

DEALING WITH FOOD ALLERGIES IN BABIES AND CHILDREN

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CHAPTER 1

What Is Food Allergy?

THE SIMPLE EXPLANATION

A simple explanation of food allergy is that it is an inappropriate response by the immune system that results in symptoms. Our immune systems keep us free from disease by recognizing a “foreign invader” when it enters the body and by releasing in response a battery of defensive chemicals (called “inflammatory mediators”) into local tissues and into the circulatory system. All the food we eat comes from foreign sources—plants and animals—that we consume as nourishment. Normally our immune systems see this material as “foreign but safe” due to a complex process of tolerance that occurs when food is processed through the digestive system. When something goes wrong during this processing, a person becomes “sensitized” to the food, and thereafter the immune system perceives it as foreign and a threat. Whenever that food enters the body again, the immune system treats it as if it could cause disease. The symptoms that we experience as a result of this defensive action are called allergy.

Unlike allergy, *food intolerance* does not involve a response of the immune system. The chemicals released in the immune response are not involved in an intolerance reaction. Most intolerance reactions that we understand (and there are many that we do not!) involve a defect in the processing of the food, either during digestion, or later, after the food parts, or components, have

been absorbed into the body. The symptoms of food intolerance are often caused by an excess of a component that has not been digested completely (for example, lactose intolerance) or a component that, for some reason, cannot be processed efficiently after it has entered the body.

Whatever the mechanism that causes the symptoms, in the final analysis the only way to avoid distress is to avoid the foods that trigger the response. The first stage in avoidance, of course, is the correct identification of the foods and food components that are the triggers for the adverse reactions.

These are the simple “bare bones” explanations for the ways in which our bodies react to foods when we experience food allergies or intolerances. However, these processes are complex and diverse. If you want a more detailed, scientific explanation of the mechanisms leading to food allergy and food intolerance, please read on.

This chapter explains food allergy; the rest of the book discusses how this knowledge applies to your child. Understanding these processes will take some time and effort for the “nonscientist,” but it will ultimately be worthwhile. You will not only understand and appreciate how your child’s body functions when he or she is experiencing the distressing symptoms of an allergic reaction, but you will also understand what you can do, with the help of your pediatrician, dietitian, and other health care providers, to prevent or alleviate these symptoms at various stages in your child’s development. Furthermore, this chapter will help you to understand and evaluate information on allergy that you find in other sources.

THE BASICS OF ALLERGY

The symptoms of an allergic reaction are caused by biologically active chemicals produced by the immune system in its attempt to protect the body from a foreign invader. Our immune systems are designed to protect us from anything that might cause disease. Usually this is a microorganism such as a virus, bacterium, or other pathogen. However, the immune system of an allergic (atopic) person attempts to protect the body not only from potential pathogens but also from harmless substances such as pollens, animal dander, dust mites, mold spores, and food.

What is it that causes the immune system of one individual to fight a harmless substance, while another’s system recognizes the same materials as innocuous? Although we do not know the entire answer to this question,

research is starting to reveal parts of the puzzle. The difference lies right at the beginning of the process of recognition of what is safe and what may be harmful to the body.

First, it is important for you to understand that food itself is incapable of causing any disease in the way that viruses, bacteria, and cancer cells can. There are no “bad foods”! It is the body’s response to components of the food that results in the miserable symptoms we call *food allergy*, *food intolerance*, *food sensitivity*, or *adverse reactions to foods*. The reason that one child’s body responds to food by developing distressing symptoms, and that another’s uses the same food for comfort and nurture, may be found in several factors:

- The child’s inherited genetic makeup
- The circumstances under which the child first encountered the food
- The microorganisms that live within a child’s digestive tract
- The medications the child may have taken by mouth or been exposed to, for example, in mother’s breast milk
- Other factors that we are only just beginning to (often incompletely) understand

Food sensitivity is unlike any other disease entity. It has many different causes, since *any* food is capable of triggering an allergic reaction in a child who has been sensitized to it, or who lacks the systems required to process it adequately when it enters the body. The same food may be absolutely safe for other children. Furthermore, food allergy can result in many different symptoms in diverse organ systems. For example, one child may develop symptoms in the skin, such as eczema or hives; another may have symptoms in the digestive tract, such as stomachache, diarrhea, nausea, or vomiting; yet another develops symptoms in the lungs, such as asthma; or the upper respiratory tract, with a stuffy, runny nose; or earache; or all body systems at the same time (anaphylaxis). All this may occur as a result of eating the *same* food, such as peanuts or shellfish for example. Each allergic child differs in the way his or her immune system responds to food and which foods it responds to.

The usual medical model of disease that your doctor traditionally follows has several distinct steps that lead from symptoms to therapy:

- The symptoms (“presentation”) suggest several possibilities as to their cause.

- Tests are carried out that will lead to a diagnosis.
- The diagnosis arrived at as a result of the tests determines the treatment.
- Treatment usually consists of medications and/or surgery.
- As a result of treatment (therapy) the symptoms are alleviated.

This protocol works extremely well for conditions that are caused by a single entity such as a bacterium, virus, cancer, injury, or other agents that cause harm to the body. It does not work well for food allergy, where there are many different agents responsible for triggering a response of the immune system, which results in a diverse array of symptoms that differ from person to person, and even within the same person at different times.

What this means in practice is that, because there are a number of different processes that can occur when body systems deal with the diverse chemicals that make up a food, it would be unrealistic to expect that the specific food responsible for triggering the body's adverse reaction could be identified by any single laboratory test. Consequently, even a clear definition of the term "food allergy" using symptoms, causative factors, physiological processes, or diagnostic tests (which are the usual ways we define a disease) has always eluded clinicians and scientists.

In the popular literature it has become convenient for all adverse reactions that result from eating to be labeled "food allergy," but in medical and scientific fields, there are several defined conditions within this broad category that indicate the probable mechanism of the reaction that is taking place within the body. These defined conditions help in determining the possible cause of the symptoms, predicting the probable severity and duration of the reaction, and suggesting the most appropriate treatment.

Definition of Food Allergy Terms

It will be helpful for you to have some understanding of the terms that are currently being used by practitioners in the field of allergy so that you can understand the medical literature as you search for information on your child's allergy. Understanding the terms will also pave the way for our discussion of

why your child has allergies and what is happening in his or her body when an allergic reaction is occurring.

The most recent attempt at a definition of adverse reactions to foods from the European Academy of Allergy and Clinical Immunology in 2001¹ includes the following:

- *Allergy* is a hypersensitivity reaction initiated by immunologic mechanisms.
- An adverse reaction to food should be called *food hypersensitivity*.
 - When immunologic mechanisms have been demonstrated, the appropriate term is *food allergy*.
 - If the role of IgE is highlighted, the correct term is *IgE-mediated food allergy*. [We shall discuss IgE and other antibodies later in this chapter.]
 - All other reactions, previously sometimes referred to as “food intolerance,” should be referred to as nonallergic food hypersensitivity.
- Severe, generalized allergic reactions to food can be classified as *anaphylaxis*.
- Anaphylaxis is a severe, life-threatening, generalized or systemic hypersensitivity reaction.
- *Atopy* is a personal or familial tendency to produce IgE antibodies in response to low doses of allergens, usually proteins, and to develop typical symptoms such as asthma, hay fever (rhinconjunctivitis) or eczema/dermatitis.

Previously, the American Academy of Allergy and Clinical Immunology (AAACI) and the National Institute of Allergy and Infectious Disease (National Institutes of Health (NIH))² defined the diverse terms in use thus:

- An *adverse food reaction* is a generic term referring to any untoward reaction after the ingestion of a food.
- Adverse food reactions can be
 - Food allergy.
 - Food intolerance.
- A *food allergy* is the result of an abnormal immunologic response after ingestion of a food.
- A *food intolerance* is the result of nonimmunological mechanisms.

In spite of (or more likely, because of) these seemingly precise, but sometimes conflicting academic definitions, authors of research papers and articles on food allergy now frequently define their own use of the terms in any published work so that the reader is quite clear about their meaning in that specific context. In accordance with this sensible practice, I will do likewise (see Table 1-1). I have used the 1984 definition of the AAACI/NIH in all my previous publications and still find this the least confusing; I will continue that practice here. The terms *anaphylaxis* and *atopy* I use in the way they are defined by the EAACI.

Table 1-1 DEFINITION OF TERMS AS USED IN THIS BOOK
<ul style="list-style-type: none"> • An <i>adverse food reaction</i> and <i>food sensitivity</i> are generic terms referring to any troublesome reaction after the ingestion of a food. • Adverse food reactions can be <ul style="list-style-type: none"> – Food allergy. – Food intolerance. • A <i>food allergy</i> is the result of an abnormal immunologic response after ingestion of a food. • Immunological <i>hypersensitivity</i> is the same as allergy. • A <i>food intolerance</i> is the result of nonimmunological mechanisms. • <i>Anaphylaxis</i> is a severe, life-threatening, generalized (systemic) allergy or hypersensitivity reaction. • <i>Atopy</i> is a term used to indicate IgE-mediated allergy.

Now that you understand what each of the terms means, we can go on to discuss the subject much more easily. If you want to refresh your memory until the terminology becomes quite familiar to you, please look at the Glossary (pp. XXX–YYY). We can start with a discussion of what happens in the body when an allergic reaction takes place.

The Immunological Process in an Allergic Reaction

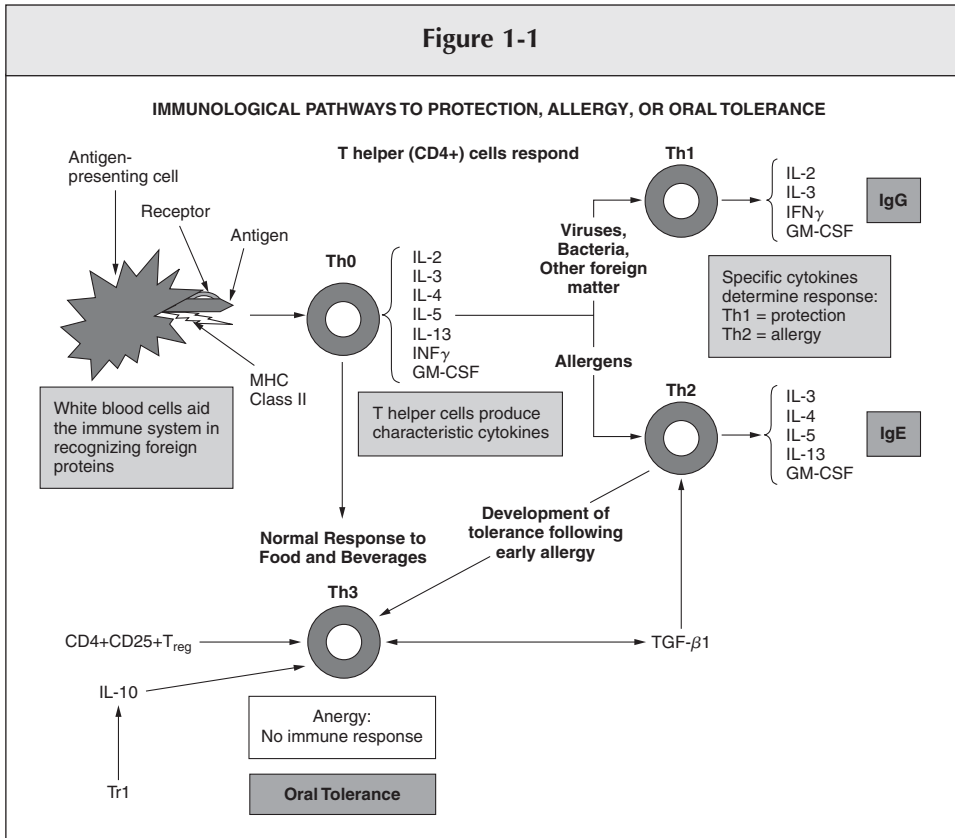
When an allergen enters the body of a person at risk for allergy, an extremely complex series of events is set in motion that will finally result in the release of chemicals (called inflammatory mediators) that act on body tissues to cause the symptoms of allergy. All immunological processes involve the various white blood cells (leukocytes), and the different types of chemicals they produce. For a more detailed description of the immunological process of allergy, you may wish to read Chapter 3 in the companion book in this series.³

The first stage of the immunological response involves recognition of the invading *antigen*. An antigen is a protein within the cells of any living (or previously living) material that enters the body causing the immune system to react to it. All foods contain numerous antigens. When the antigen causes an immune response that results in allergy, we call it an *allergen*. Not all foreign proteins (antigens) cause allergy, and therefore not all antigens are allergens. On the other hand, all allergens are antigens.

When an antigen enters the body, the white blood cells called *lymphocytes* are activated. Lymphocytes are the first cells of the immune system that recognize and respond to anything foreign entering the body. We can visualize them as the sentinels of the immune system. There are two different types of lymphocytes in blood: T cells and B cells. T-cell lymphocytes are the ultimate “gatekeepers” and controllers of the immune system. We will discuss B cells later in this chapter.

T-cell Lymphocytes Detect a Foreign Invader

Certain types of T cells, called *helper T cells* (Th cells), are responsible for identifying foreign materials that enter the body through any route, such as the mouth, nose, and skin. Th cells initiate and direct the subsequent activities of the immune system if the foreign material is deemed a threat to the health of the body. T cells exert their control of the whole immune response by means of a number of different types of “messenger chemicals” called *cytokines*. The responses of helper T cells in allergic and nonallergic individuals are different. The two types of responses have been designated Th2 and Th1 response, respectively (see Figure 1-1). Different cytokines are released in each response, and they control the way in which the body reacts to the foreign material.



Cytokines Direct the Immune Response

When a pathogen (disease-causing microorganism) enters, the immune system protects the body by a Th1 response. Cytokines such as interleukin 1 (IL-1), interleukin 2 (IL-2), interferon-gamma (INF_{γ}), and others are produced. They stimulate the formation of antibodies of the IgG class, which eventually destroy the invading microorganism by means of a complex series of events known as the complement cascade.^a Symptoms such as fever, aching

^a *Complement* is a group of over 20 enzymatic proteins in the blood that act together, in response to antigen and antibody, to destroy foreign cells by splitting them apart (*lysis*). This process is known as the *complement cascade*, which releases various chemical byproducts that act as opsonins, chemotaxins, and anaphylatoxins to help destroy a threat to the body and results in inflammation in various tissues.