

Understanding

By Jessica Schulman, PhD, MPH, RD

What is food to one man is bitter poison to others.

— Lucretius (99 BC – 55 BC)

It was a summery August night, and Emma was talking with friends and enjoying fresh-cut watermelon. The next morning, she woke up to get ready for work and could hardly open her eyes. Her eyelids were swollen and her neck was covered in hives. She knew that she was allergic to ragweed pollen, but she did not recall being allergic to watermelon. What do you think happened to Emma? Could it have been prevented? Was this a food allergy?

According to the Food Allergy and Anaphylaxis Network (FAAN), approximately 12 million Americans suffer from food allergies. As many as 30,000 individuals require emergency room treatment for severe food allergies or anaphylaxis each year. This impacts general health and emotional well-being.

Syed Arshad, MD, is director of the David Hide Asthma and Allergy Research Centre at St. Mary's Hospital, in Newport, Isle of Wight, U.K. He describes food allergies as a significant problem that is not going away. In particular, he says, "there has been an increase in peanut allergies... which tends to be the most dangerous." He suggests that food allergies are common, afflicting up to 8 percent of young children and 4 percent of older children and adults.

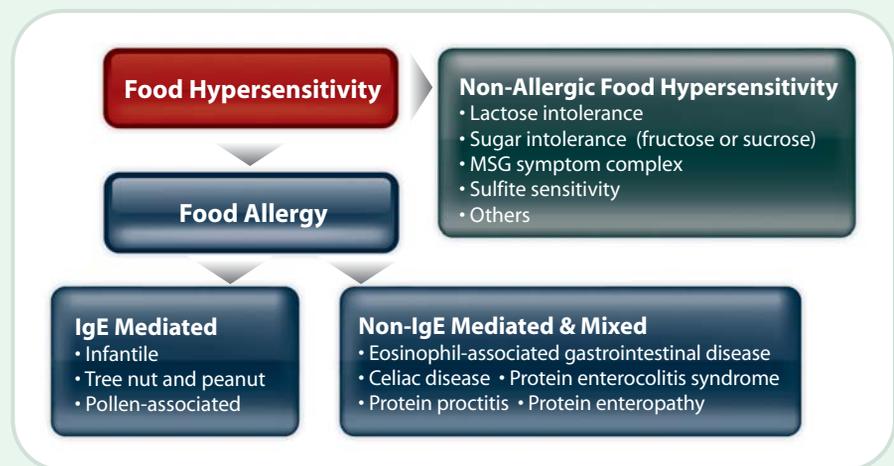
What Are Food Allergies?

Most of us have probably encountered someone with Emma's food allergy—the type that is provoked by exposure, and re-exposure, to a certain food ingredient or substance. The body mistakenly learns that a food component is harmful. Then, the immune system takes action by launching its weaponry. For example, the body may think that pollen is an infection that needs to be destroyed. What happens next? The body may respond with immunoglobulin E (IgE) antibodies and release compounds, such as histamine, that cause symptoms from mild itchiness to runny nose to atopic dermatitis to sudden death due to anaphylactic shock. Various

organs such as the skin, gastrointestinal tract and respiratory tract become irritated or injured by this process.

The European Academy of Allergy and Clinical Immunology Task Force suggests that adverse reactions to food should be called "food hypersensitivity" (see Figure 1). When the immune system is involved, the appropriate term is "food allergy." This is typically, but not always, driven by IgE antibodies. The task force suggests that other reactions, sometimes referred to as "food intolerance" (e.g., lactose intolerance), should be referred to as "non-allergic food hypersensitivity." Severe, generalized allergic reactions to food are classified as anaphylaxis.¹

Figure 1. Food Hypersensitivity and Food Allergy



¹ Adapted from: Nomenclature Revised by the European Academy of Allergology and Clinical Immunology, [Johansson et al. 2001] and the World Allergy Association [Motala, 2007].

Food Allergies



Ulrich Wahn, MD, director of the Department of Pediatric Pneumology and Immunology at the University of Berlin, suggests that, for the general population, eight foods account for 90 percent of all food-allergic reactions: milk, egg, peanut, tree nut (walnuts, almonds, cashews, pistachios, pecans, etc.), fish, shellfish, soy and wheat. Dr. Wahn provides a road map for understanding IgE-driven food allergies.

1. Infantile: Infantile food allergy begins early in life, around 6 to 12 months of age. It is generally transient, so it gets better over a period of months or a limited number of years. Most cases run their course by the baby's first birthday, but some cases last much longer. Symptoms may include vomiting, diarrhea, abdominal pain, hives, swelling, itching, eczema and difficulty breathing. The pediatrician will often recommend a special formula or diet. This involves removing one or more items from the "hit list" for the baby and the mother, if she is breastfeeding. Sometimes, specialized tests such as food challenge tests or IgE levels are ordered. The hit list includes hen eggs, cow's milk, soy and wheat. Most young children with atopic dermatitis from food allergies have reactions to milk, eggs or peanuts.

2. Tree nut and peanut: These nut allergies may be life-threatening, severe and persistent throughout life. Early signs include a runny nose, itchy skin, hives, or tingling in the mouth, tongue or lips. More severe signs include tightness in the throat, hoarse voice, wheezing, cough nausea, vomiting and anaphylaxis. Anaphylaxis may involve several symptoms at one time such as hives, blood pressure drop, narrowing of the breathing tubes and swelling of the tongue. The doctor may do specialized tests to confirm the allergy. The hit list includes cashews, almonds, pecans and walnuts among other tree nuts, and peanuts (really a legume). Although treatment for nut allergies is on the horizon, the doctor will probably recommend that the patient avoid the nut altogether.

3. Pollen-associated or pollen-food allergy syndrome: This syndrome can onset later in life. It may result from direct exposure to pollen on a fruit or vegetable or from a cross-reaction between a pollen allergy and a fruit or vegetable allergen. In a

cross-reaction, pollen-allergic individuals have IgE antibodies that also react to allergens coming from a fruit or vegetable (called cross-sensitization). For example, birch pollen allergies are associated with peach allergies (see Table 1). It has a wide range of severity, and symptoms are variable, including itching, urticaria or hives and welts, burning, swelling in the lips, tongue and palate, congestion, itchy watery eyes, wheezing, nausea, abdominal pain, diarrhea, chest or throat tightness, and difficulty swallowing or breathing. The syndrome can be persistent, and Dr. Wahn says, "The best cure is age, and you may have to wait for decades." The hit list includes fresh fruits and vegetables such as pears, apricots, melons, bananas, nuts such as hazelnuts or vegetables such as carrots. Raw and unprocessed foods tend to cause more severe reactions.

Which food allergy did Emma most likely experience? If you guessed pollen-associated, you're correct. She is allergic to ragweed pollen and developed a cross-reaction to watermelons. ➤

Table 1. Cross-reaction Allergies*

Pollen or Inhalant	Common Food Allergens
Birch pollen	Apple, raw potato, carrot, celery, hazelnut, pear, peach, plum, cherry
Mugwort pollen	Celery, apple, peanut, kiwi fruit, carrot, parsley, spices (fennel, coriander, aniseed, cumin)
Ragweed pollen	Melons (e.g., watermelon, cantaloupe, and honeydew), bananas
Latex (hevea brasiliensis tree, rubber tree)	Avocado, kiwi fruit, chestnut, papaya, banana

* Adapted from the World Allergy Organization

What Is Anaphylaxis?

Anaphylactic shock is the most severe type of food allergy: It causes death in 150 to 200 people annually.² If left untreated, it can lead to death in a matter of minutes.

On Halloween night in 2002, Gina's 2-year-old son, Conner, tasted his first chocolate-coated peanut candy. He did not like the texture and spit it



Conner and his mother, Gina

onto the floor. Within a few minutes, he was vomiting and developed fluid-filled hives that were growing and converging all over his body. By the time they reached the emergency room, the hives were around Conner's throat. Two epinephrine injections were administered, one into each of Conner's thighs. Gina says, "Within 10 minutes' time, Conner fell asleep on his daddy's shoulder, and the next morning the hives were gone." A pediatric allergist offered some unsettling guidance. "In all likelihood he will never be free of these life-threatening symptoms, so steer clear of nuts!"

Epinephrine (adrenaline) is used for controlling an anaphylactic reaction. It is available as a self-injectable device (EpiPen®, single dose, or Twinject®, two doses). In most cases, strict avoidance of the allergy-causing food is the only way to prevent a reaction. Early administration of the epinephrine is the key to treating anaphylaxis successfully, so, if the allergy is known, it is wise to carry epinephrine at all times.

Gina says, "Don't let the [epinephrine] be a source of worry. Instead, use it as a confidence builder, and help your children to live as normal a life as possible." However, cross-contamination is a problem so Gina does not take Conner to places such as ice-cream shops that may cross-contaminate with nuts. "You have to be vigilant. Sometimes people have a really difficult time grasping how a beautiful child can have a life-threatening food allergy," she says.



Epinephrine pen

How Do You Confirm a Food Allergy?

A specialist may confirm an allergy with a food challenge in which a patient is given a small amount of the substance to which he or she might be allergic. Dr. Wahn explains that "allergy is the demonstration of a positive food challenge in an individual," but he warns that "it is unethical to challenge someone who has a clear-cut history of peanut allergy."

Today, numerous allergy tests are available, but the most commonly used are the skin prick test (a mosquito bitelike bump appears if the patient is allergic to the substance) and a blood test to check for elevated IgE to certain allergens ➤

² FAAN, 2002.

Can You Say Eosinophilic?

Allergic eosinophilic gastrointestinal disease is a mixed phenomenon involving IgE antibodies and other immune components, such as T cells. This is an emerging disorder that is linked to food allergies and an irregular immune system. Buddy's story, below, may serve as a model for understanding how other parts of the immune system interact to cause allergic disease. If there is suspicion of a problem, always work through the process of making the correct diagnosis with your doctor—and be persistent.

Buddy's Story

By 5 weeks of age, Buddy had projectile vomiting and diarrhea while being breastfed, a horrible skin rash on his bottom, and he was generally irritated. "He spent his first year strapped into his car seat next to my bed because we were afraid that if we laid him down he would throw up and suffocate on his own vomit," recalls Buddy's mother, Nancy. "Some days, he would cry and scream in pain for 14 hours straight."

When I asked Nancy what steps she took to get him correctly diagnosed and treated, she said, "For the next 14 months, we went to our pediatrician, ENT, pulmonologist, allergist, immunologist, surgeon and gastroenterologist." No one was able to see the whole picture, and the family continued to suffer. "I went through endless amounts of expensive medicines to no avail. I tried numerous formulas and restricted my own diet, since I was breastfeeding. Even simple things like going to the grocery store were impossible. He would scream in pain, and everyone would look at me as if I did something to hurt him."

Nancy was tireless and continued to advocate for her child. Eventually, Buddy was diagnosed with an immune deficiency and eosinophilic enteropathy.

When Buddy was 2 years old, the family traveled 860 miles from home to seek more specialized attention at Cincinnati Children's Hospital Medical Center. He is now properly treated with a very restrictive diet and special formula. "In the beginning, we went to no food for almost one year and even now, at four years later, we still have periods where he cannot consume anything but the formula," Nancy says.

If Buddy does not tolerate the introduction of a new food during a food trial, it is immediately removed from

his diet and they are back to the drawing board for a few weeks or months. Every few months, Nancy does food trials with Buddy with the hope that perhaps one day he will be able to eat a broader diet.

After Buddy was correctly diagnosed, he got almost immediate relief from his symptoms. Though he still depends on a special formula, he is a happy little boy and doesn't seem to mind his stringent diet. "The formula is bad tasting to me," Nancy said, "but he knows, and we know, that it is safe for his body, and that is what matters."

Buddy recently celebrated his fifth birthday. He attends preschool part time, plays tee ball and soccer, rides his bike without training wheels and loves to drive his big sister nuts. Nancy explains that, with immune problems and food allergies, the hardest part is "his problems are hidden inside of his body," adding that "if he eats the wrong food or tries to sneak something, his body attacks itself on the inside! At any moment we could be heading to the hospital."

What can other families learn from Buddy's experience? "I just want parents to know that they need to follow through with their gut feeling when something isn't right. There are many great doctors out there, but all doctors can't be specialized in everything. Rare issues make for rare proper diagnosis," Nancy said with conviction.

What Happened to Buddy?

An eosinophil is a type of white blood cell that occurs naturally in the human immune system—in very small numbers. Under certain conditions, such as when there is an infection, the body releases a lot more eosinophils and they accumulate in an organ such as the gut and release toxin. This is helpful, except when the cells incorrectly respond to a food ingredient as if it were a deadly parasite. When this happens, the toxin damages everything in its path, including healthy tissue. This is what happened to Buddy. Often, the allergic reaction is delayed, which makes it difficult to know what to eat or avoid. Symptoms vary by age. Babies will have problems eating, including vomiting and excruciating pain. Adolescents and adults may have trouble swallowing. Other reported symptoms include nausea, early satiety or fullness, diarrhea, slow emptying of the stomach, blood in the stool and anemia.

(e.g., radioallergosorbent tests or ImmunoCap®). Patch testing is a relatively new method that is used to determine if certain substances are associated with inflammation of the skin. Small amounts of food ingredients are placed directly on the skin, with an adhesive, for one to two days. Then, a specialist evaluates whether or not there has been a delayed reaction to the substance. Dr. Wahn considers patch testing to be useful, "but not to the extent that it is considered a gold standard for all food allergies," he adds.

An experienced allergist will also examine the context of a suspected food allergy, such as how the patient is feeling and any concurrent health conditions such as immune dysfunction. A negative IgE blood test does not always mean that you do not have a food allergy, as a positive test does not necessarily mean that you have a food allergy. "You have to correlate the positive test to the clinical exam or status of how the patient is doing in real life," Dr. Arshad emphasizes. A positive test might indicate a need for clinical challenges. Lack of a positive test might result in an allergist challenging the patient with the food that he or she seems to be allergic to, to reproduce an adverse reaction in a controlled setting. Then the allergist will watch closely to see if there is resolution of the symptoms by eliminating the offending ingredient from the diet. This is called an elimination challenge.

Food Allergy Testing

If individuals suspect that they have food allergies, they should contact a disease-specific organization and locate a physician that has

experience diagnosing and treating allergies (see Resources). Only a qualified specialist can attach the correct meaning to the test results. Self-diagnosing food allergies without proper guidance can lead to poor eating habits or mislead an individual to overlook a significant medical problem (see Can You Say Eosinophilic?).

Allergies and Pregnancy

At the American Academy of Allergy, Asthma and Immunology (AAAAI) 2007 Annual Meeting, Drs. Arshad and Wahn explained that they have not found clear evidence that allergen avoidance during pregnancy is useful. In fact, avoidance of certain foods during pregnancy has potential to compromise the mother's diet. This does not mean that avoiding allergic foods does not delay allergies in her baby. There is evidence showing that the immune system may be negatively affected by exposure to certain allergens before birth. Until more is known, however, these scientists agree that it may not be practical to restrict the diet of a mother during pregnancy.

Allergies and Breastfeeding

It is not realistic to say that breastfeeding is magic and prevents food allergies. "If there were a clear effect of breastfeeding on allergies, there would be no debate among scientists. Still, irrespective of food allergy, nursing is an outstanding source of nutrients," Dr. Arshad says. Although large-scale literature reviews and studies show a slight protective effect of breastfeeding for allergy prevention, Dr. Arshad calls attention to the fact that "not a single study on prevention of allergies and exclusive

breastfeeding has been for more than six months." The question of how long breastfeeding remains at all protective is unanswered.



Prevention

If the child is at high risk of developing an allergy (high risk meaning that at least one or more parents or siblings has atopic disease or a confirmed food allergy), then avoiding certain food ingredients can improve outcomes. Scientists report some benefits in preventing atopic dermatitis and food allergy by eliminating cow's milk, nuts and eggs, and sometimes wheat and tree nuts. The problem, however, is that restricting such a broad array of ingredients while keeping a balanced diet can be tricky. Dr. Wahn hesitates to give general recommendations. "In certain cases, if a mom observes a problem after nursing, then you can confirm cases where [food allergy] is plausible and make diet recommendations," but "a recommendation for a whole

Resources

Allergic Disorders:
Promoting Best Practices
[www.theallergyreport.com/
reportindex.html](http://www.theallergyreport.com/reportindex.html)

American Partnership for
Eosinophilic Disorders
www.apfed.org

National Institutes of Health, National
Institute of Allergy and Infectious
Diseases (2004). *Food Allergy: An
Overview* (NIH Publication No. 04-5518).
[www.niaid.nih.gov/
publications/pdf/
foodallergy.pdf](http://www.niaid.nih.gov/publications/pdf/foodallergy.pdf)

Sicherer, S.H. (2006). *The Complete
Peanut Allergy Handbook: Understanding
and Managing Your Child's Food Allergies*.
Johns Hopkins Press.

Food Allergy and Anaphylaxis Network
800-929-4040
www.foodallergy.org

World Allergy Organization
www.worldallergy.org

Find an Allergist

- American Academy of Allergy,
Asthma & Immunology
800-822-ASMA
www.aaaai.org/physref
- American Academy of Pediatrics
800-433-9016
www.aap.org/referral
- American College of Allergy,
Asthma & Immunology
800-842-7777
www.aaaai.org/LocateAllergist

group is not appropriate." The risks and benefits must be considered. "If there is a high risk and support from a registered dietitian, restricting the diet may be worthwhile," Dr. Arshad says.

If the mother's milk is insufficient through the sixth month, a child at risk for developing food allergies will benefit from a formula where the proteins have been broken down or hydrolyzed. In one study, babies given extensively hydrolyzed formula showed significant reductions in allergic manifestations compared to those who used regular cow's milk formula.³ In most cases, however, formula is not superior to breast milk.

The American College of Allergy, Asthma and Immunology (ACAAI) recommends that the optimal age for introducing new foods should be at least six months. For children at high allergy risk, foods should be introduced one at a time, in small amounts, and on an appropriate schedule (e.g., 12 months of age for dairy products, 24 months for hen's

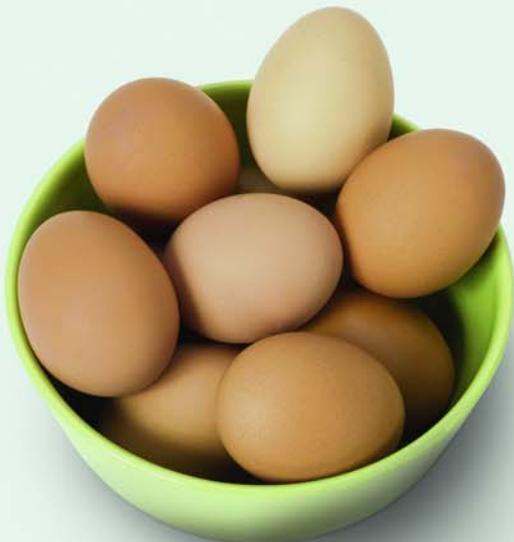
eggs and at least 36 months for peanuts, tree nuts, fish and seafood). It is helpful to keep a food journal so that you can see if there is a pattern developing. If an allergy is suspected, consult with a qualified allergist and seek guidance from a registered dietitian. ■

References

Wahn U., and Arshad S. (2007). Prevention and Natural History of Food Allergy. 2007 Annual Meeting. Presented at the annual meeting of the American Academy of Allergy, Asthma, and Immunology (AAAAI), San Diego.

Johansson, SGO., Hourihane JO., Bousquet J., Bruinjeel-Koomen C., Dreborg S., Haahtela T., et al. A revised nomenclature for allergy. *Allergy*, 2001;56,813-824.

von Berg A., Koletzko S., Grubl A., Filipiak-Pittroff B., Wichmann HE., Bauer CP., Reinhardt D., Berdel D., German Infant Nutritional Intervention Study Group. The effect of hydrolyzed cow's milk formula for allergy prevention in the first year of life: The German Infant Nutritional Intervention Study, a randomized double-blind trial. *J Allergy Clin Immunol*, 2003;111;467-470.



³ The Journal of Allergy and Clinical Immunology, 2003.