# Food Allergy
## An Overview


National Institute of Allergy and Infectious Diseases

U.S. DEPARTMENT OF HEALTH AND HUMAN SERVICES
National Institutes of Health

NIAID HEALTH INFORMATION

National Institute of Allergy and Infectious Diseases

# Food Allergy
## An Overview

U.S. DEPARTMENT OF HEALTH AND HUMAN SERVICES
National Institutes of Health

National Institute of Allergy and Infectious Diseases

NIH Publication No. 11-5518
November 2010
www.niaid.nih.gov

# Contents

# Introduction

All of us eat to survive, and most of us enjoy eating. However, recent studies have found that almost 1 in 20 young children under the age of 5 years and almost 1 in 25 adults are allergic to at least one food. Other studies indicate that food allergy, especially allergy to peanut, is on the rise. As a result, more and more people are becoming aware of food allergy, making it a subject of increasing public concern.

When one person in a family has a food allergy, the whole family is affected. There may be day-to-day anxiety that a loved one may accidentally eat a food that could lead to **anaphylaxis,** a dangerous allergic reaction.

This booklet will help you understand allergic reactions to foods and their possible causes, and it explains how a healthcare professional diagnoses and treats food allergy.

If you suspect you or a member of your family have a food allergy, consult your healthcare professional for medical advice.

Note: Words in **bold** are defined in the glossary at the end of this booklet.

# What Is Food Allergy?

Food allergy is an abnormal response to a food triggered by the body's **immune system.** There are several types of immune responses to food. This booklet focuses on one type of adverse reaction to food—that in which the body produces a specific type of **antibody** called **immunoglobulin** E (IgE).

The binding of IgE to specific **molecules** present in a food triggers the immune response. The response may be mild or in rare cases it can be associated with the severe and life-threatening reaction called anaphylaxis, which is described in a later section of this booklet. Therefore, if you have a food allergy, it is extremely important for you to work with your healthcare professional to learn what foods cause your allergic reaction.

Sometimes, a reaction to food is not an allergy at all but another type of reaction called food intolerance. A description of food intolerance appears later in this booklet.

# What Is an Allergic Reaction to Food?

A food allergy occurs when the immune system responds to a harmless food as if it were a threat. The first time a person with food allergy is exposed to the food, no symptoms occur; but the first exposure primes the body to respond the next time. When the person eats the food again, an allergic response can occur.

### WHAT IS A FIRST EXPOSURE TO FOOD?

Usually, the way you are first exposed to a food is when you eat it. But sometimes a first exposure or subsequent exposure can occur without your knowledge.

This may be true in the case of peanut allergy. A person who experiences anaphylaxis on the first known exposure to peanut may have previously

- Touched peanuts
- Used a peanut-containing skin care product
- Breathed in peanut dust in the home or when close to other people eating peanuts

## The Allergic Reaction Process

An allergic reaction to food is a two-step process.

**Step 1:** The first time you are exposed to a food **allergen,** your immune system reacts as if the food were harmful and makes specific IgE antibodies to that allergen. The antibodies circulate through your blood and attach to **mast cells** and **basophils.** Mast cells are found in all body **tissues,** especially in areas of your body that are typical sites of allergic reactions. Those sites include your nose, throat, lungs, skin, and **gastrointestinal (GI) tract.** Basophils are found in your blood and also in tissues that have become inflamed due to an allergic reaction.

**Step 2:** The next time you are exposed to the same food allergen, it binds to the IgE antibodies that are attached to the mast cells and basophils. The binding signals the cells to release massive amounts of chemicals such as **histamine.** Depending on the tissue in which they are released, these chemicals will cause you to have various symptoms of food allergy. The symptoms can range from mild to severe. A severe allergic reaction can include a potentially life-threatening reaction called anaphylaxis.

Generally, you are at greater risk for developing a food allergy if you come from a family in which allergies are common. These allergies are not necessarily food allergies but perhaps other allergic diseases, such as asthma or **eczema** (atopic dermatitis). If you have two parents who have allergies, you are more likely to develop food allergy than someone with one parent who has allergies.

An allergic reaction to food usually takes place within a few minutes to several hours after exposure to the allergen. The process of eating and digesting food and the location of mast cells both affect the timing and location of the reaction.

## Symptoms of Food Allergy

If you are allergic to a particular food, you may experience all or some of the following symptoms:

- Itching in your mouth
- Swelling of lips and tongue
- GI symptoms, such as vomiting, diarrhea, or abdominal cramps and pain
- **Hives**
- Worsening of eczema
- Tightening of the throat or trouble breathing
- Drop in blood pressure

## EOSINOPHILIC ESOPHAGITIS

Eosinophilic esophagitis (EoE) is a newly recognized chronic disease that can be associated with food allergies. It is increasingly being diagnosed in children and adults.

Symptoms of EoE include nausea, vomiting, and abdominal pain after eating. A person may also have symptoms that resemble acid reflux from the stomach. In older children and adults, it can cause more severe symptoms, such as difficulty swallowing solid food or solid food sticking in the **esophagus** for more than a few minutes. In infants, this disease may be associated with failure to thrive.

If you are diagnosed with EoE, you will probably be tested for allergies. In some situations, avoiding certain food allergens will be an effective treatment for EoE.

## CROSS-REACTIVE FOOD ALLERGIES

If you have a life-threatening reaction to a certain food, your healthcare professional will show you how to avoid similar foods that may trigger this reaction. For example, if you have a history of allergy to shrimp, allergy testing will usually show that you are also allergic to other shellfish, such as crab, lobster, and crayfish. This is called cross-reactivity.

# What Is Anaphylaxis?

If you have a food allergy, there is a chance that you may experience a severe form of allergic reaction known as anaphylaxis. Anaphylaxis may begin suddenly and may lead to death if not immediately treated.

Anaphylaxis includes a wide range of symptoms that can occur in many combinations. Some symptoms are not life-threatening, but the most severe restrict breathing and blood circulation.

Many different parts of your body can be affected.

- Skin—itching, hives, redness, swelling
- Nose—sneezing, stuffy nose, runny nose
- Mouth—itching, swelling of lips or tongue
- Throat—itching, tightness, difficulty swallowing, hoarseness
- Chest—shortness of breath, cough, wheeze, chest pain, tightness
- Heart—weak pulse, passing out, shock
- GI tract—vomiting, diarrhea, cramps
- Nervous system—dizziness or fainting

Symptoms may begin within several minutes to several hours after exposure to the food. Sometimes the symptoms go away, only to return 2 to 4 hours later or even as many as 8 hours later. When you begin to experience symptoms, you must seek immediate medical attention because anaphylaxis can be life-threatening.

Anaphylaxis caused by an allergic reaction to a certain food is highly unpredictable. The severity of a given attack does not predict the severity of subsequent attacks. The response will vary depending on several factors, such as

- Your sensitivity to the food
- How much of the food you are exposed to
- How the food entered your body

Any anaphylactic reaction may become dangerous and must be evaluated by a healthcare professional.

Food allergy is the leading cause of anaphylaxis. However, medications, insect stings, and latex can also cause an allergic reaction that leads to anaphylaxis.

## HOW DO YOU KNOW IF A PERSON IS HAVING AN ANAPHYLACTIC REACTION?

Anaphylaxis is highly likely if at least *one* of the following three conditions occurs:

1. Within minutes or several hours of the onset of an illness, a person has skin symptoms (redness, itching, hives) or swollen lips and either
   - Difficulty breathing, or
   - A drop in blood pressure
2. A person was exposed to an allergen likely to cause an allergic reaction, and, within minutes or several hours, *two* or *more* of the following symptoms occur:
   - Skin symptoms or swollen lips
   - Difficulty breathing
   - A drop in blood pressure
   - GI symptoms such as vomiting, diarrhea, or cramping
3. A person exposed to an allergen previously known to cause an allergic reaction in that person experiences a drop in blood pressure

# Common Food Allergies in Infants, Children, and Adults







In infants and children, the most common foods that cause allergic reactions are

- Egg
- Milk
- Peanut
- Tree nuts such as walnuts
- Soy (primarily in infants)
- Wheat

In adults, the most common foods that cause allergic reactions are

- Shellfish such as shrimp, crayfish, lobster, and crab
- Peanut
- Tree nuts
- Fish such as salmon

Food allergies generally develop early in life but can develop at any age. For example, milk allergy tends to develop early in life, whereas shrimp allergy generally develops later in life.

Children usually outgrow their egg, milk, and soy allergies, but people who develop allergies as adults usually have their allergies for life. Children generally do not outgrow their allergy to peanut.

Finally, foods that are eaten routinely increase the likelihood that a person will develop allergies to that food. In Japan, for example, rice allergy is more frequent than in the United States, and in Scandinavia, codfish allergy is more common than in the United States.

## ORAL ALLERGY SYNDROME

Oral allergy syndrome (OAS) is an allergy to certain raw fruits and vegetables, such as apples, cherries, kiwis, celery, tomatoes, and green peppers. OAS occurs mostly in people with hay fever, especially spring hay fever due to birch pollen and late summer hay fever due to ragweed pollen.

Eating the raw food causes an itchy, tingling sensation in the mouth, lips, and throat. It can also cause swelling of the lips, tongue, and throat; watery, itchy eyes; runny nose; and sneezing. Just handling the raw fruit or vegetable may cause a rash, itching, or swelling where the juice touches the skin.

Cooking or processing easily breaks down the **proteins** in the fruits and vegetables that cause OAS. Therefore, OAS typically does not occur with cooked or baked fruits and vegetables or processed fruits, such as in applesauce.

# Milk Allergy in Infants and Children

Allergy to cow's milk is common in infants and young children and can develop within days to months of birth.

In children, allergy to cow's milk can cause abdominal pain, hives, and eczema. These symptoms are typically associated with IgE antibodies to milk. Because abdominal pain is also a symptom of **lactose intolerance** (see page 14), only your healthcare professional can determine whether your child's symptoms are caused by an allergic reaction to cow's milk.

In other children, cow's milk can lead to a different type of reaction to milk, resulting in colic and sleeplessness, as well as blood in the stool and poor growth. This type of reaction to milk is associated with immune responses that are not related to IgE antibody.

## FOOD ALLERGY: PREGNANCY, BREASTFEEDING, AND INTRODUCING SOLID FOODS TO YOUR BABY

Healthcare experts still do not have enough conclusive evidence to tell pregnant women, nursing mothers, and mothers of infants how to prevent food allergy from developing in their children. Be sure to talk with your healthcare professional before changing your diet or your baby's diet.

Here is what healthcare experts know now:

*Pregnancy*

- When you are pregnant, you should eat a balanced diet.
- If you are allergic to a food, you should avoid it.
- If you are not allergic to foods—such as egg, tree nuts, peanut, fish, or cow's milk (all highly **allergenic**), you should *not* avoid them because there is no conclusive evidence that avoiding these foods will prevent food allergy from developing in your infant in the future.

*Breastfeeding*

- Healthcare experts recommend that mothers feed their babies only breast milk for the first 4 months of life because of the health benefits of breastfeeding.
- Mothers who breastfeed do not need to avoid foods that are considered to be highly allergenic because there is no conclusive evidence that avoiding these foods will prevent food allergy from developing in their infants.

*Introducing Solid Foods*

- Healthcare experts in the United States currently suggest that you do not introduce solid food into your baby's diet until 4 to 6 months of age.
- There is no conclusive evidence to suggest that you should delay the introduction of solid foods beyond 4 to 6 months of age.
- There is no conclusive evidence to suggest that you should delay the introduction of the most common potentially allergenic foods (milk, egg, peanut) beyond 4 to 6 months of age. Delay will not prevent your child from developing an allergy in the future.

# Is It Food Allergy or Food Intolerance?

Food allergy is sometimes confused with food intolerance. To find out the difference between food allergy and food intolerance, your healthcare professional will go through a list of possible causes for your symptoms.

## Types of Food Intolerance

### Lactose intolerance

Lactose is a sugar found in milk and most milk products. **Lactase** is an **enzyme** in the lining of the gut that breaks down or digests lactose. Lactose intolerance occurs when lactase is missing. Instead of the enzyme breaking down the sugar, **bacteria** in the gut break it down, which forms gas, which in turn causes symptoms of bloating, abdominal pain, and sometimes diarrhea.

Lactose intolerance is uncommon in babies and young children under the age of 5 years. Because lactase levels decline as people get older, lactose intolerance becomes more common with age. Lactose intolerance also varies widely based on racial and ethnic background.

Your healthcare professional can use laboratory tests to find out whether your body can digest lactose.

### Food additives

Another type of food intolerance is a reaction to certain products that are added to food to enhance taste, add color, or protect against the growth of **microbes.** Several compounds such as MSG (monosodium glutamate) and sulfites are tied to reactions that can be confused with food allergy.

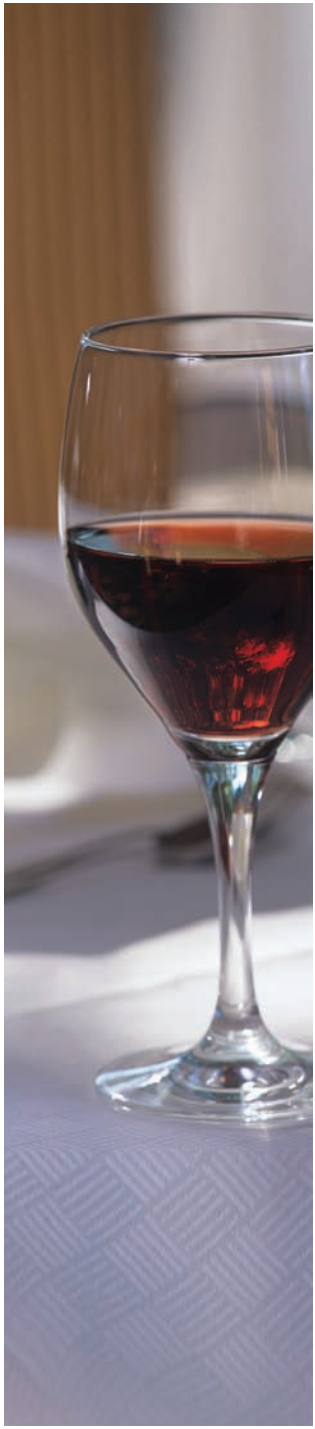
- MSG is a flavor enhancer. When taken in large amounts, it can cause some of the following:
  - Flushing
  - Sensations of warmth
  - Headache
  - Chest discomfort

  These passing reactions occur rapidly after eating large amounts of food to which MSG has been added.

- Sulfites are found in food for several reasons:
  - They have been added to increase crispness or prevent mold growth.
  - They occur naturally in the food.
  - They have been generated during the winemaking process.

  Sulfites can cause breathing problems in people with asthma.

  The Food and Drug Administration (FDA) has banned sulfites as spray-on preservatives for fresh fruits and vegetables. When sulfites are present in foods, they are listed on ingredient labels.



### Gluten intolerance

Gluten is a part of wheat, barley, and rye. Gluten intolerance is associated with **celiac disease,** also called gluten-sensitive enteropathy. This disease develops when the immune system responds abnormally to gluten. This abnormal response does not involve IgE antibody and is not considered a food allergy.

### Food poisoning

Some of the symptoms of food allergy, such as abdominal cramping, are common to food poisoning. However, food poisoning is caused by microbes, such as bacteria, and bacterial products, such as **toxins,** that can contaminate meats and dairy products.

### Histamine toxicity

Fish, such as tuna and mackerel that are not refrigerated properly and become contaminated by bacteria, may contain very high levels of histamine. A person who eats such fish may show symptoms that are similar to food allergy. However, this reaction is not a true allergic reaction. Instead, the reaction is called **histamine toxicity** or scombroid food poisoning.

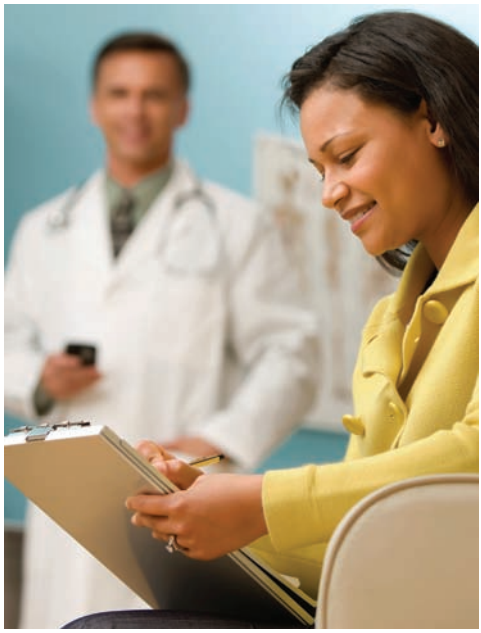
### Other

Several other conditions, such as ulcers and cancers of the GI tract, cause some of the same symptoms as food allergy. These symptoms, which include vomiting, diarrhea, and cramping abdominal pain, become worse when you eat.

# Diagnosing Food Allergy

## Detailed History

Your healthcare professional will begin by taking a detailed medical history to find out whether your symptoms are caused by an allergy to specific foods, a food intolerance, or other health problems.



A detailed history is the most valuable tool for diagnosing food allergy. Your healthcare professional will ask you several questions and listen to your history of food reactions to decide whether the facts fit a diagnosis of food allergy.

Your healthcare professional is likely to ask some of the following questions:

- Did your reaction come on quickly, usually within minutes to several hours after eating the food?
- Is your reaction always associated with a certain food?
- How much of this potentially allergenic food did you eat before you had a reaction?
- Have you eaten this food before and had a reaction?
- Did anyone else who ate the same food get sick?
- Did you take allergy medicines, and if so, did they help? (Antihistamines should relieve hives, for example.)


## Diet Diary

Sometimes your healthcare professional can't make a diagnosis based only on your history. In that case, you may be asked to keep a record of what you eat and whether you have a reaction. This diet diary contains more details about the foods you eat than your history. From the diary, you and your healthcare professional may be able to identify a consistent pattern in your reactions.

## Elimination Diet

The next step some healthcare professionals use is a limited **elimination diet,** in which the food that is suspected of causing an allergic reaction is removed from your diet. For example, if you suspect you are allergic to egg, your healthcare professional will instruct you to eliminate this one food from your diet. The limited elimination diet is done under the direction of your healthcare professional.

## Skin Prick Test

If your history, diet diary, or elimination diet suggests a specific food allergy is likely, then your healthcare professional will use the skin prick test to confirm the diagnosis.

With a skin prick test, your healthcare professional uses a needle to place a tiny amount of food **extract** just below the surface of the skin on your lower arm or back. If you are allergic, there will be swelling or redness at the test site. This is a positive result. It means that there are IgE molecules on the skin's mast cells that are specific to the food being tested.

The skin prick test is simple and relatively safe, and results are ready in minutes.

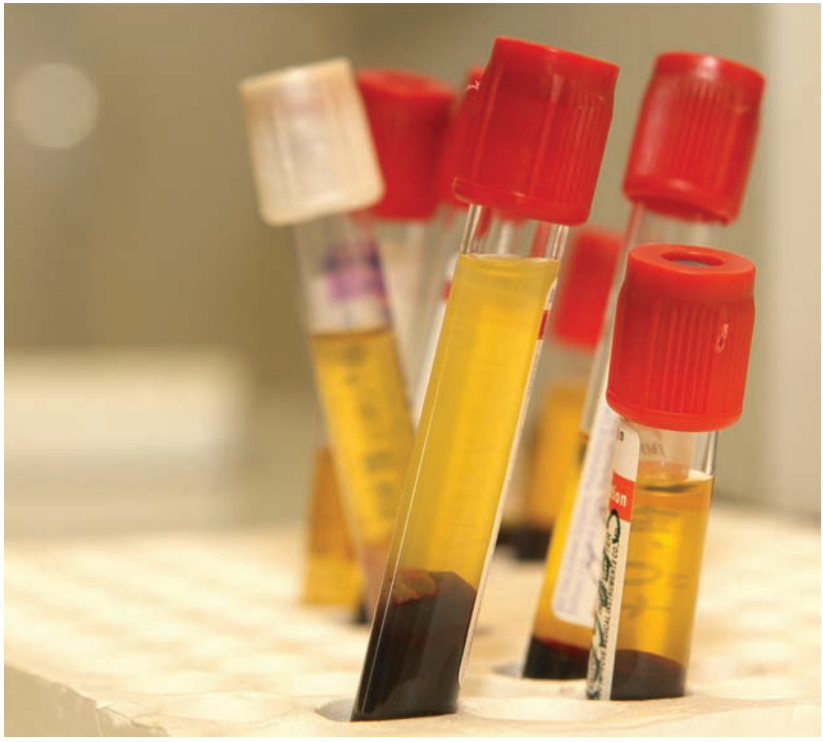
You can have a positive skin prick test to a food, however, without having an allergic reaction to that food. A healthcare professional often makes a diagnosis of food allergy when someone has *both* a positive skin prick test to a specific food *and* a history of reactions that suggests an allergy to the same food.

**(above)** A skin prick test on a person's arm.

## Blood Test

Instead of the skin prick test, your healthcare professional can take a blood sample to measure the levels of food-specific IgE antibodies.

As with skin prick testing, positive blood tests do not necessarily mean that you have a food allergy. Your healthcare professional must combine these test results with information about your history of reactions to food to make an accurate diagnosis of food allergy.



**(above)** Blood samples ready for testing.

## Oral Food Challenge

*Caution*: Because oral food challenges can cause a severe allergic reaction, they should always be conducted by a healthcare professional who has experience performing them.

An oral food challenge is the final method healthcare professionals use to diagnose food allergy. This method includes the following steps:

- Your healthcare professional gives you individual doses of various foods (masked so you do not know what food is present), some of which are suspected of starting an allergic reaction.
- Initially, the dose of food is very small, but the amount is gradually increased during the challenge.
- You swallow the individual dose.
- Your healthcare professional watches you to see whether a reaction occurs.

To prevent bias, oral food challenges are often done double blinded. In a true double-blind challenge, neither you nor your healthcare professional knows whether the substance you eat contains the likely allergen. Another medical professional has made up the individual doses. In a single-blind challenge, your healthcare professional knows what you are eating but you do not.

A reaction only to suspected foods and not to the other foods tested confirms the diagnosis of a food allergy.

# Preventing and Treating Food Allergy

## Prevention

There is currently no cure for food allergies. You can only prevent the symptoms of food allergy by avoiding the allergenic food. After you and your healthcare professional have identified the food(s) to which you are sensitive, you must remove them from your diet.

### Read food labels

You must read the list of ingredients on the label of each prepared food that you are considering eating. Many allergens, such as peanut, egg, and milk, appear in prepared foods you normally would not associate with those foods.


Since 2006, U.S. food manufacturers have been required by law to list the ingredients of prepared foods. In addition, food manufacturers must use plain language to disclose whether their products contain (or *may* contain) any of the top eight allergenic foods—egg, milk, peanut, tree nuts, soy, wheat, shellfish, and fish.

### Keep clean

Simple measures of cleanliness can remove most allergens from the environment of a person with food allergy. For example, simply washing your hands with soap and water will remove peanut allergens, and most household cleaners will remove allergens from surfaces.

## Treatment of a Food Allergy Reaction

### Unintentional exposure

When you have food allergies, you must be prepared to treat an unintentional exposure. Talk to your healthcare professional and develop a plan to protect yourself in case of an unintentional exposure to the food. For example, you should

- Wear a medical alert bracelet or necklace
- Carry an auto-injector device containing **epinephrine** (adrenaline)
- Seek medical help immediately

### Mild symptoms

Talk to your healthcare professional to find out what medicines may relieve mild food allergy symptoms that are *not part of an anaphylactic reaction*. However, be aware that it is very hard for you to know which reactions are mild and which may lead to anaphylaxis.

### EXERCISE-INDUCED FOOD ALLERGY

Exercise-induced food allergy is one situation that requires more than simply eating food to start a reaction. This type of reaction occurs after someone eats a specific food *before* exercising. As exercise increases and body temperature rises

- Itching and light-headedness start
- Hives may appear
- Anaphylaxis may develop

Some people have this reaction from many foods, and others have it only after eating a specific food.

Treating exercised-induced food allergy is simple—avoid eating for a couple of hours before exercising.

Crustacean shellfish, alcohol, tomatoes, cheese, and celery are common causes of exercise-induced food allergy reactions.

# Food Allergy Research at NIAID

The National Institute of Allergy and Infectious Diseases (NIAID) is the lead institute for food allergy research at the National Institutes of Health.

NIAID supports basic and preclinical research in allergy and immunology that provides an increasingly better understanding of the immune system and how, in certain people, food elicits an allergic reaction.

NIAID also conducts clinical trials that are attempting to change the body's immune response so that it does not trigger an allergic reaction to food. These trials are either prevention trials or treatment trials.

- Prevention trials attempt to prevent allergies from developing in young children who are not yet allergic to a food.
- Treatment trials try to train the immune systems of people who are already allergic to a food not to react to the specific food.

Both treatment and prevention strategies attempt to induce a state of immunological **tolerance** to a food.

Current food allergy clinical trials funded by NIAID can be found on the Web site ClinicalTrials.gov by searching for "NIAID" and "food allergy."

To learn more about food allergy-related research, go to NIAID's Food Allergy Health Topic at www.niaid.nih.gov/topics/foodallergy.

## GUIDELINES FOR THE DIAGNOSIS AND MANAGEMENT OF FOOD ALLERGY

NIAID organized the development of the "Guidelines for the Diagnosis and Management of Food Allergy in the United States: Report of the NIAID-Sponsored Expert Panel." These guidelines are intended for use by healthcare professionals to diagnose and manage patients with food allergies and related conditions such as eczema (atopic dermatitis), asthma, and eosinophilic esophagitis. The guidelines can be viewed and downloaded from the NIAID Web site at www.niaid.nih.gov/topics/foodallergy/clinical. A version of the guidelines for the general public is also available on the NIAID Web site.

# Glossary

**allergen**—a substance that causes an allergic reaction.

**allergenic**—describes a substance that produces an allergic reaction.

**anaphylaxis**—a severe reaction to an allergen that may lead to death.

**antibody**—a protein molecule tailor-made by the immune system to detect and help destroy invaders, such as bacteria, viruses, and toxins.

**bacteria**—single-celled microbes that have no nucleus. Some bacteria are potentially disease causing.

**basophils**—white blood cells that contribute to allergic inflammatory reactions.

**celiac disease**—an autoimmune disease of the digestive system that damages the small intestine and interferes with the absorption of the nutritional content of food. People who have celiac disease cannot tolerate gluten (a protein in wheat, rye, and barley).

**eczema**—the term for a group of allergic conditions that causes the skin to become inflamed and is characterized by redness, itching, and oozing lesions that become crusty. The most common type of eczema is known as atopic dermatitis, or atopic eczema, and is particularly common in young children and infants.

**elimination diet**—removal of certain foods from a person's diet.

**enzyme**—a protein produced by living cells that promotes specific biochemical reactions.

**epinephrine**—a hormone, also called adrenaline, that works rapidly to contract blood vessels, preventing them from leaking fluid. It also relaxes airways, relieves cramping in the gastrointestinal tract, decreases swelling, and blocks itching and hives. Epinephrine is the drug in an EpiPen used to counter an anaphylactic reaction.

**esophagus**—the passageway through which food moves from the throat to the stomach.

**extract**—a liquid preparation containing food allergens from specific foods.

**gastrointestinal (GI) tract**—the organ system of the body that includes the esophagus, stomach, and small and large intestines.

**histamine**—a chemical stored in the granules of mast cells and basophil granules prior to release.

**histamine toxicity**—a reaction, which resembles an allergic reaction, to eating foods containing high levels of histamine.

**hives**—a raised, itchy area of skin that is usually a sign of an allergic reaction.

**immune system**—a complex network of cells, tissues, and organs that defends the body against attacks by disease-causing microbes.

**immunoglobulin**—one of a large family of proteins, also known as antibody.

**lactase**—the enzyme responsible for breaking down lactose in the gut. Lactase is produced by cells lining the small intestine.

**lactose intolerance**—the inability to digest lactose, a kind of sugar found in milk and other food products, because of a shortage of the enzyme lactase.

**mast cells**—large granule-containing cells that are found in body tissues where typical allergic reactions occur.

**microbes**—tiny life forms, such as bacteria and fungi, that are visible only under a microscope. They may cause disease.

**molecule**—a group of atoms chemically joined together. In a cell, examples of different molecules include proteins, fats, and carbohydrates.

**proteins**—large molecules composed of one or more chains of amino acids.

**tolerance**—a state in which a person with a food allergy fails to develop allergic reactions after ingesting specific foods. This lack of response is sustained over a long period of time.

**tissues**—groups of similar cells joined to perform the same function.

**toxins**—agents produced by plants and bacteria that are poisonous and may also trigger allergic reactions.

# More Information

## General Information

**National Institute of Allergy and Infectious Diseases**
**National Institutes of Health**
6610 Rockledge Drive, MSC 6612
Bethesda, MD 20892–6612
866–284–0147 or 301–496–5717
www.niaid.nih.gov

**National Library of Medicine**
**MedlinePlus**
8600 Rockville Pike
Bethesda, MD 20894
888–FIND–NLM (888–346–3656) or 301–594–5983
www.medlineplus.gov

**Allergy & Asthma Network Mothers of Asthmatics**
8201 Greensboro Drive, Suite 200
McLean, VA 22102
800–878–4403
www.aanma.org

**American Academy of Allergy, Asthma & Immunology**
555 East Wells Street, Suite 1100
Milwaukee, WI 53202–3823
414–272–6071
www.aaaai.org

**American Academy of Pediatrics**
141 Northwest Point Boulevard
Elk Grove Village, IL 60007–1098
847–434–4000
www.aap.org

**American College of Allergy, Asthma & Immunology**
85 West Algonquin Road, Suite 550
Arlington Heights, IL 60005
847–417–1200
www.acaai.org

**Asthma and Allergy Foundation of America**
8201 Corporate Drive, Suite 1000
Landover, MD 20785
800–7–ASTHMA (800–727–8462) or 202–466–7643
www.aafa.org

**Food Allergy and Anaphylaxis Network**
11781 Lee Jackson Highway, Suite 160
Fairfax, VA 22033–3309
800–929–4040
www.foodallergy.org

**Food Allergy Initiative**
1414 Avenue of the Americas, Suite 1804
New York, NY 10019–2514
212–207–1974
www.faiusa.org

### Allergy Extracts

**Food and Drug Administration**
**Center for Biologics Evaluation and Research**
10903 New Hampshire Avenue
Silver Spring, MD 20993–0002
888–INFO–FDA (888–463–6332)
www.fda.gov/cber

### Celiac Disease and Lactose Intolerance

**National Institute of Diabetes and Digestive and Kidney Diseases**
**National Digestive Diseases Information Clearinghouse**
**National Institutes of Health**
2 Information Way
Bethesda, MD 20892–3570
800–891–5389
www.digestive.niddk.nih.gov

### Eczema

**National Arthritis and Musculoskeletal and Skin Diseases Information Clearinghouse**
**National Institutes of Health**
1 AMS Circle
Bethesda, MD 20892–3675
877–22–NIAMS (877–226–4267) or 301–495–4484
www.niams.nih.gov

**American Academy of Dermatology**
P.O. Box 4014
Schaumburg, IL 60168–4014
866–503–SKIN (866–503–7546) or 847–247–1280
www.aad.org

**National Eczema Association for Science and Education**
4460 Redwood Highway, Suite 16D
San Rafael, CA 94903–1953
800–818–7546 or 415–499–3474
www.nationaleczema.org

### Food Contents

**U.S. Department of Agriculture**
**Food and Nutrition Information Center**
National Agricultural Library
10301 Baltimore Avenue, Room 105
Beltsville, MD 20705
301–504–5414
www.nal.usda.gov/fnic

### Food Facts

**American Dietetic Association**
120 South Riverside Plaza, Suite 2000
Chicago, IL 60606–6995
800–877–1600 or 312–899–0040
www.eatright.org/public

# Credits

| | |
|---|---|
| Cover | © Getty Images |
| Facing Contents | © iStockphoto |
| Page 2 | © iStockphoto |
| Page 4 | © iStockphoto |
| Page 5 | © iStockphoto |
| Page 7 | © iStockphoto |
| Page 9 | © iStockphoto |
| Page 10 | *(top to bottom)* © iStockphoto |
| Page 11 | © iStockphoto |
| Page 12 | © iStockphoto |
| Page 13 | © iStockphoto |
| Page 15 | © iStockphoto |
| Page 16 | © iStockphoto |
| Page 17 | © iStockphoto |
| Page 18 | © iStockphoto |
| Page 19 | © Custom Medical Stock Photo |
| Page 20 | © iStockphoto |
| Page 22 | © Getty Images |
| Page 23 | © iStockphoto |
| Page 25 | © iStockphoto |



U.S. DEPARTMENT OF HEALTH AND HUMAN SERVICES
National Institutes of Health

National Institute of Allergy
and Infectious Diseases

NIH Publication No. 11-5518
November 2010
www.niaid.nih.gov