

CHAPTER 16

Allergy to Tree Nuts and Edible Seeds

Tree nuts and edible seeds represent a group of foods that tend to be highly allergenic and may trigger an anaphylactic reaction in particularly sensitive individuals. Furthermore, tree nut allergy is especially problematic, because the allergy tends to be persistent and in the majority of cases lasts for a person's lifetime.

Tree Nut Allergy

There is not much information on the prevalence of tree nut allergy in populations, and reports vary in the methods of data collection as well as the ages of the study populations. The few reports available indicate that in the United States, an allergy to tree nuts affects about 0.5% of the population.¹ In Canada, the number is 1.22%;² in the United Kingdom, the number varies from 1.4%³ to 2.2%;⁴ France reports an incidence of 0.7%;⁵ Germany 8.5%;⁶ Sweden 4.1%;⁷ and Israel 0.03%.⁸

Previously, it was believed that allergies to tree nuts—including cashews, almonds, Brazil nuts, walnuts, hazelnuts, macadamia nuts, pecans, pistachios, and pine nuts—lasted a lifetime. However, recent research indicates that at least 9% of young children outgrow their nut allergy.⁹ Even children who have experienced a severe nut allergy can outgrow it. However, the results of the study indicated that children who are allergic to multiple types of tree nuts are less likely to outgrow their allergy than children who are allergic to only one or at most two types of nuts. Based on their results, the study authors recommend that children with tree nut allergies be reevaluated periodically by an allergist/immunologist. They suggest that oral challenges should be considered in children 4 years of age and older who have less than 5 kilounits per liter of tree nut-specific IgE in their blood.

Allergy to Edible Seeds

Allergy to edible seeds is usually uncommon, although all seeds contain proteins capable of becoming allergenic. Some seeds are eaten as is, some are used as seasoning, and some are pressed for their oil.

Sesame seed is becoming increasingly reported as the trigger for IgE-mediated allergic reactions in all populations. Allergy to sesame seeds has been increasing in incidence in the Western world over the past five decades.¹⁰ The allergy seems to present clinically in two forms:

- Immediate hypersensitivity, with positive skin prick test or sesame-specific IgE antibody in serum
- Delayed response to compounds in sesame oil that presents as a contact dermatitis

Symptoms

Symptoms associated with tree nut allergy include:

- Reactions in the oral cavity and associated tissues, such as tingling of lips; itching of the mouth, ears, and eyes; oral allergy syndrome; contact dermatitis, especially of oral tissues; and throat tightening
- Reaction in the skin and mucous membranes, including urticaria, angioedema, and conjunctivitis (often from transfer of the allergen to the eye by contaminated hands)
- Reactions in the respiratory tract, such as asthma (in asthmatics)
- Reactions in the gastrointestinal tract, including abdominal pain, diarrhea, and vomiting
- Systemic reactions such as anaphylaxis, which is sometimes life-threatening

Sesame seed allergy is not very different from other food allergies. In a study from three allergy clinics in France¹¹ that involved 14 children with reported sesame seed allergy and whose median age at the beginning of sesame seed allergy was 5 years (range from 5 months to 16 years old), all of the selected children reacted immediately after sesame seed consumption. The symptoms observed included edema (9 cases, 48%); urticaria (5 cases, 27%); and one report of each of the following symptoms: vomiting, rhinitis, conjunctivitis, asthma, and anaphylactic shock. One patient had recurrent anaphylactic shocks and another had an anaphylactic shock after subsequent sesame seed exposure; these two patients were asthmatic. Three patients outgrew their food allergy. Prior to that study, most of the cases of sesame seed allergy had been reported in adolescents or adults.

Because of the risk for anaphylaxis and the increasing incidence of allergy, sesame seed is considered a “priority allergen” that is required to be listed on food labels in many countries, including Canada and the United Kingdom. Such a requirement is not yet in place in the United States, so people allergic to sesame seeds in the countries that do not require its notation on a label need to be aware of the terms that indicate the presence of sesame seeds in a product.

Diagnosis of Tree Nut and Edible Seed Allergy

The diagnosis of tree nut and edible seed allergies starts with a medical history and exam. Having ruled out any other cause for the symptoms, a physician will typically perform tests for allergen-specific IgE, usually skin prick tests and blood tests. The allergen-specific IgE blood tests should begin with a test for a “nut mix” (which usually includes edible seeds) that, if positive, can be followed by tests for the specific nuts and seeds within the mix.

However, many reports indicate a low level of correlation between the tests and the development of symptoms on challenge with the individual nuts and seeds. Based on the study of 96 children investigated for nut allergy using skin prick tests, allergen-specific IgE in blood serum, and oral challenge over a 27-month period, one report concludes that “skin prick testing and IgE measured by radioallergosorbent testing [ImmunoCAP-RAST] are inadequate tests for nut allergy. The definitive diagnostic test for nut allergy in the hospital setting is direct oral challenge.”¹² A 2003 study¹³ supports this conclusion, reporting that 46% of their study population of 1,000 adults and children who tolerated a nut on consumption, tested positive on skin prick tests. There was poor concordance between these tests and allergen-specific IgE in blood serum. Of patients with a clear history of nut allergy, only 0.5% had negative skin prick tests, but 22% had negative ImmunoCAP. The authors further determined that the severity of the reaction on oral consumption cannot be predicted by the size of the skin prick wheal or the level of allergen-specific IgE in serum.

In contrast, a 2008 study¹⁴ of 324 atopic adults and children allergic to peanuts, tree nuts, and sesame seeds in the United States found a good correlation between the results of their tests, stating that, “quantification of food-specific IgE is a valuable tool that will aid in the diagnosis of symptomatic food allergy and might decrease the need for double-blind, placebo-controlled food challenges.”

The apparent discrepancies in these studies can be partly explained by the methods employed in evaluating the results, such as prospective or retrospective trials, selection of subject populations, and the parameters used in quantifying the data. It remains for future research to clarify the value of the various testing modalities in clinical practice.

Mechanisms of Tree Nut and Edible Seed Allergy

Nuts and seeds represent the reproductive part of the plant. In the majority of cases, the most highly allergenic molecules of plants are associated with the storage proteins in the seed. Nuts, grains, legumes (eg, peas, beans, lentils), and seeds all contain similar types of storage albumins, which may be highly allergenic. The seed storage albumins are used by the growing plant during germination. They possibly have a defensive role against pathogens, since many of these types of albumins have been shown to have antifungal properties.

It is possible that many of the huge number of *dicot seeds* (seeds that have two parts) contain cross-reacting albumins. However, the degree of clinical

cross-reactivity, in which a person allergic to one nut, seed, grain, or legume is allergic to another from a different plant species, has not been determined with any degree of confidence. It appears that each storage albumin is unique to the species of plant that produces it.

In addition to the storage proteins, nuts and seeds contain other proteins that are often allergenic. These include the profilins and pathogenesis-related proteins.¹⁵ Profilins are active in cellular activities, including regeneration; pathogenesis-related proteins are produced in a plant “under stress” and act as defensive chemicals. These two classes of proteins are considered to be *panallergens*, which means that they are similar in a wide range of plants and may be responsible for cross-reactivity in which allergy to one leads to allergy to many (see Chapter 2 for more details).

A person’s allergic profile (the range of foods to which he or she is allergic) depends on exactly which types of proteins trigger their hypersensitivity reactions. In practice, it is not possible to identify the individual allergens within a specific food to which a person is sensitized; it is sufficient to know that symptoms develop when a person eats that food.

In theory, it is only necessary to avoid the specific species of nut that has been identified as the culprit allergen. But, because allergy to certain tree nuts is often associated with anaphylactic reactions, in the interest of safety, a person who is known to be allergic to one or more species of nut should avoid all nuts, since many people find it very difficult to identify individual nuts in nut mixtures (see Box 16.1). Additionally, the risk of cross-contamination of one type of nut with another is high.

BOX 16.1 Botanic Families of Nuts

Nuts belong to a wide array of different biological families. For example:

- Walnuts and pecans belong to the *Judanglacea* family, which also includes the hickory nut.
- Almond is of the *Drupaceae* family, which includes peaches, apricots, plums, nectarines, and cherries.
- Cashews and pistachios belong to the *Anacardiaceae* family group, which also includes mango.
- Hazelnut (filbert) is part of the *Betulaceae* family, to which birch trees belong.
- Chestnuts belong to the *Fagaceae* family, which includes beech trees.
- Coconut belongs to the *Arecaceae* family group, which also includes date and palm trees.
- Brazil nuts belong to the *Lecythidaceae*, a family of tropical trees that includes the anchovy pear (*Grias cauliflora*; a West Indian species with edible fruit used for pickles) and several lumber trees of South America.
- Macadamia nuts belong to a tropical plant family called the *Proteaceae*, which includes the coneflower and pincushion tree.

Some edible seeds are also highly allergenic, and it is important that the specific seed responsible for a person's allergic reaction be correctly identified. However, like nuts, if an anaphylactic reaction has been experienced after consuming seeds, it is usually advisable for the allergic person to avoid all seeds in the interest of safety.

Note on Coconut and Nutmeg

Coconut and nutmeg are not usually included on lists of tree nuts. Most people allergic to tree nuts can eat coconut and nutmeg without difficulty. Occasionally a person will be sensitized independently to coconut or nutmeg, apart from any tree nut allergy. In these cases, the allergic person must recognize the presence of their allergens in manufactured and prepared foods and avoid them. If a person is allergic to a specific seed, all sources of the seed should be investigated and avoided.

Management of Allergies to Tree Nut and Edible Seeds

Diet Free from Tree Nuts

Tree nuts are not a common constituent of foods and are included in recipes and manufactured foods selectively. It is very important to recognize the sources where nuts are likely to be found and to recognize terms that would indicate the presence of nuts on manufacturers' labels or in recipes

Diet Free from Edible Seeds

Some seeds are eaten as is, some are used as seasoning, and some are pressed for their oil. If a person is allergic to a specific seed, all sources of the seed should be recognized and avoided. Refer to Box 16.2 for a list of edible seeds with allergenic potential.

BOX 16.2 Selected Potentially Allergenic Seeds

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| • Celery seed | • Psyllium |
| • Cottonseed | • Pumpkin seed |
| • Flax seed (linseed) | • Rape seed |
| • Melon seeds | • Safflower seed |
| • Mustard seeds | • Sesame seed |
| • Pomegranate seed | • Squash seeds |
| • Poppy seed | • Sunflower seed |

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