Current perspectives in the management of common pediatric food allergies

Seafood, peanut and wheat rank among some of the most common major food allergens; along with cow milk, egg, tree nuts and soy, these groups account for more than 90% of food-allergies in infants and older children. Each of these food allergies has distinct features and presents specific challenges in pediatric and adult health that require tailored management strategies.

Seafood Allergy

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Seafoods are categorized as either fish or shellfish, the latter including crustaceans (eg, shrimps, crabs, lobsters, crayfish) and mollusks (eg, abalones, mussels and squid).[1] Accurate data on the prevalence of seafood allergy are limited, due to the scarcity of double-blind, placebo-controlled, food challenge studies. However, in one notable study that involved a large population cohort, the estimated rates of seafood allergies were 0.6% in children and 2.8% in adults.[2]

Parvalbumin is the major allergen responsible for allergic reactions to fish. It is resistant to heat, chemical or enzymatic proteolysis and may trigger allergic reactions via airborne exposure.[3] Approximately 50% of individuals who are allergic to a particular type of fish are at risk for developing allergies to another species. The most studied allergen in shellfish is tropomysin, which is involved in cross-reactivity among crustaceans, mollusks, and other arthropods. Patients allergic to a certain type of shellfish have an approximately 75% risk of reacting to a second species.[4] Although cross-reactivity between fish allergens and shellfish allergens does not occur, due to their lack of structural homology, 21% to 43% of individuals who are allergic to fish may also develop allergy to shellfish because they have an atopic predisposition.[4]

In general, allergic reactions to seafood are similar to those associated with other allergenic foods. Patients may develop adverse reactions that involve the skin, respiratory or gastrointestinal tracts, and the cardiovascular system.[2] An interesting variant of seafood allergy is mite-crustacean-molluscs syndrome, in which a patient with shrimp-allergy develops an oral-mucosal reaction that is similar to oral allergy syndrome caused by exposure to dust-mite or cockroach allergens.[5]

A diagnosis of seafood allergy is confirmed by an oral food challenge, which is considered the gold standard procedure; however, skin-prick test (SPT), prick-to-prick test, and serum specific immunoglobulin E (sIgE) may also provide supplementary data to determine sensitization. Considering that seafood may cause lifelong allergic reactions, it is imperative for physicians to emphasize the importance of avoiding these foods to affected patients. It is also important for patients to be able to recognize the associated symptoms so that they can treat themselves if they suffer an allergic episode when immediate medical care is unavailable.

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Peanut Allergy

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Peanut is another allergenic foodstuff that is commonly encountered by children and adults and has emerged as a major global health concern over recent decades, especially in developed countries;[6] however, the underlying causes of the rising trend remain unclear. Evidence suggests that environmental, immunological, and genetic factors may all significantly influence the incidence and outcomes of peanut allergy. Genetic predisposition to atopy or peanut allergy, maternal ingestion during pregnancy or breastfeeding, use of antacids, ingestion of cross-reactive proteins (soy), mode of exposure, and geographical location are some of the elements that have been found to determine the likelihood of an allergic response.[7]

Allergic reactions to peanut can present early in life and range from mild oral allergy to anaphylaxis. Given the possible severity of adverse reactions, it is essential for patients suspected of peanut allergy to undergo careful evaluation. Peanut allergy has been conventionally presumed to be a persistent condition that is less likely to be outgrown. Persistent allergy after many years was validated in a double-blind, placebo-controlled peanut challenge study, in which only 21.5% of patients outgrew their allergy.[8]

Diagnosis of a peanut allergy can be confirmed by medical history that shows temporal association between eating peanuts and immediate appearance of symptoms. This can be supported by evidence of peanut-specific sensitization via SPT or blood test. Allergy characterized as persistent can be predicted by SPT ≥6 mm (p <0.01) and peanuts sIgE ≥3kUA/L

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> *World Allergy Organization*

(p <0.001) before 2 years of age.[9] Due to the possibility that peanut allergy may be outgrown, it is recommended that peanut-allergic children should be re-evaluated every 1 to 2 years until age 6, preferably by sIgE measurement.

Strict avoidance of the allergen is the favored treatment for peanut allergy. Patients should make it a habit to read nutritional labels on food products and avoid high-risk foods such as baked goods, ethnic food products, and processed sweets (eg, chocolates, candy, ice cream). Unfortunately, the ubiquity of peanut in modern food production processes makes complete avoidance hard to achieve; for this reason, patients and their carers should have an emergency action plan ready to execute in the event of an inadvertent peanut exposure. Self-injectable epinephrine and medicAlerts bracelets are useful tools in an emergency situation.

Potential therapies for peanut allergy under investigation include anti-IgE antibodies, immunotherapy, and Chinese herbal formulations. Breastfeeding, early complementary feeding, and consumption of peanuts in infancy are also being evaluated as preventive measures.[10,11]

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Wheat Allergy

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IgE-mediated food allergy arising from exposure to wheat products is an underrated health problem. In fact, wheat is the most common food implicated in food-dependent, exercise-induced anaphylaxis in Asian countries and nearby regions. The symptoms are usually severe, and the diagnosis is sometimes overlooked due to the absence of a gold standard. Common trigger factors include exercise, stress, drugs (eg, aspirin), or alcohol intake.

Wheat protein can be categorized according to protein solubility, into four divisions: albumin; globulin; gliadin; and glutenin. Albumin and globulin are the major allergens associated with atopic dermatitis and vapor asthma, whereas omega-5 gliadin is implicated in immediate hypersensitivity to wheat and wheat-dependent exercise-induced anaphylaxis (WDEIA). In one clinical trial, approximately 80% children with immediate symptoms had IgE antibodies to purified omega-5 gliadin in enzyme-linked immunosorbent assay.[12] The pathogenesis of WDEIA involves the cross-linkage of omega-5 gliadin-derived peptides by tissue transglutaminase, which causes a marked increase in IgE binding. During physical activities such as exercise, transglutaminase may also be activated in the intestinal mucosa of patients with WDEIA, which leads to enhanced absorption and formation of high-molecular-weight complexes, thereby causing anaphylactic reactions.[13] Aspirin has also been found to exacerbate WDEIA; similar to exercise, aspirin can increase allergen absorption in the gastrointestinal tract and thereby trigger hypersensitivity responses.[14]

Patient history is the easiest way to diagnose food allergies; however, in cases of wheat allergy, this may not be sufficient due to its complexity. Wheat is frequently 'hidden' in processed foods such as snacks, noodles and seasonings, which makes the responsible allergenic food difficult to identify. Radioallergosorbent blood testing (RAST) is a useful technique often used to diagnose wheat allergy, albeit with low sensitivity for wheat itself of 62% and specificity of 84%. Given these low values, a RAST test specific for omega-5 gliadin was investigated and yielded improved sensitivity of 84%, with 100% specificity.[15] Another assay, in which recombinant omega-5 gliadin was used with the ImmunoCAP system diagnosed WDEIA with 78% sensitivity and 96% specificity at the 0.89kUa/l threshold. Accurate determination of sensitivity to omega-5 gliadin is of paramount importance, as it has been found to play a role in the persistence of wheat allergy and the development of asthma later in life.

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