

## Introduction to food allergies

Either food allergy or food intolerance affects nearly everyone at some point. When people have an unpleasant reaction to something they ate, they often think that they have an allergy to the food. Actually, however, only up to 3% of adults and 6%-8% of children have clinically proven true allergic reactions to food.

This difference between the prevalence of clinically proven food allergy and the public's perception of the problem is due primarily to misinterpreting food intolerance or other adverse food reactions to food as food allergy. A true food allergy is an abnormal response to food that is triggered by a specific reaction in the immune system and expressed by certain, often characteristic, symptoms. Other kinds of reactions to foods that are not food allergies include food intolerances (such as lactose or milk intolerance), food poisoning, and toxic reactions. Food intolerance also is an abnormal response to food, and its symptoms can resemble those of food allergy. Food intolerance, however, is far more prevalent, occurs in a variety of diseases, and is triggered by several different mechanisms that are distinct from the immunological reaction responsible for food allergy.

People who have food allergies must identify and prevent them because, although usually mild and not severe, these reactions can cause devastating illness and, in rare instances, can be fatal.

### How do allergic reactions to food occur?

The allergens in food are those components that are responsible for inciting an allergic reaction. They are proteins that usually resist the heat of cooking, the acid in the stomach, and the intestinal digestive enzymes. As a result, the allergens survive to cross the gastrointestinal lining, enter the bloodstream, and go to target organs, causing allergic reactions throughout the body. The mechanism of food allergy involves the immune system and heredity.

**Immune system:** An allergic reaction to food involves two components of the immune system. One component is a type of protein, an antibody called immunoglobulin E (IgE), which circulates through the blood. The other is the mast cell, a specialized cell that is found in all tissues of the body. The mast cell is especially common, however, in areas of the body that are typical sites of allergic reactions, including the nose and throat, lungs, skin, and gastrointestinal tract.

**Heredity:** The tendency of an individual to produce IgE against something seemingly as innocuous as food appears to be inherited. Generally, people with allergies come from families in which allergies are common -- not necessarily to food but perhaps allergies to pollen, fur, feathers, or drugs. Thus, a person with two allergic parents is more likely to develop food allergies than someone with one allergic parent.

**Mechanism:** Food allergy is a hypersensitivity reaction, meaning that before an allergic reaction to an allergen in food can occur, a person needs to have been exposed previously, that is, sensitized, to the food. At the initial exposure, the allergen stimulates lymphocytes (specialized white blood cells) to produce the IgE antibody that is specific for the allergen. This IgE then is released and attaches to the surface of the mast cells in different tissues of the body. The next time the person eats that food, its allergen hones in on the specific IgE antibody on the surface of the mast cells and prompts the cells to release chemicals such as histamine. Depending upon the tissue in which they are released, these chemicals cause the various symptoms of food allergy.

## What are the symptoms and signs of food allergy?

The complex process of digestion affects the timing, location, and particular symptoms of an allergic reaction to food. All of the symptoms of food allergy occur within a few minutes to an hour of eating. A food allergy can initially be experienced as an itching in the mouth and difficulty swallowing and breathing. Then, during digestion of the food in the stomach and intestines, symptoms such as nausea, vomiting, diarrhea, and abdominal pain can start. Incidentally, the gastrointestinal symptoms of food allergy are those that are most often confused with the symptoms of different types of food intolerance.

As mentioned previously, the allergens are absorbed and enter the bloodstream. When they reach the skin, allergens can induce hives or eczema, and when they reach the airways, they can cause asthma. As the allergens travel through the blood vessels, they can cause lightheadedness, weakness, and anaphylaxis, which is a sudden drop in blood pressure. Anaphylactic reactions are severe even when they start off with mild symptoms, such as a tingling in the mouth and throat or discomfort in the abdomen. They can be fatal if not treated quickly.

## Do infants and children have problems with food allergy?

Most allergies to foods begin in the first or second year of life. While some of these reactions may resolve over time (such as allergies to cow's milk or eggs), other food allergies acquired in infancy (such as allergies to nuts or shellfish) typically persist throughout life. Allergies to milk or soy formula (a milk substitute made from soybeans) sometimes occur in infants and young children. These early allergies sometimes do not involve the usual hives or asthma but rather can cause symptoms resembling infantile colic, and perhaps blood in the stool, or poor growth.

The clinical picture of infantile colic, which usually starts within one month of birth, is that of a crying child who sleeps poorly at night. The cause of colic is uncertain. A variety of psychosocial and dietary factors have been implicated, however, and allergy to milk or soy has been proposed as a cause of colic in a minority of infants with colic.

In infants, food allergy is usually diagnosed by observing the effect of changing the infant's diet; rarely, by using a food challenge. If the baby is on cow's milk, the doctor will suggest a change to soy formula or breast milk only, if possible. If the soy causes an allergic reaction, the baby can be placed on an elemental formula. These formulas are processed proteins and carbohydrates, basically amino acids and sugars, and contain few, if any, allergens.

**Breastfeeding:** Exclusive breastfeeding, that is, excluding all other foods, for at least the first four months of life appears to help protect high-risk children against milk allergy and eczema in the first two years of life. Breast milk contains less protein that is foreign to the infant and, therefore, is less allergenic than cow's milk or soy formula. Exclusive breastfeeding should be a consideration, therefore, especially in infants who are predisposed to food allergy. Some children are so sensitive to a certain food, however, that if the mother eats that food, sufficient quantities enter the breast milk to cause a reaction to the food in the child. In this situation, the mothers themselves must avoid eating those foods to which the baby is allergic. No conclusive evidence has been obtained that suggests that breastfeeding prevents the development of allergies later in life.

**Special considerations in children:** An allergic child who itches, sneezes, and wheezes a lot can feel miserable and, therefore, sometimes misbehave or appear hyperactive. At the other extreme, children who are on antiallergy medicines that can cause drowsiness may become sleepy in school or at home. Parents and caregivers must understand these different behaviors, protect the children from the foods that induce their allergies and know how to manage an allergic reaction, including how to

administer epinephrine. Also, schools need to have plans in place to address emergencies, including anaphylactic shock.

### **What are the most common food allergies?**

**In adults, the most common foods that cause allergic reactions are** shellfish, such as shrimp, crayfish, lobster, and crab; nuts from trees, such as walnuts; fish; eggs; and peanuts, a legume that is one of the chief foods that cause serious anaphylactic reactions. In highly allergic people, even minuscule amounts of a food allergen (for example, 1/44,000 of a peanut kernel) can evoke an allergic reaction. Less sensitive people, however, may be able to tolerate small amounts of a food to which they are allergic.

In children, the pattern is somewhat different from adults, and the most common foods that cause allergic reactions are eggs, milk, peanuts, and fruits, particularly tomatoes and strawberries. Children sometimes outgrow their allergies, but adults usually do not lose theirs. Also, children are more likely to outgrow allergies to cow's milk or soy formula than allergies to peanuts, fish, or shrimp. Adults and children tend to react to those foods they eat more often. For example, in Japan, allergy to rice, and in Scandinavia, allergy to codfish, is more common than elsewhere.

### **What is cross-reactivity?**

Cross-reactivity is the occurrence of allergic reactions to foods that are chemically or otherwise related to foods known to cause allergy in an individual. If someone has a life-threatening reaction to a certain food, the doctor will counsel that patient to avoid related foods, which also might induce the same reaction. For example, if a person has a history of a severe allergy to shrimp, he or she can also possibly be allergic to crab, lobster, and crayfish.

### **What is oral allergy syndrome?**

The oral allergy syndrome is another type of cross-reactivity. This syndrome occurs in people who are highly sensitive, for example, to ragweed or birch pollen. During the seasons that these allergens pollinate, the affected individual may find that when he or she tries to eat fruits, chiefly melons and apples, a rapid onset of itching is experienced in the mouth and throat, and the fruit cannot be eaten. The oral allergy syndrome is also known as or pollen-food allergy syndrome and is thought to be a type of contact allergy related to the presence of proteins in certain foods that cross react with allergy-causing pollen proteins. Oral allergy syndrome occurs in up to 50% of those who have allergic rhinitis caused by pollen. Symptoms are immediate upon ingestion of fresh or uncooked foods and include the itching, irritation, and mild swelling of the lips, tongue, palate, and throat. Cooked fruits and vegetables usually do not cause the reaction. The symptoms usually go away within minutes, although up to 10% of people will develop systemic (body-wide) symptoms, and a small number (1%-2%) may experience anaphylactic shock. Tree nuts and peanuts tend to cause more severe reactions than other foods

### **What is exercise-induced food allergy?**

Exercise can induce an allergic reaction to food. The usual scenario is that of a person eating a specific food and then exercising. As he exercises and his body temperature increases, he begins to itch, gets lightheaded, and soon develops the characteristic allergic reactions of hives, asthma, abdominal symptoms, and even anaphylaxis. This condition has been referred to as food dependent, exercise-induced anaphylaxis (FDEIA), and is most common in teens and young adults. The cure, actually a preventive measure, for exercise-induced food allergy is simple -- not eating for at least two hours before exercising.

## What conditions have mistakenly been attributed to food allergy?

Studies have shown that individuals who are prone to migraines can have their headaches brought on by histamine, which is one of the compounds that mast cells produce in an allergic reaction. The theory that food allergies can cause migraine headaches, however, is unproven. There is also inadequate scientific evidence to support the claims that food allergies can cause or aggravate rheumatoid arthritis, osteoarthritis, tension-fatigue syndrome, cerebral allergy (headaches and difficulty concentrating), environmental-toxic reactions, or hyperactivity in children.

## What conditions mimic food allergy?

There are many conditions that can mimic food allergy. It is critical to distinguish true food allergy from other abnormal responses to food, that is, from food intolerance, which can occur in a variety of other illnesses or food poisoning, which occurs when contaminated food is ingested. If a patient says to the doctor, "I think I have a food allergy," the doctor has to consider a number of diagnoses. The possibilities include not only food allergy but also any other diseases that have symptoms brought on by food. These include reactions to certain chemicals in food for example, histamine or food additives, food poisoning, several other gastrointestinal diseases, and psychological symptoms.

**Histamine toxicity:** Some natural substances (for example, histamine) in foods can cause reactions resembling allergy. Histamine can reach high levels in cheese, some wines, and certain fish, particularly tuna and mackerel. In fish, the histamine is believed to stem from bacterial contamination, especially in fish that has not been refrigerated properly. Remember that mast cells release histamine in an allergic reaction. If a person eats a food that contains a high level of histamine, therefore, he may develop histamine toxicity, a response that strongly resembles an allergic reaction to food. Histamine toxicity has been referred to as pseudoallergic fish poisoning and accounts for over one-third of seafood-related food-borne illnesses, according to the U.S. Centers for Disease Control and Prevention (CDC).

**Food additives:** Another type of food intolerance is an adverse reaction to certain compounds that are added to food to enhance taste, provide color, or protect against the growth of microorganisms. Consumption of large amounts of these additives can produce symptoms that mimic the entire range of allergic symptoms. (Although some doctors attribute hyperactivity in children to food additives, the evidence is not compelling, and the cause of this behavioral disorder remains uncertain.)

The compounds most frequently tied to adverse reactions that can be confused with food allergy are yellow dye number 5, monosodium glutamate (MSG), and sulfites. Yellow dye number 5 can cause hives, although rarely. MSG enhances flavor, but when consumed in large amounts, can cause flushing, sensations of warmth, lightheadedness, headache, facial pressure, pain in the chest, and feelings of detachment. These symptoms occur soon after eating large amounts of food containing added MSG and are temporary.

Sulfites occur naturally in some foods and are added to others to enhance crispness or prevent the growth of mold. In high concentrations, sulfites can pose problems for people with severe asthma. The sulfites emit a gas called sulfur dioxide, which the asthmatic inhales while eating the food containing sulfites. This gas irritates the lungs and can induce in an asthmatic a severe constriction of the air passages to the lungs (bronchospasm), making breathing very difficult. Such reactions led the U.S. Food and Drug Administration (FDA) to ban the use of sulfites as spray-on preservatives for fresh fruits and vegetables. Sulfites, however, are still added to some foods, and they also form during the fermentation of wine.

**Food poisoning:** Eating food that is contaminated with microorganisms, such as bacteria, and their products, such as toxins, is the usual cause of food poisoning. Thus, the ingestion of contaminated eggs, salad, milk, or meat can produce symptoms that mimic food allergy. Common microbes that can cause food poisoning include the noroviruses, *Campylobacter jejuni*, Salmonella, *Listeria monocytogenes*, *Vibrio vulnificus*, and E. coli 0157:H7.

**Lactase deficiency (lactose intolerance):** Another cause of food intolerance, which often is confused with a food allergy, specifically to milk, is lactase deficiency. This common food intolerance affects at least one out of 10 people. Lactase is an enzyme in the lining of the small intestine. This enzyme digests or breaks down lactose, a complex sugar in milk, to simple sugars, which are then absorbed into the blood. If a person has lactase deficiency, he does not have enough lactase to digest the lactose in most milk products. Instead, other bacteria in the intestine use the undigested lactose, thereby producing gas. Symptoms of lactose intolerance include bloating, abdominal pain, and diarrhea. In a diagnostic test for lactase deficiency, the patient ingests a specific amount of lactose. Then, by analyzing a blood sample for simple sugars, the doctor determines the patient's ability to digest the lactose and absorb the simple sugars. A lower than normal value usually means a lactase deficiency.

**Gluten-sensitive enteropathy:** Intolerance to gluten occurs in a disease called gluten-sensitive enteropathy, or celiac sprue. Gluten-sensitive enteropathy is caused by a unique abnormal immune response to certain components of gluten, which is a constituent of the cereal grains wheat, rye, and barley. Although sometimes referred to as an allergy to gluten, this immune response involves a branch of the immune system that is different from the one involved in a classical food allergy. The patients have an abnormality in the lining of the small intestine and experience diarrhea and malabsorption, especially of dietary fat. The treatment for this condition involves the avoidance of dietary gluten.

**Other gastrointestinal diseases:** Several other gastrointestinal diseases produce abdominal symptoms (especially nausea, vomiting, diarrhea, and pain) that are sometimes caused by food. These diseases, therefore, can resemble food allergies. Examples include peptic ulcer, gallstones, non-ulcer dyspepsia (which is a type of indigestion), Crohn's disease (regional enteritis), cancers of the gastrointestinal tract, and a rare condition called eosinophilic gastroenteritis.

**Psychological:** Some people have a food intolerance that has a psychological origin. In these people, a careful psychiatric evaluation may identify a traumatic event in that person's life, often during childhood, tied to eating a particular food. The eating of that food years later, even as an adult, is associated with a rush of symptoms that can resemble an allergic reaction to food.

### **How is food allergy diagnosed?**

To diagnose food allergy, a doctor first must determine if the patient is having an adverse reaction to specific foods. The doctor makes this assessment with the help of a detailed history from the patient, the patient's dietary diary, or an elimination diet. He or she then confirms the diagnosis by the more objective skin tests, blood tests, or food challenges.

**History:** The history usually is the most important diagnostic tool in diagnosing food allergy. The physician interviews the patient to determine if the facts are consistent with a food allergy. The doctor may ask the following questions:

- What was the timing of the reaction? Did the reaction come on quickly, usually within an hour after eating the food?
- Was treatment for allergy successful? For example, if hives stem from a food allergy,

antihistamines should relieve them.

- Is the reaction always associated with a certain food?
- Did anyone else get sick? For example, if the person has eaten fish contaminated with histamine, everyone who ate the fish should be sick. In an allergic reaction, however, only the person allergic to the fish becomes ill.
- How much did the patient eat before experiencing a reaction? The severity of the patient's reaction can sometimes relate to the amount of the suspect food eaten.
- How was the food prepared? Some people will have a violent allergic reaction only to raw or undercooked fish. A thorough cooking of the fish destroys those allergens in the fish to which they react, so that they then can eat it with no allergic reaction.
- Were other foods eaten at the same time as the food that caused the allergic reaction? Fatty foods can delay digestion and thus delay the onset of the allergic reaction.

**Dietary diary:** Sometimes, a history alone cannot determine the diagnosis. In that situation, the doctor may ask the patient to keep a record of the contents of each meal and whether reactions occurred that are consistent with allergy. The dietary diary provides more details than the oral history, so that the doctor and patient can better determine if there is a consistent relationship between a food and the allergic reactions.

**Elimination diet:** The next step that some doctors use is an elimination diet. Under the doctor's direction, the patient does not eat a food suspected of causing the allergy, for example, eggs, and substitutes another food, in this instance, another source of protein. If after the patient removes the food, the symptoms go away, the doctor almost always can make a diagnosis of food allergy. If the patient then resumes eating the food (still under the doctor's direction) and the symptoms return, this sequence confirms the diagnosis. The patient should not resume eating the food, however, if the allergic reactions have been severe because this re-challenge is too risky. This technique is also not suitable if the allergic reactions have been infrequent.

If the patient's history, dietary diary, or elimination diet suggests that a specific food allergy is likely, the doctor then will use tests, such as skin tests, blood tests, and a food challenge, which can more objectively confirm an allergic response to food.

**Skin tests:** In a scratch-the-skin test, a dilute extract of the suspected food is placed on the skin of the forearm or back. This portion of the skin then is scratched with a needle and observed for swelling or redness, which would signify a local allergic reaction to the food. A positive scratch test indicates that the patient has the IgE antibody that is specific for the food being tested on the skin's mast cells. Skin tests are rapid, simple, and relatively safe.

A person can have a positive skin test to a food allergen, however, without experiencing allergic reactions to that food. A doctor diagnoses a food allergy only when the patient has a positive skin test to a specific allergen and the history suggests an allergic reaction to the same food. In some highly allergic people, however, especially if they have had anaphylactic reactions, skin tests should not be done because they could provoke another dangerous reaction. Skin tests also cannot be done in patients with extensive eczema.

**Blood tests:** In those situations where skin tests cannot be done, a doctor may use blood tests such as the RAST and the ELISA. These tests measure the presence of food-specific IgE antibodies in the blood of patients, but they cost more than skin tests, and the results are not available immediately. As with positive skin tests, positive blood tests make the diagnosis of a specific food allergy only when the clinical history is compatible.

**Food challenge:** The double-blind food challenge has become the gold standard for objective allergy

testing. (Some physicians prefer the term double-masked, rather than double-blind.) In this test, various foods, some of which are suspected of inducing an allergic reaction, are placed in individual opaque capsules. Both the patient and the doctor are blinded, so that neither of them knows which capsules contain the suspected allergens. (The capsules are prepared by another medical worker.) The patient swallows a capsule and the doctor then observes whether an allergic reaction occurs. This process is repeated with each capsule. Alternatively, the food to be tested may be disguised in another type of food to which the person is not allergic.

The advantage of a food challenge is that if the patient has an allergic reaction only to the suspected foods and not to the other foods tested, the diagnosis of food allergy is confirmed. Just as with a re-challenge after the elimination diet and with the skin tests, however, someone having a history of severe reactions should not be tested with a food challenge because of the danger of inducing another severe reaction. In addition, this procedure is expensive because it is difficult and requires a lot of time, especially for patients with multiple food allergies. This type of test must also be done under the careful supervision of a physician. Consequently, double-blind food challenges are done infrequently. They are done most commonly, however, when the doctor wishes to obtain evidence to confirm the suspicion that the patient's symptoms are not due to a food allergy. Then, additional efforts may be directed at finding the real cause of the patient's symptoms.

- [epinephrine auto-injector, Epi E-Z Pen, Epipen](#) - Consumer information about the medication EPINEPHRINE AUTO-INJECTOR (Epi E-Z Pen, Epipen), includes side effects, drug interactions, recommended dosages, and storage information. Read more about the prescription drug EPINEPHRINE AUTO-INJECTOR.
- [ELISA Tests](#) - ELISA stands for "enzyme-linked immunosorbent assay." This is a rapid immunochemical test that involves an enzyme (a protein that catalyzes a biochemical reaction). It also involves an antibody or antigen (immunologic molecules).
- [Abdominal Pain](#) - Learn about abdominal pain (pain in the stomach / abdomen) including causes, symptoms, how abdominal pain is diagnosed, and how abdominal pain is treated.

## How is food allergy treated?

**Dietary avoidance:** Avoiding the offending allergen in the diet is the primary treatment of food allergy. Once a food to which the patient is sensitive has been identified, the food must be removed from the diet. To do this, affected people need to read lengthy, detailed lists of ingredients on the label for each food they consider eating. Many allergy-producing foods such as peanuts, eggs, and milk appear in foods that are not ordinarily associated with them. For example, peanuts often are used as protein supplements, eggs are found in some salad dressings, and milk is in bakery products. The FDA requires that the ingredients in a food be listed on its label. People can avoid most of the foods to which they are sensitive if they carefully read the labels on foods and, when in restaurants, avoid ordering foods that might contain ingredients to which they are allergic.

**Treating an anaphylactic reaction:** People with severe food allergies must be prepared to treat an anaphylactic reaction. Even those who know a lot about their own allergies can either make an error or be served food that does not comply with their instructions. To protect themselves, people who have had anaphylactic reactions to a food should wear medical alert bracelets or necklaces stating that they have a food allergy and that they are subject to severe reactions. These individuals also always should carry a syringe of adrenaline ([epinephrine](#) [EpiPen]), obtained by prescription from their doctors, and be prepared to self-administer it if they think they are developing an allergic reaction. They then should immediately seek medical help by either calling the rescue squad or having themselves transported to an emergency room.

**Treating other symptoms of food allergy:** Several medications are available for treating the other

symptoms of food allergy. For example, antihistamines can relieve gastrointestinal symptoms, hives, sneezing, and a runny nose. Bronchodilators can relieve the symptoms of asthma. These medications are taken after a person inadvertently has ingested a food to which he is allergic. They are not effective, however, in preventing an allergic reaction when taken prior to eating the food. In fact, no medication in any form is available to reliably prevent an allergic reaction to a certain food before eating that food.

### **Are allergy shots effective in preventing or decreasing food allergy?**

Allergy shots, a form of treatment known as immunotherapy, involve injecting small quantities of substances to which the patient is allergic. The shots are given regularly for a long time with the aim of desensitizing the patient or getting the patient to tolerate the allergen without developing symptoms. This type of therapy is effective in controlling symptoms of allergies related to hay fever, indoor allergens, and insect stings. Researchers, however, have not yet proven that these shots can prevent any allergic reactions to food.

### **Summary**

Food allergy is caused by immunological reactions to foods, sometimes in individuals or families predisposed to allergies. A number of foods, especially shellfish, milk, eggs, peanuts, and fruit can cause allergic reactions (notably hives, asthma, abdominal symptoms, lightheadedness, and anaphylaxis) in adults or children. When a food allergy is suspected, a medical evaluation is the key to proper management.

It is important to distinguish a true food allergy from other abnormal responses to food, that is, food intolerances, which actually are far more common than food allergy. Once the diagnosis of food allergy is made (primarily by the medical history) and the allergen is identified (usually by skin tests), the treatment basically is to avoid the offending food. People with food allergies should work with their physicians and become knowledgeable about allergies and how they are diagnosed and treated.

This article incorporates information from the U.S. National Institutes of Health.

### **Food Allergy At A Glance**

- Food allergy is not common but can be serious.
- Food allergy differs from food intolerance, which is far more common.
- The more frequent types of food allergies in adults differ from those in children.
- Children can outgrow their food allergies, but adults usually do not.
- The diagnosis of food allergy is made with a detailed history, the patient's diet diary, or an elimination diet.
- Food allergy is treated primarily by dietary avoidance.

Source: WebMD.com

### **References:**

U.S. National Institute of Allergy and Infectious Diseases. "Food Allergy." May 3, 2010. <<http://www.niaid.nih.gov/topics/foodallergy/Pages/default.aspx>>.

Young, E., M.D. Stoneham, A. Petrukevitch, J. Barton, and R. Rona. "A Population Study of Food Intolerance." *Lancet* 343.8906 May 7, 1994: 1127-1130.