

Food Allergies



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KEYWORDS

- Food allergies • Anaphylaxis • Desensitization • Oral immunotherapy
- Food challenge • Peanuts • Milk

KEY POINTS

- Food allergies are prevalent, especially among children of all ages, requiring identification and treatment or prevention with medication and education to parents, teachers, and other community leaders.
- Nut and milk allergies are the most common food allergies, thus warranting special attention within the childhood population as well as enhanced safeguards within typical community gathering places (schools, amusement parks, camps, and so forth).
- Food challenge and oral immunotherapy are at the heart of identification and potentially reversing food allergies among affected individuals. Undertaking these therapies requires appropriate preparation and caution.

INTRODUCTION

Food allergies are common. Recent statistics show an increasing prevalence of reported food allergies worldwide.^{1–3} Food allergies affect people of all ages, ethnicities and heritage. Varying estimates of prevalence have been reported, however. Food allergies affect approximately 5% of adults and 8% of children.^{1,4} Among children ages 0 to 17 years, the prevalence of food allergies increased from 3.4% in 1997 to 1999 to 5.1% in 2009 to 2011.³

What Are Food Allergies?

Food allergy “occurs when the body has a specific and reproducible immune response to certain foods.”⁵ Whether the response is mild, moderate, or severe (anaphylaxis), food allergy is usually an adverse health outcome and should be thoroughly evaluated and addressed by medical professionals.⁵ Allergic reactions to foods have become the most common cause of anaphylaxis in community health settings.⁶

Food allergy is often mistaken for food intolerance. When a food product causes irritation or digestive upset anywhere along the gastrointestinal tract, this is labelled an intolerance. Symptoms of food intolerance may include the following:

- Flatulence
- Abdominal cramps

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- Bloating
- Heartburn
- Irritability
- General malaise
- Headaches

Lactose and food additives are the most commonly reported food intolerance.⁷

There are numerous risk factors for food allergies. **Box 1** presents the most common risk factors.

PREVENTION

There is currently no cure for food allergies. Strict avoidance of the food allergen is the only way to prevent a reaction.¹⁵ In 2013, the Centers for Disease Control and Prevention published “Voluntary Guidelines for Managing Food Allergies in Schools and Early Care and Education Programs,” which delineates a broad, preventative approach to minimizing allergic reactions among school-aged children.¹⁶ **Fig. 1** outlines a checklist for school officials to use as a template for minimizing food allergy–induced outcomes among children.¹⁶

The 2008 official statement from the American Academy of Pediatrics regarding allergy prevention states¹⁷

1. At the present time, there is lack of evidence that maternal dietary restrictions during pregnancy play a significant role in the prevention of atopic disease in infants. Similarly, antigen avoidance during lactation does not prevent atopic disease, with the possible exception of atopic eczema, although more data are needed to substantiate this conclusion.
2. For infants at high risk of developing atopic disease, there is evidence that exclusive breastfeeding for at least 4 months compared with feeding intact cow milk protein formula decreases the cumulative incidence of atopic dermatitis and cow milk allergy (CMA) in the first 2 years of life.

Box 1
Risk factors for food allergies

- Antacid overuse
- Atopy (comorbid atopic dermatitis)
- Dietary fat (reduced consumption of omega-3 polyunsaturated fatty acids)
- Genetics (familial associations, HLA, and specific genes)
- Increased hygiene
- Northern climate
- Obesity (being an inflammatory state)
- Race/ethnicity (increased among Asian and black children compared with white children)
- Reduced consumption of antioxidants
- Season of birth
- Gender (male gender in children)
- Timing and route of exposure to foods (increased risk for delaying allergens with possible environmental sensitization)
- Vitamin D insufficiency^{8–14}

Check If You Have Plans or Procedures	Priorities for a Food Allergy Management and Prevention Plan
1. Does your school or ECE program ensure the daily management of food allergies for individual children by:	
☐	Developing and using specific procedures to identify children with food allergies?
☐	Developing a plan for managing and reducing risks of food allergic reactions in individual children through an Emergency Care Plan (Food Allergy Action Plan)?
☐	Helping students manage their own food allergies? (Does not apply to ECE programs.)
2. Has your school or ECE program prepared for food allergy emergencies by:	
☐	Setting up communication systems that are easy to use in emergencies?
☐	Making sure staff can get to epinephrine auto-injectors quickly and easily?
☐	Making sure that epinephrine is used when needed and that someone immediately contacts emergency medical services?
☐	Identifying the role of each staff member in a food allergy emergency?
☐	Preparing for food allergy reactions in children without a prior history of food allergies?
☐	Documenting the response to a food allergy emergency?
3. Does your school or ECE program train staff how to manage food allergies and respond to allergy reactions by:	
☐	Providing general training on food allergies for all staff?
☐	Providing in-depth training for staff who have frequent contact with children with food allergies?
☐	Providing specialized training for staff who are responsible for managing the health of children with food allergies on a daily basis?
4. Does your school or ECE program educate children and family members about food allergies by:	
☐	Teaching all children about food allergies?
☐	Teaching all parents and families about food allergies?
5. Does your school or ECE program create and maintain a healthy and safe educational environment by:	
☐	Creating an environment that is as safe as possible from exposure to food allergens?
☐	Developing food-handling policies and procedures to prevent food allergens from unintentionally contacting another food?
☐	Making outside groups aware of food allergy policies and rules when they use school or ECE program facilities before or after operating hours?
☐	Creating a positive psychosocial climate that reduces bullying and social isolation and promotes acceptance and understanding of children with food allergies?

Fig. 1. Food allergy management and prevention plan checklist. (From Centers for Disease Control and Prevention. Voluntary Guidelines for Managing Food Allergies in Schools and Early Care and Education Programs. Washington, DC: US Department of Health and Human Services; 2013.)

3. There is evidence that exclusive breastfeeding for at least 3 months protects against wheezing in early life. In infants at risk of developing atopic disease, however, the current evidence that exclusive breastfeeding protects against allergic asthma occurring beyond 6 years of age is not convincing.
4. In studies of infants at high risk of developing atopic disease who are not breastfed exclusively for 4 to 6 months or are formula fed, there is modest evidence that atopic dermatitis may be delayed or prevented by the use of extensively or partially hydrolyzed formulas, compared with cow milk formula, in early childhood. Comparative studies of the various hydrolyzed formulas have also indicated that not all formulas have the same protective benefit. Extensively hydrolyzed formulas may be more effective than partially hydrolyzed in the prevention of atopic disease. In addition, more research is needed to determine whether these benefits extend into late childhood and adolescence. The higher cost of the hydrolyzed formulas must be considered in any decision-making process for their use. To date, the use of amino acid based formulas for atopy prevention has not been studied.

5. There is no convincing evidence for the use of soy-based infant formula for the purpose of allergy prevention.
6. Although solid foods should not be introduced before 4 to 6 months of age, there is no current convincing evidence that delaying their introduction beyond this period has a significant protective effect on the development of atopic disease regardless of whether infants are fed cow milk protein formula or human milk. This includes delaying the introduction of foods that are considered to be highly allergic, such as fish, eggs, and foods containing peanut protein.
7. For infants after 4 to 6 months of age, there are insufficient data to support a protective effect of any dietary intervention for the development of atopic disease.
8. Additional studies are needed to document the long-term effect of dietary interventions in infancy to prevent atopic disease, especially in children older than 4 years and in adults.

Common Food Allergens

Eight foods or food groups account for 90% of serious allergic reactions in the United States:

- Milk
- Eggs
- Fish (eg, bass, flounder, and cod)
- Crustacean shellfish (eg, crab, lobster, and shrimp)
- Wheat
- Soy
- Peanuts
- Tree nuts (eg, almonds, walnuts, and pecans)⁴

To help Americans avoid the health risks posed by food allergens, Congress passed the Food Allergen Labeling and Consumer Protection Act of 2004 (FALCPA).¹⁶ The law requires that labels must clearly identify the food source names of all ingredients that are—or contain any protein derived from—the 8 most common food allergens, which FALCPA defines as “major food allergens.”¹⁸

Food labels must identify the food source names of all major food allergens used to make the food.¹⁸ This requirement is met if the common or usual name of an ingredient (eg, buttermilk) that is a major food allergen already identifies that allergen’s food source name (ie, milk). Otherwise, the allergen’s food source name must be declared at least once on the food label in 1 of 2 ways.

The name of the food source of a major food allergen must appear

1. In parentheses after the name of the ingredient.
Examples: lecithin (soy), flour (wheat), and whey (milk)
OR
2. Immediately after or next to the list of ingredients in a “contains” statement.
Example: Contains wheat, milk, and soy.¹⁸

FOOD ALLERGY SYMPTOMS

A food allergy is typically categorized as mild to moderate or severe based on reaction history (**Box 2**). Mild-to-moderate symptoms are usually reported as

- Angioedema of the lips, eyes, or face
- Other angioedema
- Coughing

Box 2

Allergic symptoms

Mild–moderate

- Abdominal cramps
- Coughing
- Face, tongue, or lip swelling
- Flushed skin or rash
- Hives
- Swelling of the throat and vocal cords
- Tight, hoarse throat
- Tingling or itchy sensation in the mouth
- Trouble swallowing
- Vomiting and/or diarrhea

Severe

- Difficulty breathing
- Dizziness and/or lightheadedness
- Loss of consciousness
- Weak pulse
- Wheezing

Data from Refs. ^{5,18,19}

- Other oropharyngeal symptoms
- Eczema
- Flushing
- Hives
- Pruritus
- Vomiting⁵

Severe symptoms mainly include any report of

- Anaphylaxis
- Low blood pressure
- Trouble breathing
- Wheezing

A reaction, including vomiting, angioedema, and coughing, in combination is also categorized as severe.⁵

In general, childhood food allergies to milk, egg, wheat, and soy typically resolve during childhood, whereas allergies to peanut, tree nuts, fish, and shellfish are persistent.²⁰ There is evidence, however, that resolution rates have slowed for allergies that have been commonly outgrown, such as those to milk, egg, wheat, and soy.²⁰

Food allergy severity varies—38.7% of children have a history of severe reactions.⁴ Among allergic children, 1 or more food allergies affect a strong minority; 30.4% have multiple food allergies.⁴

Prevalence of food allergies among children is included ([Table 1](#)).

Table 1
Prevalence of common food allergies according to age group

Age Group	Frequency, % (95% CI)									
	All Allergens (N = 3339)	Peanut (N = 767)	Milk (N = 702)	Shellfish (N = 509)	Tree Nut (N = 430)	Egg (N = 304)	Fin Fish (N = 188)	Strawberry (N = 189)	Wheat (N = 170)	Soy (N = 162)
Prevalence among all children surveyed										
All ages (N = 38,480)	8.0 (7.7–8.3)	2.0 (1.8–2.2)	1.7 (1.5–1.8)	1.4 (1.2–1.5)	1.0 (0.9–1.2)	0.8 (0.7–0.9)	0.5 (0.4–0.6)	0.4 (0.4–0.5)	0.4 (0.3–0.5)	0.4 (0.3–0.4)
0–2 y (n = 5429)	6.3 (5.6–7.0)	1.4 (1.1–1.8)	2.0 (1.6–2.4)	0.5 (0.3–0.8)	0.2 (0.2–0.5)	1.0 (0.7–1.3)	0.3 (0.1–0.4)	0.5 (0.3–0.7)	0.3 (0.1–0.5)	0.3 (0.2–0.4)
3–5 y (n = 5910)	9.2 (8.3–10.1)	2.8 (2.3–3.4)	2.0 (1.7–2.5)	1.2 (0.8–1.6)	1.3 (1.0–1.7)	1.3 (0.9–1.7)	0.5 (0.3–0.8)	0.5 (0.3–0.8)	0.5 (0.3–0.7)	0.5 (0.3–0.7)
6–10 y (n = 9911)	7.6 (7.0–8.2)	1.9 (1.6–2.3)	1.5 (1.2–1.8)	1.3 (1.1–1.6)	1.1 (0.87–1.4)	0.8 (0.6–1.1)	0.5 (0.3–0.7)	0.4 (0.3–0.5)	0.4 (0.3–0.5)	0.3 (0.2–0.5)
11–13 y (n = 6716)	8.2 (7.4–9.0)	2.3 (1.9–2.8)	1.4 (1.1–1.8)	1.7 (1.3–2.1)	1.2 (1.0–1.6)	0.5 (0.4–0.8)	0.6 (0.4–0.8)	0.4 (0.3–0.6)	0.7 (0.5–0.9)	0.6 (0.4–0.8)
2:14 y (n = 10,514)	8.6 (7.9–9.3)	1.7 (1.4–2.1)	1.6 (1.3–1.9)	2.0 (1.7–2.5)	1.2 (0.9–1.5)	0.4 (0.2–0.5)	0.6 (0.4–0.9)	0.4 (0.3–0.6)	0.3 (0.2–0.4)	0.3 (0.2–0.4)
P	.0000	.0001	.0504	.0000	.0000	.0000	.1045	.7700	.0089	.0509

Prevalence among children surveyed with food allergy										
All ages (N = 3339)	—	25.2 (23.3– 27.1)	21.1 (19.4– 22.8)	17.2 (15.6– 18.9)	13.1 (11.7– 14.6)	9.8 (8.5–11.1)	6.2 (5.2–7.3)	5.3 (4.4–6.3)	5.0 (4.2–6.0)	4.6 (3.8–5.6)
0–2 y (n = 469)	—	22.2 (17.4– 27.8)	31.5 (26.6– 36.8)	7.5 (4.7–11.9)	5.4 (3.6–8.1)	15.8 (12.0– 20.4)	4.0 (2.3–6.9)	7.5 (5.2–8.2)	4.0 (2.2–7.2)	4.2 (2.7–6.5)
3–5 y (n = 539)	—	30.3 (25.8– 35.3)	22.1 (18.3– 26.5)	12.9 (9.7– 16.9)	14.3 (11.1– 18.2)	13.7 (10.5– 17.6)	5.7 (3.8–8.6)	5.5 (3.6–8.2)	5.0 (3.2–7.7)	5.1 (3.3–7.8)
6–10 y (n = 847)	—	25.5 (22.0– 29.5)	19.6 (16.6– 23.0)	17.1 (14.0– 20.6)	14.3 (11.6– 17.5)	11.1 (8.6– 14.3)	6.2 (4.5–8.5)	4.8 (3.4–6.9)	5.0 (3.5–7.1)	4.0 (2.6–6.2)
11–13 y (n = 584)	—	28.1 (23.7– 32.9)	17.7 (14.2– 22.0)	20.4 (16.8– 24.7)	15.2 (12.0– 19.2)	6.6 (4.4–9.9)	7.0 (4.8–10.1)	4.6 (3.1–6.8)	8.2 (5.9–11.2)	6.9 (4.7–10.0)
2:14 y (n = 900)	—	20.2 (17.0– 23.7)	18.4 (15.3– 22.1)	23.8 (20.1– 27.9)	13.4 (10.7– 16.6)	4.1 (2.9–5.9)	7.2 (5.2–9.8)	4.9 (3.3–7.3)	3.3 (2.1–5.0)	0.3 (0.2–0.4)
P	—	.0050	.0001	.0000	.0010	.0000	.4646	.4486	.0174	.1296

Common food allergens are those reported with a frequency of $n > 150$.

From Gupta R, Springston EE, Warrier MR, et al. The prevalence, severity and distribution of childhood food allergy in the United States. *Pediatrics* 2011;128(1):e13; with permission.

SPECIFIC FOOD ALLERGIES

Nut Allergies

Peanut allergy is the most common cause of food-induced anaphylaxis.²¹ Exposure to peanuts can occur in various ways.

Direct contact

- The most common cause of peanut allergy is eating peanuts or peanut-containing foods. Sometimes direct skin contact with peanuts can trigger an allergic reaction. This situation may occur at school, arranged outings, or special occasions or in public.

Cross-contact

- Cross-contact is the unintended introduction of peanuts into a product. It is generally the result of a food being exposed to peanuts during processing or handling. Manufacturers are required by law to label foods that may have been processed in a factory where peanuts have been handled or available.¹⁸

Inhalation

- An allergic reaction may occur if inhaling dust or aerosols containing peanuts, from a source such as peanut flour or peanut oil cooking spray. It behooves individuals with severe peanut allergies to cleanse and prepare their cooking environment accordingly.²¹

Suffice it to say that eating foods outside a controlled environment for any individual with peanut allergies requires vigilance and education. Many improvements to safeguarding the environment for individuals with severe peanut allergies have been made, especially in restaurants, sports and recreational centers, and camps, among others.^{22–24}

Peanut allergy risk factors include the following:

Age

- Food allergies are most common in children, especially toddlers and infants. With age, the digestive system matures, and the body is less likely to react to food that triggers allergies.

Past allergy to peanuts

- Some children with peanut allergy outgrow it. Even if they seem to have outgrown peanut allergy, however, it may recur.

Other allergies

- If already allergic to one food, there may be increased risk of becoming allergic to another. Likewise, having another type of allergy, such as hay fever, increases the risk of having a food allergy.

Family members with allergies

- There is increased risk of peanut allergy if other allergies, especially other types of food allergies, are common in a family.

Atopic dermatitis

- Some people with the skin condition atopic dermatitis (eczema) also have a food allergy.²¹

Given the prevalence of peanuts in society, schools have taken initiative in safeguarding the environment for those individuals afflicted with life-threatening peanut allergies.²² **Box 3** lists pitfalls to avoid when faced with severe peanut allergies.

Box 3**Pitfalls to avoid when faced with severe, life-threatening peanut allergies**

1. Eating unlabeled foods
2. Accidental contamination of other foods (eg, jam, butter, or of eating utensils, food trays, table, and toys)
3. Unpackaged foods, such as buffet foods, free samples at grocery stores, and foods at pot luck dinner
4. Contamination during food preparation
5. Contamination during serving – using same utensil for a peanut and non-peanut-containing food
6. Trusting a nonpreparer of food to assert safety of the food (waiter, flight attendant, friend, etc.)
7. Trying a food to see if “still allergic” especially with an anaphylactic allergy.
8. Vending machines may have different foods at different times – thus, foods may be contaminated with traces of nuts if there were nuts in the dispensing machine before.
9. Nonfood sources of peanut, such as homemade playdough, homemade scented crayons, cosmetics or fishing lures with peanut, peanut shell stuffing in bean bags, draft stoppers, stuffed toys, peanut in animal food (eg, hamster, gerbil and bird food granules).

Adapted from FAQ about Food Allergies and District Food Guidelines. Forest Hills School District. Available at: <http://www.foresthills.edu/userfiles/1522/FAQ%20about%20Food%20Allergies%20and%20District%20Food%20Guidelines.pdf>. Accessed January 5, 2016.

Reducing the risk for anaphylaxis among peanut allergy sufferers is the ultimate goal. Recent advances in rendering the peanut itself less allergenic have been reported.²⁵

Schools are the most common gathering place for children outside their respective homes. Food policies have evolved rapidly over the past decade to minimize exposure to the most common food allergens: peanuts, nuts, milk, and eggs.²⁶ Notices are now sent at the beginning of the school year reminding parents to not send nut-containing snacks or dairy products to school with their kids. Examples of such notices are listed in **Boxes 4** and **5**.²⁶ Replacing peanut oil at many schools with canola oil is now commonplace.²⁷

Milk Allergies

The second most common food allergen, CMA, can develop in exclusively or partially breastfed infants, when cow milk protein is introduced into the feeding regime. The incidence of CMA is lower in exclusively breastfed infants compared with formula-fed or mixed-fed infants, and clinical reactions in the breastfed group are mostly mild to moderate. This might be related to lower levels of cow milk protein in breast milk compared with cow milk. Immunomodulators in breast milk and differences in gut flora between breastfed and formula-fed infants may also play a role.²⁸

CMA results from an immunologic reaction to 1 or more milk proteins. Common offending milk proteins include whey and casein.²⁹ This immunologic basis distinguishes CMA from other adverse reactions to cow milk protein, such as lactose intolerance.²⁸

Clinical reactions can be either immediate or delayed. Immediate reactions occur less than 2 hours after ingestion. The most frequent manifestations are immunoglobulin E (IgE)-mediated cutaneous (urticaria, angioedema, or acute flare-up of atopic eczema) and gastrointestinal (vomiting, diarrhea, or colic) reactions.²⁸ Anaphylaxis is a potential reaction and happens almost immediately (within minutes and up to 2 hours) after the ingestion of cow milk or dairy.³⁰

Box 4**Milk and egg avoidance strategies**

Anaphylactic reactions to milk and egg can occur when small quantities are ingested. Therefore, the allergic child must avoid all traces of milk/egg. Direction from Anaphylaxis Canada is that products containing milk and eggs are ones that are not to be banned or restricted, because trying to eliminate them is both unrealistic and a burden for the wider community.

Risk Reduction Strategies***Milk***

It is imperative for teachers to collaborate with parents/guardians to establish suitable risk reduction strategies, along with following key safety rules, such as

- Carrying epinephrine autoinjector and not to eat without the autoinjector
- Wearing medical identification, such as a MedicAlert bracelet
- Eating only food items approved by parents/guardians
- Not trading or sharing foods, utensils, or food containers
- Washing hands before and after eating

Elementary schools have adopted different strategies to reduce the risk of exposure for milk and egg allergic children.

Milk products

Where milk products are allowed in classrooms, the following practices are implemented to reduce the risk:

- Children are given straws to put in bevel-topped milk containers (which are distributed through milk programs) and are taught to close the top once the straw is inserted.
- Children who bring milk from home are asked to bring it in a plastic bottle with a straw.
- Children at risk for milk allergy sit at a table where spillable milk products are not being consumed. Alternatively, they sit at the same table but not directly beside classmates who have spillable milk products (eg, milk and yogurt).
- Some parents of milk allergic children either take their child home for lunch on pizza days (where they have this option); others send their child with a homemade milk-free pizza or an alternative snack so they can still participate. Special care should be taken to ensure that children properly wash their hands after pizza lunches.

Risk Reduction Strategies: Egg

It is imperative for teachers to collaborate with parents/guardians to establish suitable risk reduction strategies.

Some food products that may contain egg protein are bread brushed with egg white; deli meats with egg; drinks, such as orange julep; and egg substitutes. Nonfood items that may contain egg protein include egg tempera paints, cosmetics, and shampoo.

In classrooms where there are egg-allergic children, parents and staff have worked to reduce the risk of accidental exposure by

- Avoiding egg in cooking classes or egg shells in craft activities (these includes both egg whites and yolks, either cooked or raw).
- Selecting activities that do not involve the use of egg for special activities (eg, Easter egg decorating or hunts [with real eggs]).
- Seating children with egg allergy away from those who bring eggs for lunch or snack (eg, hard boiled and egg salad sandwiches) or whose food may contain eggs (eg, mayonnaise).

Adapted from Canadian Society of Allergy and Clinical Immunology. Anaphylaxis in schools & other settings, 3rd edition. Available at: http://www.aaia.ca/en/Anaphylaxis_3rd_Edition.pdf.

Box 5**Peanuts and tree nuts avoidance strategies***Background*

- Peanut allergy requires stringent avoidance and management plans, because it is one of the most common food allergies in children, adolescents, and adults.
- Reactions to peanuts are often more severe than to other foods.
- Peanut has been a leading cause of severe, life-threatening, and even fatal allergic reactions.
- Minute quantities of peanut, when ingested, can result in a life-threatening reaction.
- Cross-contamination is more likely to occur with peanut butter due to the adhesive nature of the peanut protein to other foods/surfaces.

For any of the signs and/or symptoms observed with an anaphylactic child, the first response is to follow the anaphylaxis emergency treatment plan, ACT:

- Administer the epinephrine autoinjector.
- Call 911, stating there is a child with anaphylaxis.
- Transport to hospital in an ambulance.

Sample strategies to reduce the risk of exposure to peanuts and tree nuts in the classroom and common school areas

- Communication (by letter, newsletter, school Web site, and so forth) is sent to each family in the school outlining that the school has students with life-threatening allergies to peanuts/tree nuts and requesting parent/guardian support in making the school a minimized allergen environment by not sending or bringing food products that contain or may contain peanuts and/or tree nuts.
- Include reminder items during holiday times and celebrations that the school is a minimized allergen environment and food items with peanut/tree nuts should not be brought on school site.
- Provide parents of students in an allergic child's class with information about how they can assist in supporting a safe learning environment. This communication should come directly from the school administration, not from parents of the allergic child.
- Inform parents that food items should not contain traces of peanuts/nuts for celebrations (eg, birthdays).
- Stress with staff to be vigilant in not having food items with peanuts and other nuts in the school and not to bring food products that may contain the allergen (eg, baked goods, such as donuts or cookies from doughnut shops) to staff meetings/lunches or special occasions (eg, birthdays).
- School fundraisers should avoid products containing the allergens (eg, peanuts and tree nuts) that the school is trying to minimize (eg, chocolate almonds).
- Teachers, particularly in the primary grades, should be aware of the possible peanut/nut allergens present in curricular materials
 - Playdough
 - Bean bags and stuffed toys (peanut shells are sometimes used)
 - Counting aids (beans and peas)
 - Science projects
 - Special seasonal activities
- Students with anaphylaxis should not be involved in garbage disposal, yard clean-ups, or other activities that could bring them into contact with food wrappers, containers, or debris.
- Foods are often stored in lockers and desks. Allowing anaphylactic students to keep the same desk all year may help prevent accidental contamination.

List of peanut/tree nut-free items

Recommendations are NOT to provide a list of “safe” peanut/tree nut-free snacks and so forth. The contents of products and the lines on which they are produced change often and cannot always guarantee that their product is peanut/tree nut-free. The best advice is to request the parents/caregivers read the contents of the packages and where it says, “may contain: nut products” – please do NOT send.

Adapted from Canadian Society of Allergy and Clinical Immunology. Anaphylaxis in schools & other settings, 3rd edition. Available at: http://www.aaia.ca/en/Anaphylaxis_3rd_Edition.pdf.

Delayed reactions are immunologic, non-IgE-mediated reactions and occur several hours, even days, after milk consumption. Skin and gastrointestinal manifestations are most commonly observed, typically inducing flare-ups of eczema or conditions, known as food protein-induced enterocolitis, enteropathy, and proctocolitis.³⁰

Diagnostic testing for milk allergies is discussed in detail elsewhere.²⁹ Skin prick testing (SPT) and radioallergosorbent test (RAST) (blood test used to determine the substances a subject is allergic to) are typical diagnostic standards of care. A summary of the recommendations for diagnostic testing is as follows:

- A formal challenge with cow milk remains the best diagnostic test.
- Food challenge should be performed with physician supervision regardless of food-specific IgE value.
- In settings where oral food challenge is not considered a requirement for making a diagnosis of IgE-mediated complementary and alternative medicine, a positive SPT and/or RAST can be used as diagnostic tests in cases of high pretest probability.
- In such settings, a negative SPT and/or RAST with whole milk can be used as rule-out tests in case of low pretest probability.
- In any case of high uncertainty, food challenges remain necessary.^{28,29}

DIAGNOSIS

Diagnosis is typically based on clinical presentation (symptoms are discussed previously) and/or further allergen testing.

Food Allergen Challenge Test

For all individuals with suspected food allergies, a food allergen challenge test is usually recommended (Fig. 2).

Allergists typically administer this test in an office or, more rarely, in a hospital's intensive care setting. The procedure involves having the patient ingest a food item that has the presumed allergenic food substance within.

Double-blind, placebo-controlled testing is best undertaken to eliminate bias, such that the patient and physician are unaware of which food item contains the offending food allergen.³¹ Reactions, if any, are documented and measured. If this initial test is negative for any reaction, an open challenge test can be administered where the patient knowingly ingests a food substance thought to induce allergic reactions. Should this test prove negative as well, the patient is not deemed allergic and is encouraged to consume age-appropriate amounts of the food substance on a regular basis.

Precautionary measures include advising individuals to carry an epinephrine auto-injector (EpiPen) for several months after having established a negative allergy test as a backup for unexpected reactions.³²

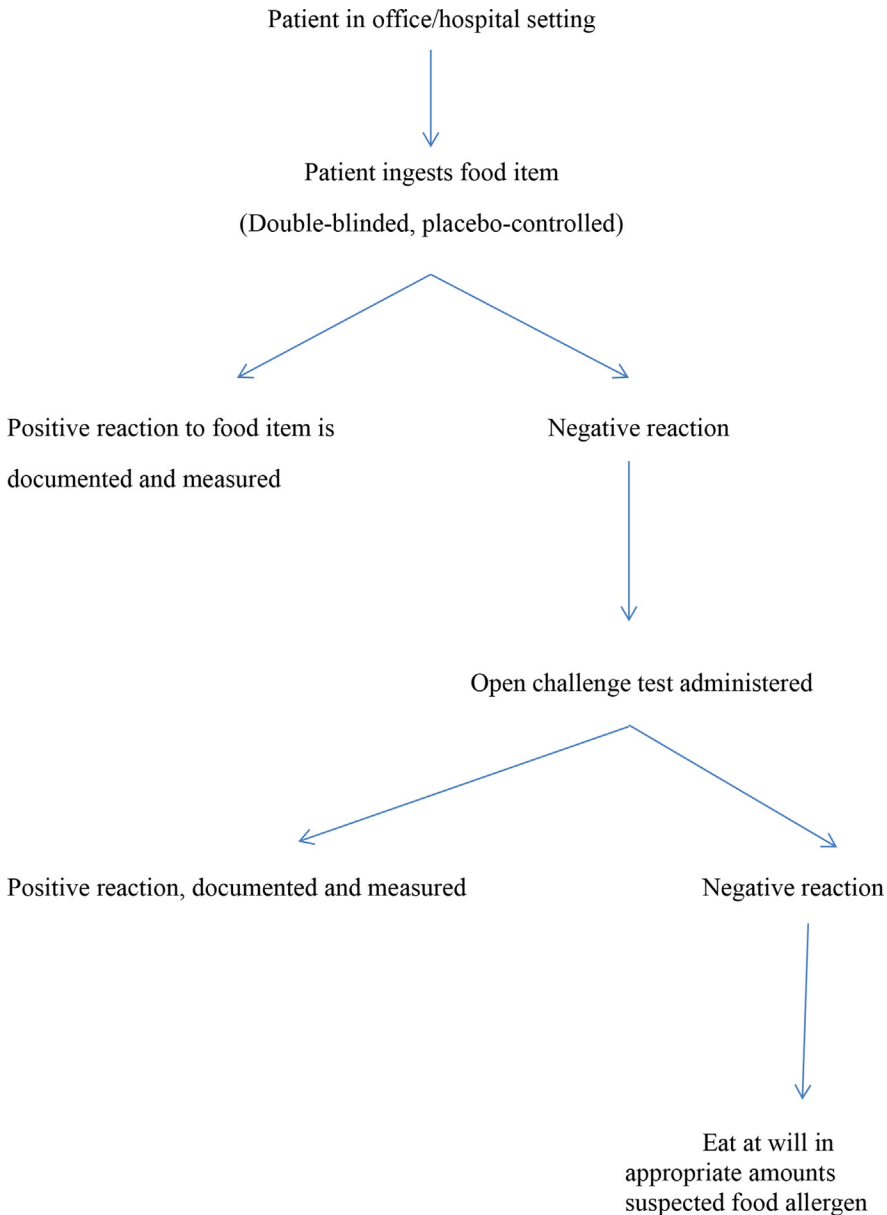


Fig. 2. Food allergen challenge test.

This type of allergy testing is not suitable for all allergic individuals. The following types of patients are not good allergy testing candidates:

- Patients with known or suspected multiple food or other allergies might develop a reaction to 1 or more food substances but there is no way to decipher which food substance generated the reaction.
- Asthma patients are deemed high risk, because allergic-type reactions might exacerbate underlying asthma and cause severe wheezing.

- Any individual taking antihistamines should cease this class of medication for 1 week prior to the test to eliminate false-negative results.^{31,32}

Risk of allergy testing is obvious: any reaction, whether of mild, moderate or severe intensity, poses a risk to an allergic individual. Anaphylaxis can occur anytime within a 2-hour window after administration of the food challenge. Thus, medical personnel and appropriate medications (diphenhydramine, epinephrine, albuterol, prednisone, or prednisolone) should be on hand and readily available for immediate as-needed administration.^{31,32}

TREATMENT OF FOOD ALLERGIES

Identification of a particular food allergy can sometimes be a tiresome task. With wheat, eggs, nuts, dairy, and so forth being components of so many different products, it is imperative to instruct patients to be fastidious in food selection and preparation and also in food journaling. Initially, to help determine what food allergy may exist, patients should do the following:

- For at least 2 weeks, write down everything they eat or drink. Write down how much they eat and when, how the food was prepared, and how they feel throughout the day and even the next day.
- Next, start an elimination diet by removing common foods from the diet—one at a time—for 2 to 6 weeks per food item. Note any improvement in symptoms and make a note of which food eliminations preceded the improvements.
- If food allergies are severe, once personal food triggers have been identified, avoid them permanently.
- If food allergies are mild to moderate, move on to the next step, which is reintroducing foods to retest and confirm food triggers and to re-evaluate the body's immune system response to them. To do this, add each of the trigger foods back into the diet, 1 food per day. Eat the suspect food as part of at least 2 meals that day, making sure to not introduce other potential allergens at the same time. Record the date and time each food is reintroduced and note any immediate and delayed reactions experienced.
- If a reaction is experienced to a particular food, eliminate it from the diet permanently. Before any new food is reintroduced, make sure that to have been symptom-free for at least 2 days. Repeat this testing with all the suspected trigger foods until figuring out exactly which ones cause the food intolerance or food allergy symptoms.³³

Not all patients can reintroduce the offending food allergen into their diet. A severe, life-threatening food allergy requires life-preserving precautions, such as carrying an EpiPen, wearing a bracelet signifying a severe food allergy, and confirming every food item is completely free of the food allergen(s). There is a growing movement, however, to attempt reintroduction of foods that cause allergies in graduated, incrementally tiny doses. Dr Kari Nadeau, an allergist-immunologist at Stanford University, has attempted this process with ongoing successes.³⁴ This process is known as food oral immunotherapy and is being studied as a way to help treat food allergies. Under close supervision, a person takes in small daily doses of a food allergen by mouth or under the tongue. The goal is to try to make the immune system tolerate the allergen so that the body does not react as badly to it. This is called desensitization (discussed later). Now the paradigm of avoidance of specific, common food allergens in infancy, such as nuts, is being reversed, with exposure to peanuts and nut products in infancy considered a good thing among allergists.³⁵

Strategies Designed to Alter the Immune Response to Food Allergens

Oral immunotherapy (discussed previously) is the most studied approach to modulating the immune system response to specific food allergens.³⁶ This approach has been discussed in detail elsewhere.³⁶ Increased amounts of the particular food allergen(s) are given in rapid fashion over a short course, followed by escalation of doses within a 2-week time frame, with the maintenance phase lasting up to several months to years.³⁶

Clinical desensitization is the confirmation of the body's immune system responding less allergically to particular food allergen(s). Reduction in mast cell activity, basophil activation, and helper T cells along with changes in immunoglobulin profiles have been demonstrated.³⁶

Scientific trials are being undertaken regarding how best to prevent food allergies.

The Enquiring About Tolerance study aims to find out how to best prevent food allergy in young children.²⁹ The study aims to find out whether introducing certain foods early in a child's diet along with continued breastfeeding could stop infants developing food allergy.³⁷ In this double-blind, placebo-controlled study, 1302 children were enrolled, split into 2 groups: 1 group received allergenic foods as of age 3 months onward, along with breast milk; the other group received breast milk exclusively until age 6 months. Children were then monitored until age 3 years and the rate of food allergies monitored and compared. Results are pending.³⁷

Science has already confirmed that desensitization can occur for peanuts, milk, and eggs.^{38–40}

Functional tolerance to food allergens has also been clinically proved, such that after the appropriate desensitization period patients are able to consume certain amounts of food allergens on an ad hoc basis without generating an allergic-type reaction.⁴¹

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