Anaphylaxis

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Learning Objective

- Define anaphylaxis.
- Identify common triggers of anaphylaxis.
- Identify anaphylaxis clinical criteria.
- Identify steps for managing anaphylaxis

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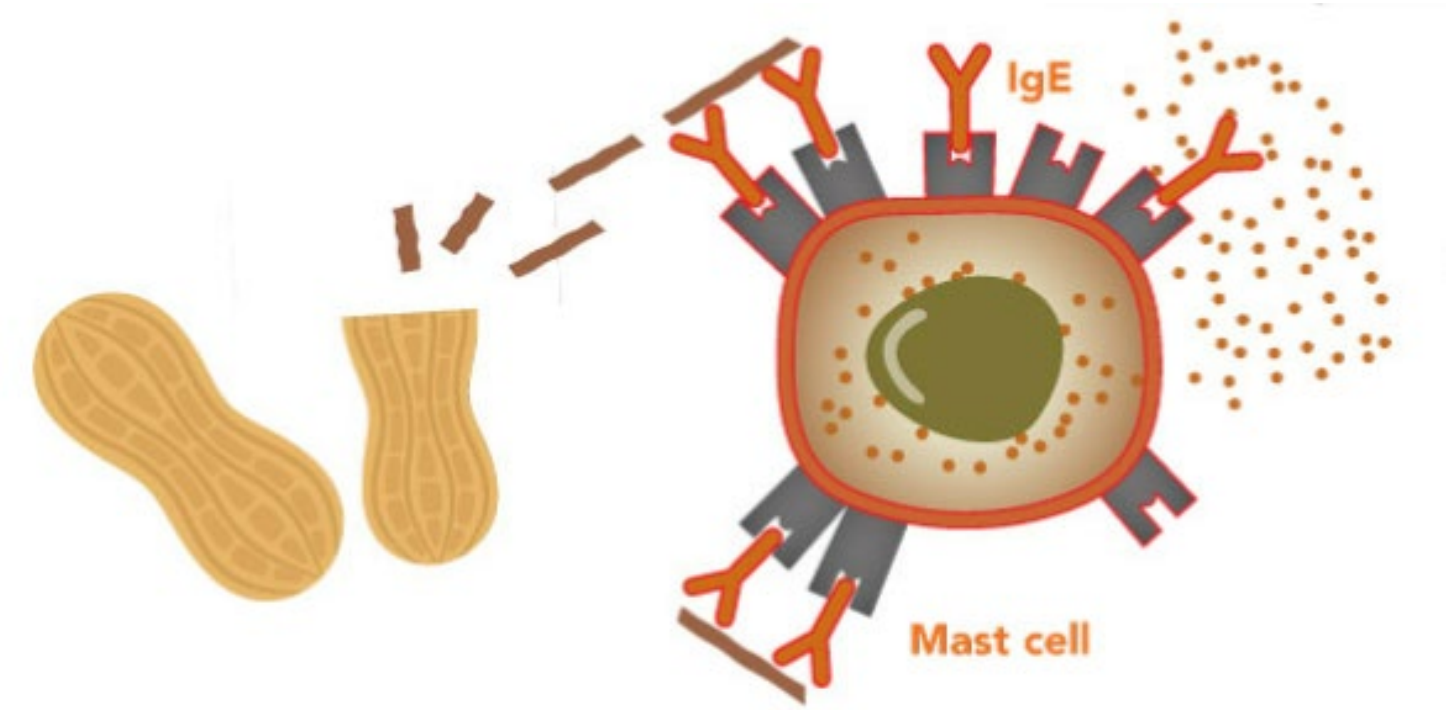

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What is Anaphylaxis?

The World Allergy Organization definition of anaphylaxis.

"Anaphylaxis is a serious systemic hypersensitivity reaction that is usually rapid in onset and may cause death. Severe anaphylaxis is characterized by potentially life-threatening compromise in airway, breathing and/or the circulation, and **may occur without typical skin features or circulatory shock being present**."

Cardona et al. World Allergy Organization Journal (2020) 13:100472
http://doi.org/10.1016/j.waojou.2020.100472

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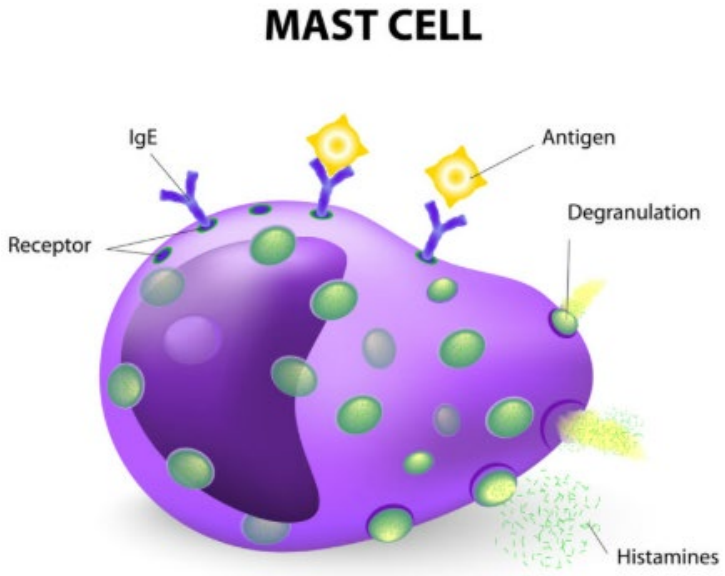
Pathophysiology of Anaphylaxis

Immunologic mechanism (IgE dependent)

- IgE-mediated anaphylaxis is triggered by the interaction of an allergen (usually a protein) interacting with an allergen-specific receptor on mast cells or basophils.
- Considered the classic and most frequent mechanism.
- Usually develops within minutes to one hour of exposure

Nonimmunologic mechanism

- Caused by agents or events that induce sudden, mast cell or basophil degranulation in the absence of immunoglobulins.



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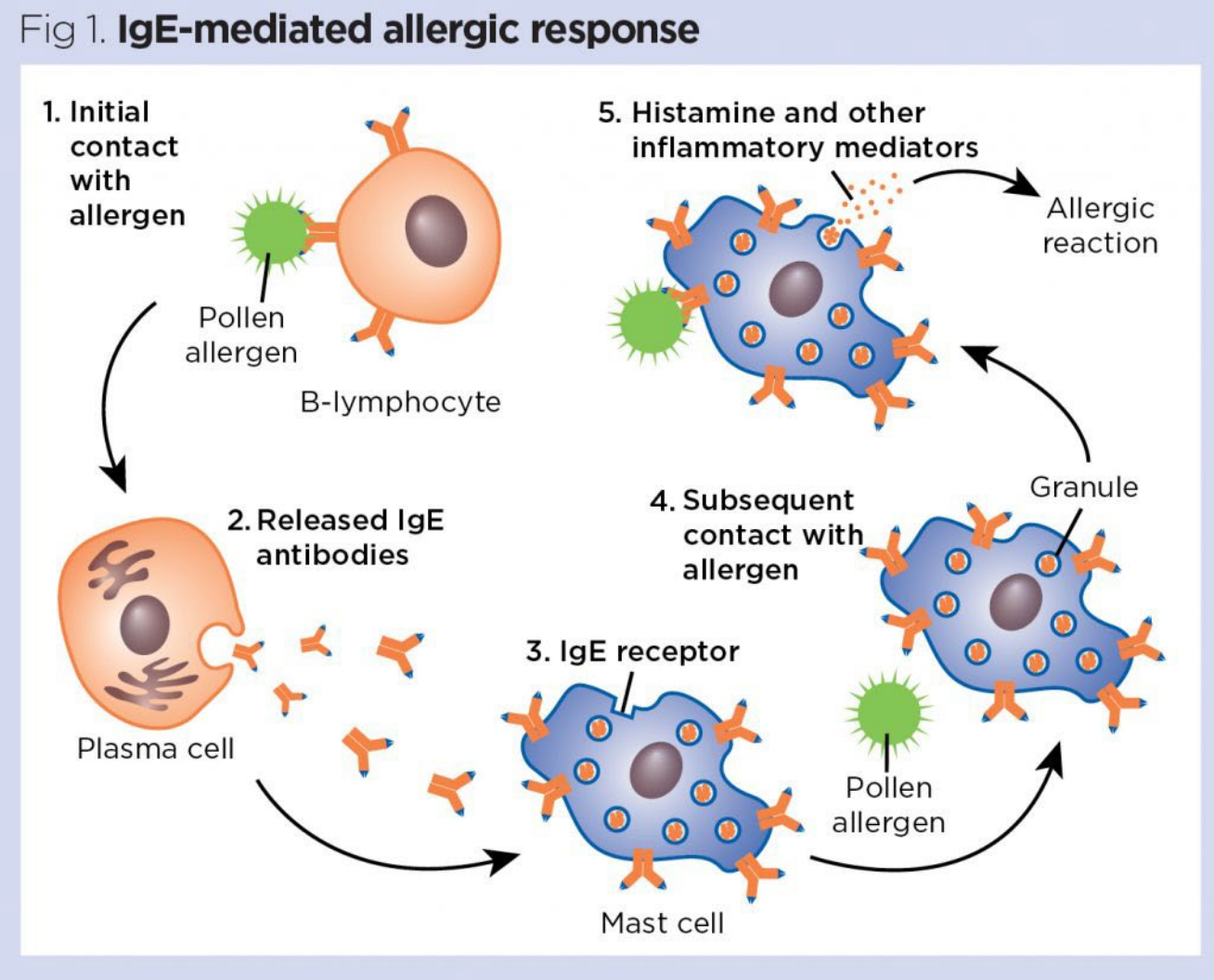
Pathophysiology of IgE Mediated Anaphylaxis



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Anaphylaxis Triggers

Immunologic Mechanism (IgE Dependent)

- **Foods**: Peanut, tree nut, cow's milk, hen's eggs, wheat, crustacean shellfish, fish
- **Insect Stings:** wasps, hornets, yellow jackets, ants, spiders
- **Medications**: antibiotics, NSAIDS
- **Natural rubber latex**
- **Biologic materials**: allergen immunotherapy, monoclonal antibiodies, chemotherapy agents and vaccines (rare)
- **Food additives**: spices, insect-derived colorants, vegetable gums
- **Inhalants** (rare: horse dander, cat dander, grass pollen)

Nonimmunologic Mechanisms (Direct Mast Cell Activation)

- **Physical Factors:** exercise, cold, heat, sunlight
- **Alcohol**
- **Medications:** opioids, NSAIDS

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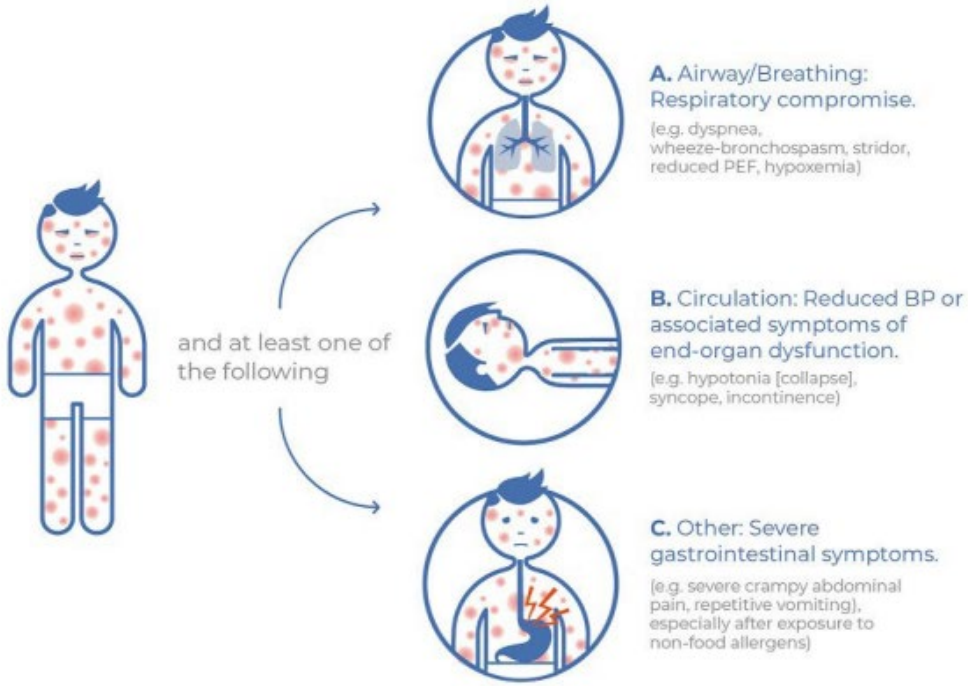
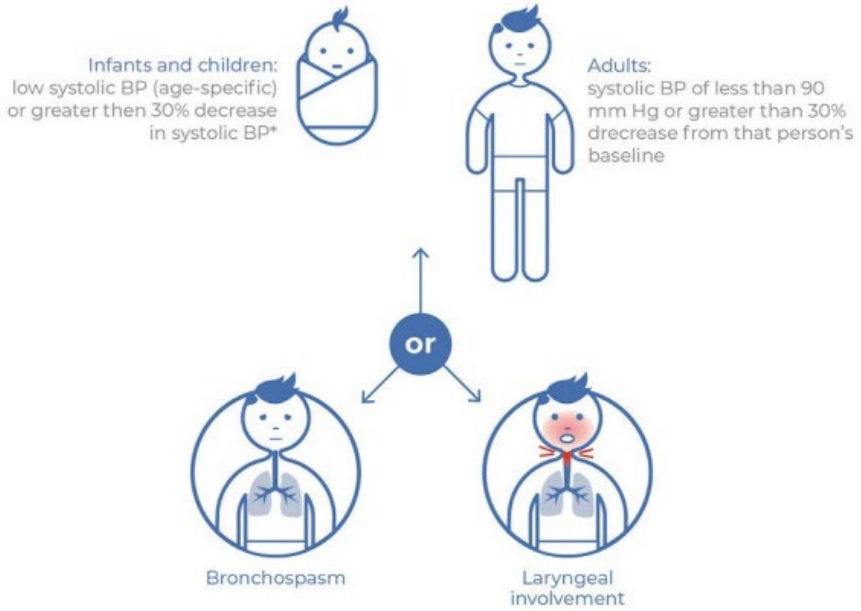
Anaphylaxis Symptom Criteria

Anaphylaxis is highly likely when any one of the following **two criteria is fulfilled**

1. Acute onset of an illness (minutes to several hours) with involvement of the skin, mucosal tissue, or both (e.g. generalized hives, pruritus or flushing, swollen lips-tongue-uvula)



2. Acute onset of **hypotension*** or **bronchospasm** or **laryngeal involvement#** after exposure to a known or highly probable allergen for that patient (minutes to several hours), **even in the absence of typical skin involvement.**



PEF, Peak expiratory flow; BP blood presure.

*Hypotension defined as a decrease in systolic BP greater than 30% from that person's baseline, OR
i. Infants and children under 10 years: systolic BP less than (70mmHg + [2 x age in years])
ii. Adults: systolic BP les than < 90 mmHg

Laryngeal symptoms include: stridor, vocal changes, odynophagia.

Cardona et al. World Allergy Organization Journal (2020) 13:100472. http://doi.org/10.1016/j.waojou.2020.100472.

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Anaphylaxis Symptom Criterion 1

Criterion 1 — Acute onset of an illness (minutes to several hours) with involvement of the skin, mucosal tissue, or both (eg, generalized hives, pruritus or flushing, swollen lips-tongue-uvula) and at least one of the following:

- **Airway/Breathing:** Respiratory compromise (eg, dyspnea, wheeze-bronchospasm, stridor, reduced peak expiratory flow, hypoxemia)
- **Circulation:** Reduced BP or associated symptoms of end-organ dysfunction (eg, hypotonia [collapse], syncope, incontinence)
- **Other:** Severe gastrointestinal symptoms (eg, severe crampy abdominal pain, repetitive vomiting), especially after exposure to non-food allergens

Cardona et al. World Allergy Organization Journal (2020) 13:100472.
http://doi.org/10.1016/j.waojou.2020.100472.

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Anaphylaxis Symptom Criterion 2

Criterion 2 — Acute onset of **hypotension** or **bronchospasm** or **laryngeal** involvement after exposure to a known or highly probable allergen for that patient (minutes to several hours), **even in the absence of typical skin involvement**

- **Hypotension**: Hypotension is defined as:
  - Adults and children >10 years – Decrease in systolic BP >30 percent from that person's baseline or **systolic BP <90 mmHg.**
  - Infants and children <10 years – Decrease in systolic BP >30 percent from that person's baseline or:

    -Age 1 month to 1 year – **Less than 70 mmHg**.

    -Age 1 to 9 years – **Less than (70 mmHg + [2 x age]).**

- **Bronchospasm**: The definition of bronchospasm excludes lower respiratory symptoms triggered by common inhalant allergens (asthma) or food allergens perceived to cause "inhalational" reactions in the absence of ingestion.
- **Laryngeal involvement:** include stridor, vocal changes, and odynophagia (painful difficulty swallowing).

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Allergic Reaction Symptoms

Cutaneous (Skin)

- Hives and/or red-warmth and/or itchiness
- Tingling, or itching of the lips
- Angioedema: swelling of submucosa or subcutaneous tissue (not laryngeal)

Upper Respiratory

- Nasal symptoms (sneezing, runny nose, nasal itching, and or nasal congestion)
- Throat-clearing (itchy throat)
- Cough not related to bronchospasm

Conjunctival (Eyes)

- Redness, itchiness or tearing

Other

- Nausea

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Questions to Ask to Identify Symptoms

Mucosal:

- Does your mouth feel different?
- Does your tongue feel swollen?
- Is your throat itchy?
- Do your ears itch?

Cardiovascular:

- Do you feel light-headed, dizzy.
- Do you feel weak?

Breathing:

- Is it difficult to breathe? If yes, when did that start?
- Does your chest feel tight?
- Does it feel like there is something heavy on your chest making it hard to breath?

Laryngeal involvement:

- Does it hurt to swallow?
- Are you having trouble swallowing?
- Is there a change in voice quality. Ask the child to speak followed by: Is that your normal voice or has it changed?

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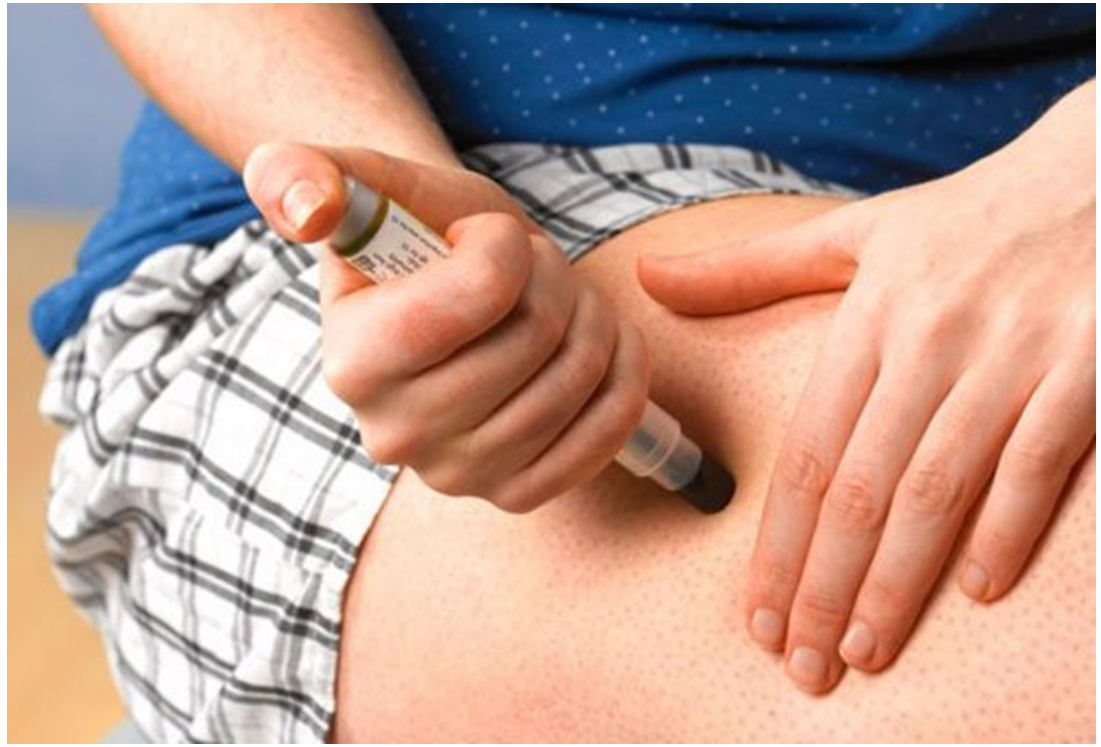
Management of Anaphylaxis

The following steps should happen simultaneously and as quickly as possible.

1. **Remove exposure** to the trigger if possible.
2. **Place the patient on back** unless there is respiratory distress (sitting may optimize respiratory effort) or vomiting (side lying is preferred if vomiting). Avoid sudden standing or sitting which can decrease cardiac output and lead to severe life-threatening hypotension.
3. **Assess the patient**: Airway / Breathing / Circulation, mental status, skin.
4. **Call for help**: Alert others that there is an anaphylactic emergency. Bring epinephrine to the child. Call 911
5. **Inject epinephrine**: intramuscularly in the mid-anterolateral aspect of the thigh
6. **Continue to monitor** symptoms closely as a second dose of epinephrine may be needed while waiting for EMS to arrive.



Do not delay the administration of Epinephrine if Anaphylaxis is suspected.

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Diagnosis of Anaphylaxis

Clinical History of Episode

- **Symptoms:** Skin, mucosal, respiratory, cardiovascular, gastrointestinal
- **Exposures**: anything ingested (food, medication), injected, inhaled, or otherwise taken into the body (insect sting)
- **Chronology**: time elapsed between exposure to trigger and onset of first symptom(s)
  - IgE mediated usually develops within minutes to one hour of exposure
- **Comorbidities**: Asthma (especially if symptoms are not well controlled); other pulmonary or cardiac diseases increase the risk of severe anaphylaxis. Mastocytosis or other mast cell disorder.
- **Review of Treatment**: What medication were used to treat symptoms.
- **Concurrent medications and other substances**: prescription, over-the-counter, recreational in the preceding 24 hours
- **Lab test results obtained at time of anaphylaxis**: elevated serum tryptase obtained 1-3 hours after onset of symptoms confirms diagnosis, normal levels cannot rule out the diagnosis.

IgE serum levels: specific to allergen

Skin testing: traditional method for demonstrating sensitization

Reference: UpToDate. Uptodate.com. Published 2025. Accessed March 15, 2025. https://www.uptodate.com/contents/anaphylaxis-confirming-the-diagnosis-and-determining-the-causes?

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Resources for Anaphylaxis Management

- Asthma and Allergy Foundation of America
  - Kids with Food Allergies
- Neffy in Schools
- Allergy and Asthma Network

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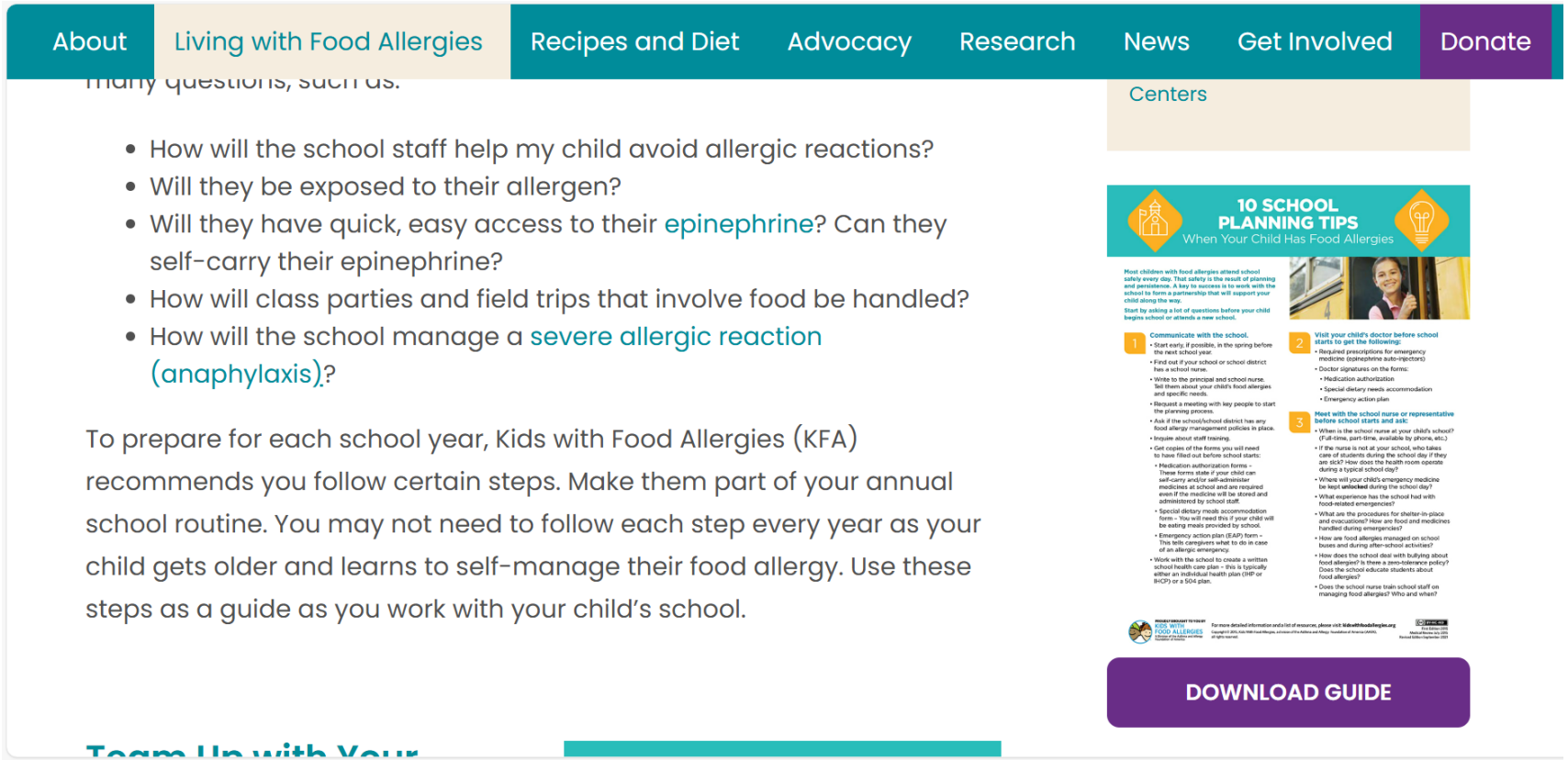
Managing Food Allergies at School

[Helping Students Manage Food Allergies at School | kidswithfoodallergies.org]

[10 School Planning Tips When Your Child Has Food Allergies September 2021]



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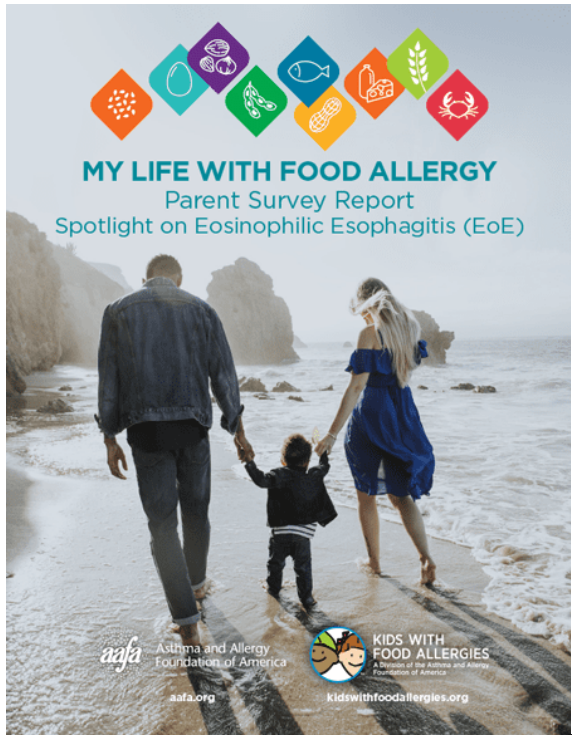
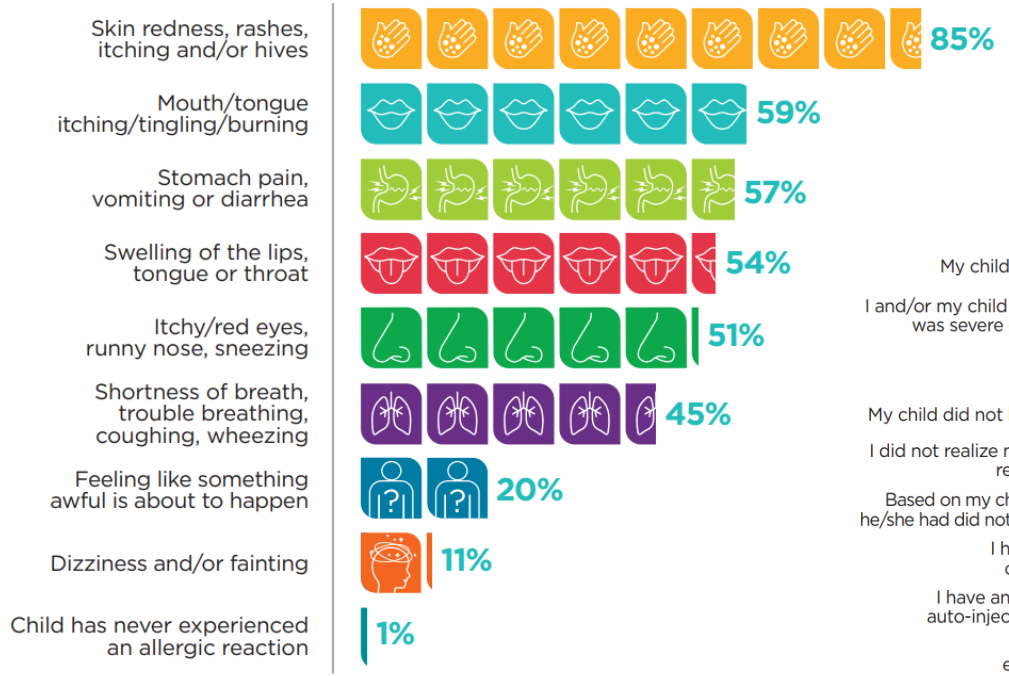
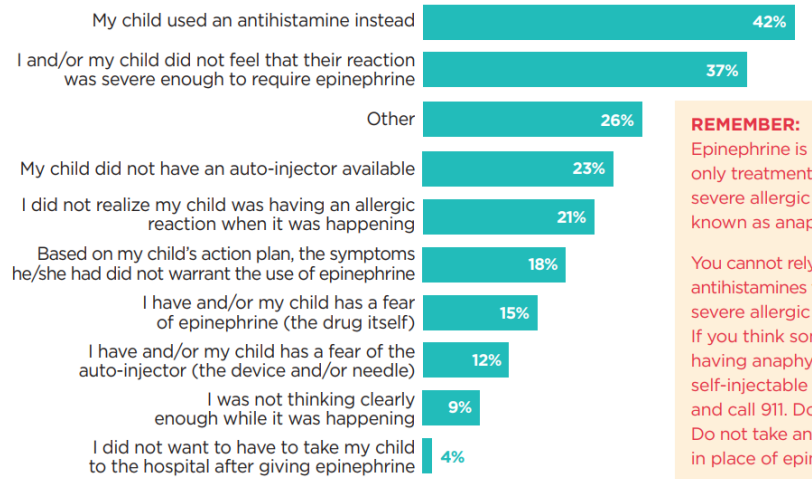
Asthma and Allergy Foundation of America
Food Allergies | AAFA.org



SYMPTOMS EXPERIENCED DURING AN ALLERGIC REACTION TO FOOD



REASONS FOR NOT ADMINISTERING EPINEPHRINE DURING SEVERE ALLERGIC REACTION (N=792)



REMEMBER:
Epinephrine is the only treatment for a severe allergic reaction known as anaphylaxis.

You cannot rely on antihistamines to treat severe allergic reactions. If you think someone is having anaphylaxis, use self-injectable epinephrine and call 911. Do not delay. Do not take antihistamines in place of epinephrine.

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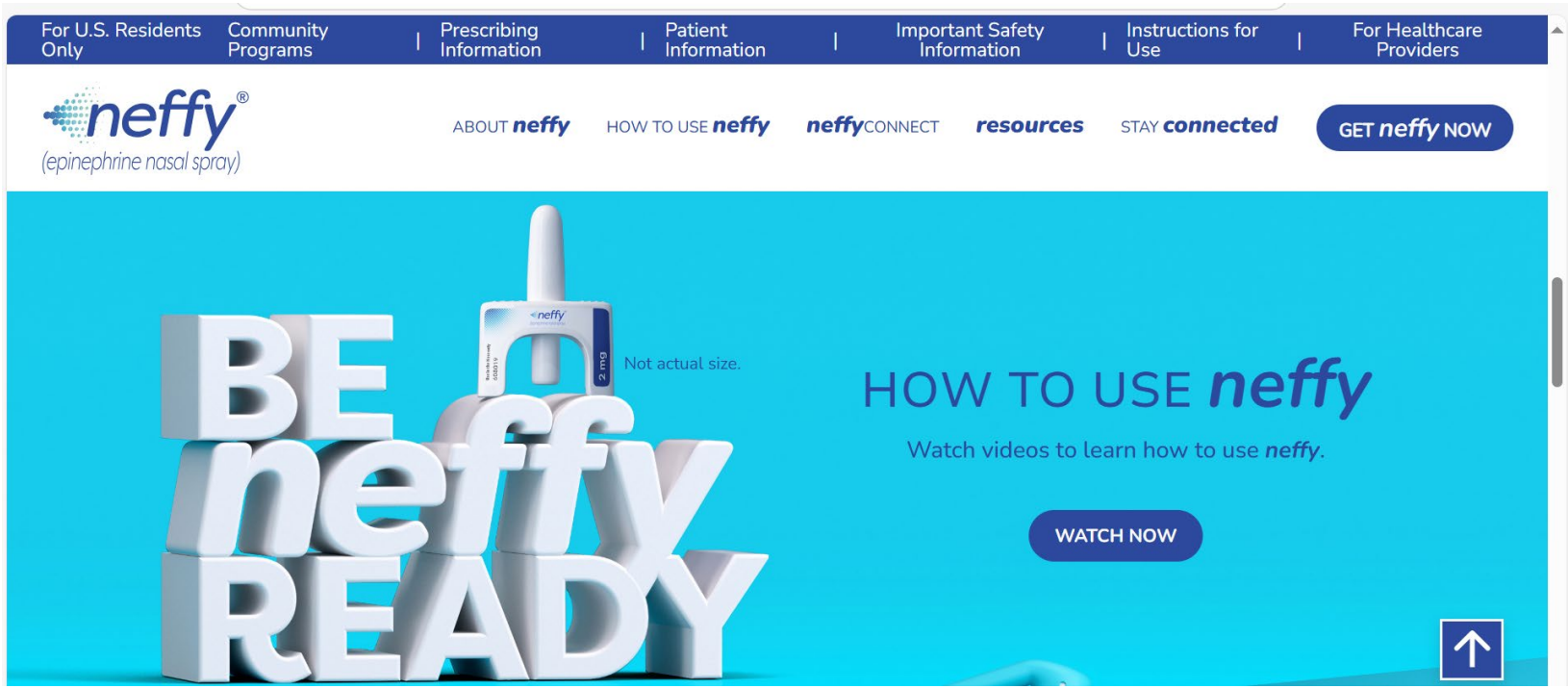
Epinephrine (*neffy*) Nasal Spray

Neffy is a nasal spray used for emergency treatment of anaphylaxis and is FDA approved (August 2024) for adults and children 4 years and older who weigh 33 lbs or greater.



[How to Use neffy® (epinephrine nasal spray)]

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Neffy in Schools Free Program

For U.S. Residents Only | Community Programs | Prescribing Information | Patient Information | Important Safety Information | Instructions for Use | For Healthcare Providers

neffy® (epinephrine nasal spray)

ABOUT neffy | HOW TO USE neffy | neffyCONNECT | resources | STAY connected | GET neffy NOW

neffy in Schools

GET FREE neffy, NEEDLE-FREE EPINEPHRINE NASAL SPRAY, IN every school* now

- ARS Pharma is committed to working with our communities to provide essential epinephrine in schools, which is why we have launched the **neffyinSchools** Program.
- All public and private K-12 Schools in the U.S. will be

Free neffy® (epinephrine nasal spray) in Schools Program

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Questions about neffy in Schools

The following questions and answers for school use are on the neffy website. [Free neffy® (epinephrine nasal spray) in Schools Program]

- Will school nurses or others who administer epinephrine in emergencies be liable?
- Does my state allow and/or mandate stock epinephrine in my schools? What about *neffy* specifically?
  - In 2013, the School Access to Emergency Epinephrine Act was signed. It encourages states to adopt laws requiring K-12 schools to have undesignated epinephrine on hand. While nearly every state has passed legislation or guidelines regarding stock epinephrine in schools, the rules differ by state. Some states require K-12 schools to stock epinephrine and other states allow schools to stock it. Currently, 49 states and Washington, DC have legislation in place to either require or allow schools to stock epinephrine. The specifics of each state's legislation, and ability to stock neffy specifically, may vary. To learn more please visit: Advocacy Groups
- What if my stat does not allow neffy in their stocking protocols?
- Is there anything I can do to prepare my school for this program prior to applying?
- How can my school apply?
- What happens when *neffy* expiries?

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Asthma and Allergy Network

[epinephrine treatments - Allergy & Asthma Network Store]

Allergy & Asthma NETWORK | American College of Allergy, Asthma & Immunology

Epinephrine Treatments 2024

AllergyAsthmaNetwork.org • 800-878-4403

	Brand Devices			Generic Devices		
	Auvi-Q®	**EpiPen®**	**neffy®**	**Auto-Injector (Amneal)**	**Auto-Injector (Teva)**	**Auto-Injector (Viatris)**
Type	Auto-Injector	Auto-Injector	Nasal spray	Auto-Injector	Auto-Injector	Auto-Injector
Dosage	0.10 mg for **16.5 - 33 lbs.** 0.15 mg for **33 - 66 lbs.** 0.3 mg for **over 66 lbs.**	0.15 mg for 33 **- 66 lbs.** 0.3 mg for **over 66 lbs.**	2 mg for **over 66 lbs.**	0.15 mg for **33 - 66 lbs.** 0.3 mg for **over 66 lbs.**	0.15 mg for **33 - 66 lbs.** 0.3 mg for **over 66 lbs.**	0.15 mg for **33 - 66 lbs.** 0.3 mg for **over 66 lbs.**
Storage Temperature	68 to 77 degrees F	68 to 77 degrees F	68 to 77 degrees F (with excursions up to 122 degrees F)	68 to 77 degrees F	68 to 77 degrees F	68 to 77 degrees F
Administration	Outer middle of thigh	Outer middle of thigh	Spray in nostril (use same nostril if second dose is needed)	Outer middle of thigh	Outer middle of thigh	Outer middle of thigh
Hold Time	2 seconds	3 seconds	None	10 seconds	3 seconds	3 seconds
Is a trainer available?	Yes	Yes	Yes	Yes	Yes	Yes
Twin-packs available?	Yes	Yes	Yes	Yes	Yes	Yes
Shelf life	12 to 18 months	12 to 18 months	30 months	12 to 18 months	12 to 18 months	12 to 18 months
Special feature	Voice prompt; needle fully covered after injection	Needle fully covered after injection	Needle-free	If needle is sticking out after injection, you received the dose	Needle fully covered after injection	Needle fully covered after injection
Manufacturer	Kaléo	Viatris	ARS Pharmaceuticals	Amneal Pharmaceuticals	Teva Pharmaceuticals	Viatris
Website	*auvi-q.com*	*epipen.com*	*neffy.com*	*epinephrineautoinject.com*	*tevaepinephrine.com*	*epipen.com*
Patient assistance	877-302-8847	800-395-3376	877-696-3339	800-934-6729	844-248-7949	800-395-3376

Reviewed by Dennis Williams, PharmD

Thank you to ARS PHARMA ars-pharma.com for supporting the 2024 update of this poster.

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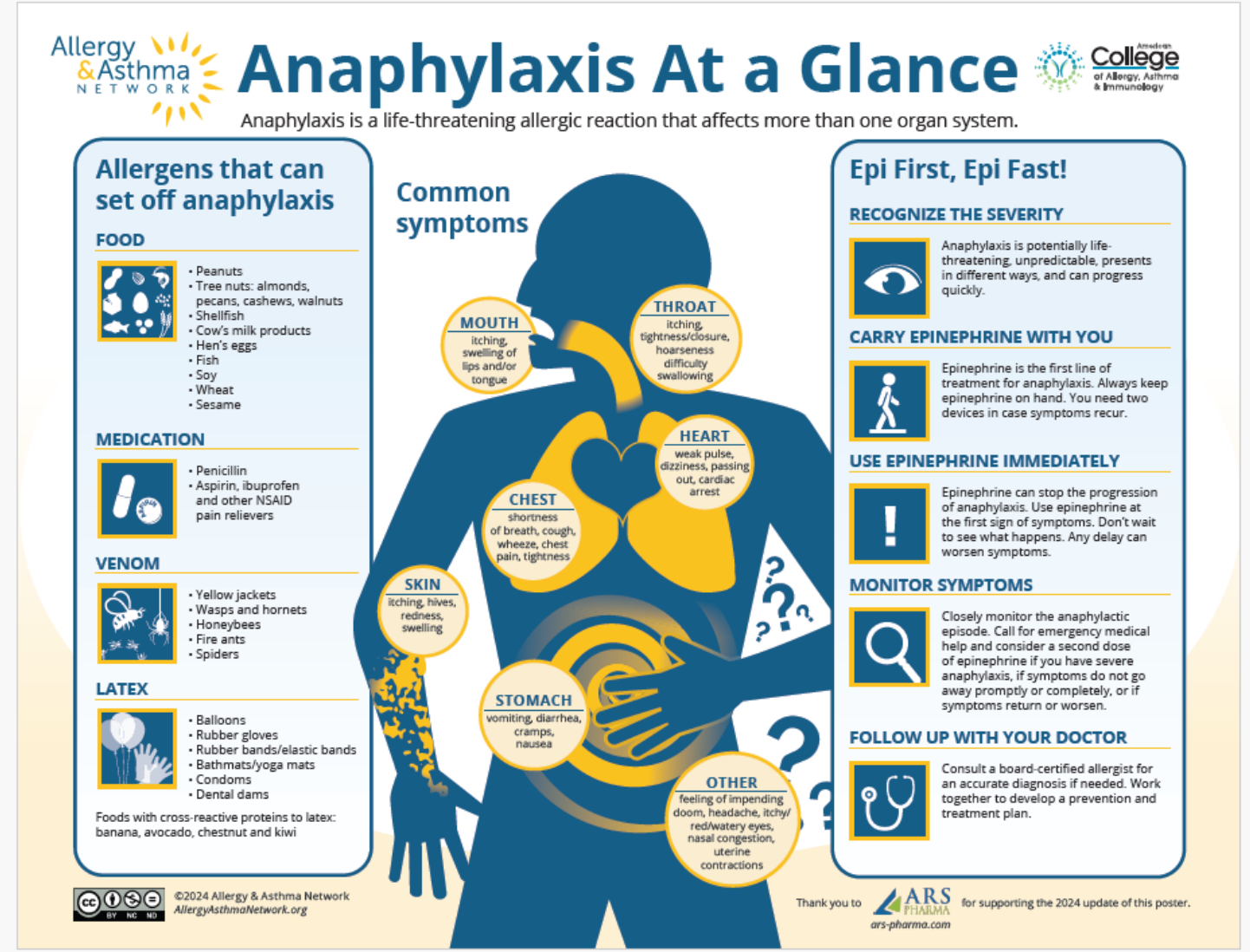
Allergy and Asthma Network

[The Allergy & Asthma Network Store]



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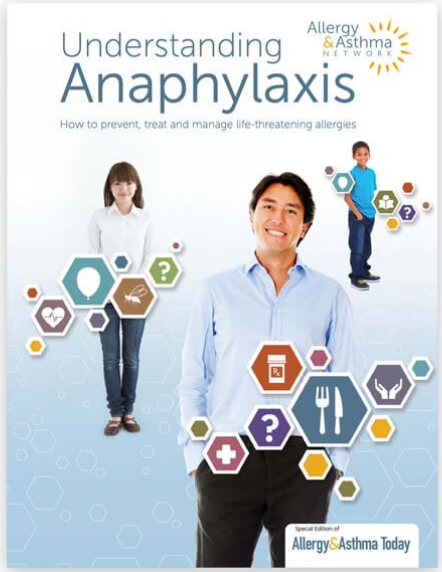
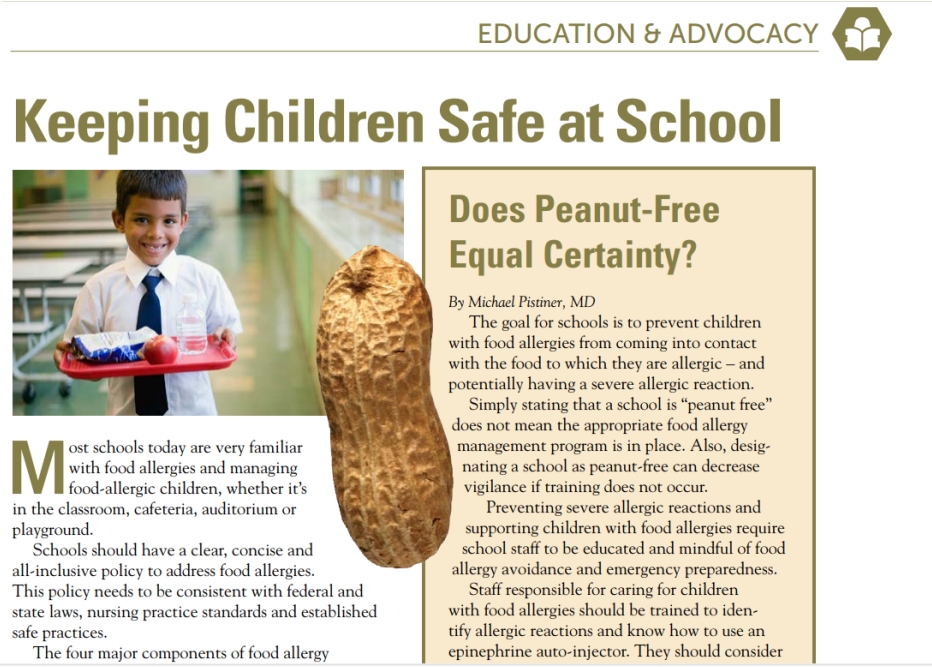
Allergy and Asthma Network



[The Allergy & Asthma Network Store]

Understanding Anaphylaxis (under publications)



EDUCATION & ADVOCACY

Keeping Children Safe at School

Most schools today are very familiar with food allergies and managing food-allergic children, whether it's in the classroom, cafeteria, auditorium or playground.

Schools should have a clear, concise and all-inclusive policy to address food allergies. This policy needs to be consistent with federal and state laws, nursing practice standards and established safe practices.

The four major components of food allergy

Does Peanut-Free Equal Certainty?

By Michael Pistiner, MD

The goal for schools is to prevent children with food allergies from coming into contact with the food to which they are allergic – and potentially having a severe allergic reaction.

Simply stating that a school is "peanut free" does not mean the appropriate food allergy management program is in place. Also, designating a school as peanut-free can decrease vigilance if training does not occur.

Preventing severe allergic reactions and supporting children with food allergies require school staff to be educated and mindful of food allergy avoidance and emergency preparedness.

Staff responsible for caring for children with food allergies should be trained to identify allergic reactions and know how to use an epinephrine auto-injector. They should consider

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School Health Resources

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School Health Resources

Children learn best when they are healthy. From support and resources for school nurses, to School-Based Health Clinics, Mary Bridge Children's and the Bessler Center are helping build a healthier future.

Patient & Family Support Services

A health strategy of the Bessler Center

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References

1. Cardona et al. World Allergy Organization Journal (2020) 13:100472. http://doi.org/10.1016/j.waojou.2020.100472.
2. Reference: UpToDate. Uptodate.com. Published 2025. Accessed March 15, 2025. https://www.uptodate.com/contents/anaphylaxis-confirming-the-diagnosis-and-determining-the-causes?

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