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## *Prehospital Treatment of Anaphylaxis*



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## Objectives

1. Define anaphylaxis.
2. Describe the immune system.
3. Identify the effects, signs, and symptoms of anaphylaxis.
4. Discuss prehospital treatment of anaphylaxis.
5. Explain the use of epinephrine auto-injectors.

## Goals

- **Define anaphylaxis**
- **Describe the immune system**
- **Identify the effects, signs, and symptoms of anaphylaxis**
- **Discuss prehospital treatment of anaphylaxis**
- **Explain the use of epinephrine auto-injectors**

## **Pathophysiology**

- **Immune system**: a complex network of specialized cells, tissues, and organs that recognize and defend the body from foreign substances, primarily disease-causing microorganisms such as bacteria, viruses, parasites, and fungi
- **Immune response function**
  - defense
  - homeostasis
  - surveillance

## **Pathophysiology**

- **Hypersensitivity reaction**: exaggerated or inappropriate immunologic responses occurring in response to an antigen or allergen
- **Autoimmune disease**: happens when the body's natural defense system can't tell the difference between your own cells and foreign cells, causing the body to mistakenly attack normal cells

## **Pathophysiology**

- **Basophil**: type white blood cells that make up less than 1% of all of your circulating white blood cells and are the least abundant
- **Granulocyte**: type of immune cell that has granules (small particles) with enzymes that are released during infections, allergic reactions, and asthma

## **Pathophysiology**

- **Mast cell**: cell filled with basophils and granulocytes that releases histamine and other substances during an infection or inflammatory response

# **Pathophysiology**

- **Lymphoid organs**

- adenoids
- appendix
- blood vessels
- bone marrow
- lymph nodes
- lymphatic vessels
- Peyer's patches
- spleen
- thymus
- tonsils

# **Pathophysiology**

- **Allergens can be inhaled, ingested, or enter through the skin**
- **If you have an allergy, your immune system overreacts to an allergen by producing antibodies called immunoglobulin E (IgE); these antibodies travel to cells that release chemicals, causing an allergic reaction**

## **Pathophysiology**

- **Anaphylaxis** is an acute, potentially life-threatening, IgE-mediated allergic reaction that occurs in previously sensitized people when they are re-exposed to the sensitizing antigen
- **Type I hypersensitivity** is also known as an immediate reaction and involves IgE-mediated release of antibodies against the soluble antigen – this results in mast cell degranulation and release of histamine and other inflammatory mediators

## **Pathophysiology**

- **Type I hypersensitivities** include atopic diseases, which are exaggerated IgE-mediated immune responses (i.e., allergic: asthma, rhinitis, conjunctivitis, and dermatitis), and allergic diseases, which are immune responses to foreign allergens (i.e., anaphylaxis, urticaria, angioedema, food, and drug allergies)

## **Statistics**

- **Between 1.6 and 5.1% of the United States population have experienced anaphylaxis**
- **1 in 12 children have a food allergy**
- **25% of reactions in school without a previous diagnosis**
- **\$24.8 billion annual costs of food allergies**
- **29% of children with food allergies have asthma**

## **Statistics**

- **Fatalities**
  - **150-200 per year from food allergies**
  - **40 per year from insect stings**
  - **400 per year from drug allergies**
- **1-6% of Americans have a latex allergy**

## **Risk Factors for Anaphylaxis**

- **Previous anaphylaxis**
- **Family history of allergies**
- **Allergies**
  - **medications commonly linked to allergies**
    - aspirin
    - NSAIDs
    - cephalosporin
    - penicillin
    - tetracycline
    - sulfonamide
    - local anesthetic
    - chemotherapy
    - insulins

## **Risk Factors for Anaphylaxis**

- **Previous anaphylaxis**
- **Family history of allergies**
- **Allergies**
  - **foods commonly linked to allergies**
    - eggs
    - milk
    - peanuts
    - nuts
    - shellfish
    - fish
    - chocolate
    - strawberries
  - **latex**

## **Risk Factors for Anaphylaxis**

- **Previous anaphylaxis**
- **Family history of allergies**
- **Allergies**
  - **insect sting**
    - **bees**
    - **wasps**
    - **hornets**
    - **yellow jackets**
    - **fire ants**

## **Risk Factors for Anaphylaxis**

- **Previous anaphylaxis**
- **Family history of allergies**
- **Allergies**
- **Exposure to the allergen**
- **Asthma**
- **Heart disease**

## **Signs and Symptoms of Anaphylaxis**

- **Integumentary (does not always occur in anaphylaxis)**

- redness
- itching
- warmth
- hives

- **Eyes**

- watering
- red
- itching
- swollen

## **Signs and Symptoms of Anaphylaxis**

- **Mouth/nose**

- nasal congestion
- sneezing
- runny nose
- metallic taste
- swollen tongue/lips

- **Respiratory**

- chest tightness
- bronchospasm
- swollen tongue
- wheezing
- swollen oropharynx/  
larynx

## **Signs and Symptoms of Anaphylaxis**

- **Gastrointestinal**

- nausea/vomiting
- difficulty swallowing
- abdominal cramping/pain
- urinary incontinence
- diarrhea

- **Central nervous system**

- confusion
- anxiety
- altered mental status
- dizziness
- headache

## **Signs and Symptoms of Anaphylaxis**

- **Cardiovascular**

- arrhythmias
- increase in heart rate
- chest pain/tightness
- weak pulse
- syncope
- hypotension

- \* **Anaphylactic shock**

- cardiovascular

## **Signs and Symptoms of Anaphylaxis**

- Integumentary
- Eyes
- Mouth/nose
- Respiratory
- Gastrointestinal
- Central nervous system
- Cardiovascular
- \* Anaphylactic shock
  - cardiovascular

## **Epinephrine Auto-Injector Use**

- Encourage people to **ALWAYS** carry EpiPen®
- Make sure patients know how to use it (watch training videos)
- Orange to the thigh, blue to the sky
- Never administer in buttocks, hands, or fingers
- Administer in thigh (may administer through clothing, but avoid pockets and seams)

## **Epinephrine Auto-Injector Use**

- Lay down when administering
- Call 911 prior to administering
- Check expiration date and check for cloudiness

## **Epinephrine Auto-Injector Use Steps**

- Flip open the yellow cap of your EpiPen<sup>®</sup> or the green cap of your EpiPen Jr<sup>®</sup> carrier tube and slide the auto-injector out of the carrier tube
- Hold the auto-injector in your fist with the orange tip pointing downward (orange to the thigh, blue to the sky)
- With your other hand, remove the blue safety release by pulling straight up

## **Epinephrine Auto-Injector Use Steps**

- **NOTE:** The needle comes out of the orange tip. To avoid an accidental injection, never put your thumb, fingers, or hand over the orange tip. If an accidental injection happens, get emergency medical help right away.
- If you are administering to a young child, hold the leg firmly in place while administering an injection

## **Epinephrine Auto-Injector Use Steps**

- Place the orange tip against the middle of the outer thigh (upper leg) at a right angle (perpendicular) to the thigh
- Swing and push the auto-injector firmly until it “clicks” (the click signals that the injection has started)
- Hold firmly in place for 10 seconds (count slowly 1, 2, 3...)

## **Epinephrine Auto-Injector Use Steps**

- **Remove the auto-injector from the thigh (the orange tip will extend to cover the needle – if the needle is still visible, do not attempt to reuse it)**
- **Massage the injection area for 10 seconds**
- **Get emergency help right away!**
- **Epinephrine can worsen the condition of patients with heart disease or arrhythmias**

## **Prehospital Treatment**

- **Follow protocol**
- **Assessment/history**
- **IV/IO fluids**
- **Oxygen**
- **Epinephrine**
- **Antihistamines**
- **Bronchodilators**

## **Prehospital Treatment**

- **IM epinephrine may be repeated at 5- to 15-minute intervals if there is no response or an inadequate response or even sooner if clinically indicated**
- **Isotonic fluids may be administered IV bolus 20 ml/kg**
- **Glucagon for patients taking beta-blockers – adult dosing is 1 to 5 mg slow IV bolus over five minutes**

## **Prehospital Treatment**

- **H1 antihistamines (such as diphenhydramine or cetirizine) relieve itch and hives**
- **H2 antihistamines (e.g., famotidine) given with an H1 antihistamine may provide some additional relief of hives**
- **Glucocorticoids are commonly given in the treatment of anaphylaxis; however, there is little evidence of benefit**

## **Prehospital Treatment**

- **ECG**
- **Clear and concise report**

## **Key “Teaching” Tips**

- **Avoid exposure to allergen (allergy testing to determine allergen)**
- **Carry epinephrine auto-injector at all times**
- **Know how to use an epinephrine auto-injector**
- **Wear medic alert**

## **Case Studies**

### **Case Study**

- **12-year-old female**
- **Chest tightness**
- **Throat tightening, tongue and lip swollen**
- **Anxiety**
- **Mom states she is allergic to peanut butter. A friend brought her Rice Krispies Treats™.**
- **Symptoms began 30 minutes ago**
- **Has an epinephrine auto-injector**

## **Case Study**

- **43-year-old male**
- **Difficulty breathing**
- **Heart racing**
- **Hand is swollen and red**
- **Was mowing the yard and started to feel “funny”**
- **Removed gloves and noticed redness and swelling on his hand**
- **No known allergies**

## **Case Study**

- **67-year-old female**
- **Develops hives**
- **Calls 911**

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## **Prehospital Treatment of Anaphylaxis**

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