Case 1

- What is the first medication you should give this child?
  1) Benadryl
  2) Zantac
  3) IM Epinephrine
  4) SC Epinephrine
  5) Steroids

Case 1

- 15 month old male presents to the ER with an acute onset of urticaria/facial angioedema and wheezing. Symptoms began 5 minutes after he started eating scrambled egg. Family is unsure if he has ever been exposed to egg before. Physical exam is notable for generalized urticaria, facial angioedema, mild wheezing and a BP of 65/35.
Food Allergy

• Definition:
  ✓ An adverse immune response to food proteins.

Food Hypersensitivity Disorders

| IgE mediated | Gastrointestinal | Oral allergy syndrome, gastrointestinal anaphylaxis |
| Cutaneous | Urticaria, angioedema, morbilliform rashes and flushing |
| Respiratory | Acute rhinoconjunctivitis, bronchospasm (wheezing) |
| Generalized | Anaphylactic shock |
| Mixed IgE and cell mediated | |
| Gastrointestinal | Eosinophilic esophagitis/Gastroenteropathy |
| Cutaneous | Aleppic dermatitis |
| Respiratory | Asthma |
| Cell mediated | |
| Gastrointestinal | Food protein–induced enterocolitis syndrome (FPIES) |
| | Food protein–induced proctocolitis (allergic colitis) |
| | Food protein–induced enteropathy syndrome |
| | Celiac disease |
| Cutaneous | Contact dermatitis, Dermatitis herpetiformis |
| Respiratory | Food-induced pulmonary hemosiderosis (Heiner syndrome) |

Causes of Adverse Reactions to Foods

• Intolerance
  ✓ Lactose intolerance, galactosemia
• Pharmacologic
  ✓ Caffeine, tyramine in aged cheeses
• Toxins
  ✓ Food poisoning
• Food Allergy
  ✓ IgE mediated
  ✓ Mixed IgE mediated and non-IgE mediated
  ✓ Non-IgE mediated

Food Allergy

• More prevalent in westernized nations
• Incidence is increasing
• Anaphylaxis (IgE mediated) related to food allergies accounts for at least ¼ to ½ of anaphylaxis cases seen in ED’s.

Food allergy is a major risk factor for severe life-threatening asthma.


J Allergy Clin Immunol May 2004; 113:805-19
Symptoms: IgE Based Reactions

- Typically occur within 60-90 minutes
- Urticaria
- Angioedema (especially of face)
- Wheezing
- Vomiting/Diarrhea
- Rhinoconjunctivitis
- Anaphylaxis

Food Allergy

- Affects 6% of children under 3 years of age.
- 73% caused by Milk, Egg, and Peanut
- Up to 95% of reactions in children are caused by: Milk, Eggs, Peanut, Tree Nut, Soy, Wheat and Fish
- 20% of peanut allergic children eventually develop clinical tolerance

IgE Mediated Responses

Mechanism
- Allergen
- IgE synthesis
- Mast cell degranulation
- Inflammatory mediators
- Clinical symptoms

Treatment
- Allergen avoidance
- Specific immunotherapy
- Mast cell stabilization
- Mediator antagonists: antihistamines, antileukotrienes
- Anti_Price inhibitors: steroids

Prevalence of Food Allergy in the United States

<table>
<thead>
<tr>
<th>Food</th>
<th>Young Children</th>
<th>Adults</th>
</tr>
</thead>
<tbody>
<tr>
<td>Milk</td>
<td>2.5%</td>
<td>0.3%</td>
</tr>
<tr>
<td>Egg</td>
<td>1.3%</td>
<td>0.2%</td>
</tr>
<tr>
<td>Peanut</td>
<td>0.8%*</td>
<td>0.6%</td>
</tr>
<tr>
<td>Tree Nuts</td>
<td>0.2%</td>
<td>0.5%</td>
</tr>
<tr>
<td>Fish</td>
<td>0.1%</td>
<td>0.4%</td>
</tr>
<tr>
<td>Shellfish</td>
<td>0.1%</td>
<td>2%</td>
</tr>
<tr>
<td>OVERALL</td>
<td>6%</td>
<td>3.7%</td>
</tr>
</tbody>
</table>

*Peanut

Adapted from Roitt J. Essential Immunology. 1994.

J Allergy Clin Immunol 2004;113:935-10
Food Allergy

- 32 fatal food-induced anaphylaxis cases
  - 94% due to peanut and tree nuts
  - Majority are adolescents/young adults
  - Virtually all had history of previous reaction to the implicated food
  - Majority had asthma
  - Only 10% had epinephrine available

Diagnosis

- Skin Prick Testing
  - Simple, generally safe
  - Results in 10 - 20 minutes
  - Good negative predictive value (> 95%) but poor positive predictive value (< 50%)
  - Examples when difficult to perform: dermographism, patient cannot stop antihistamines
  - Age requirements

Clinical Diagnosis

- History
  - What food had been eaten?
  - Time course of reaction
  - Symptoms and treatment of reaction
  - Previous exposure?
  - Other food allergies?
  - Other atopic disease?

Video Demonstration of Allergy Skin Test
In Vitro IgE (Cap-System FEIA)

- Open
  - Easiest to perform
  - Child, parent, and health care team aware the patient is ingesting the possible allergen
- Single-Blinded
  - Possible allergen hidden in liquid such as grape juice
  - Health care team aware of when the patient is ingesting the sample with the suspected allergen

Approximate rate of clinical reactivity to at least 1 other related food

<table>
<thead>
<tr>
<th>If Allergic to:</th>
<th>Risk of Reaction to At Least One</th>
<th>Risk:</th>
</tr>
</thead>
<tbody>
<tr>
<td>A soy*</td>
<td>Other legumes</td>
<td>5%</td>
</tr>
<tr>
<td>A tree nut</td>
<td>Other legumes</td>
<td>37%</td>
</tr>
<tr>
<td>A fish*</td>
<td>Other fish</td>
<td>60%</td>
</tr>
<tr>
<td>A shellfish</td>
<td>Other shellfish</td>
<td>79%</td>
</tr>
<tr>
<td>Poultry</td>
<td>Other legumes</td>
<td>20%</td>
</tr>
<tr>
<td>Eggs</td>
<td>Other legumes</td>
<td>10%</td>
</tr>
<tr>
<td>Quinoa*</td>
<td>Quinoa</td>
<td>92%</td>
</tr>
<tr>
<td>Grapes</td>
<td>Other legumes</td>
<td>4%</td>
</tr>
<tr>
<td>Raisins</td>
<td>Other legumes</td>
<td>65%</td>
</tr>
<tr>
<td>Dates</td>
<td>Other legumes</td>
<td>65%</td>
</tr>
<tr>
<td>Peanuts</td>
<td>Other legumes</td>
<td>82%</td>
</tr>
<tr>
<td>Honey*</td>
<td>Other legumes</td>
<td>30%</td>
</tr>
<tr>
<td>Tree nuts</td>
<td>Latex</td>
<td>11%</td>
</tr>
</tbody>
</table>

Food Challenges

- Open
  - Easiest to perform
  - Child, parent, and health care team aware the patient is ingesting the possible allergen
- Single-Blinded
  - Possible allergen hidden in liquid such as grape juice
  - Health care team aware of when the patient is ingesting the sample with the suspected allergen

Treatment

- Currently is avoidance
- Early use of epinephrine
- Future Possibilities
  - Anti-IgE therapy
  - Desensitization
  - Genetic engineering
  - Immunotherapy using CpG motifs
Patient Education

- If allergic to peanut / tree nuts, avoid bakeries, ice cream parlors, and Asian restaurants
- Demonstrate EpiPen using trainer
- Identification bracelet / necklace
- Communication with other caretakers
- Dietary consults
- Suggested Resource:
  ✓ Food Allergy and Anaphylaxis Network
  www.foodallergy.org

Case #2

- A 12 y/o male is seen in your office for complaint of certain foods getting stuck in esophagus during eating. Other than some seasonal allergic rhinitis and rare heartburn, he has been previously healthy. Physical exam is unremarkable.
- You start him on a proton pump inhibitor bid, recommend he avoids caffeine, and suggest follow-up in 4 weeks.

Vaccine Use in Egg-Allergic Children

- Avoid influenza and yellow fever vaccines
- Red Book States that children with egg allergy may be given MMR without previous skin testing (vaccine derived from chicken egg fibroblast tissue cultures, but does not contain significant amounts of egg cross-reacting proteins)

...Case #2

- On follow-up, he tells you he is no better on the antacid, and twice in the past 2 weeks was unable to swallow meat, until it was washed down with extra milk purchased in the school lunch line.
- You subsequently refer him to GI, who performs an upper endoscopy.
...Case #2

Which of the following would be the most likely diagnosis?

A) Candida esophagitis
B) Vocal cord dysfunction
C) Gastroesophageal reflux disease
D) Eosinophilic esophagitis

Eosinophilic Esophagitis

- An immune reaction due to an IgE mediated, non-IgE mediated or combined response
- Characterized by infiltration of the esophagus with eosinophils
- Seen most often during infancy through adolescence
Pathology and Diagnosis of Eosinophilic Esophagitis

<table>
<thead>
<tr>
<th>No. of eosinophils per HPF</th>
<th>≤15</th>
</tr>
</thead>
<tbody>
<tr>
<td>Consider aggressive antireflux Rx</td>
<td></td>
</tr>
<tr>
<td>&gt;15</td>
<td></td>
</tr>
<tr>
<td>Consider Rx for allergy or primary eosinophilic esophagitis</td>
<td></td>
</tr>
</tbody>
</table>

GERD

Eosinophilic Esophagitis

Clinical Features of Eosinophilic Esophagitis

<table>
<thead>
<tr>
<th>Metric</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Mean age at presentation (yr)</td>
<td>8 ± 0.9 (range, 1-16)</td>
</tr>
<tr>
<td>Sex (M/F)</td>
<td>14/5</td>
</tr>
<tr>
<td>Duration of symptoms before diagnosis (yr)</td>
<td>2.3 ± 0.6</td>
</tr>
<tr>
<td>Presenting complaints (%)</td>
<td></td>
</tr>
<tr>
<td>Dysphagia</td>
<td>58</td>
</tr>
<tr>
<td>Vomiting</td>
<td>42</td>
</tr>
<tr>
<td>Heartburn</td>
<td>37</td>
</tr>
<tr>
<td>Abdominal pain</td>
<td>32</td>
</tr>
<tr>
<td>Food impaction</td>
<td>11</td>
</tr>
<tr>
<td>Failure to thrive</td>
<td>11</td>
</tr>
<tr>
<td>Diarrhea</td>
<td>5</td>
</tr>
<tr>
<td>Family history of allergic disease (%)</td>
<td>58</td>
</tr>
<tr>
<td>Personal history of allergic disease (%)</td>
<td>84</td>
</tr>
<tr>
<td>Peripheral eosinophilia (%)</td>
<td>58</td>
</tr>
</tbody>
</table>

*Some patients had more than 1 presenting symptom.

Teitelbaum JE. Gastroenterology. 2002; 122:1216-1225
Eosinophilic Esophagitis: Clinical Features in INFANTS

Symptoms may be more vague
- Feeding refusal
- Early satiety
- Failure to thrive
- Poor weight gain

Eosinophilic Esophagitis

- Commonly, but not always attributed to food allergy (68% (+) Skin test +/- RAST).
- Treatment options
  - Food elimination or hypoallergenic formula
  - Swallowed topical steroid treatment
  - Long term prognosis unclear
  - Strictures in some

Case #3

- A 12 month old girl with a history of eczema since age 4 months is brought into your office for her well visit. During the interview, you note she is continuously scratching her legs. Mom reports antihistamines and numerous topical creams, including steroids and emollients, have resulted in minimal improvement.

Case #3

- In reviewing her history:
  - On milk formula since shortly after birth. Started solids at 4-5 months
  - On 3 courses of antibiotics for secondarily infected skin.
  - No history of urticaria, abscesses or pneumonia.
  - Exam is significant for generalized xerosis, areas of erythema with some scaling on the trunk and extremities, and lichenification with excoriation over the hands, wrists, and ankle areas.
While awaiting dermatology and allergy appointments, you obtain a CBC with diff and an IgE level.

- **WBC** 12.2 (6-17.5) K/cu mm
- **53 Lymphs / 39 Neutrophils / 3 Monos / 5 Eos**
- **HGB** 11.7 (10.5-13.5) g/dL
- **HCT** 36.4 (33-39) %
- **PLT** 248 (140-440) K/cu mm
- **IgE** 7,332 (0-75)

Which of the following is true?

A. The likelihood she has a food allergy is at least 30%
B. She meets the criteria for Hyper IgE (Job’s) Syndrome
C. She is unlikely to develop asthma
D. She is a candidate for Xolair (omalizumab), the anti IgE antibody
E. She should stop using soap during baths
Atopic Dermatitis

- The strength of association between IgE-mediated food allergy and atopic dermatitis increases with the increasing severity of the atopic dermatitis
- For those most severely affected, 69% had IgE food allergy


Case #4

What would you be most likely to do?

A) Prescribe an Epi-Pen and recommend he avoid bananas and all melons
B) Explain to him he has Oral Allergy syndrome, and should avoid foods that cause symptoms
C) Tell him it’s all in his head, and refer for psychiatric evaluation

Case #4

A 16 year old boy with seasonal allergic rhinitis most noticeable in the late summer and fall complains of itching on roof of mouth and throat whenever he eats banana or cantaloupe.

He denies the sensation of throat closing, and has no rash or respiratory distress.
Pollen-Food Allergy / Oral Allergy Syndrome

- A syndrome elicited by a variety of plant proteins (fruits or vegetables) that cross-react with airborne allergens and lead to pruritis of oral mucosa
- Symptoms: pruritis / mild angioedema
- Symptoms usually limited to oropharyngeal mucosa because allergens responsible for these reactions are easily degraded.
- Heat-labile: Cooking usually abolishes reaction

<table>
<thead>
<tr>
<th>POLLEN</th>
<th>CROSS REACTING FOOD</th>
</tr>
</thead>
<tbody>
<tr>
<td>Ragweed</td>
<td>Fresh melon, banana</td>
</tr>
<tr>
<td>Birch</td>
<td>Raw potato, carrot, celery, apple, pear, peach, kiwi</td>
</tr>
<tr>
<td>Grass Pollen</td>
<td>Raw tomato</td>
</tr>
<tr>
<td>Mugwort</td>
<td>Carrot, celery, fennel, parsley</td>
</tr>
</tbody>
</table>

Case #5

- A 3 week old female presents with 2 days of small amounts visible blood mixed in stool.
  - No fever
  - Loose, pasty, mucousy stool (not watery)
  - Not irritable, no eczema
  - Acting normal
  - Born term (39 4/7 weeks)
  - Family history negative for bleeding disorders or recurrent infections
  - On dairy based infant formula

Case #5

- Physical Exam
  - Afebrile, VSS
  - No apparent distress
  - Chest: Clear
  - CV: RRR. Normal S1 and S2, no murmurs
  - ABD: Abdomen non-distended, no visible loops. Normal bowel sounds. Soft, non tender, no abnormal masses
  - Skin: no rash / jaundice / petechiae
Case #5

Which of the following is the most likely diagnosis?
A) IgE mediated hypersensitivity
B) Intussusception
C) Allergic Colitis (Food Protein Induced Proctocolitis)
D) Food Protein Induced Enterocolitis Syndrome
E) Wiscott Aldrich Syndrome

Food Protein-Induced Proctocolitis (Allergic Colitis)

- Relatively benign disorder due to cow’s milk, sometimes soybean
- Characterized by inflammatory changes in the rectum and colon due to immune mediated reactions to ingested foreign proteins
- Non-IgE mediated, presents in 1st few months
- Results in bloody, mucousy stool
- Can also occur in breast-fed infants
- Histology: focal eosinophil infiltrates (biopsy not required to confirm diagnosis)

Case #5

Which of the following is the most likely diagnosis?
A) IgE mediated hypersensitivity
B) Intussusception
C) Allergic Colitis (Food Protein Induced Proctocolitis)
D) Food Protein Induced Enterocolitis Syndrome
E) Wiscott Aldrich Syndrome

Formula Guide Pyramid

- Similac Advanced, Enfamil, Isomil, Prosobee
- PARTIALLY HYDROLYZED Nestle Good Start
- HYDROLYZED Alimentum, Progestamil, Nutramigen
- ELEMENTAL (Amino Acid Based) Elscare, Neocate, One+ Neocate, EO28, Nutramigen AA LIPIL
Prevention of Food Hypersensitivity: Current AAP Recommendations

- High-risk infants exclusively breastfeed
- Breast feeding mothers avoid peanuts and tree nuts
- Delay introducing solids until 6 months
- No egg until age 2 years
- Introduce peanuts, nuts and seafood after age 3 years

Prevention of Food Hypersensitivity: Future Recommendations??

- At this time, the only intervention likely to decrease incidence of atopy is attempt to exclusively breast feed for 1st 6 months of life in genetically predisposed infants.