

So, Someone in your Family has Peanut Allergy!

by [Richard S. Roberts, M.D.](#)



You are not alone. More than 3 million people in the United States report being allergic to peanut, tree nuts, or both. Peanut allergy affects approximately 1.2% of children. Since 1997, the percentage of children with peanut allergy has more than doubled in the United States. Approximately 60% of fatal food anaphylaxis is caused by peanuts. This all sounds like a big problem. Let's take a closer look.

What actually is a peanut?

The botanical name for a peanut plant is *Arachis hypogea*. It is a member of the legume family (soy, peas, beans). The actual peanut that we see in a shell grows underground. Each peanut kernel (usually 2 per shell) contains about 325 milligrams of peanut protein along with sugar and fats. Approximately 8 of the peanut proteins are known to cause allergic reactions. The fat does not cause allergic reactions. Peanut allergic individuals may be allergic to one or more of these proteins. (Peanut oil is made of fat. In the manufacturing process, small amounts of peanut protein may contaminate the fat. The amount of contamination varies according to which process is used.) Three of the peanut proteins, Ara h1 (the Ara h is an abbreviation for peanut's botanical name), Ara h2, and Ara h3 have been most closely linked to serious peanut allergic reactions. People who are primarily allergic to Ara h8, on the other hand, usually only have an itchy mouth or slight mouth swelling from eating peanuts.

Peanut (*Arachis hypogea*)

Interestingly, Ara h8 is similar to a protein found in birch tree pollen, as well as in fresh apples, fresh cherries, fresh peaches, and fresh plums. Therefore, itching of the mouth can occur in birch tree pollen hay fever patients if they eat peanuts or the fresh fruits mentioned above. This is called the oral allergy syndrome. Another peanut protein, Ara h5, is also found in many plant materials including grass pollen. It rarely causes trouble even if a person becomes allergic to it. All of this explanation about individual peanut proteins may sound like too much detail, but it helps explain, in part, why some people with positive allergy tests for peanut have little to no trouble when peanuts are eaten. Peanut allergy testing, whether it is done by skin testing or ImmunoCAP blood testing will be positive regardless of which specific peanut protein the person is allergic to. A new form of allergy blood test called "component resolved diagnostics" is becoming available to identify which specific peanut proteins are causing the problem. This may help lessen the confusion about what a positive peanut allergy test means.

OK, so I know what makes up a peanut but what actually is a peanut allergy?

When we eat a peanut (or any other food) our body recognizes it as a foreign substance. Our immune system has to decide what to do about that. In most people the immune system learns to uneventfully accept the fact that the food is foreign but in some individuals, probably in part due to their genetic background, the immune system makes an allergy antibody called IgE (Immunoglobulin type E), whose target is one or more of the proteins in the food. The allergy antibodies float around in the blood, then attach themselves to "allergy cells." One type of "allergy cell" called mast cells lives in the skin, respiratory tract and gastrointestinal tract. Another type of "allergy cell" called basophils, lives in the blood. Once the allergy antibodies are in place on the surface of the "allergy cells," as peanut proteins reach them, the proteins stick to them, causing a chain reaction which triggers the release of histamine and other substances from the "allergy cells." These released materials may cause any combination of itch, hives, swelling, red eyes, wheezing, runny nose, vomiting, uterine cramps, diarrhea, abdominal pain, low blood pressure, even death. Allergy skin testing detects allergy antibody on mast cells. ImmunoCAP allergy blood tests detect allergy antibody that is floating in the blood. Both types of the allergy tests are valid. They provide two different ways of assessing the same problem. At times, your allergist may need to do both types of tests to best understand your peanut allergy problem.

In some people, with time, the ability of these allergy antibodies to cause symptoms becomes blunted as protective factors in the immune system begin to take over. This is called tolerance. In such a person, the allergy tests to peanut will be positive yet that person can eat peanuts without trouble. For this type of individual, the positive peanut allergy test reflects "peanut sensitivity," not clinically relevant "peanut allergy." On the other hand, a person with a positive skin test who has had the symptoms mentioned above has both "peanut sensitivity" and clinically relevant "peanut allergy."

It is likely that the process of tolerance and the presence of low grade allergy to "milder" peanut proteins (Ara h5, Ara h8) explains why in the U.S. almost 9% of the entire population has a positive allergy test to peanut yet overall, less than 1% of the population has clinically relevant "peanut allergy."

As an aside, unfortunately, some individuals whose "peanut allergy" has evolved to tolerance, with time, lose this tolerance. How this occurs is unknown.

What is the "Threshold Concept" and why is it important for understanding peanut allergy?

With all food allergies including peanut allergy, for each allergic person there is an amount of consumed food protein above which an allergic reaction occurs and below which nothing noticeable happens. Remember that one peanut kernel contains approximately 325mg of protein. For adults and children, it has been shown in several studies that some patients react to as little as 0.1mg of peanut protein while others required 3,000mg (9 peanut kernels) to react. In these studies for approximately 75% of the patients it took eating the equivalent of three peanut kernels for symptoms to occur. Unfortunately, this does not mean that those who react only at higher doses will have milder reactions. However, it may explain why some peanut allergic patients with higher thresholds can uneventfully eat peanut oil (except the cold-pressed type that contains much protein) or foods that are labeled as possibly having trace amounts of peanuts. It is likely that for those

patients the amount of peanut protein in those foods is below their individual peanut allergy protein threshold. What makes this tricky is that a person's threshold can change, either on its own with time (better or worse) or during viral illnesses (worse). It can also change (worse) if the food consumption is followed by exercise in some patients. It is safest to avoid eating products that may contain peanut protein. Your allergist can help with specific recommendations in this regard.

Are there factors that influence who will become peanut allergic and who won't?

Probably, but it's a complicated puzzle that researchers haven't figured out. Many factors have been considered. For instance, it has been questioned as to whether the eating of peanuts by the mother during pregnancy or during breastfeeding increases the infant's chances of developing peanut allergy. Interestingly, even in families with a tendency for allergies several studies suggest that the mother's avoidance of peanut in pregnancy/breastfeeding does not reduce the chance of an infant becoming peanut allergic, but this issue continues to be controversial.

A study was published in December 2010 by Drs. Sicherer, Burks, Sampson and colleagues to update the debate as to whether the frequency of eating peanuts in pregnancy and while breastfeeding influences the likelihood of a child becoming sensitized to peanut by 15 months of age.

The young children (3 to 15 months old) they chose to study came from families where most parents had known allergies. The children were also known to be very allergic because they already had milk allergy, egg allergy, or eczema.

The researchers looked to see if there was a relationship between the chance of these children having a high peanut allergy blood test score (in a range at which most children would react if given peanut) and how often peanut was eaten in pregnancy and during breastfeeding.

They found that this risk was highest in mothers who ate peanut two or more times per week during the pregnancy. The amount of peanut eaten as the mother went on to breastfeed showed the same trend but was not statistically significant.

Therefore, in this group of highly allergic families with highly allergic infants the chances of a child having a high (potentially dangerous) peanut allergy blood test score by 15 months of age was greatest in mothers who during pregnancy ate peanuts more than 2 times per week.

This study does not address the question of how many of these infants with highly allergic backgrounds, but with low or no pregnancy peanut exposure, will go on to develop peanut allergy by an older age, say 4 or 5 years old. By age 5, will it really matter for these highly allergic children that their mothers ate fewer peanuts in pregnancy? Will the children of pregnancy peanut avoiders still have less peanut allergy by kindergarten? Several studies suggest maybe not. Does this new study apply to families with less of an allergic background? This is uncertain.

Genetic factors probably play a role since brothers and sisters of a peanut allergic child have a four-fold increased chance of developing peanut allergy. But genetics can't be the whole answer. As example, in rural China peanut

allergy is rare while in genetically similar “westernized” regions of China such as Hong Kong peanut allergy rates are almost as high as in the U.S. It has been conjectured that this is due to the “hygiene hypothesis,” a theory that suggests that “westernized” children’s reduced exposure to both serious infections and “dirt” allows their immune system to more easily develop allergic responses to foods and environmental substances. According to this theory, training the immune system in early life to fight off serious infections may suppress the immune system’s ability to later develop allergy. This theory has not been proven.

Does delay in introducing peanuts to children (until 3 years old) protect them from eventually developing peanut allergy? Probably not. Studies are being considered to see if the opposite is true. The American Academy of Pediatrics updated its infant feeding recommendations in 2008 to reflect this lack of protection. They state, “Although solid foods should not be introduced before 4-6 months of age, there is no current

convincing evidence that delaying their introduction beyond this period has a significant protective effect on the development of atopic (allergic) disease regardless of whether infants are fed cow’s milk formula or human milk. This includes delaying the introduction of foods that are considered to be highly allergic such as fish, eggs, and foods containing peanut protein.”

Does skin contact or airborne exposure to peanut initiate peanut allergy? Although it is known that in experimental models applying peanut to damaged skin can cause allergy this hasn’t been adequately studied in humans. It is intriguing to wonder if the protein that peanuts share with pollens could trigger peanut allergy, but that is unknown. Airborne peanut particles in a home have not been linked, as of yet, to the development of peanut allergy. A September 2007 article written by two of the world’s top peanut allergy experts, Dr. Scott Sicherer and Dr. Hugh Sampson, in *The Journal of Allergy and Clinical Immunology*, sums up this issue well. They state, “Although we currently lack evidence-based advice to present to atopy (allergy) prone parents who want to avoid having a child with peanut allergy, it is also apparent that we can reassure families with a child with peanut allergy that they need not feel guilty that they caused the allergy by following or not following the advice of various agencies or medical societies.”

Why is the incidence of peanut allergy rising?

Factors that have been considered but not proven in this regard include the general increase in all allergies worldwide, especially in “westernized” countries related to the “hygiene hypothesis” mentioned above. Also, it is known that drying and roasting peanuts make them more allergenic, as opposed to boiling or frying. It is, therefore, conjectured that the worldwide increase in the consumption of dry-roasted peanuts may play a role in the rise in peanut allergy. Increased infant consumption of soy has been questioned as a causative risk factor in some studies, but has been disproven in others. Inadequate Vitamin D levels have even been proposed as a contributing factor. Basically, we just don’t have all the answers.

Does having only a mild reaction to eating a peanut guarantee that future reactions will be mild?

No! Although it is common for patients to have similar reactions upon re-exposure to peanut, mild reactions do not rule out the possibility of having a more serious reaction with subsequent exposures. In a study from the United Kingdom, one-third of peanut allergy deaths occurred in people whose prior reaction to peanut had been mild.

Does the height of the score for peanut skin testing or allergy blood testing (ImmunoCAP) predict the severity of reactions?

No! Severe reactions can occur whether the positive score is high or low. On rare occasions reactions can occur even when the tests are negative. In such instances, the low level of allergy antibody that is present is below the detectable limits of the test but is adequate to activate mast cells and basophils upon peanut exposure. If the history suggests that this may be the case additional skin testing with fresh peanut may be needed or careful graded food challenge by an allergist certified by the American Board of Allergy and Immunology may be undertaken for proper diagnosis and clarification.

Conversely, high skin test and/or allergy blood test scores, although worrisome, are not a guarantee that an allergic reaction will occur. (Some such patients may have already developed tolerance or the test is positive due to allergy to one of the “milder” peanut proteins).

So, if test scores may not predict the severity of a reaction can they predict who will react at all?

Sort of. In 1997, Dr. Hugh Sampson published peanut research data that showed that in children with a known allergic background (asthma or eczema) an ImmunoCAP blood test score of 14kU/L or higher was associated with an allergic reaction to eating peanuts in 90% of all children with that score. For children with a score of 3kU/L the risk was still about 75% and for those with a score of 1kU/L the risk was about 50%.

For reference, remember that ImmunoCAP scores can measure allergy antibody levels to peanut (and all other foods) from 0.35kU/L to 100kU/L.

For children who regularly eat peanut products uneventfully, having a positive peanut allergy skin test or blood test rarely suggests future peanut problems and peanut consumption should be continued. Losing this tolerance would be unusual.

For children who have never/rarely eaten peanuts or for whom it has been many months or years since they've eaten peanuts, interpreting test results is more difficult. Children with no well defined past peanut or other major allergy problem or who have never eaten peanut have about a 75% or greater chance of tolerating peanuts if their ImmunoCAP score is less than 5kU/L. For skin testing, if a child has never eaten peanuts and their skin test reaction produces a greater than 6-8 millimeter wheal (mosquito bite-sized raised white bump), they have about a 50% chance of reacting to peanut.

What are the facts about peanut exposure in public places?

First, remember that the odor of peanuts is due to an organic volatile compound called pyrazine. This substance contains none of the 8 allergic peanut proteins and, therefore, does not cause allergic reactions. It is, therefore, not surprising that a study which involved holding a 3oz dish of peanut butter one foot from peanut allergic children's noses for 10 minutes caused no reaction. In another study, a group of 19 volunteers sat in a school cafeteria eating peanuts and peanut butter. Air sampling of the cafeteria air during this "peanut party" found no airborne peanut protein. Nonetheless, there may be situations where peanut protein could become airborne. Restaurants that offer customers peanuts in the shell could theoretically have peanut protein in their airborne dust as peanuts drop to the floor and become crushed. Within an airplane, as passengers simultaneously open multiple packets of peanuts, peanut dust within the bags could become airborne. Fortunately, allergic reactions under these circumstances are not guaranteed. If they were to occur, they would most likely involve either the skin or respiratory tract, similar to what a cat allergic person would experience being near an indoor cat. Systemic anaphylaxis would be extremely rare from such airborne exposures.

What about the risk of reacting to direct peanut skin contact?

In a 2007 study, peanut allergic patients had the equivalent of 3 peanut kernels smeared onto their skin for 15 minutes. There was no significant reaction. In another study adult volunteers contaminated their hands with peanut. Subsequent washing of their hands with "soap and water" and commercial "wipes" removed all traces of peanut. Plain water and hand sanitizers did not.

With respect to table tops and desks, peanut contamination can be removed by "soap and water," wipes," Formula 409 type cleaners, and cleaners with bleach. Dishwashing liquid has been shown to be less effective. In a survey of school water fountains peanut contamination was rarely found and was at such low levels that reactions were felt to be unlikely to occur.

What about peanut protein in saliva?

After eating peanuts, saliva continues to contain peanut protein for several hours. Therefore, if a peanut allergic person shares utensils, straws, or kisses with someone who has eaten peanuts within the past several hours, reactions, sometimes very serious, can occur. In a 2006 study, peanut protein was gone from saliva in 87% of patients after one hour. Unfortunately, in this study it took waiting three hours along with the eating of an additional meal to guarantee that all peanut in saliva would be gone. In this study, brushing teeth or chewing gum helped peanut disappear more quickly in some, but not all, people. Basically, partners of peanut allergic people should not eat peanuts if intimate contact could occur that day.

Should peanut allergic patients worry about eating nuts or seeds?

Although peanuts are in the legume family as are peas, beans, and soy, peanut allergic patients have trouble eating other legumes only about 5% of the time. This is despite the fact that allergy tests for legumes are often positive in peanut allergic patients. Therefore, if your peanut allergic family member has positive allergy tests for soy, bean, etc., but eats those items fine, that can usually continue.

With respect to tree nuts (almonds, cashews, pistachio, hazelnut, Brazil nut, walnut, pecan), approximately 25%-50% of peanut allergic patients will have allergic reactions to tree nuts. For peanut allergic children it is often safer to avoid both peanuts and tree nuts, even if allergy tests for tree nuts are negative. Fewer mistakes are likely to occur and there is less chance of eventually developing tree nut allergy. Otherwise, up to 50% of peanut allergic children will develop tree nut allergy by 14 years of age.

Seeds, especially sesame, and occasionally poppy/sunflower can cause allergic reactions in peanut allergic patients. It is unclear how often this occurs. Allergy testing for these seeds can help determine safety. Coconut almost never cross reacts with peanut. Nutmeg does not either.

Lupine, a bean used to enrich some "organic" breads, cookies and pasta has been shown to cause allergic reactions in about 50% of peanut allergic patients.

Is it possible to outgrow peanut allergy?

Yes. Overall, approximately 20% of young children will become tolerant of peanut products by school age. However, the chances for some children may be better than that. This more favorable group includes young children who had a mild peanut reaction, positive but small skin tests, few or no other allergies, and an ImmunoCAP score of 2kU/L or less. By about 6 years of age, approximately 60% of these children outgrow their peanut allergy. Unfortunately, peanut allergy may return in approximately 8% of children, especially in those who refuse to eat peanuts once they've become tolerant. Therefore, after outgrowing peanut allergy, to reduce the chance of relapse, it has been recommended to eat peanuts regularly. Epinephrine should continue to be available until it is certain that tolerance to peanut is being maintained over months or years.

For those who acquire peanut allergy after 10 years of age, symptoms are often, but not always, mild and may be due to cross reaction with certain pollens. It is unknown how often these individuals lose their allergy.

What does it mean when a box of cookies says, “made in a facility that processes peanuts”?

Could peanut have found its way into that product? First, remember that this type of labeling by the food industry is voluntary. Although it is the law that if the product's recipe contains peanut it must be listed clearly on the package, it is optional for a company to mention peanut using the phrases “made in a facility that processes” or “may contain” if peanut is not in the recipe, but is present in a different product made in the same facility.

So, what is the chance that peanut will be in a “made in a facility” or “may contain” labeled package? If peanut is not mentioned at all, does that guarantee the absence of peanut?

In July 2010, Dr. Scott Sicherer and colleagues published a study to address these questions. They checked baking mixes, chocolate and non-chocolate candies, cookies, salty snacks, cold cereal, pastas and pancake mixes. They found peanut in 4.5% of the “may contain” and “made in a facility...” labeled foods. They found no peanut in the above types of items where peanut was not listed at all. The maximum amount of peanut found was 6mg per serving, an amount below the reaction threshold for most but not all peanut allergic people. The authors caution that they only checked 1 package of each item so they couldn't guarantee that other packages might not contain more peanut. They also comment that their findings may not apply to other varieties of food that were not among the categories listed above.

So, the bottom line is to be cautious, continue to avoid products labeled this way but don't panic if by accident they are eaten.

How should peanut allergy be treated?

The only current guaranteed treatment that is available for people who have had an allergic reaction to peanut is avoidance. Unfortunately, this is not foolproof. A 2006 study showed that about 14% of peanut allergic school age children eat peanuts by accident each year.

All people who have had an allergic reaction to peanut should carry or have immediately available injectable epinephrine. Two doses of injectable epinephrine should be available at all relevant locations. Up to 25% of peanut allergy attacks require a second dose. The second dose can be given within five minutes if symptoms are worsening. Injectable epinephrine is now recommended for any generalized allergic symptoms.

Skin symptoms could include widespread hives, generalized itch, flushing or swelling. Gastrointestinal symptoms could include stomach pain, vomiting, diarrhea, or throat pain due to swelling. Respiratory symptoms could include nasal congestion, cough, wheeze, shortness of breath, runny nose, or itchy/red eyes. Respiratory symptoms usually occur along with skin or gastrointestinal symptoms, rarely by themselves. On the other hand, isolated skin or gastrointestinal symptoms can commonly occur. Uterine cramping may be the only symptom in allergic females.

Fatalities occur due to a drop in blood pressure and/or respiratory distress due to swelling of the throat or lungs. The risk of death is greatest in adolescents/young adults (less careful about avoiding peanuts?), peanut allergic patients who also have asthma, and situations where there has been a failure or delay in injecting epinephrine. **Do not wait to give epinephrine until trouble breathing starts.** Antihistamines such as Benadryl may be given at any time, especially if the reaction involves only a few facial hives. **Antihistamines will not prevent fatality.**

Once epinephrine has been injected “911” should be called. In the Emergency Room, steroids, H2 blockers, antihistamines, additional epinephrine, oxygen, breathing treatments, IV fluids may be needed. Even with proper treatment, there should be at least 4 hours of Emergency Room observation to watch for return of anaphylaxis.

Could additional treatment options for peanut allergy be available in the future?

Yes. Several medical centers (Duke University, Mt. Sinai in New York City, University of Arkansas) are successfully studying oral desensitization in which increasing quantities of carefully measured peanut flour are eaten daily for two years or longer. Early results suggest that 90% of these patients tolerate up to 12 peanut kernels per day while being

treated. Additional work on these patients, published in 2010, has shown that protection may persist even after treatment ends. How long this protection will last off treatment is being investigated.

Studies are also underway at Duke University by Dr. Wesley Burks with sublingual peanut immunotherapy in which drops containing 100 micrograms of peanut protein are administered twice weekly under the tongue. Currently, the safety of these drops is being examined. Later studies will judge whether these drops are protective.

At Mt. Sinai, Dr. Sampson and colleagues are studying a Chinese 9 herb preparation called "Food Allergy Formula - 2" which has been shown to block peanut anaphylaxis in mice. Early human safety studies are underway.

It is possible that peanut allergy will be treatable within the next decade. Unfortunately, regular allergy shots that contain standard peanut extract have been shown to be dangerous and ineffective.

Where can we get additional information about peanut allergy?

The American Academy of Allergy , Asthma , and Immunology (www.AAAAI.org), the American College of Allergy , Asthma , and Immunology (www.ACAAI.org) and The Food Allergy and Anaphylaxis Network (www.foodallergy.org) are just a few of several good sources of information.

At www.foodallergy.org it is possible to sign up for E-Mail notification of mistakes made by the food industry in which peanuts have accidentally contaminated foods, without it being on the food's label. Having access to this information is a good idea.

Last but not least...

Be knowledgeable and carry your injectable epinephrine!!!

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<http://www.carolinaasthma.com/news/so-someone-in-your-family-has-peanut-allergy/>