Food Allergy:
Fact and Fiction

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Quiz

• Which of the following statements about food allergy is false?

1. The severity of a reaction increases with each subsequent exposure.
2. Smelling, touching or being in the same area as a food can cause a systemic reaction in an allergic patient.
3. Common foods that cause allergy include strawberries, red dye and artificial sweeteners.
4. An oral antihistamine can halt a serious allergic reaction.
5. Allergy testing can predict the severity of a reaction.
6. Patients with mild food allergies do not need to carry an Epipen.

Answer

• All of the above.
Definition: What It Is

- An abnormal, immune-mediated response to an ingested food protein due to failure of normal tolerance
- May be IgE, T-cell, eosinophilic, mixed or unknown

Definition: What It Is Not

- Chemical/pharmaceutical effect
  - Histamine (strawberries, tomatoes)
  - Caffeine: Tremor, diarrhea, cramps
  - Tyramine (cheese, tomatoes): Migraines
  - Scombroid fish poisoning: histidine → flush, pruritis, bronchospasm
  - Sulfites (cheese, wine, beer, dried fruit, lettuce): bronchospasm
  - MSG: flush, abdominal cramps
  - Aspartame
- Enzyme deficiency, malabsorption, bacterial toxin, neurogenic reflex

Definition

- There may be children in your schools who need to avoid certain foods who would not require immediate attention if they were exposed.
- For the purpose of this talk, “food allergy” will refer to an IgE mediated allergy that could cause immediate, life threatening symptoms.
Epidemiology

• About 4% of total U.S. population (12 million) has food allergy
  – 6-8% of children (3 million)
    • 3-4% (1 in 25) school age children
  – 3.5% of adults

• Food allergy in U.S. and other industrialized countries is increasing, along with other atopic diseases
  – 18% increase in school aged children from 1997 to 2007

Epidemiology

• 8 foods account for 90% of food allergy in U.S.:
  Egg, milk, wheat, soy, peanut, tree nuts, fish, and shellfish

• Egg, milk, wheat and soy seen almost exclusively in children
  – Up to 60% of egg, milk, wheat and soy allergy is outgrown by school age, 90% by adolescence

• Nut, fish and peanut allergy tend to be life-long
  – 20% of peanut allergic children outgrow peanut allergy, but 8% of these may re-sensitize
  – 10% children outgrow tree nut allergy

Pathophysiology

• IgE-mediated
  – Histamine, tryptase, eicosanoids
  – Reactions occur seconds to hours after exposure
  – Can affect multiple organ systems
  – Acute, self-limited

• Non-IgE-mediated
  – T-cells, complement, antibody complexes
  – Reactions occur hours to days after exposure
  – Targeted organ systems
  – Chronic
Pathophysiology

**IgE-Mediated Reactions**

**Pre-formed mediators:**
- Histamine
- Tryptase
- Heparin

**Synthesized on activation:**
- Prostaglandins
- Leukotrienes
- Platelet activating factor

**Mast cells reside along blood vessels in:**
- Connective tissue
- Mucosa
- GI tract
- Respiratory tract
- Conjunctiva
- Skin

**Pathophysiology**

- Bronchoconstriction
- Mucous production
- Cough receptor

- Gastric acid secretion
- Intestinal motility
- Vascular permeability

- Abdominal pain/cramping
- Vomiting
- Diarrhea

- Itch receptors
- Vascular permeability
- Vasodilation

- Pruritus
- Flush
- Urticaria
- Angioedema

- Tachycardia
- Vascular permeability
- Hypotension

- Syncope
- Seizures
- Shock
- Death
Clinical Presentation

• 80-90% reactions involve the skin

• 70% reactions involve the GI tract

• 30-40% reactions involve the respiratory tract

• <10% reactions involve the cardiovascular system

Clinical Presentation

• Symptoms may start immediately or up to 6 hours after ingestion, rarely even later

• Symptoms usually resolve within hours, may last 24-48 hours

• A very small amount may cause a reaction
  – Reaction is not dose-dependent

• Reaction severity can vary from episode to episode

Clinical Presentation

• Contact reactions:
  – Skin contact
    • Localized hives, redness, itching
    • Inhalation of protein particles (not simply smell)
    • Rhinorrhea, nasal congestion
    • Eye itching, redness, watering
    • SOB, wheeze, cough

• Systemic reactions:
  – Require ingestion
  – Amount ingested may be very small
Oral Allergy Syndrome

- Itching of lips, mouth, tongue, palate with fresh fruits and vegetables
- Due to cross-reactivity of protein in food with proteins in pollens
- Fruit/vegetable proteins involved are heat-labile
- Symptoms can rarely become systemic
- Symptoms resolve with IT for the pollen allergy

Anaphylaxis: Definition

- Criterion 1 — Acute onset of an illness (over minutes to several hours) involving the skin, mucosal tissue, or both AND AT LEAST ONE OF THE FOLLOWING:
  - Respiratory compromise (eg, dyspnea, wheeze, bronchospasm, stridor, reduced peak expiratory flow, hypoxemia)
  - Reduced blood pressure (BP) or associated symptoms of end-organ dysfunction (eg, hypotonia, syncope, incontinence).
- Criterion 2 — TWO OR MORE OF THE FOLLOWING that occur rapidly after exposure TO A LIKELY ALLERGEN FOR THAT PATIENT (minutes to several hours):
  - Involvement of the skin-mucosal tissue
  - Respiratory compromise
  - Reduced BP or associated symptoms
  - Persistent gastrointestinal symptoms
- Criterion 3 — Reduced BP after exposure TO A KNOWN ALLERGEN FOR THAT PATIENT (minutes to several hours).

Anaphylaxis in Food Allergy: Epidemiology

- Food allergy is estimated to cause 50% of anaphylaxis cases treated in ED (30,000 visits per year)
  - most common cause of anaphylaxis in children
- 25% of food-induced anaphylaxis in children is due to previously undiagnosed food allergy
- 150 deaths per year from food allergy in the U.S.
Anaphylaxis in Food Allergy: Presentation

- Cutaneous symptoms are present in up to 90 percent of anaphylactic reactions
- GI symptoms more common in food-induced anaphylaxis than in anaphylaxis from other causes
- Biphasic reactions
  - Can occur in 20% of cases
  - Recurrence of symptoms 1-4 hours after resolution of initial symptoms
- Food-dependent exercise-induced anaphylaxis

Fatal Anaphylaxis in Food Allergy

- Risk factors for fatal anaphylaxis from food include:
  - History of asthma
  - History of anaphylaxis
  - Delayed administration of epinephrine
    - Median time from food ingestion to cardiac arrest was 30 minutes (3-360 minutes)
  - Adolescent age group
  - Absence of skin symptoms
- Peanuts, tree nuts and milk are the most common foods causing fatal anaphylaxis in children
- Most patients with fatal reactions had history of mild reactions in past - there is no such thing as a mild food allergy, they ALL have the potential to be severe

Testing and Diagnosis

- 50% false positive rate!
- Test results must correlate to clinical history
- Multiple studies demonstrate that 50-90% of suspected food allergies are not allergy
  - Birth cohort 933 children, SPT or RAST testing at 8 y
  - 110 (11.8 %) had + testing
  - Oral challenge only positive in 22%
- Testing CANNOT predict the severity of a reaction
Treatment: Avoidance

- Must read labels
  - “May contain traces of…” - protein found up to 60% of the time
  - “Shared equipment” - protein found up to 33% of the time
  - “Shared facility” – protein found up to 28% of the time

- Labels can change – must check every time

- Peanut allergy: typical dose eliciting symptoms is about 1/3 of a peanut
  - Reactions can occur to 1/1000th of a peanut

Treatment: Avoidance

- 15-30% of families report one accidental ingestion per year
  - In one study, 85% of patients reporting an accidental ingestion to peanut went to peanut-free schools

- Specific situations
  - Soy lecithin/soybean oil
  - Peanut oil
  - Nuts – ice cream parlors
  - Seafood – restaurants
  - Fish – cooking fumes

Treatment: Medications

- ONLY epinephrine can treat a severe allergic reaction

- AAAAI recommends to give epinephrine if:
  - Known ingestion of a known allergen plus any symptoms
  - If previous reaction caused cardiovascular collapse, give epinephrine immediately after ingestion even if no symptoms

- Epinephrine
  - Twinject or Epipen (>25k) / Epipen Jr (<25k)
  - Any symptoms other than cutaneous, or if symptoms progress
Treatment: Medications

- Epinephrine
  - Shoot first, ask questions later
  - The only life-saving treatment for anaphylaxis
  - The benefits far outweigh the risks
  - There are no absolute contraindications to giving epinephrine
    - Cardiovascular disease (prolonged Q-T syndrome)
    - MAOIs, TCAs
    - Stimulants
    - Beta-blocker

- Study after study has shown that delayed administration of epinephrine is a risk factor for more severe, prolonged and even fatal reactions
  - A study of 4 fatalities occurring in school showed that there was at least a 22 minute delay in giving epinephrine (mean time was 75 minutes) after symptoms started
  - In one study, only 8 of 37 patients with fatalities from food induced anaphylaxis received epinephrine
  - Another study showed that hospitalization rates in children were decreased in those who received epinephrine early (15%) compared to those who

Treatment: Medications

- Oral antihistamine
  - Will not treat bronchospasm, laryngeal angioedema or hypotension
  - Benadryl (2 mg/kg or 50 mg in adult)
  - May use first if skin symptoms only

- Albuterol
  - Wheeze, SOB, cough, chest tightness

- Antihistamines and albuterol are NOT substitutes for epinephrine
Treatment

- If patient is feeling lightheaded, have them lie down
- 911 if:
  - any systemic symptoms
  - epinephrine given
  - epinephrine not available
- Vitals are vital
- Symptoms may progress quickly, patient must be monitored closely

Food Allergy in Schools: Epidemiology

- 16-18% of food allergic children have had a reaction at school
- In one case series, 9 of 32 fatalities occurred in school
- Reactions occur in cafeterias, classrooms, on playgrounds, on the bus
  - 79% of reactions occurred in classrooms – often contact reactions from projects using peanut butter; 12% occurred in cafeteria
  - 46% cases of anaphylaxis occurred in classrooms, 9% in the cafeteria
- Consider keeping one epinephrine injector in the classroom or with the student
Food Allergy in Schools: Avoidance

- Banning specific foods is not recommended
  - Not safer – reactions in peanut allergic children reported in peanut free facilities
  - “Slippery slope” – do you ban all foods?
    - Milk causes a large number of reactions
    - Wheat, soy and egg are also common food allergies in younger children

- Wash hands and surfaces before and after eating
  - Peanut can be cleaned from hands with soap and water or commercial wipes; antibacterial gels are not sufficient
  - Peanut can be cleaned from surfaces with commercial wipes or spray cleaners

Food Allergy in Schools: Avoidance

- No food sharing

- For celebrations, packaged goods with labels

- Avoid projects that require food

- No eating on bus

- Allergen free table or “safe zone” (tray)

Food Allergy in Schools: Emergency Treatment

- Adequate preparation should avoid most or all serious complications from food allergies

- Multiple studies have shown that lack of emergency action plans and inadequate staff training are a major problem in schools

- All food allergic children should have 2 automatic epinephrine injectors and an Action Plan that specifies the child’s allergies

- Multiple staff members should be trained on the use of epinephrine and how to recognize the signs and symptoms of an allergic reaction
Case #1

10 y female with history of asthma, no known food allergy. Ate PB&J for lunch. 20 minutes later c/o hives, abdominal pain, throat tightness and SOB.
1. * Give epinephrine if available
2. Instruct someone to call 911
3. Benadryl (25-50 mg)
4. Albuterol – up to 6 puffs with spacer
5. Vitals: BP, pulse, RR, O2
6. Instruct her to lie down, especially if she has any lightheadedness

Case #2

• 5 y male with known peanut allergy. Ate a store bought cookie brought in by another student. Within 10 minutes, develops facial angioedema, hives, says throat feels “funny”.
1. Give epinephrine
2. Call 911
3. Give Benadryl 2 mg/kg
4. Vitals
5. If possible, track down label from cookies (says “manufactured on shared equipment with peanuts”)

Case #3

- 7 y old male with known history of tree nut and peanut allergy.
  - Brought home candy from Valentine’s Day
  - Parents immediately check all labels
  - Box of candy hearts: no nuts/peanuts in ingredients. Label states “may contain traces of peanuts or tree nuts”.
  - Box goes in the trash

Case #4

- 14 y female with known nut allergy. Collapses in class 30 minutes after lunch (unknown if exposed to nuts).
  On exam, very pale, thready pulse and rapid, shallow breaths.
  1. Give epinephrine
  2. Instruct someone to call 911
  3. Vitals
  4. Repeat epi every 5-15 minutes as needed until ambulance arrives

Food Allergy: Future Directions

- Several treatments to protect against accidental ingestion are currently being investigated
  - Oral immunotherapy
  - IgE antibody (Xolair)
  - Chinese herbal medicine
Food Allergy: Resources for Patients

• Food Allergy and Anaphylaxis Network
  – www.foodallergy.org

• American Academy of Allergy, Asthma, and Immunology
  – www.aaaai.org

• American College of Allergy, Asthma, and Immunology