NIAID HEALTH INFO

Food Allergy

An Overview

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

National Institute of Allergy and Infectious Diseases

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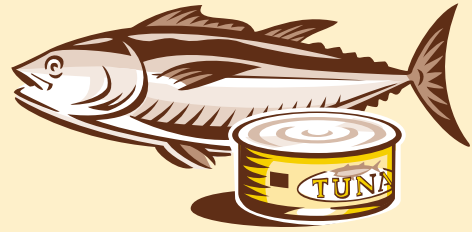
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Introduction

Food allergy affects up to 6 to 8 percent of children under the age of three and 2 percent of adults. If you have an unpleasant reaction to something you have eaten, you might wonder if you have a food allergy. One out of three people either believe they have a food allergy or modify their or their family's diet. Thus, while food allergy is commonly suspected, health care providers diagnose it less frequently than most people believe.

This pamphlet describes allergic reactions to foods and their possible causes as well as the best ways to diagnose and treat allergic reactions to food. It also describes other reactions to foods, known as food intolerances, which can be confused with food allergy, and describes some unproven and controversial food allergy theories.

What Is Food Allergy?

Food allergy is an abnormal response to a food triggered by the body's **immune system**.

Allergic reactions to food can cause serious illness and, in some cases, death. Therefore, if you have a food allergy, it is extremely important for you to work with your health care provider to find out what food(s) causes your allergic reaction.

Sometimes, a reaction to food is not an allergy at all but another type of reaction called "food intolerance."

Food intolerance is more common than food allergy. The immune system does not cause the symptoms of a food intolerance, though these symptoms can look and feel like those of a food allergy.

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

How Do Allergic Reactions Work?

An immediate allergic reaction involves two actions of your immune system.

- Your immune system produces immunoglobulin E (IgE), a type of protein that works against a specific food. This protein is called a food-specific **antibody**, and it circulates through the blood.
- The food-specific IgE then attaches to **mast cells**, cells found in all body **tissues**. They are more often found in areas of your body that are typical sites of allergic reactions. Those sites include your nose, throat, lungs, skin, and **gastrointestinal (GI) tract**.

Generally, your immune system will form IgE against a food if you come from a family in which allergies are common—not necessarily food allergies but perhaps other allergic diseases such as hay fever or asthma. If you have two allergic parents, you are more likely to develop food allergy than someone with one allergic parent.

If your immune system is inclined to form IgE to certain foods, you must be exposed to the food before you can have an allergic reaction.

- As this food is digested, it triggers certain cells in your body to produce a food-specific IgE in large amounts. The food-specific IgE is then released and attaches to the surfaces of mast cells.
- The next time you eat that food, it interacts with food-specific IgE on the surface of the mast cells and triggers the cells to release chemicals such as histamine.

- Depending upon the tissue in which they are released, these chemicals will cause you to have various symptoms of food allergy.

Food **allergens** are proteins within the food that enter your bloodstream after the food is digested. From there, they go to target organs, such as your skin or nose, and cause allergic reactions.

An allergic reaction to food can take place within a few minutes to an hour. The process of eating and digesting food affects the timing and the location of a reaction.

- If you are allergic to a particular food, you may first feel itching in your mouth as you start to eat the food.
- After the food is digested in your stomach, you may have GI symptoms such as vomiting, diarrhea, or pain.
- When the food allergens enter and travel through your bloodstream, they may cause your blood pressure to drop.
- As the allergens reach your skin, they can cause hives or eczema.
- When the allergens reach your lungs, they may cause asthma.

Cross-Reactivity

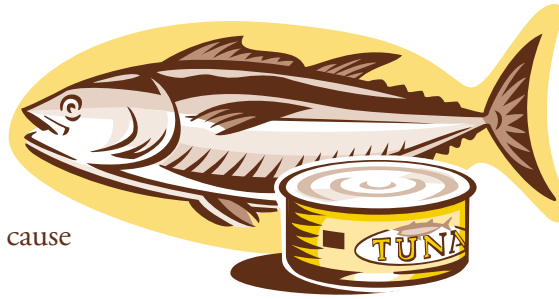
If you have a life-threatening reaction to a certain food, your health care provider will show you how to avoid similar foods that might trigger this reaction. For example, if you have a history of allergy to shrimp, testing will usually show that you are not only allergic to shrimp but also to crab, lobster, and crayfish. This is called "cross-reactivity."

Another interesting example of cross-reactivity occurs in people who are highly sensitive to ragweed. During ragweed pollen season, they sometimes find that when they try to eat melons, particularly cantaloupe, they experience itching in their mouths and simply cannot eat the melon. Similarly, people who have severe birch pollen allergy also may react to apple peels. This is called the "oral allergy syndrome."

Common Food Allergies

In adults, the foods that most often cause allergic reactions include

- Shellfish such as shrimp, crayfish, lobster, and crab
- Peanuts
- Tree nuts such as walnuts
- Fish
- Eggs



The most common foods that cause problems in children are

- Eggs
- Milk
- Peanuts

Tree nuts and peanuts are the leading causes of deadly food allergy reactions called **anaphylaxis**.

Adults usually keep their allergies for life, but children sometimes outgrow them. Children are more likely to outgrow allergies to milk or soy, however, than allergies to peanuts or shrimp. The foods to which adults or children usually react are those foods they eat often. In Japan, for example, rice allergy is more frequent. In Scandinavia, codfish allergy is more common.

Food Allergy or Food Intolerance?

If you go to your health care provider and say, "I think I have a food allergy," your provider has to consider other possibilities that may cause symptoms and could be confused with food allergy, such as food intolerance. To find out the difference between food allergy and food intolerance, your provider will go through a list of possible causes for your symptoms. This is called a "differential diagnosis." This type of diagnosis helps confirm that you do indeed have a food allergy rather than a food intolerance or other illness.

Types of Food Intolerance

Food poisoning

One possible cause of symptoms like those of food allergy is foods contaminated with **microbes**, such as bacteria, and bacterial products, such as **toxins**. Contaminated meat and dairy products sometimes cause symptoms, including GI discomfort, that resemble a food allergy when it is really a type of food poisoning.

Histamine toxicity

There are substances, such as histamine present in certain foods, that cause a reaction like an allergic reaction. For example, histamine can reach high levels in cheese, some wines, and certain kinds of fish such as tuna and mackerel.

In fish, histamine is believed to come from contamination by bacteria, particularly in fish that are not refrigerated properly. If you eat one of these foods with a high level of histamine,

you could have a reaction that strongly resembles an allergic reaction to food. This reaction is called "histamine toxicity."

Lactose intolerance

Another cause of food intolerance confused with a food allergy is lactose intolerance or lactase deficiency. This common food intolerance affects at least one out of ten people.

- Lactase is an **enzyme** that is in the lining of the gut.
- Lactase breaks down lactose, a sugar found in milk and most milk products.
- There is not enough lactase in the gut to digest lactose.
- Lactose, instead, is used by bacteria to form gas which causes bloating, abdominal pain, and sometimes diarrhea.

There are tests your health care provider can use 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, provide 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

MSG is a flavor enhancer, and, when taken in large amounts, can cause some of the following signs.

- Flushing
- Sensations of warmth

- Headache
- Chest discomfort
- Feelings of detachment

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

Sulfites

Sulfites occur naturally in foods or may be added to increase crispness or prevent mold growth. Sulfites in high concentrations sometimes pose problems for people with severe asthma. Sulfites can give off a gas called sulfur dioxide that the asthmatic inhales while eating the sulfited food. This irritates the lungs and can send an asthmatic into severe bronchospasm, a tightening of the lungs.

The Food and Drug Administration (FDA) has banned sulfites as spray-on preservatives in fresh fruits and vegetables. Sulfites are still used in some foods, however, and occur naturally during the fermentation of wine.

Gluten intolerance

Gluten intolerance is associated with the disease called "gluten-sensitive enteropathy" or "celiac disease." It happens if your immune system responds abnormally to gluten, which is a part of wheat and some other grains.

Psychological causes

Some people may have a food intolerance that has a psychological trigger. If your food intolerance is caused by this type of trigger, a careful psychiatric evaluation may identify an unpleasant event in your life, often during childhood, tied to eating a particular food. Eating that food years later, even as an adult, is associated with a rush of unpleasant sensations.

Other causes

There are several other conditions, including ulcers and cancers of the GI tract, that cause some of the same symptoms as food allergy. These problems include vomiting, diarrhea, and cramping abdominal pain made worse by eating.

Diagnosis

After ruling out food intolerances and other health problems, your health care provider will use several steps to find out if you have an allergy to specific foods.

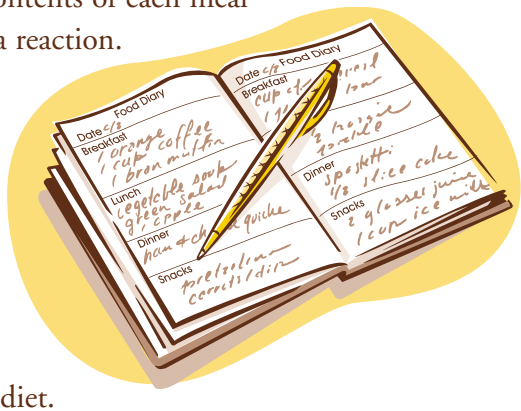
Detailed History

This technique is the most valuable. Your provider will ask you several questions and listen to your history of food reactions to decide if the facts go with a food allergy.

- What was the timing of your reaction?
- Did your reaction come on quickly, usually within an hour after eating the food?
- Did allergy medicines help? Antihistamines should relieve hives, for example.
- Is your reaction always associated with a certain food?
- Did anyone else who ate the same food get sick? For example, if you ate fish contaminated with histamine, everyone who ate the fish should be sick.
- How much did you eat before you had a reaction? The severity of a reaction is sometimes related to the amount of food eaten.
- How was the food prepared? Some people will have a violent allergic reaction only to raw or undercooked fish. Complete cooking of the fish may destroy the allergen, and they can then eat it with no allergic reaction.
- Did you eat other foods at the same time you had the reaction? Some foods may delay digestion and thus delay the start of the allergic reaction.

Diet Diary

Sometimes your health care provider can't make a diagnosis solely on the basis of your history. In that case, you may be asked to keep a record of the contents of each meal you eat and whether you have a reaction. This gives more detail from which you and your provider can see if there is a consistent pattern in your reactions.



Elimination Diet

The next step some health care providers use is an elimination diet. Under your provider's direction

- You don't eat a food suspected of causing the allergy, such as eggs
- You then substitute another food—in the case of eggs, another source of protein
- Your provider can almost always make a diagnosis if the symptoms go away after you remove the food from your diet

The diagnosis is confirmed if you then eat the food and the symptoms come back. You should do this only when the reactions are not significant and under health care provider direction.

Your provider can't use this technique, however, if your reactions are severe or don't happen often. If you have a severe reaction, you should not eat the food again.

Skin Test

If your history, diet diary, or elimination diet suggests a specific food allergy is likely, your health care provider will then use tests to confirm the diagnosis.

One of these is a scratch skin test, during which an extract of the food is placed on the skin of your lower arm. Your provider will then scratch this portion of your skin with a needle and look for swelling or redness which would be a sign of a local allergic reaction. If the scratch test is positive, it means that there is IgE on the skin's mast cells that is specific to the food being tested. Skin tests are rapid, simple, and relatively safe.

You can have a positive skin test to a food allergen, however, without having an allergic reaction to that food. A health care provider diagnoses a food allergy only when someone has a positive skin test to a specific allergen and the history of reactions suggests an allergy to the same food.

Blood Test

If you are extremely allergic and have severe anaphylactic reactions, your health care provider cannot use skin testing because causing an allergic reaction could be dangerous. Skin testing also cannot be done if you have eczema over a large portion of your body.

In those cases, a health care provider may use blood tests such as the RAST (radioallergosorbent test) or the ELISA (enzyme-linked immunosorbent assay). These tests measure

the presence of food-specific IgE in your blood. As with skin testing, positive tests do not necessarily mean you have a food allergy.

Double-Blind Food Challenge

The final method health care providers use to diagnose food allergy is double-blind food challenge. This testing has come to be the "gold standard" of allergy testing.

- Your health care provider will give you individual opaque capsules containing various foods, some of which are suspected of starting an allergic reaction.
- You swallow a capsule and are watched to see if a reaction occurs. This process is repeated until you have swallowed all the capsules.

In a true double-blind test, your health care provider is also "blinded" (the capsules having been made up by another medical person). In that case your provider does not know which capsule contains the allergen.

The advantage of such a challenge is that if you react only to suspected foods and not to other foods tested, it confirms the diagnosis. You cannot be tested this way if you have a history of severe allergic reactions.

In addition, this testing is difficult because it takes a lot of time to perform and many food allergies are difficult to evaluate with this procedure. Consequently, health care providers seldom do double-blind food challenges.

This type of testing is most commonly used if your health care provider thinks the reaction you describe is not due to a specific food and wishes to obtain evidence to support this. If your provider finds that your reaction is not due to a specific food, then additional efforts may be used to find the real cause of the reaction.

Treatment

Food allergy is treated by avoiding the foods that trigger the reaction. Once you and your health care provider have identified the food(s) to which you are sensitive, you must remove them from your diet. To do this, you must read the detailed ingredient lists on each food you are considering eating.

Many allergy-producing foods such as peanuts, eggs, and milk, appear in foods one normally would not associate them with. Peanuts, for example, are often used as a protein source, and eggs are used in some salad dressings.

FDA requires ingredients in a packaged food to appear on its label. You can avoid most of the things to which you are sensitive if you read food labels carefully and avoid restaurant-prepared foods that might have ingredients to which you are allergic.

If you are highly allergic, even the tiniest amounts of a food allergen (for example, a small portion of a peanut kernel) can prompt an allergic reaction.

If you have severe food allergies, you must be prepared to treat unintentional exposure. Even people who know a lot about what they are sensitive to occasionally make a mistake. To protect yourself if you have had allergic reactions to a food, you should

- Wear a medical alert bracelet or necklace stating that you have a food allergy and are subject to severe reactions
- Carry a syringe of adrenaline (epinephrine), obtained by prescription from your health care provider, and be prepared to give it to yourself if you think you are getting a food allergic reaction

- Seek medical help immediately by either calling the rescue squad or by getting transported to an emergency room

Anaphylactic allergic reactions can be fatal even when they start off with mild symptoms such as a tingling in the mouth and throat or GI discomfort.

Schools and day care centers must have plans in place to address any food allergy emergency. Parents and caregivers should take special care with children and learn how to

- Protect children from foods to which they are allergic
- Manage children if they eat a food to which they are allergic
- Give children epinephrine

Exercise-Induced Food Allergy

At least one situation may require more than simply eating food with allergens to start a reaction: exercise-induced food allergy. People who have this reaction only experience it after eating a specific food before exercising. As exercise increases and body temperature rises, itching and light-headedness start and allergic reactions such as hives may appear and even anaphylaxis may develop.

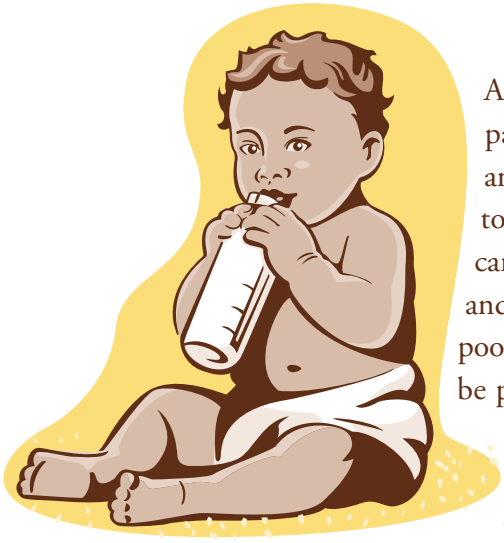
The cure for exercised-induced food allergy is simple—avoid eating for a couple of hours before exercising.

There are several medicines that you can take to relieve food allergy symptoms that are not part of an anaphylactic reaction. These include

- Antihistamines to relieve GI symptoms, hives, or sneezing and a runny nose
- Bronchodilators to relieve asthma symptoms

You should take these medicines if you have accidentally eaten a food to which you are allergic. They do not prevent an allergic reaction when taken before eating the food. No medicine in any form will reliably prevent an allergic reaction to that food before eating it.

Food Allergy in Infants and Children



Allergy to cow's milk is particularly common in infants and young children. In addition to causing hives and asthma, it can lead to colic and sleeplessness, and perhaps blood in the stool or poor growth. Infants are thought to be particularly susceptible to this allergic syndrome because their immune and digestive systems are immature. Milk allergy can develop within days to months of birth.

If your baby is on cow's milk formula, your provider may suggest a change to soy formula or an elemental formula if possible. Elemental formulas are produced from processed proteins with supplements added (basically sugars and **amino acids**). There are few if any allergens within these materials.

Health care providers sometimes prescribe glucocorticosteroid drugs to treat infants with very severe GI reactions to milk formulas. Fortunately, this food allergy tends to go away within the first few years of life.

Breast feeding often helps babies avoid feeding problems related to allergic reactions. Therefore, health experts often suggest that mothers feed their baby only breast milk for the first 6 to 12 months of life to avoid milk allergy from developing within that time frame.

Some babies are very sensitive to a certain food. If you are nursing and eat that food, sufficient amounts can enter your breast milk to cause a food reaction in your baby. To keep possible food allergens out of your breast milk, you might try not eating those foods that could cause an allergic reaction in your baby, such as peanuts.

There is no conclusive evidence that breast feeding prevents allergies from developing later in your child's life. It does, however, delay the start of food allergies by delaying your infant's exposure to those foods that can prompt allergies. Plus, it may avoid altogether food allergy problems sometimes seen in infants.

By delaying the introduction of solid foods until your baby is 6 months old or older, you can also prolong your baby's allergy-free period. In addition, the American Academy of Pediatrics recommends you delay adding eggs to your child's diet until he or she is 2 years old and peanuts, tree nuts, and fish until he or she is 3 years old.

Some Controversial and Unproven Theories

There are several disorders that are popularly thought by some to be caused by food allergies. There is not enough scientific evidence, or evidence that does exist goes against such claims.

Migraine Headaches

There is controversy about whether migraine headaches can be caused by food allergy. Studies show people who are prone to migraines can have their headaches brought on by histamines and other substances in foods. The more difficult issue is whether food allergies actually cause migraines in such people.

Arthritis

There is virtually no evidence that most rheumatoid arthritis or osteoarthritis can be made worse by foods, despite claims to the contrary.

Allergic Tension Fatigue Syndrome

There is no evidence that food allergies can cause a disorder called the allergic tension fatigue syndrome, in which people are tired, nervous, and may have problems concentrating, or have headaches.

Cerebral Allergy

Cerebral allergy is a term that has been given to people who have trouble concentrating and have headaches as well as other complaints. These symptoms are sometimes blamed on mast cells activated in the brain but no other place in the body. Researchers have found no evidence that such a scenario can happen. Most health experts do not recognize cerebral allergy as a disorder.

Environmental Illness

In a seemingly pristine environment, some people have many non-specific complaints such as problems concentrating or depression. Sometimes this is blamed on small amounts of allergens or toxins in the environment. There is no evidence that such problems are due to food allergies.

Childhood Hyperactivity

Some people believe hyperactivity in children is caused by food allergies. But researchers have found that this behavioral disorder in children is only occasionally associated with food additives, and then only when such additives are consumed in large amounts. There is no evidence that a true food allergy can affect a child's activity except for the possibility that if a child itches and sneezes and wheezes a lot, the child may be uncomfortable and therefore more difficult to guide. Also, children who are on anti-allergy medicines that cause drowsiness may get sleepy in school or at home.

Controversial and Unproven Diagnostic Methods

Cytotoxicity testing

One controversial diagnostic technique is cytotoxicity testing, in which a food allergen is added to your blood sample. A technician then examines the sample under the microscope to see if white cells in the blood "die." Scientists have evaluated this technique in several studies and have found it does not effectively diagnose food allergy.

Provocative challenge

Another controversial approach is called sublingual (placed under the tongue) or subcutaneous (injected under the skin) provocative challenge. In this procedure, diluted food allergen is put under your tongue if you feel that your arthritis, for instance, is due to foods. The technician then asks you if the food allergen has made your arthritis symptoms worse. In clinical studies, researchers have not shown that this procedure can effectively diagnose food allergy.

Immune complex assay

An immune complex assay is sometimes done on people suspected of having food allergies to see if groups, or complexes, of certain antibodies connect to the food allergen in the bloodstream. Some think that these immune groups link with food allergies. But the formation of such immune complexes is a normal offshoot of food digestion, and everyone, if tested with a sensitive enough measurement, has them. To date, no one has conclusively shown that this test links with allergies to foods.

IgG subclass assay

Another test is the IgG subclass assay, which looks specifically for certain kinds of IgG antibody. Again, there is no evidence that this diagnoses food allergy.

Controversial and Unproven Treatments

Controversial treatments include putting a diluted solution of a particular food under your tongue about a half hour before you eat the food suspected of causing an allergic reaction. This is an attempt to "neutralize" the subsequent exposure to the food that you believe is harmful. The results of a carefully conducted clinical study show this procedure does not prevent an allergic reaction.

Allergy shots

Another unproven treatment involves getting shots (immunotherapy) containing small quantities of the food extracts to which you are allergic. These shots are given regularly for a long period of time with the aim of "desensitizing" you to the food allergen. Researchers have not yet proven that allergy shots reliably relieve food allergies.

Research

The National Institute of Allergy and Infectious Diseases does research on food allergy and other allergic diseases. This research is focused on understanding what happens to the body during the allergic process—the sequence of events leading to the allergic response and the factors responsible for allergic diseases. This understanding will lead to better methods of diagnosing, preventing, and treating allergic diseases. Researchers also are looking at better ways to study allergic reactions to foods.

One study by the Johns Hopkins Children's Center showed that simply washing your hands with soap and water will remove peanut allergens. Also, most household cleaners will remove them from surfaces such as food preparation areas at home as well as day care facilities and schools. These easy-to-do measures will help prevent peanut allergy reactions in children and adults.

Educating people, including patients, health care providers, school teachers, and day care workers, about the importance of food allergy is also an important research focus. The more people know about the disorder, the better equipped they will be to control food allergies.

More Information

American Academy of Allergy, Asthma and Immunology

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Milwaukee, WI 53202-3823
1-800-822-2762
http://www.aaaai.org

The American Academy of Pediatrics

141 Northwest Point Boulevard
Elk Grove Village, IL 60007-1098
847-434-4000
http://www.aap.org

American College of Allergy, Asthma and Immunology

85 W. Algonquin Road, Suite 550
Arlington Heights, IL 60005
1-800-842-7777
http://allergy.mcg.edu

Asthma and Allergy Foundation of America

1233 20th Street, NW, Suite 402
Washington, DC 20036
1-800-7-ASTHMA (1-800-727-8462) or 202-466-7643
http://www.aafa.org

The Food Allergy and Anaphylaxis Network

11781 Lee Jackson Highway, Suite 160
Fairfax, VA 22033
1-800-929-4040
http://www.foodallergy.org

Allergy Extracts

Food and Drug Administration

Center for Biologics Evaluation and Research
1401 Rockville Pike
Rockville, MD 20852-1448
1-800-835-4709 or 301-827-1800
http://www.fda.gov/cber

Celiac Disease and Lactose Intolerance

National Institute of Diabetes and Digestive and Kidney Diseases

National Digestive Diseases Information Clearinghouse
2 Information Way
Bethesda, MD 20892-3570
1-800-891-5389 or 301-654-3810
http://digestive.niddk.nih.gov

Eczema

National Arthritis, Musculoskeletal and Skin Diseases Information Clearinghouse

1 AMS Circle
Bethesda, MD 20892-3675
1-877-22-NIAMS (1-877-226-4267) or 301-495-4484
http://www.niams.nih.gov

American Academy of Dermatology

P.O. Box 4014
Schaumburg, IL 60168-4014
847-330-0230
http://www.aad.org

National Eczema Association for Science and Education

4460 Redwood Highway, Suite 16-D
San Rafael, CA 94903-1953
1-800-818-7546 or 415-499-3474
http://www.nationaleczema.org

Food Contents

U.S. Department of Agriculture

Food and Nutrition Information Center
Agricultural Research Service
National Agricultural Library, Room 105
10301 Baltimore Avenue
Beltsville, MD 20705-2351
301-504-5719
http://www.nal.usda.gov/fnic/

Food Facts

American Dietetic Association

National Center for Nutrition and Dietetics Information Line
1-800-366-1655
http://www.eatright.org/Public

Glossary

allergen—substance that causes an allergic reaction

amino acids—any of the 26 building blocks of proteins

anaphylaxis—severe reaction to an allergen which can cause itching, fainting, and in some cases, death

antibody—a molecule tailor-made by the immune system to lock onto and destroy specific foreign substances, such as allergens

enzyme—protein produced by living cells

extract—concentrated liquid preparation containing minute parts of specific foods

gastrointestinal (GI) tract—area of the body that includes the stomach and intestines

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

microbes—tiny living things, such as bacteria, viruses, and fungi, which sometimes cause disease

mast cells—large granule-containing cells

molecule—building block of a cell. Examples are proteins, fats, and carbohydrates

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

toxins—poisonous agents produced by plants and bacteria, normally very damaging to human cells

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