

# FOOD ALLERGY AND INTOLERANCES

Food allergies or food intolerances affect nearly everyone at some point. People often have an unpleasant reaction to something they ate and wonder if they have a food allergy. One out of three people either say that they have a food allergy or that they modify the family diet because a family member is suspected of having a food allergy. But only about three percent of children have clinically proven allergic reactions to foods. In adults, the prevalence of food allergy drops to about one percent of the total population.

This difference between the clinically proven prevalence of food allergy and the public perception of the problem is in part due to reactions called "food intolerances" rather than food allergies. A food allergy, or hypersensitivity, is an abnormal response to a food that is triggered by the immune system. The immune system is not responsible for the symptoms of a food intolerance, even though these symptoms can resemble those of a food allergy.

It is extremely important for people who have true food allergies to identify them and prevent allergic reactions to food because these reactions can cause devastating illness and, in some cases, be fatal.

## **How Allergic Reactions Work**

An allergic reaction involves two features of the human immune response. One is the production of immunoglobulin E (IgE), a type of protein called an antibody that circulates through the blood. The other is the mast cell, a specific cell that occurs in all body tissues but is especially common in areas of the body that are typical sites of allergic reactions, including the nose and throat, lungs, skin, and gastrointestinal tract.

The ability of a given individual to form IgE against something as benign as food is an inherited predisposition. Generally, such people come from families in which allergies are common—not necessarily food allergies but perhaps hay fever, asthma, or hives. Someone with two allergic parents is more likely to develop food allergies than someone with one allergic parent.

Before an allergic reaction can occur, a person who is predisposed to form IgE to foods first has to be exposed to the food. As this food is digested, it triggers certain cells to produce specific IgE in large amounts. The IgE is then released and attaches to the surface of mast cells. The next time the person eats that food it interacts with 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 a person to have various symptoms of food allergy. If the mast cells release chemicals in the ears, nose, and throat, a person may feel an itching in the mouth and may have trouble breathing or swallowing. If the affected mast cells are in the gastrointestinal tract, the person may have abdominal pain or diarrhea. The chemicals released by skin mast cells, in contrast, can prompt hives.

Food allergens (the food fragments responsible for an allergic reaction) are proteins within the food that usually are not broken down by the heat of cooking or by stomach acids or enzymes that digest food. As a result, they survive to cross the gastrointestinal lining, enter the bloodstream, and go to target organs, causing allergic reactions throughout the body.

The complex process of digestion affects the timing and the location of a reaction. If people are allergic to a particular food, for example, they may first experience itching in the mouth as they start to eat the food. After the food is digested in the stomach, abdominal symptoms such as vomiting, diarrhea, or pain may start. When the food allergens enter and travel through the bloodstream, they can cause a drop in blood pressure. As the allergens reach the skin, they can induce hives or eczema, or when they reach the lungs, they may cause asthma. All of this takes place within a few minutes to an hour.

### **Common Food Allergies**

In adults, the most common foods to cause allergic reactions include: shellfish such as shrimp, crayfish, lobster, and crab; peanuts, a legume that is one of the chief foods to cause severe anaphylaxis, a sudden drop in blood pressure that can be fatal if not treated quickly; tree nuts such as walnuts; fish; and eggs.

In children, the pattern is somewhat different. The most common food allergens that cause problems in children are eggs, milk, and peanuts. Adults usually do not lose their allergies, but children can sometimes outgrow them. Children are more likely to outgrow allergies to milk or soy than allergies to peanuts, fish, or shrimp.

The foods that adults or children react to are those foods they eat often. In Japan, for example, rice allergy is more frequent. In Scandinavia, codfish allergy is more common.

### **Cross Reactivity**

If someone has a life-threatening reaction to a certain food, the doctor will counsel the patient to avoid similar foods that might trigger this reaction. For example, if someone has a history of allergy to shrimp, testing will

usually show that the person is not only allergic to shrimp but also to crab, lobster, and crayfish as well. This is called cross-reactivity.

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

### **Differential Diagnoses**

A differential diagnosis means distinguishing food allergy from food intolerance or other illnesses. If a patient goes to the doctor's office and says, "I think I have a food allergy," the doctor has to consider the list of other possibilities that may lead to symptoms that could be confused with food allergy.

One possibility is the contamination of foods with microorganisms, such as bacteria, and their products, such as toxins. Contaminated meat sometimes mimics a food reaction when it is really a type of food poisoning.

There are also natural substances, such as histamine, that can occur in foods and stimulate a reaction similar to an allergic reaction. For example, histamine can reach high levels in cheese, some wines, and in certain kinds of fish, particularly tuna and mackerel. In fish, histamine is believed to stem from bacterial contamination, particularly in fish that hasn't been refrigerated properly. If someone eats one of these foods with a high level of histamine, that person may have a reaction that strongly resembles an allergic reaction to food. This reaction is called histamine toxicity.

Another cause of food intolerance that is often confused with a food allergy is lactase deficiency. This most common food intolerance affects at least one out of ten people. Lactase is an enzyme that is in the lining of the gut. This enzyme degrades lactose, which is in milk. If a person does not have enough lactase, the body cannot digest the lactose in most milk products. Instead, the lactose is used by bacteria, gas is formed, and the person experiences bloating, abdominal pain, and sometimes diarrhea. There are a couple of diagnostic tests in which the patient ingests a specific amount of lactose and then the doctor measures the body's response by analyzing a blood sample.

Another type of food intolerance is an adverse reaction to certain products that are added to food to enhance taste, provide color, or protect against the growth of microorganisms. Compounds that are most frequently tied to adverse reactions that can be confused with food allergy are yellow dye number 5, monosodium glutamate, and sulfites. Yellow dye number 5 can

cause hives, although rarely. Monosodium glutamate (MSG) is a flavor enhancer, and, when consumed in large amounts, can cause flushing, sensations of warmth, headache, facial pressure, chest pain, or feelings of detachment in some people. These transient reactions occur rapidly after eating large amounts of food to which MSG has been added.

Sulfites can occur naturally in foods or are added to enhance 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, which the asthmatic inhales while eating the sulfited food. This irritates the lungs and can send an asthmatic into severe bronchospasm, a constriction of the lungs. Such reactions led the U.S. Food and Drug Administration (FDA) to ban sulfites as spray-on preservatives in fresh fruits and vegetables. But they are still used in some foods and are made naturally during the fermentation of wine, for example.

There are several other diseases that share symptoms with food allergies including ulcers and cancers of the gastrointestinal tract. These disorders can be associated with vomiting, diarrhea, or cramping abdominal pain exacerbated by eating.

Gluten intolerance is associated with the disease called gluten-sensitive enteropathy or celiac disease. It is caused by an abnormal immune response to gluten, which is a component of wheat and some other grains.

Some people may have a food intolerance that has a psychological trigger. In selected cases, a careful psychiatric evaluation may identify an unpleasant 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 unpleasant sensations that can resemble an allergic reaction to food.

## **Diagnosis**

To diagnose food allergy a doctor must first determine if the patient is having an adverse reaction to specific foods. This assessment is made with the help of a detailed patient history, the patient's diet diary, or an elimination diet.

The first of these techniques is the most valuable. The physician sits down with the person suspected of having a food allergy and takes a history to determine if the facts are consistent with a food allergy. The doctor asks such questions as:

- What was the timing of the reaction? Did the reaction come on quickly, usually within an hour after eating the food?
- Was allergy treatment successful? (Antihistamines should relieve

- hives, for example, if they stem from a food allergy.)
- 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 is sometimes related to the amount of food the patient ate.
  - How was the food prepared? Some people will have a violent allergic reaction only to raw or undercooked fish. Complete cooking of the fish destroys those allergens in the fish to which they react. If the fish is cooked thoroughly, they can eat it with no allergic reaction.
  - Were other foods ingested at the same time of the allergic reaction? Some foods may delay digestion and thus delay the onset of the allergic reaction.

Sometimes a diagnosis cannot be made solely on the basis of history. In that case, the doctor may ask the patient to go back and keep a record of the contents of each meal and whether he or she had a reaction. This gives more detail from which the doctor and the patient can determine if there is consistency in the reactions.

The next step some doctors use is an elimination diet. Under the doctor's direction, the patient does not eat a food suspected of causing the allergy, like eggs, and substitutes another food, in this case, another source of protein. If the patient removes the food and the symptoms go away, the doctor can almost always make a diagnosis. If the patient then eats the food (under the doctor's direction) and the symptoms come back, then the diagnosis is confirmed. This technique cannot be used, however, if the reactions are severe (in which case the patient should not resume eating the food) or infrequent.

If the patient's history, diet diary, or elimination diet suggests a specific food allergy is likely, the doctor will then use tests that can more objectively measure an allergic response to food. One of these is a scratch skin test, during which a dilute extract of the food is placed on the skin of the forearm or back. This portion of the skin is then scratched with a needle and observed for swelling or redness that would indicate a local allergic reaction. If the scratch test is positive, the patient has IgE on the skin's mast cells that is specific to the food being tested.

Skin tests are rapid, simple, and relatively safe. But a patient can have a positive skin test to a food allergen without experiencing allergic reactions to that food. A doctor diagnoses a food allergy only when a patient has a positive skin test to a specific allergen and the history of these reactions suggests an allergy to the same food.

In some extremely allergic patients who have severe anaphylactic reactions, skin testing cannot be used because it could evoke a dangerous reaction. Skin testing also cannot be done on patients with extensive eczema.

For these patients a doctor may use blood tests such as the RAST and the ELISA. These tests measure the presence of food-specific IgE in the blood of patients. These tests may cost more than skin tests, and results are not available immediately. As with skin testing, positive tests do not necessarily make the diagnosis.

The final method used to objectively diagnose food allergy is double-blind food challenge. This testing has come to be the "gold standard" of allergy testing. Various foods, some of which are suspected of inducing an allergic reaction, are each placed in individual opaque capsules. The patient is asked to swallow a capsule and is then watched to see if a reaction occurs. This process is repeated until all the capsules have been swallowed. In a true double-blind test, the doctor is also "blinded" (the capsules having been made up by some other medical person) so that neither the patient nor the doctor knows which capsule contains the allergen.

The advantage of such a challenge is that if the patient has a reaction only to suspected foods and not to other foods tested, it confirms the diagnosis. Someone with a history of severe reactions, however, cannot be tested this way. In addition, this testing is expensive because it takes a lot of time to perform and multiple food allergies are difficult to evaluate with this procedure.

Consequently, double-blind food challenges are done infrequently. This type of testing is most commonly used when the doctor believes that the reaction a person is describing is not due to a specific food and the doctor wishes to obtain evidence to support this judgment so that additional efforts may be directed at finding the real cause of the reaction.

### **Exercise-Induced Food Allergy**

At least one situation may require more than the simple ingestion of a food allergen to provoke a reaction: exercise-induced food allergy. People who experience this reaction eat a specific food before exercising. As they exercise and their body temperature goes up, they begin to itch, get light-headed, and soon have allergic reactions such as hives or even anaphylaxis. The cure for exercised-induced food allergy is simple—not eating for a couple of hours before exercising.

### **Treatment**

Food allergy is treated by dietary avoidance. Once a patient and the patient's doctor have identified the food to which the patient is sensitive, the food must be removed from the patient's diet. To do this, patients must read lengthy, detailed ingredient lists on each food they 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. The FDA requires ingredients in a food to appear on its label. People can avoid most of the things to which they are sensitive if they read food labels carefully and avoid restaurant-prepared foods that might have ingredients to which they are allergic.

In highly allergic people even minuscule amounts of a food allergen (for example, 1/44,000 of a peanut kernel) can prompt an allergic reaction. Other less sensitive people may be able to tolerate small amounts of a food to which they are allergic.

Patients with severe food allergies must be prepared to treat an inadvertent exposure. Even people who know a lot about what they are sensitive to occasionally make a mistake. 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. Such people should always carry a syringe of adrenaline (epinephrine), obtained by prescription from their doctors, and be prepared to self-administer it if they think they are getting a food allergic reaction. They should then immediately seek medical help by either calling the rescue squad or by having themselves 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 gastrointestinal discomfort.

Special precautions are warranted with children. Parents and caregivers must know how to protect children from foods to which the children are allergic and how to manage the children if they consume a food to which they are allergic, including the administration of epinephrine. Schools must have plans in place to address any emergency.

There are several medications that a patient can take to relieve food allergy symptoms that are not part of an anaphylactic reaction. These include antihistamines to relieve gastrointestinal symptoms, hives, or sneezing and a runny nose. Bronchodilators can relieve asthma symptoms. These medications are taken after people have inadvertently ingested a food to which they are allergic but are not effective in preventing an allergic reaction when taken prior to eating the food. No medication in any form can be taken before eating a certain food that will reliably prevent an allergic reaction to that food.

There are a few non-approved treatments for food allergies. One involves injections containing small quantities of the food extracts to which the patient is allergic. These shots are given on a regular basis for a long period of time with the aim of "desensitizing" the patient to the food allergen. Researchers have not yet proven that allergy shots relieve food allergies.

### **Infants and Children**

Milk and soy allergies are particularly common in infants and young children. These allergies sometimes do not involve hives and asthma, but rather lead to colic, and perhaps blood in the stool or poor growth. Infants and children are thought to be particularly susceptible to this allergic syndrome because of the immaturity of their immune and digestive systems. Milk or soy allergies in infants can develop within days to months of birth. Sometimes there is a family history of allergies or feeding problems. The clinical picture is one of a very unhappy colicky child who may not sleep well at night. The doctor diagnoses food allergy partly by changing the child's diet. Rarely, food challenge is used.

If the baby is on cow's milk, the doctor may suggest a change to soy formula or exclusive breast milk, if possible. If soy formula causes an allergic reaction, the baby may be placed on an elemental formula. These formulas are processed proteins (basically sugars and amino acids). There are few if any allergens within these materials. The doctor will sometimes prescribe corticosteroids to treat infants with severe food allergies. Fortunately, time usually heals this particular gastrointestinal disease. It tends to resolve within the first few years of life.

Exclusive breast feeding (excluding all other foods) of infants for the first 6 to 12 months of life is often suggested to avoid milk or soy allergies from developing within that time frame. Such breast feeding often allows parents to avoid infant-feeding problems, especially if the parents are allergic (and the infant therefore is likely to be allergic). There are some children who are so sensitive to a certain food, however, that if the food is eaten by the mother, sufficient quantities enter the breast milk to cause a food reaction in the child. Mothers sometimes must themselves avoid eating those foods to which the baby is allergic.

There is no conclusive evidence that breast feeding prevents the development of allergies later in life. It does, however, delay the onset of food allergies by delaying the infant's exposure to those foods that can prompt allergies, and it may avoid altogether those feeding problems seen in infants. By delaying the introduction of solid foods until the infant is 6 months old or older, parents can also prolong the child's allergy-free period.

## **Controversial Issues**

There are several disorders thought by some to be caused by food allergies, but the evidence is currently insufficient or contrary to such claims. It is controversial, for example, whether migraine headaches can be caused by food allergies. There are studies showing that 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. There is virtually no evidence that most rheumatoid arthritis or osteoarthritis can be made worse by foods, despite claims to the contrary. There is also 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 is a term that has been applied to people who have trouble concentrating and have headaches as well as other complaints. This is sometimes attributed to mast cells degranulating in the brain but no other place in the body. There is no evidence that such a scenario can happen, and most doctors do not currently recognize cerebral allergy as a disorder.

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

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 proviso that if a child itches and sneezes and wheezes a lot, the child may be miserable and therefore more difficult to guide. Also, children who are on anti-allergy medicines that can cause drowsiness may get sleepy in school or at home.

## **Controversial Diagnostic Techniques**

One controversial diagnostic technique is cytotoxicity testing, in which a food allergen is added to a patient's 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 not been found it to effectively diagnose food allergy.

Another controversial approach is called sublingual or, if it is injected under the skin, subcutaneous provocative challenge. In this procedure, dilute food allergen is administered under the tongue of the person who may feel that

his or her arthritis, for instance, is due to foods. The technician then asks the patient if the food allergen has aggravated the arthritis symptoms. In clinical studies, researchers have not shown that this procedure can effectively diagnose food allergies.

An immune complex assay is sometimes done on patients suspected of having food allergies to see if there are complexes of certain antibodies bound to the food allergen in the bloodstream. It is said that these immune complexes correlate 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 correlates with allergies to foods.

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 Treatments**

Controversial treatments include putting a dilute solution of a particular food under the tongue about a half hour before the patient eats that food. This is an attempt to "neutralize" the subsequent exposure to the food that the patient believes is harmful. As the results of a carefully conducted clinical study show, this procedure is not effective in preventing an allergic reaction.

### **Summary**

Food allergies are caused by immunologic reactions to foods. There actually are several discrete diseases under this category, and a number of foods that can cause these problems.

After one suspects a food allergy, a medical evaluation is the key to proper management. Treatment is basically avoiding the food(s) after it is identified. People with food allergies should become knowledgeable about allergies and how they are treated, and should work with their physicians.

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