Cow's Milk Allergy (CMA)

- ***Soy based formulas*** For IgE-CMA, soy co-allergy is 0-14%¹. For non-IgE CMA, soy co-allergy 0%² to 60%³.
- Partial hydrolysates (e.g. Good Start, Peptamin Jr, Pediasure Peptide) are ***not recommended for CMA***
- ***Extensively hydrolyzed formulas*** (EHF) Alimentum, Nutramigen, Pregestimil: >90% tolerance in IgE-CMA
- ***Elemental amino acid based formulas*** (Neocate, Elecare, PurAmino): CMA, FPIES intolerant of EHF, EoE

¹Katz Y, et al. JACI 2010;126:77-82. ²Katz Y, et al. JACI 2011;127:647-53.

³Sicherer SH, et al. J Pediatr 1998; 133: 214–219

Reasons for Allergy Referral

- Known food allergy diagnosis for ongoing management and follow-up for possible development of tolerance.
- When food-specific IgE level is undetectable in a child with a convincing history of an immediate-type food reaction.
- When food-specific IgE levels indicate sensitization prior to the food being introduced.
- Known diagnosis of a food allergy at risk for other food allergies e.g. egg allergy/eczema hi-risk for peanut allergy