Chapter 27

MEDICAL NUTRITION THERAPY FOR ADVERSE REACTIONS TO FOOD: FOOD ALLERGIES AND INTOLERANCES
Objectives

- Define Adverse Reactions to Food (ARF)
- Compare and contrast food allergies and intolerances
- Define sensitization
- List and describe the types of foods allergies
- Know the super eight food allergens
- Explain several different food intolerances
- Assessment and diagnosis of ARF
- MNT for ARFs
Food Allergies and Intolerances
ARFs encompass both **food allergies** and **food intolerances**

Growing in prevalence

Our modern diet and environmental factors interact with genetic predisposition

20% of the population alters their diet because of adverse reactions to food (ARF)
Adverse Reactions to Food (ARF)

- **Adverse food reaction**: any undesired response to a food regardless of mechanism

- **Food allergy or hypersensitivity**: *immune-mediated* reaction to food, usually protein

- **Food intolerance**: adverse reaction to a food that does not involve the immune system; occurs because of the way the body processes food
  - Ex: milk; intolerant due to inability to digest lactose, not allergy to milk protein

- **Food sensitivity**: adverse reaction to food when it is not clear whether it is intolerance or allergy
Allergic reactions

1. IgE-mediated
2. Cell-mediated
3. Mixed IgE- and non-IgE mediated

- Release of inflammatory mediators
  - GI, Cutaneous, Respiratory and Systemic Symptoms, Anaphylaxis
    - Medical Management
      - Physical exam, tx to optimize GI function
      - Reintroduction to foods
      - Epinephrine management
    - Nutrition Management
      - Food diaries
      - Elimination diet
      - Education around avoidance
      - Supplementation - GI
An allergy to a food is caused by an inappropriate response of the immune system.

Non-specific (Innate) Immunity
- Barriers
- Phagocytes like monocytes and macrophages circle the body looking for foreign substances.

Adaptive Immunity
- Up-regulates when necessary - more specific than innate system
- Specific antibodies binds to specific antigens
- Humeral (B cells)
- Cell-mediated immunity (T cells)
Food Allergy (Immune System)

Lymphocytes:

- B cells: made from stem cells in bone marrow- humoral immunity.
  - B cells will produce antibodies that can be released into the blood stream: these are called immunoglobulins

- T cells: made in marrow but mature in thymus gland- cell-mediated immunity
  - “helper” – regulate to produce antibodies to damage target cells, mediate allergic response
Antigen-specific antibodies are produced by B lymphocytes in the presence of the antigen

Antibody globulin proteins:

- Immunoglobulin-A (IgA)
- Immunoglobulin-D (IgD)
- **Immunoglobulin-E (IgE)**
- Immunoglobulin-G (IgG)
- Immunoglobulin-M (IgM)
Food Allergy (Immune System)

- When an antigen and antibody bond a chemical cascade ensues:
  - Degranulation of mast cells or basophils
  - Release of chemical inflammatory mediators e.g.:
    - Histamine
    - Prostaglandins
    - Leukotrienes
    - Cytokines
  Causing:
    - Itching
    - Pain
    - Reddening
    - Tissue swelling
    - Contraction of smooth muscle
    - Vasodilation
    - Fluid secretion
The first step of an immune response has no symptoms

- Sensitization is the first exposure to an allergen can be:
  - Oral
  - Skin
  - Inhaled

Sensitization to an allergen now means that next time that allergen enters the body, the body’s immune system recognizes that allergen as an “enemy” and mounts an inappropriate immune response.

Symptoms can range from hives to anaphylaxis
Food Allergy

Super Eight
1. Cow’s milk
2. Eggs
3. Peanuts
4. Tree nuts (pecans, walnuts)
5. Wheat
6. Soy
7. Fish
8. Shellfish

ANY food is capable of eliciting an Ig-E mediated response.

All the following are IgE-mediated immune reactions
- Food-induced anaphylaxis
- Oral allergy syndrome (OAS)
- Immediate GI hypersensitivity
- Latex-food allergy syndrome
- Exercise-induced anaphylaxis
### Food Allergy

#### Food-induced anaphylaxis

(most often after exposure to tree nuts and peanuts – in kids: eggs and milk too)

- **Acute**
- **Severe**
- Sometimes fatal

Those with a hx of anaphylactic allergy need to carry and be prepared to use epinephrine to reverse an allergic rxn prn

#### Symptoms can include,

- Respiratory distress
  - wheezing, shortness of breath, throat tightness, cough, hoarse voice, chest pain/tightness, trouble swallowing, itchy mouth/throat, nasal stuffiness/congestion
- Abdominal pain
- Nausea
- Vomiting
- Cyanosis
- Arrhythmia
- Hypotension
- Angioedema (swelling under the skin)
- Urticaria
- Diarrhea
- Shock
- Cardiac arrest
- Death
Oral Allergy Syndrome or Pollen- Food Syndrome (PFS)

- Symptoms most often confined to oropharynx
- Sensitization through skin or respiratory system to pollen- not food
- The rxn to food (fruits, veggies, nuts) occurs as a result of the presence of antigen in the food that looks too similar to that of pollen
- Heating the food can eliminate or decrease immune response bc offending proteins are often heat-labile

Symptoms
  - Rapid
  - Itching and irritation of oral tissue
  - Subsides w/in 30 minutes
- Most often in individuals seasonal allergies to birch, ragweed or grasses.
Immediate GI hypersensitivity

- A range of symptoms that can occur within minutes to up to two hours after ingesting offending food
  - Nausea
  - Vomiting
  - Diarrhea
  - Abdominal pain
  - Wheezing

Can also cause respiratory and/or epidermal rxns
Latex-food allergy syndrome

- Allergy to latex or natural rubber is relatively common
- Many latex-allergic people have IgE antibodies cross-reactive to the antigens coming from vegetables and/or fruits e.g.
  - Avocado, Banana, Chestnut, Kiwi
  - Apple, Carrot, Celery, Melons, Papaya, Potato, Tomato
Exercise-induced anaphylaxis

- Food-dependent, exercise-induced anaphylaxis (FDEIA) is a distinct form of physical allergy in which an offending food triggers an anaphylactic reaction only when the patient exercises 2-4 hours after ingestion of offending food.
- More common in adolescent girls & younger women.
- Common Foods:
  - Celery
  - Seafood
  - Gliadin (component in wheat)
  - Other foods
Non-IgE Mediated
Mixed Antibody Reactions

Note: not all food allergy is via an IgE-mediated response

- Non-IgE antigen-antibody complexes may play a role in food-related inflammatory diseases
  - Various forms of colitis, malabsorptive disorders, ulceration, celiac disease, ulcerative colitis
Food Intolerances are non allergic food sensitivities are ARFs caused by nonimmunologic mechanisms

- Symptoms can be similar to those of immune response allergy
  - GI
  - Respiratory

- More common than food allergies
Lactose Intolerance (most common ARF/intolerance)
- Intolerance to the disaccharide lactose due to a reduction in the amount of lactase
- Half of the world's population has hypolactasia

Symptoms - several hours after ingestion:
- Bloating
- Cramping
- Flatulence
- Diarrhea

** Some people confuse lactose-intolerance with milk allergy
Food Intolerance

- Carbohydrate Intolerance
  - Can occur if one is lacking any of the many enzymes needed to digest or absorb sugars, starches and polysaccharides
    - Included in the sugars are the sugar alcohols (sorbitol, malitol etc)
    - More common in individuals with underlying GI disorder (i.e. IBS)
    - Ex: GI symptoms after ingestion of fruit juice may be related to fructose intolerance- problem of use of high-fructose corn syrup
Food Intolerance

Food additives or pharmacologic reactions

- Preservatives
- Flavor enhancers
- Coloring agents
- Sulfites
- MSG
Assessment and Diagnosis

• Diagnosis of ARF requires:
  1. Identification of suspected offender
  2. Proof it causes adverse rxns
  3. Verification of immune or nonimmune-mediated response
Assessment and Diagnosis

Step 1- Assessment
Clinical history:
- Symptoms
- Timing
- Recent reactions
- Suspected foods
- Quantity

Measurements for infants and children to determine if growth has been affected.
Step 2
Testing to rule out non-allergenic causes of symptoms: CBC, stool tests, hydrogen breath test
Following by more specific tests if necessary
Assessment and Diagnosis

Immunologic Testing

Skin-prick test: the skin is pricked and a food allergen is placed under the skin to see if there is a local IgE mediated response

- Economical
- Can see results in 15-30 minutes

Results are compared to a positive control wheal (histamine) and a negative control (e.g. saline)

- Test wheals that are 3mm greater than the negative control can be taken as a positive
- Negative tests are usually accurate i.e. no IgE-mediated response
- Positive tests only indicate a possibility of a food allergy and must be confirmed with a food challenge

The skin-prick test is contraindicated for those who have atopic dermatitis d/t likelihood of false-positive
Food and Symptom Diary

- Record all food, beverages, amounts (ingredients), time, supplement
- Record symptoms – if any - timing, stress, PA, location
  - The more information that can be gathered the better
Medical Nutrition Therapy

Food-Elimination Diet

- Eliminate all forms of suspected food (4-12 weeks)
  - Keep a food diary the whole time
- Sometimes use elemental diet
  - If multiple foods are suspected
  - Low-palatability, high cost
  - Elemental formula – high quality calories in easily digestible form
    • Used for most restrictive cases
- Gradually introduce foods back to diet- monitor symptoms
Medical Nutrition Therapy

- Food challenge
  - Supervised medical setting once symptoms have resolved and patient is not taking antihistamines
  - One food at a time on different days
    1. Open food challenge
    2. Single-blind food challenge - food hidden from patient
    3. Double-blind, placebo-controlled – food hidden from patient and practitioner

Increase amount of offending food every 15-60 minutes
Be prepared for emergency treatment of reactions and observe for an additional 2 hours
Medical Nutrition Therapy

- Avoid the food
- Possible food immunotherapy vaccine in future
  - Still experimental
- Specific Oral Tolerance Induction (SOTI): introduce the offending food in minute quantities with other foods and slowly increase
  - Guidelines/suggestions needed in meal planning
- Nutritional counseling
  - Hidden forms of the food
  - Reading labels
  - Replace nutrients missing
- Retest for allergy every 1 to 3 months (children grow out of the allergies)
The Food Allergen Labeling and Consumer Protection Act of 2004

- FALCPA applies to food products that are labeled on or after January 1, 2006.
- Eight top allergens must be clearly listed: milk, egg, fish, shellfish, tree nuts, peanuts, wheat, and soybeans
- Applies to all packaged foods sold in the United States
- Does not apply to USDA-regulated products including meat poultry and some egg products
- Does not list sources of possible contamination
Genetically-Modified Foods

- GM – process of transferring a protein from one plant to another
- Plants can be made to tolerate herbicides & more insect resistant
- Allergenicity potential: (1) introduce allergens, (2) changes the levels of natural allergens
- GM foods complicate the elimination diet
- Study: GM-corn vs. non-GM corn result in an increase in inflammatory response
- Food safety testing should include allergenic potential