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Food allergy

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Learning objectives

- Describe diverse manifestations of food allergy
- Describe prevalence of food allergy
- Explain natural history of food allergy
- Describe strategies for food allergy prevention
- Develop rational approach to diagnosis of food allergy
- Examine avoidance strategies for various environments
- Appraise treatment of acute allergic reactions including anaphylaxis
- Summarize future therapies for food allergy

- An **adverse food reaction** is a general term for **any untoward response** to the ingestion of a food.
- Adverse food reactions can be divided into food allergies, which are immunologically mediated, and all other reactions, which are nonimmunologic.

Nonimmunologic adverse food reactions

➤ Gastrointestinal disorders:

- ✓ Nonceliac gluten sensitivity
- ✓ Gastroesophageal reflux
- ✓ Carbohydrate malabsorption
 - Lactase deficiency
 - Sucrose-isomaltase deficiency
- ✓ Irritable bowel syndrome
- ✓ Intolerance of short-chain fermentable carbohydrates (FODMAPs)
- ✓ Yeast overgrowth syndrome
- ✓ Pancreatic insufficiency (cystic fibrosis)
- ✓ Peptic ulcer disease
- ✓ Gallbladder disease

➤ Toxic reactions

- ✓ Seafood
- ✓ Scombroid poisoning (fresh tuna and mackerel)
- ✓ Ciguatera poisoning (grouper, snapper)
- ✓ Saxitoxin (shellfish)
- ✓ Other food poisoning
- ✓ Fungal toxins

➤ Intolerances:

❖ Pharmacologic agents

- ✓ Caffeine
- ✓ Theobromine (tea, chocolate)
- ✓ Histamine and histamine-like compounds (berries, wine, fish, sauerkraut)
- ✓ Tryptamine (tomato, plum)
- ✓ Tyramine (aged cheeses, pickled fish)
- ✓ Serotonin (banana, tomato)
- ✓ Phenylethylamine (chocolate)
- ✓ Glycosidal alkaloid solanine (potatoes)
- ✓ Alcohol

❖ Flavorings and preservatives

- ✓ Sodium metabisulfite
- ✓ Monosodium glutamate

➤ **Neurologic reactions**

Auriculotemporal syndrome

➤ **Psychologic reactions**

Food phobias

Food aversions

➤ **Accidental contaminations**

Pesticides

Antibiotics (if allergy present)

- The **term "food allergy"** refers to **an abnormal immunologic** reaction to a food that results in the development of symptoms on exposure to that food.
- This clinical reactivity is assessed **by history or challenge**.
- Such reactions can be mediated by **IgE molecules** directed against specific food proteins that **activate mast cells and basophils** or can arise from other **cellular processes** involving eosinophils or T cells.

➤ GENETICS

- Genetic factors play an important role in the development of food allergy.
- Family and twin studies show that family history confers a **2-10-fold increased risk**, depending on the study setting, population, specific food, and diagnostic test.
- Candidate gene studies suggest that genetic variants in the HLA-DQ locus (HLA-DQB1*02 and DQB1*06:03P), filaggrin, interleukin-10, STAT6, and FOXP3 genes are associated **with food allergy**,
- differential methylation at the HLA-DR and -DQ regions was associated with food allergy.
- Epigenetic studies implicate **DNA methylation** effects **on interleukins 4, 5, and 10 and interferon (IFN)-γ** genes and in the mitogen-activated protein kinase (MAPK) pathway.

- Adverse food reactions are common and often assumed by patients to be allergic in nature.
- However, nonimmunologic reactions to food are more common than true food allergies
- Food allergy most often begins in the **first two years of life**.
- Certain food allergies, such as those to **cow's milk and hen's egg**, are usually outgrown during childhood or adolescence, whereas **peanut and tree nut allergies** are more likely to persist into adulthood or may develop in later childhood or adulthood.

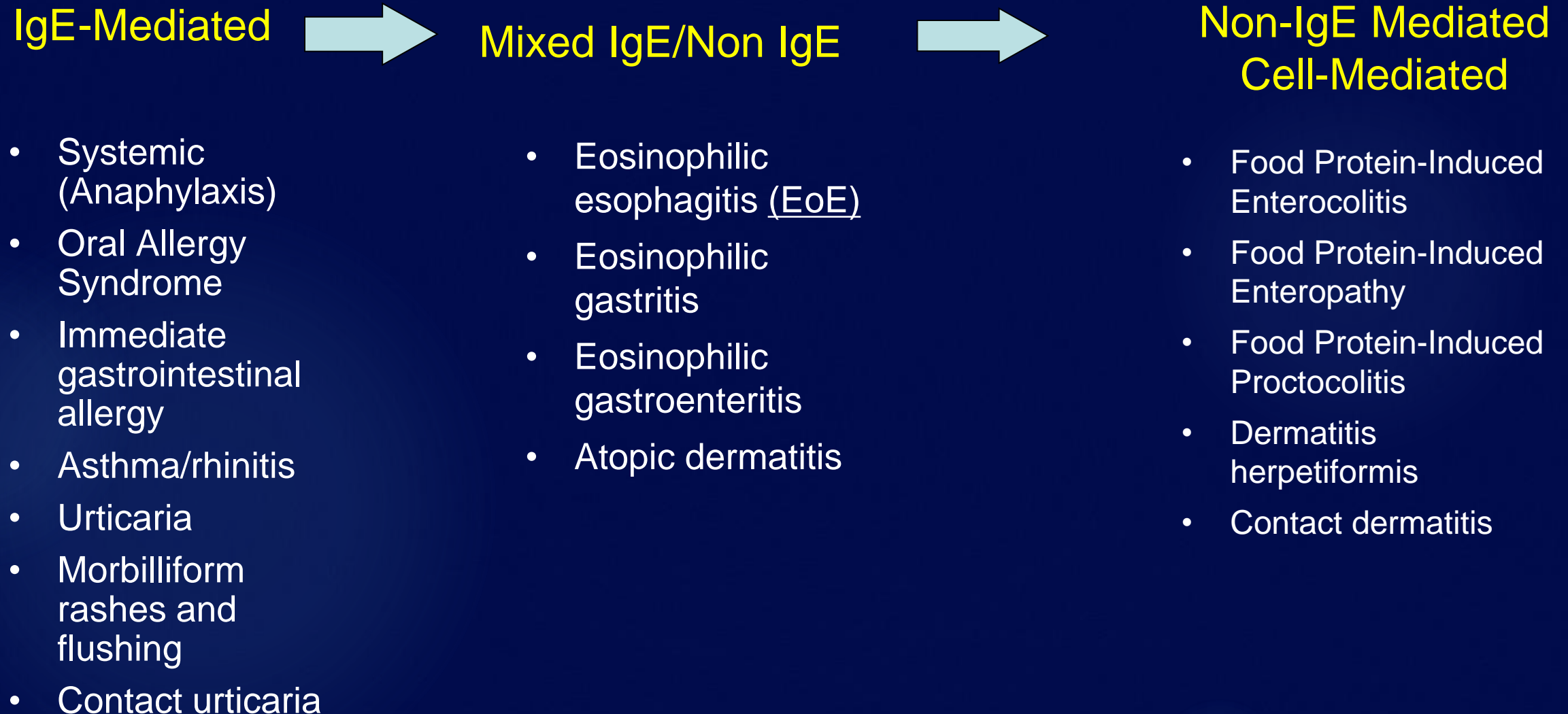
- The term "**sensitization**" : the presence of IgE directed against a specific antigen (a "positive" test), as detected by in vivo (skin prick testing [SPT]) or in vitro (fluorescent-enzyme immunoassay [FEIA]) testing.
- **However**, a patient who is sensitized to a particular food may not be clinically reactive upon exposure to the food.
- Less commonly, a patient may have **a clear history of food-allergic reactions** with low or undetectable levels of food-specific IgE.

- **Up to one-third of parents** report adverse food reactions in their young children, although the rates of verifiable food allergy are much lower
- **Nonimmunologic adverse reactions** account for the bulk of adverse food reactions.
- **Food sensitization and/or allergy occur in approximately 5 to 10 percent of young children,** with peak prevalence at approximately **one year of age.**
- However, studies that measure sensitization to food allergens can overestimate the prevalence of true allergic reactions to foods because not all sensitized children will develop symptoms upon ingestion.

- Most food allergy is acquired in **the first or second year of life**.
- The peak prevalence of food allergy is approximately **6 to 8 percent at one year of age**, although reported rates of food challenge-confirmed food allergy are as high as 11 percent [
- Prevalence then falls progressively **until late childhood**, after which it remains stable at approximately **3 to 4 percent**
- Some studies have suggested that the prevalence of food allergy has increased over time.

Young children who are sensitized to foods or have confirmed IgE-mediated food allergy are more likely than their nonallergic peers to **develop allergic rhinitis and asthma later on.**

Immunologic (Allergic) Adverse Food Reactions



IgE-MEDIATED REACTIONS

- rapid in onset,
- typically beginning within minutes to two hours from the time of ingestion.
- IgE-mediated reactions to carbohydrate allergens in meats, a type of reaction reported mainly in adults, represent an exception to this temporal pattern since these reactions begin four to six hours after ingestion.
- Most patients react to one or two specific foods/food groups, although an increasing number of patients react to multiple foods.

➤ Signs and symptoms can involve the skin, respiratory and gastrointestinal tracts, and cardiovascular system and are believed to be caused by **mediator release** from tissue mast cells and circulating basophils

➤ **Two distinct presentations :**

- ✓ **oral allergy syndrome**
- ✓ **food-dependent, exercise-induced anaphylaxis (FDEIAn).**

IgE-Mediated Food Allergy Presentation

➤ Clinical features

- ❖ **Dermatologic** - Pruritus, flushing, urticaria/angioedema, diaphoresis
- ❖ **Eyes** - Conjunctival injection, lacrimation, periorbital edema, pruritus
- ❖ **Respiratory tract** - Nose/oropharynx (sneezing, rhinorrhea, nasal congestion, oral pruritus, metallic taste), upper airway (hoarseness, stridor, sense of choking, laryngeal edema), lower airway (dyspnea, tachypnea, wheezing, cough, cyanosis)
- ❖ **Cardiovascular** - Conduction disturbances, tachycardia, bradycardia (if severe), arrhythmias, hypotension, cardiac arrest
- ❖ **Gastrointestinal** - Nausea/vomiting, abdominal cramping, bloating, diarrhea
- ❖ **Neurologic** - Sense of impending doom, syncope, dizziness, seizures

Mixed IgE/ Non-IgE-Mediated Food Allergy

Eosinophilic Esophagitis, Gastritis, Gastroenteritis

- Vomiting, nausea, abdominal pain, diarrhea, failure to thrive, weight loss, dysphagia, food impaction

Atopic Dermatitis

- Itchy, erythematous papulo-vesicular rash localized to flexor areas, in infants rash can be generalized; chronic lesions-hypertrophy, lichenification, hyperpigmentation

➤ **NON-IgE-MEDIATED REACTIONS**

- more subacute and/or chronic symptoms
- typically isolated to the gastrointestinal tract and/or skin.
- **The exclusive non-IgE-mediated food allergy disorders principally include:**
 - ✓ ● Food protein-induced enterocolitis syndrome (FPIES; entire gastrointestinal tract)
 - ✓ ● Food protein-induced enteropathy (small bowel)
 - ✓ ● Food protein-induced proctitis and proctocolitis (rectum and colon)
 - ✓ ● Food-induced pulmonary hemosiderosis (Heiner syndrome)

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

➤ Pulmonary manifestations :

- Food-induced pulmonary hemosiderosis (Heiner syndrome) is a rare syndrome in infants that consists of recurrent pneumonia with pulmonary infiltrates, hemosiderosis, iron deficiency anemia, and failure to thrive.
- **Cow's milk** is the most common causative food, with pork and egg also being reported .
- Elimination of the offending food results in resolution.

- The pathogenesis of Heiner syndrome is unclear.
- Serum precipitins to cow's milk and peripheral eosinophilia are often seen, and deposits of immunoglobulins and C3 may be found on lung biopsy.
- Lymphocytes from patients show abnormal proliferative responses to milk proteins

- Coexistence of celiac disease and idiopathic pulmonary hemosiderosis, also known as **Lane-Hamilton syndrome**, has been reported in a number of cases.
- Idiopathic pulmonary hemosiderosis is a rare disease found primarily in children that causes recurrent episodes of **diffuse alveolar hemorrhage** that may eventually produce **pulmonary hemosiderosis and fibrosis**.
- Diffuse alveolar hemorrhage is characterized by hemoptysis, dyspnea, alveolar opacities on chest radiographs, and anemia.
- Introduction of a gluten-free diet has been associated with remission of pulmonary symptoms in several patients.

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
- **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

Disorders Not Proven to be Related to Food Allergy

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

NATURAL HISTORY OF SPECIFIC ALLERGIES

➤ Cow's milk

- Cow's milk allergy (CMA) is the most common food allergy among infants and young children.
- CMA affects approximately 0.5 to 2.5 percent of children during the first two years of life, with lower rates reported for allergy confirmed by food challenge compared with self-reported allergy
- CMA is even more prevalent in infants.
- Resolution is gradual throughout childhood and adolescence and is influenced by various factors.
- Patients are typically reevaluated yearly, with clinical history and in vitro and/or skin prick testing (SPT).

- Symptoms: eczema, hives, wheezing, anaphylaxis, colic, GE reflux (10%), bloody diarrhea.
- **Much of reported CMA is non-IgE mediated.**
- NOT isolated nasal congestion and mucous.
- 37% outgrown by age 12 yrs; 79% outgrown by age 16 yrs
- Up to 50 percent of children with CMA also have concomitant adverse reactions to other foods

Resolution :

- The resolution of CMA is variable, **depending upon the type of allergy** (IgE mediated or non-IgE mediated) and the population examined (general public or referral populations)
- Non-IgE-mediated CMA tends to resolve more quickly.
- The common milk protein-induced proctocolitis typically resolves by one year of age, and, for this condition, milk can be introduced at home.
- Several studies have suggested that **introduction of baked cow's milk products** may increase the likelihood of cow's milk allergy (CMA) resolution and/or speed the process

- For **food protein-induced enterocolitis syndrome (FPIES)**, a careful supervised challenge in a setting appropriate for a high-risk procedure is warranted by the age of two to three years if there have been no recent reactions from accidental exposures.
- Challenges in patients with FPIES who were very ill upon presentation should be performed under close supervision in a hospital setting.
- Concomitant allergic rhinitis and asthma and onset of the allergy at <1 month of age are risk factors for persistent IgE-mediated food allergies.
- **Introduction of extensively heated milk** may speed resolution of IgE-mediated CMA
- Resolution rates for IgE-mediated CMA are significantly **lower than** those of non-IgE-mediated milk allergy,

Egg Allergy

- Egg allergy affects **1 to 9 percent** of young children
- Usually develops in the first **6-24 months**
- Present in influenza and yellow fever vaccines; (not present in MMR or Varicella)
- 80% risk of allergic rhinitis and asthma at age 4 yrs for infants with egg allergy and eczema
- 48% outgrow by age 12 yrs; 68% outgrown by age 16 yrs⁴
- As with CMA, tolerance of extensively heated (baked) egg predicts increased rate of resolution, and introduction of baked egg may speed resolution of egg allergy.
- Over 70% of children may tolerate extensively heated egg²

Wheat Allergy

- Wheat allergy is a common childhood food allergy that is usually outgrown by adolescence
- Prevalence in children 0.4%¹
- Concomitant atopic disease and other food allergies are frequently seen
- Cross-reactivity with other grains (rye, barley, oat, grasses): 20%
- Associated with exercise-induced anaphylaxis²

Peanut and tree nuts

- prevalence of peanut and tree nut allergies at 0.4 to 1.3 percent in children and 0.5 to 1 percent in the overall population
- may be increasing over time.
- **Although it was initially believed to be a lifelong sensitivity in nearly all cases, subsequent studies have shown that tolerance can develop in approximately 20 to 25 percent of patients.**
- Less is known about tree nut allergy, although a minority of patients appear to lose this sensitivity as well.
- A substantial minority of patients (ie, **20 to 25 percent for peanut and 9 percent for tree nuts**) **lose their sensitivity over time.**

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).

Table 176.3 Natural History of Food Allergy and Cross-Reactivity Between Common Food Allergies

FOOD	USUAL AGE AT ONSET OF ALLERGY	CROSS REACTIVITY	USUAL AGE AT RESOLUTION
Hen's egg white	0-1 yr	Other avian eggs	7 yr (75% of cases resolve)*
Cow's milk	0-1 yr	Goat's milk, sheep's milk, buffalo milk	5 yr (76% of cases resolve)*
Peanuts	1-2 yr	Other legumes, peas, lentils; coreactivity with tree nuts	Persistent (20% of cases resolve)
Tree nuts	1-2 yr; in adults, onset occurs after cross reactivity to birch pollen	Other tree nuts; co-reactivity with peanuts	Persistent (9% of cases resolve)
Fish	Late childhood and adulthood	Other fish (low cross-reactivity with tuna and swordfish)	Persistent [†]
Shellfish	Adulthood (in 60% of patients with this allergy)	Other shellfish	Persistent
Wheat*	6-24 mo	Other grains containing gluten (rye, barley)	5 yr (80% of cases resolve)
Soybeans*	6-24 mo	Other legumes	2 yr (67% of cases resolve)
Kiwi	Any age	Banana, avocado, latex	Unknown
Apples, carrots, and peaches [§]	Late childhood and adulthood	Birch pollen, other fruits, nuts	Unknown

Table 176.6 Clinical Implications of Cross-Reactive Proteins in IgE-Mediated Allergy

FOOD FAMILY	RISK OF ALLERGY TO ≥1 MEMBER (%; approximate)	FEATURE(S)
Legumes	5	Main causes of reactions are peanut, soybean, lentil, lupine, and garbanzo (chickpea).
Tree nuts (e.g., almond, cashew, hazelnut, walnut, brazil)	35	Reactions are often severe.
Fish	50	Reactions can be severe.
Shellfish	75	Reactions can be severe.
Grains	20	
Mammalian milks	90	Cow's milk is highly cross-reactive with goat's or sheep's milk (92%) but not with mare's milk (4%).
Rosaceae (pitted fruits)	55	Risk of reactions to >3 related foods is very low (<10%); symptoms are usually mild (oral allergy syndrome).
Latex-food	35	For individuals allergic to latex, banana, kiwi, fig, chestnut, and avocado are the main causes of reactions.
Food-latex	11	Individuals allergic to banana, kiwi, fig, chestnut, and avocado may be at an increased risk of reactions to latex.

Food Allergy Prevention

Recommendations for prevention of allergic diseases aimed at the *high-risk* newborn who has not manifested atopic disease include

- (1) exclusive breast feeding for the first 4-6 months or
- (2) using an extensively hydrolyzed formula for the first 4-6 months and introducing solid foods between 4 and 6 months of age.
- (3) Other approaches, such as maternal avoidance diets during pregnancy and during lactation, as well as avoidance of allergenic foods for infants beyond 6 months of age, are unproven.

Introduction of Complementary Foods

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- Complementary foods, including cow's milk protein (except for whole cow's milk), egg, soy, wheat, peanut, tree nuts, fish, and shellfish, can be introduced between 4-6 months of age
- New data suggest that early introduction of highly allergenic foods (e.g. peanut) may reduce the risk of food allergy
- If a patient has difficult to control moderate-severe AD or a food allergy, referral to an allergist for possible testing is recommended before introduction of highly allergenic foods

- ▶ the Learning Early About Peanut Allergy (LEAP) study showed that **early introduction** of peanut in **high-risk infants** significantly decreased the development of peanut allergy.

Diagnosis of Food Allergy

Evaluation: History & Physical Exam

- History: very important
 - Symptoms, timing, amount, raw vs. cooked food, reproducibility, treatment, and outcome
 - Concurrent exercise, medications, alcohol
- Diet details / symptom diary
- Physical exam: assess for other disorders
- Identify general mechanism
 - Allergy vs. intolerance; IgE vs. non-IgE mediated

Evaluation of Food Allergy

- Suspect IgE-mediated:
 - Panels/broad screening should NOT be done without supporting history because of high rate of false positives.
 - Skin prick tests (prick with fresh food if pollen-food syndrome); *In vitro* tests for food-specific IgE
 - Oral food challenge
- Suspect non-IgE-mediated, consider: Biopsy of gut, skin
- Suspect non-immune, consider referral for:
 - Hydrogen breath test, Sweat test, Endoscopy

Evaluation: Interpretation of Laboratory Tests

- Positive skin prick test or food-specific IgE
 - Indicates presence of IgE antibody NOT clinical reactivity
 - ~90% sensitivity; ~50% specificity
 - ~50% asymptomatic sensitization
 - Larger skin tests/higher sIgE levels correlate with increased likelihood of reaction but not severity
- Negative skin prick test or food-specific IgE
 - Essentially excludes IgE antibody (>95% specific)

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

Evaluation:

Elimination Diets & Food Challenges

- **Elimination diets** (1-6 weeks) most useful for chronic disease (eg. AD, GI syndromes)
 - Eliminate suspected food(s) or
 - Prescribe limited “few food” diet or
 - Elemental (free amino acid) diet
- **Oral food challenge** – MD supervised, emergency meds available
 - Open
 - Single-blind
 - Double-blind, placebo-controlled (DBPCFC)-gold standard
 - Usually full serving of food administered in divided, increasing doses over 1 hour, followed by observation

Diagnostic Approach: Suspicion of IgE-Mediated Allergy

- If test for food-specific IgE is
 - Negative: reintroduce food*
 - Positive: food avoidance recommended
- If elimination diet is associated with
 - No resolution: reintroduce food*
 - Resolution
 - Open / single-blind challenges to “screen”
 - DBPCFC for equivocal open challenges

Diagnostic Approach: Non-IgE-Mediated Disease or Those with Unclear Mechanism

- Elimination diets (may need elemental amino acid-based diet)
- Physician-supervised Oral Food Challenges
 - Timing/dose/approach individualized for disorder
 - Enterocolitis syndrome can induce shock
 - Eosinophilic gastroenteritis may need prolonged feedings before symptoms develop
 - Blinded challenges may be necessary
 - May require ancillary testing (endoscopy/biopsy)

Management of Food Allergy

➤ TREATMENT

- **Appropriate identification and elimination** of foods responsible for food hypersensitivity reactions are the only validated treatments for food allergies.
- Complete elimination of common foods (milk, egg, soy, wheat, rice, chicken, fish, peanut, nuts) is very difficult because of their widespread use in a variety of processed foods.

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)

- Avoidance of the suspect food is crucial.
- Careful reading of food labels is a priority.
- Medical information jewelry with appropriate information should be worn.

Dietary Elimination

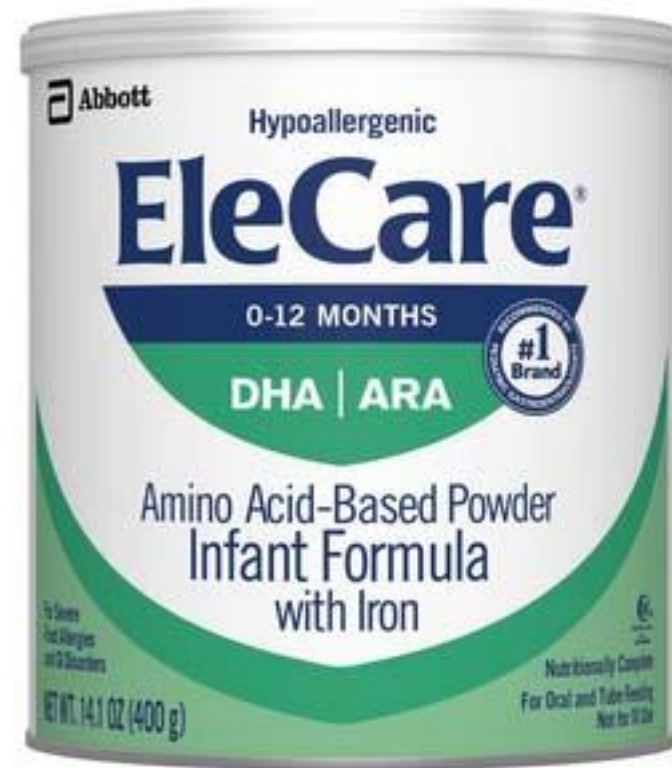
- **Complete avoidance** (e.g. peanut) vs. **partial avoidance** (e.g. avoid whole egg but eat baked egg products if tolerant)
- **FALPCA**¹ (effective 1/1/06) requires labeling for **the 8 major food allergens**.
- **Advisory warning labels** (May contain..., Processed in a facility...). For peanut, <10% of products had peanut.²

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







Management: Emergency Treatment of Anaphylaxis

- Epinephrine: drug of choice
 - Have 2 doses of self-injectable epinephrine available as 12% of children, 17 % of adults require >1 dose
 - **Emergency transport to hospital** to monitor for possible biphasic (late phase) anaphylaxis
- Antihistamines: **WILL NOT STOP ANAPHYLAXIS**
- Written Anaphylaxis Emergency Action Plan
- Emergency identification bracelet

Respond Quickly!

- Administer epinephrine quickly
- Activate EMS – 911
- Then, call emergency contacts



Management of Food Allergies in Schools

- Preventive proactive plan for day-to-day management
- Recommendations on avoidance measures for the classroom, snack and lunch periods and other school environments including school bus, sports, trips.
- Guidelines for access to epinephrine and designating staff responsible for administration of epinephrine and implementation of the emergency action plan.



FOOD ALLERGY & ANAPHYLAXIS EMERGENCY CARE PLAN

Name: _____ D.O.B.: _____
Allergy to: _____
Weight: _____ lbs. Asthma: ☐ Yes (higher risk for a severe reaction) ☐ No

PLACE
PICTURE
HERE

NOTE: Do not depend on antihistamines or inhalers (bronchodilators) to treat a severe reaction. USE EPINEPHRINE.

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.

FOR ANY OF THE FOLLOWING: SEVERE SYMPTOMS



LUNG

Short of breath,
wheezing,
repetitive cough



HEART

Pale, blue,
faint, weak
pulse, dizzy



THROAT

Tight, hoarse,
trouble
breathing/
swallowing



MOUTH

Significant
swelling of the
tongue and/or lips



SKIN

Many hives over
body, widespread
redness



GUT

Repetitive
vomiting, severe
diarrhea



OTHER

Feeling
something bad is
about to happen,
anxiety, confusion

OR A
COMBINATION
of symptoms
from different
body areas.

1. **INJECT EPINEPHRINE IMMEDIATELY.**
2. **Call 911.** Tell them the child is having anaphylaxis and may need epinephrine when they arrive.
- Consider giving additional medications following epinephrine:
 - Antihistamine
 - Inhaler (bronchodilator) if wheezing
- Lay the person flat, raise legs and keep warm. If breathing is difficult or they are vomiting, let them sit up or lie on their side.
- If symptoms do not improve, or symptoms return, more doses of epinephrine can be given about 5 minutes or more after the last dose.
- Alert emergency contacts.
- Transport them to ER even if symptoms resolve. Person should remain in ER for at least 4 hours because symptoms may return.

MILD SYMPTOMS



NOSE

Itchy/runny
nose,
sneezing



MOUTH

Itchy mouth



SKIN

A few hives,
mild itch



GUT

Mild nausea/
discomfort

FOR MILD SYMPTOMS FROM MORE THAN ONE
SYSTEM AREA, GIVE EPINEPHRINE.

FOR MILD SYMPTOMS FROM A SINGLE SYSTEM
AREA, FOLLOW THE DIRECTIONS BELOW:

1. Antihistamines may be given, if ordered by a healthcare provider.
2. Stay with the person; alert emergency contacts.
3. Watch closely for changes. If symptoms worsen, give epinephrine.

MEDICATIONS/DOSES

Epinephrine Brand: _____

Epinephrine Dose: ☐ 0.15 mg IM ☐ 0.3 mg IM

Antihistamine Brand or Generic: _____

Antihistamine Dose: _____

Other (e.g., inhaler-bronchodilator if wheezing): _____

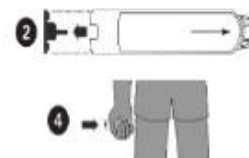
PARENT/GUARDIAN AUTHORIZATION SIGNATURE: _____ DATE: _____ PHYSICIAN/HOP AUTHORIZATION SIGNATURE: _____ DATE: _____



FOOD ALLERGY & ANAPHYLAXIS EMERGENCY CARE PLAN

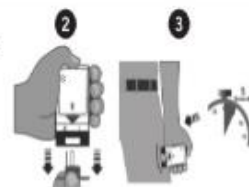
EPIPEN® (EPINEPHRINE) AUTO-INJECTOR DIRECTIONS

1. Remove the EpiPen Auto-Injector from the plastic carrying case.
2. Pull off the blue safety release cap.
3. Swing and firmly push orange tip against mid-outer thigh.
4. Hold for approximately 10 seconds.
5. Remove and massage the area for 10 seconds.



AUVI-Q™ (EPINEPHRINE INJECTION, USP) DIRECTIONS

1. Remove the outer case of Auviqu. This will automatically activate the voice instructions.
2. Pull off red safety guard.
3. Place black end against mid-outer thigh.
4. Press firmly and hold for 5 seconds.
5. Remove from thigh.



ADRENACLICK®/ADRENACLICK® GENERIC DIRECTIONS

1. Remove the outer case.
2. Remove grey caps labeled "1" and "2".
3. Place red rounded tip against mid-outer thigh.
4. Press down hard until needle penetrates.
5. Hold for 10 seconds. Remove from thigh.



OTHER DIRECTIONS/INFORMATION (may self-carry epinephrine, may self-administer epinephrine, etc.):

Treat the person before calling emergency contacts. The first signs of a reaction can be mild, but symptoms can get worse quickly.

EMERGENCY CONTACTS — CALL 911

NEAREST HOSPITAL: _____
ADDRESS: _____ PHONE: _____
PARENT/GUARDIAN: _____ PHONE: _____

OTHER EMERGENCY CONTACTS

IMMEDIATE RELATIONSHIP: _____
PHONE: _____
IMMEDIATE RELATIONSHIP: _____
PHONE: _____

PARENT/GUARDIAN AUTHORIZATION SIGNATURE: _____

DATE: _____

Anaphylaxis Emergency Action Plan

Patient Name: _____ Age: _____

Allergies: _____

Asthma ☐ Yes (*high risk for severe reaction*) ☐ No

Additional health problems besides anaphylaxis: _____

Concurrent medications: _____

	Symptoms of Anaphylaxis
MOUTH	itching, swelling of lips and/or tongue
THROAT*	itching, tightness/closure, hoarseness
SKIN	itching, hives, redness, swelling
GUT	vomiting, diarrhea, cramps
LUNG*	shortness of breath, cough, wheeze
HEART*	weak pulse, dizziness, passing out

*Only a few symptoms may be present. Severity of symptoms can change quickly.
Some symptoms can be life-threatening. ACT FAST!

Emergency Action Steps - DO NOT HESITATE TO GIVE EPINEPHRINE!

1. Inject epinephrine in thigh using (check one): ☐ Adrenaclick (0.15 mg) ☐ Adrenaclick (0.3 mg)
☐ Auvi-Q (0.15 mg) ☐ Auvi-Q (0.3 mg)
☐ EpiPen Jr (0.15 mg) ☐ EpiPen (0.3 mg)
Epinephrine Injection, USP Auto-injector- authorized generic
☐ (0.15 mg) ☐ (0.3 mg)
☐ Other (0.15 mg) ☐ Other (0.3 mg)

Specify others: _____

IMPORTANT: ASTHMA INHALERS AND/OR ANTIHISTAMINES CAN'T BE DEPENDED ON IN ANAPHYLAXIS.

2. Call 911 or rescue squad (before calling contact)

3. Emergency contact #1: home _____ work _____ cell _____

Emergency contact #2: home _____ work _____ cell _____

Emergency contact #3: home _____ work _____ cell _____

Comments: _____

Doctor's Signature/Date/Phone Number

Parent's Signature (for individuals under age 18 yrs)/Date

Managing Food Allergies in Restaurants and Travel

- Always declare your food allergies to the restaurant staff. When traveling avoid eating airline food; bring your own food.
- Inspect seating for residual food from previous passengers; clean seat and table.
- Some airlines do provide additional accommodations when requests are made in advance of travel.
- Always have epinephrine auto-injector for quick access!

- Children with asthma and IgE-mediated food allergy, peanut or nut allergy, or a history of a previous severe reaction should be given selfinjectable epinephrine and a written emergency plan in case of accidental ingestion
- Because many food allergies are outgrown, children should be reevaluated periodically by an allergist to determine whether they have lost their clinical reactivity

Future Therapies for Food Allergy

In clinical trials:

- Oral immunotherapy (OIT) for milk, egg, peanut, multiple food combinations
- OIT in combination with anti-IgE
- Sublingual immunotherapy (SLIT)
- Epicutaneous (patch) immunotherapy for milk, peanut
- OIT with baked milk, egg for milk and egg allergy
- Chinese Herbal Formula (FAHF-2)
- Anti-IL5 for treatment of eosinophilic esophagitis

- **oral, sublingual, and epicutaneous** (patch immunotherapy for the treatment of IgE-mediated food allergies (milk, egg, peanut).
- Combining **oral immunotherapy with anti-IgE treatment(omalizumab)** may improve safety compared to oral immunotherapy alone.
- **extensively heated milk or egg in baked products** are tolerated by the majority of milk and egg-allergic children.
- Regular ingestion of baked products with milk and egg appears to accelerate resolution of milk and egg allergy

OIT is still investigational – not for general clinical practice

Questions remaining:

- Do risks of adverse reactions with OIT outweigh risks of accidental exposures with avoidance diets?
- Desensitization vs. induction of tolerance?
- Standardization of extracts, protocols, and duration of treatment

Role of the Allergist

- Identification of causative food, risk of anaphylaxis and education on elimination diet.
- Education on the signs and symptoms of allergic reactions and anaphylaxis, and appropriate treatment including correct technique of using epinephrine auto- injector.
- Assist in formulation of IHP and EAP, particularly for child-care and educational settings.

- Regular follow-up to update status of food allergies and possible development of tolerance, and to update prescriptions for epinephrine and review technique of auto-injector use.
- Be a resource for not only patients and families, but for schools, the community and primary physicians

Thank you