

Allergenicity of Foods

Although any food protein can be potentially allergenic, relatively few cause most allergic reactions. In addition, an allergenic protein can only induce an allergic reaction in an allergic person who has been sensitized to it. [*Sensitization* occurs when a person's immune system has responded to a food as if it were a foreign material that could pose a threat to the body.] Most of the severe allergic reactions to foods occur in response to a surprisingly small number of foods.

The foods most commonly associated with allergic reactions in children are: milk, egg, wheat, soy, peanut, tree nuts, fish and shellfish. Allergies to milk, egg, wheat and soy are usually outgrown in early childhood. Adults generally experience allergic reactions to the foods that tend to persist as allergens beyond infancy. These are: peanuts, tree nuts, shellfish and certain species of fish.

Lists of the most highly allergenic foods vary according to the source of the data. In general, the "top eight allergenic foods" include:

Peanut and peanut products

Soy and soy products

Egg and egg products

Milk and milk products

Tree nuts and tree nut products: the most allergenic of these tend to be:

- Almond
- Brazil nut
- Cashew
- Filbert (Hazelnut)
- Macadamia
- Pecan
- Pine nut
- Pistachio
- Walnut

Fish and fish products (not all species of fish have the same allergenicity)

Shellfish: Crustaceans (shrimp, prawn, lobster, crab, crayfish (crawfish)) and

Molluscs (clams, mussels, oysters, scallops)

Wheat and wheat products

However, the severity of reactions associated with these foods varies. For example:

Peanuts, tree nuts, shellfish, fish, milk and egg account for most reported cases of anaphylactic reactions in children and adults

Soy is less frequently reported as a highly allergenic food, although it is often associated with severe cases of allergy and atopic dermatitis (eczema) in childhood

Wheat allergy (quite distinct from gluten-sensitive enteropathy or celiac disease, which is not considered an allergic condition) is usually mild, and is omitted from many "top allergen lists"

Other allergenic foods, present on some lists, absent on others include:

Sesame seed and products containing sesame seed
Mustard seed
Cod
Corn

Food additives rarely cause IgE-mediated hypersensitivity reactions, and therefore do not appear on allergen lists. The exception is sulfite, which is included on many food allergen lists.

Change in Allergenicity

Cooking and processing of foods can affect their allergenicity: Some foods, especially vegetables and fruits, become less allergenic when cooked. The allergenicity of many other foods is unaffected by heat and they cause the same degree of reaction whether eaten raw or cooked.

Milk contains 30 potentially allergenic proteins, some of which are sufficiently changed by heating as to no longer cause an allergic reaction, while others are unaffected even by boiling. Whether a person can tolerate boiled milk or not depends on the specific proteins to which they are sensitized: If a person is allergic to milk proteins that are denatured by heat (heat labile proteins) they will tolerate boiled milk, but not milk that has been insufficiently heated. When a person is sensitized to milk proteins that are unaffected by heat (heat stable proteins), they will develop allergic symptoms after consuming milk regardless of whether it has been boiled or not.

The method of cooking also seems to affect the allergenicity of some foods: For example, roasting peanuts, which is common in Western countries, tends to increase the allergenicity of the peanuts, whereas boiling or other methods of cooking, more common in Oriental countries, either reduces, or does not affect peanut allergenicity.

In addition, the ripeness of vegetables and fruits can affect their degree of allergenicity. During the ripening process the plant produces different components, some of which may be less or more allergenic than the unripe form. Thus it is often not possible to predict whether a fruit or vegetable will be less or more allergenic as it ripens.

An interesting example of a change in the “reactivity potential” of a plant product is the tomato. In this case it appears that it is the histamine content of the fruit that changes, not the protein. The green tomato rarely causes symptoms in a histamine-intolerant person, whereas the ripe fruit does cause a reaction. Tomatoes release histamine during the process of ripening. Although this is not, strictly speaking, an example of a change in allergenicity, it is a very good illustration of how a food in one stage of maturation causes symptoms, but in a later stage does not.

The Food Allergen Scale

Despite the fact that every atopic individual will react differently to foods, with diverse symptoms of varying severity, and that they will develop symptoms in response to various foods in a range of different dose levels, it is possible to summarize the more commonly allergenic foods in the form of a scale of “relative reactivity”. The Food Allergen Scale provided here (often referred to as the ***Joneja Allergen Scale***) has been developed over

fifteen years and summarizes data and information from many published articles as well as individual allergists from several countries who have kindly shared their experiences in food allergy management of patients with the author.

A scale of this type has several uses:

Used as “reactivity chart” it allows a person to see the number of foods that are available to them after their allergens have been crossed off. So often a patient is overwhelmed when informed that they must avoid a number of staple foods (for example, wheat, milk and milk products and eggs), and the common response is, “But there is nothing left to eat!” A glance at the remaining foods on the chart reassures them, and counselling can proceed in a more amiable fashion thereafter

The foods most likely to cause an allergic response (the “top eight”) are apparent. This is useful for the atopic individual because so often chronic reactivity to these foods in particular seems to lead to “hidden food allergy”. As a person begins to make alternative choices, their symptoms are more readily identifiable when the culprit food is eaten less frequently

If there is a risk of severe or anaphylactic reactions, the culprit foods can be marked in red: this makes family members more aware of the allergic individual’s needs and to be alert to sources of the problem food. Many people like to keep a copy of the scale on the fridge door to alert themselves and others to their danger. For this reason the printed scale is limited to a single page

The ***Food Allergen Scale*** is based on the typical experience of persons eating a Western diet. In cultures where significantly different foods are commonly consumed, the chart should be adjusted to reflect the more likely allergens.

FOOD ALLERGEN SCALE

Foods are listed from the highest to the lowest allergenicity, based on reports from a variety of sources.
People vary in their reactivity to foods and show a different pattern of reactivity depending on their individual characteristics.
The scale is based on the typical North American diet. Persons following ethnic diets tend to show a different order of allergenicity.

GRAINS & FLOURS	VEGETABLES	FRUITS	NUTS, SEEDS, & DRIED LEGUMES	MEATS & ALTERNATES	MILK & MILK PRODUCTS
Wheat Triticale Semolina Bulgur Spelt Kamut	Tomato Spinach Celery (raw)	Strawberry Raspberry Orange Fig Mango Watermelon	Peanut Soy Hazelnut (Filbert) Sesame seed	Egg white Egg yolk	Ice cream Cow's milk: Homogenized Raw milk 1% 2% Skim
Rye	Carrot (raw) Green pea Lima bean Broad bean (fava bean)	Apple (raw) Apricot (raw) Peach (raw) Date Cantaloupe	Walnut Pecan Brazil nut Almond	Shellfish: - Crab - Lobster - Prawn/shrimp	Cheese: Fermented: Cheddar Camembert Blue Swiss Edam Mozzarella
Corn	Cabbage (heart)	Pineapple Raisin Apple (cooked)	Cocoa bean Chocolate Coconut	- Clam - Oyster - Scallop	Goat cheese
Oats Barley	Cauliflower Brussels sprouts Green bean	Kiwi Cherry Plum/prune Apricot (cooked)	Cashew Pistachio Macadamia	Fin fish - Cod - Sole - other white fish - Tuna - Salmon	Cottage cheese Cream cheese
White rice Brown rice Wild rice	Avocado Cabbage (outer leaves)	Loganberry Boysenberry	Dried peas Lentils Dried beans - Navy - Pinto - Garbanzo Carob	Processed meats - Pepperoni - Salami - Bologna - Wieners	Cream Sour cream
Millet T'ef	Onion Green onion Garlic	Plantain Banana Grape	Sunflower seed Flax seed	Ham Bacon	Canned milk (evaporated)
Buckwheat (kasha)	Celery (cooked) Green/red peppers	Grapefruit Lemon Lime			Goat milk Sheep milk
Amaranth	Potato Cucumber Lettuce	Currants (Red/Black)	Pumpkin seed	Pork	Processed cheese
Tapioca Cassava	Asparagus Broccoli Beets	Peach (cooked/canned)	Bean sprouts	Chicken Beef Veal Turkey	Soft cheese (Philadelphia)
Sago Arrowroot Quinoa	Squashes (all types)	Cranberry Blackberry Blueberry	Poppy seed	Wild meats - Deer - Elk - Moose - Bear - Buffalo	Yogurt Buttermilk
	Carrot (cooked) Parsnip	Pear			Butter
	Turnip Sweet potato Yam	Rhubarb		Rabbit Lamb	Clarified butter

Reference: J.M.Vickerstaff Joneja, *Dealing with Food Allergies*. Bull Publishing Company, Colorado 2003, Page 106