Food allergy

Stefano Luccioli, MD
Office of Food Additive Safety
Goals

• Define “food allergy”

• Discuss mechanisms, prevalence and clinical presentation

• Discuss diagnosis and sensitivity

• Discuss management
  – Food label
  – Treatment
  – Prevention
True or False:
Lactose intolerance is due to milk protein and is a true food allergy.
What is a “Food allergy”?

• “An immunological (IgE antibody-mediated) adverse reaction to a food”

• Not all food reactions are allergies!

• 1 in 5 people who claim to have a food allergy actually have one
Adverse Reactions to Food

http://www.cfsan.fda.gov/~dms/alrgn2.html#ii
Celiac disease (or sprue):

A) is a food hypersensitivity to gluten proteins from wheat, rye and/or barley
B) involves mostly the small intestine
C) is characterized by autoantibodies to transglutaminase proteins in the intestinal wall
D) is the most common genetic disorder in humans
E) All of the above
What differentiates a “Food allergy”?

• “IgE-mediated adverse reaction to a food”

• Typical symptoms
  ➢ Immediate (most begin w/in 1 hour)
  ➢ Rapidly progressive and can be life-threatening!

• Foods/proteins commonly consumed in diet
  • **US**: peanut, soy, egg, milk, ....
  • **Europe**: ... sesame, mustard, celery
  • **Japan**: ... buckwheat

• Genetic AND environmental
ALLERGY – Step 1 (Sensitization)

IgE production

Food protein(1)/ pollen (2)

B cell

T cell

IgE

Antibody

Specific to food or pollen
ALLERGY – Step 1 (Sensitization)

- Priming
- IgE Antibody
- Mast cell/Basophil
- FcεRI (IgE receptor)
ALLERGY – step 2 (Challenge)

Receptor crosslinking

Food

Mast cell/ Basophil
ALLERGY – step 3 (Elicitation)

**Mediator release**

**Mediators:** Histamine, leukotrienes, prostaglandins, cytokines, etc.

**Effects:** blood vessel leakage and dilation, smooth muscle contraction, nerve irritation, etc.
ALLERGY – step 3 (Elicitation)

Symptoms

**Skin** - itchiness, flushing, hives, swelling, eczema

**GI** - nausea, vomiting, abdominal pain, diarrhea

**Lung** - runny nose, wheezing, throat closing/swelling

**Circulation** - dizziness, faintness, heart irregularities, “sense of impending doom”, shock
Symptoms

**Skin** - itchiness, flushing, hives, swelling, eczema

**GI** - nausea, vomiting, abdominal pain, diarrhea

**Lung** - runny nose, wheezing, throat closing/swelling

**Circulation** - dizziness, faintness, heart irregularities, “sense of impending doom”, shock

Anaphylaxis!
Let’s Pause for Two Questions.

Please type your questions on the chat.
Food allergy prevalence

- Increase in prevalence over past 20 years
- 4% of total US population: Infants > adults

<table>
<thead>
<tr>
<th>Food</th>
<th>Young children</th>
<th>Adults</th>
<th>Outgrown?</th>
</tr>
</thead>
<tbody>
<tr>
<td>Milk</td>
<td>2.5%</td>
<td>0.3%</td>
<td>80%</td>
</tr>
<tr>
<td>Egg</td>
<td>1.3%</td>
<td>0.2%</td>
<td>60-70%</td>
</tr>
<tr>
<td>Peanut</td>
<td>0.8%</td>
<td>0.6%</td>
<td>20%</td>
</tr>
<tr>
<td>Tree nut</td>
<td>0.2%</td>
<td>0.5%</td>
<td>No</td>
</tr>
<tr>
<td>Fish</td>
<td>0.1%</td>
<td>0.4%</td>
<td>No</td>
</tr>
<tr>
<td>Shellfish</td>
<td>0.1%</td>
<td>2.0%</td>
<td>No</td>
</tr>
<tr>
<td>Other</td>
<td>6%</td>
<td>3.7%</td>
<td></td>
</tr>
</tbody>
</table>

Sampson, J Allergy Clin Immunol 2004; 113:805-819
Food allergic reactions result in:

A) 30,000 ER visits/ 500 hospitalizations/ 10 deaths/yr

B) 30,000 ER visits/ 2,000 hospitalizations/ 150 deaths/yr

C) 300,000 ER visits/ 20,000 hospitalizations/ 1,500 deaths/yr

D) 1,000,000 ER visits/ 50,000 hospitalizations/ 4,500 deaths/yr

Sampson, Pediatrics 2003; 111:1601-8
Disorders associated w/ food allergy

- Crossreactivity phenomena:
  - **Pollen-food allergy syndrome**
    - Birch tree pollen ⇒ apple, plum, potato, carrot, hazelnut ...
    - Grass pollen ⇒ tomato ...
    - Ragweed pollen ⇒ melon ...
  - Latex allergy ⇒ kiwi, bananas, avocados ...
  - Insects (dust mites, cockroach) and shellfish (NOT iodine!)
Disorders associated with food allergy

- Atopic dermatitis (Eczema)
- Occupational Asthma
- Chronic urticaria (hives)
- (Food-dependent) Exercise-induced anaphylaxis
- Allergic eosinophilic esophagitis/gastroenteritis
Disorders associated w/ food allergy

Controversial:

• Migraine headaches
• Chronic fatigue
• Attention deficit disorder
• Autism
• Irritable bowel disease
• Crohn’s disease
Diagnosis and Testing

Observed history of reaction to food

AND

Positive skin prick test (SPT) or blood IgE test (RAST)* to food protein

AND/OR

Positive oral food challenge

• Other diagnostic tests:
  – Testing with fresh or raw food sample
  – Elimination diet (especially for chronic symptoms)
True or False:
Diagnostic tests do not predict the severity of future allergic reactions.
Sensitivity and severity

• Trace amounts of food can be harmful
  – Not true for most people!
  – Most allergic reactions are not life threatening

• Fatal reactions can occur in individuals with prior mild reactions

• H/O asthma ↑ risk for severe reaction

• Most US fatalities due to nuts
What do we know about severe food allergic reactions?

A) We can predict who is at risk

B) One’s sensitivity to foods and reaction severity stay the same over time

C) Severe reactions are potentiated by exercise, alcohol and fatty foods

D) All of the above
True or False:
Effective treatments are available for preventing food allergic reactions.
Management – laws and labeling

- No effective tx - Avoidance is key!
- Focus on food label:

**Food Allergen Labeling and Consumer Protection Act of 2004 (FALCPA)**

- Enacted by Congress; FDA enforces
- In effect January 1, 2006
- These do not include all allergens!
- Also discusses “gluten-free”
FALCPA food label

• Deals only with intentionally added ingredients in packaged goods (includes flavors and processing aids)

➤ Does not deal with cross-contact issues in precautionary label statements (i.e. “may contain” “produced in a factory…”, etc.) or in restaurants, bakeries, etc.

• No threshold levels, so any minute amount is labeled; only exemption is highly refined oil
FALCPA food label examples:

1. Allergen following common or usual name of ingredient.
   - “lecithin (soy),” “flour (wheat),” and “whey (milk)”

2. Allergen(s) in a “contains” statement.
   - “Contains Wheat, Milk, and Soy.”
   - For tree nuts, fish, shellfish, can list individual source, Ex: “Contains walnut, salmon and crab”, etc.

Note: FDA has tree nut list; currently includes 19 nuts, including coconut
http://www.cfsan.fda.gov/~dms/alrguid4.html
Let’s Pause for Two Questions.

Please type your questions on the chat.
Management- Allergic reaction

- Initial mild symptoms may progress to severe anaphylaxis very rapidly!

**Anaphylaxis is likely w/:**

1. Any H/O previous severe reaction
2. Skin rash (e.g., hives, flushing) AND any GI, throat or respiratory uneasiness
3. Isolated fainting or low blood pressure symptoms
“Anaphylaxis” can involve:

- Skin flushing
- Conjunctivitis
- Constricted airways in the lungs
- Severe lowering of blood pressure and shock
- Suffocation by swelling of the throat

• Any and all of the above
What medical term describes this boy’s lip?

A) Eczema
B) Angioedema
C) Urticaria
D) Schindler’s syndrome
Management- Treating anaphylaxis

✓ Epinephrine injector – May need two!
  ➢ Epi-pen Jr (0.15mg): 33-66 lbs
  ➢ Epi-pen (0.3mg): > 66 lbs

✓ Have patient lie down with legs raised and give fluids

✓ Antihistamines (e.g., Benadryl/ Claritin, preferably liquid)

✓ Treat asthma/wheezing with inhaler
  ➢ May also give steroids (e.g., Prednisone) if available
True or False:
Once the patient responds promptly to medications, the possibility for delayed allergic reactions (> 4 hrs) is still 10-20%.

<table>
<thead>
<tr>
<th>True</th>
<th>False</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
</tr>
</tbody>
</table>
Management - Prevention

- Delayed introduction of allergens in infants until certain age (??)

- Hypoallergenic foods
  - Ex: Hydrolyzed milk infant formulas

- Probiotics or other “functional” foods (??)
Management - Prevention

School setting:
- Education and training of personnel
- Identifying allergic individuals and risky food situations (e.g., class snack, birthday parties)
- Allergen-free schools (??)
Helpful educational material

- FDA Food allergen fact sheet
  http://www.cfsan.fda.gov/~dms/ffalrgn.html

- Main FDA food allergen webpage
  http://www.cfsan.fda.gov/~dms/wh-alrgy.html

- Anaphylaxis webpage (Academy of Allergy)
  http://www.aaaai.org/patients/publicedmat/tips/whatisanaphylaxis.stm

- School Guidelines for Managing Students with Food Allergies (pdf)
Thank You

FDA
http://www.elluminate.com
Welcome to The NSTA Learning Center

Get the Help, When You Need It

NSTA developed the Learning Center as a professional development website to help address your classroom needs and busy schedule. Using this site, you can gain access to more than 1,200 different resources and opportunities, such as:

- Over 1,000 NSTA Journal articles (230 of them available FREE of charge)—many containing high-quality lesson plans.
- More than 35 FREE Science Objects (one- to two-hour interactive simulation-based learning experiences).
- More than 125 e-chapters from selected books and series (40 chapters FREE of charge).
- FREE weekly live Web Seminars where you can interact with experts from NASA, NOAA, FDA, NSF, and the NSDL Community.
- More than 20 SciGuides (A resource to help teachers integrate the internet into the classroom).

PLUS: NSTA has also developed a suite of practical tools called My Library, My Notepad, and My Transcript. Use these tools to organize, personalize, and document your professional growth within the Learning Center.

Learn More.
National Science Teachers Association
Gerry Wheeler, Executive Director
Frank Owens, Associate Executive Director
Conferences and Programs
Al Byers, Assistant Executive Director e-Learning

NSTA Web Seminars
Flavio Mendez, Director
Jeff Layman, Technical Coordinator

NSTA WEB SEMINARS
LIVE INTERACTIVE LEARNING @ YOUR DESKTOP