The Spectrum of Food Allergy

Susan Waserman, MSc, MD, FRCPC; and Noranda Nyholt, BHSc

There has recently been a tremendous amount of media attention on the subject of food allergy. While the exact prevalence is not known, recent estimates suggest that 6% of children and up to 4% of adults in North America are affected and that these numbers are continuing to rise.[1-3] Annually, there are approximately 150 deaths in the USA[4] and 10 deaths to 15 deaths in Canada (extrapolated from US data) attributed to food allergy. Accurate diagnosis is critical, as accidental exposure to even minute quantities of the food may result in anaphylaxis.

Meet Sam

- Sam, a two-year-old boy, is brought to your office for a suspected allergic reaction to a food
- He was at a birthday party that afternoon and was playing in the backyard, when he developed abdominal pain, had an episode of vomiting and broke out in hives which covered his entire body
- He had not been stung by anything while playing. Lunch consisted of hot dogs, chips and birthday cake
- He has a history of eczema and had been noted to wheeze with a respiratory infection a few months ago
- He has no history of previous food related reactions, but his parents have avoided introducing peanut products
- He has been otherwise healthy and is on no medication
- His mother has asthma and his father has seasonal allergic rhinitis

What's wrong with Sam? Go to page 71 to find out.

What is food allergy?

Food allergy presents as well defined symptoms, based on immunological mechanisms. The immune response can be IgE-mediated (immediate reaction), as in the case of anaphylaxis and Oral allergy syndrome (OSA), or non-IgE-mediated (delayed onset), as in the case of milk-induced enterocolitis and Celiac disease (Figure 1). Food allergy does not cause, nor is characterized by symptoms such as:

- Bloating or discomfort
- Migraines
- Behavioural or developmental disorders
- Arthritis
- Inflammatory bowel disease
- Seizures

In North America, > 90% of food allergies are caused by milk, egg, peanut, tree nuts, fish, shellfish, wheat, soy and sesame seed.

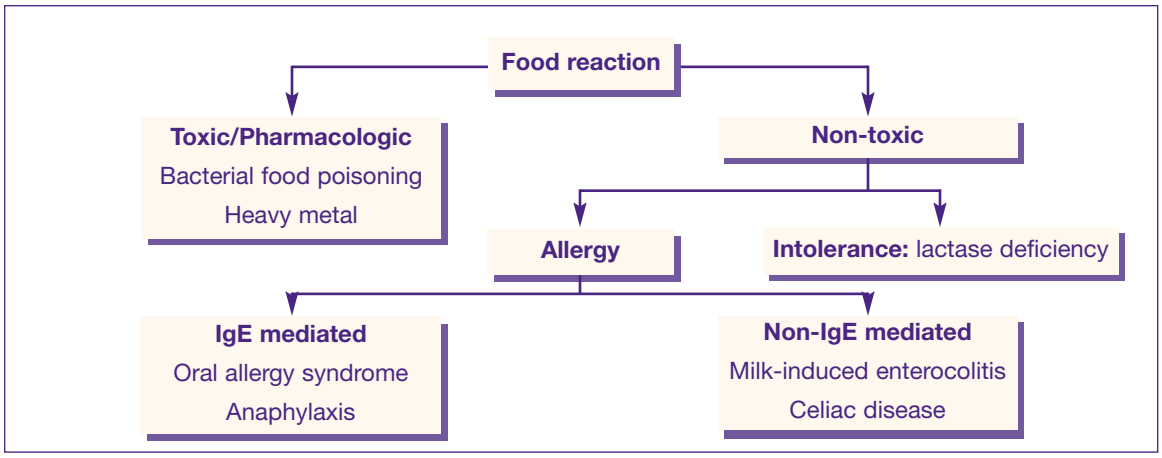

Figure 1. Mechanisms of adverse reactions to foods

What foods cause food allergy?

In North America, > 90% of food allergies are caused by:

- Milk and egg
- Peanut and tree nuts
- Fish and shellfish
- Wheat, soy and sesame seed[4]

It is the protein component, not the fat or carbohydrate of these foods that trigger an allergic reaction. Allergenic segments or epitopes of these proteins tend to be small (10 kDa to 70 kDa) glycoproteins that are resistant to denaturation by heat or acid and therefore can remain intact even after processing, storage, cooking and digestion.[1] There have been recent advances in the characterization of specific epitopes and research is ongoing.

What are the signs and symptoms?

Allergic individuals may exhibit various signs and symptoms after ingesting a food to which they are allergic, depending on the underlying disease mechanism and the severity of their allergy (Table 1). The mildest reaction is OAS, an IgE-mediated response causing tingling and itching of the mouth, palate and pharynx. This is typically triggered after consumption of fresh fruits and vegetables in pollen-allergic individuals. It is caused by cross reactivity of IgE antibodies to certain pollens with proteins in some fresh fruits and vegetables (Figure 2). Fortunately, these proteins are heat-labile, enabling most allergic individuals to eat the allergenic foods when cooked.

Table 1

Signs and symptoms of an allergic reaction

	IgE	Non-IgE
Skin		
• Urticaria	√	
• Angioedema	√	
• Atopic dermatitis	√	√
Respiratory		
• Throat tightness	√	
• Rhinitis	√	
• Asthma	√	
Gut		
• Vomiting	√	√
• Diarrhea	√	√
• Pain	√	√
Anaphylaxis	√	

In the case of OAS, a detailed history is essential, since skin tests to the foods in question are usually negative. In a small proportion of those with OAS, there may be progression to systemic symptoms.

The most severe allergic response is anaphylaxis, a reaction which results from the binding of a food antigen to IgE on mast cells throughout the body, causing a systemic release of inflammatory mediators. There are numerous signs and symptoms which typically develop within two hours of food exposure. Because reactions can be highly unpredictable and vary from person to person, as well as from attack to attack in the same person, early symptoms should not be ignored. This is especially true if there is a history of a previous anaphylactic reaction. Peanut, nuts, milk, egg and shellfish are typical culprits; however, anaphylaxis can also be triggered by foods other than common food allergens, depending on the circumstances.

Figure 2

Oral allergy syndrome

Pollen	Fresh fruit/vegetable
Birch	Apple, apricot, carrot, cherry, kiwi, plum
Ragweed	Banana, cucumber, melon, watermelon
Grass	Cherry, peach, potato, tomato

Cross reaction between proteins in pollen and fresh fruits and vegetables

Ms. Nyholt is a Medical Student, University of Western Ontario, Schulich School of Medicine and Dentistry, London, Ontario.

Dr. Waserman is the past President of the Canadian Society of Allergy and Clinical Immunology and currently the Associate Professor of Medicine, Division of Allergy and Clinical Immunology, McMaster University, Hamilton, Ontario.

Update on Sam

- Sam was referred to an allergist for assessment
- He was found to have a positive skin test to peanut which was an ingredient in the cake
- He was advised to avoid peanuts and nuts, and was given an epinephrine auto-injector
- Nut avoidance was recommended because of the risk of cross-contamination with peanuts

How is food allergy diagnosed?

Diagnosis of a food allergy may be straightforward or complex. In either case, the workup should include a:

- Detailed history
- Physical examination
- Diagnostic tests such as skin prick tests (SPT) or an ImmunoCap-FEIA (fluoroenzyme immunoassay).

History should elicit:

- Symptoms
- Timing of the reaction
- Reproducibility and associations such as alcohol or exercise

Physical examination is used to look for supporting evidence of atopy and to exclude non-allergic causes of symptoms. The SPT is the quickest, simplest, safest and most sensitive (> 90% sensitivity) investigation to diagnose food allergy. A positive SPT appears as a wheal-and-flare reaction. The ImmunoCap, a blood test that measures specific IgE to the food in question, is useful for diagnosis if SPTs are not possible or available. The level of specific IgE may be used to determine the individual's risk of reaction if challenged with the food and if the allergy has been outgrown. Children often outgrow milk, egg, wheat and soy allergy by age five. Peanut allergy tends to be lifelong, yet may still be outgrown in up to 20% of cases.[6] Allergy to peanut, tree nut, fish and shellfish is generally lifelongIn situations where the diagnosis is not straightforward, food and symptom diaries, elimination diets and food challenges may be appropriate (Figure 3).

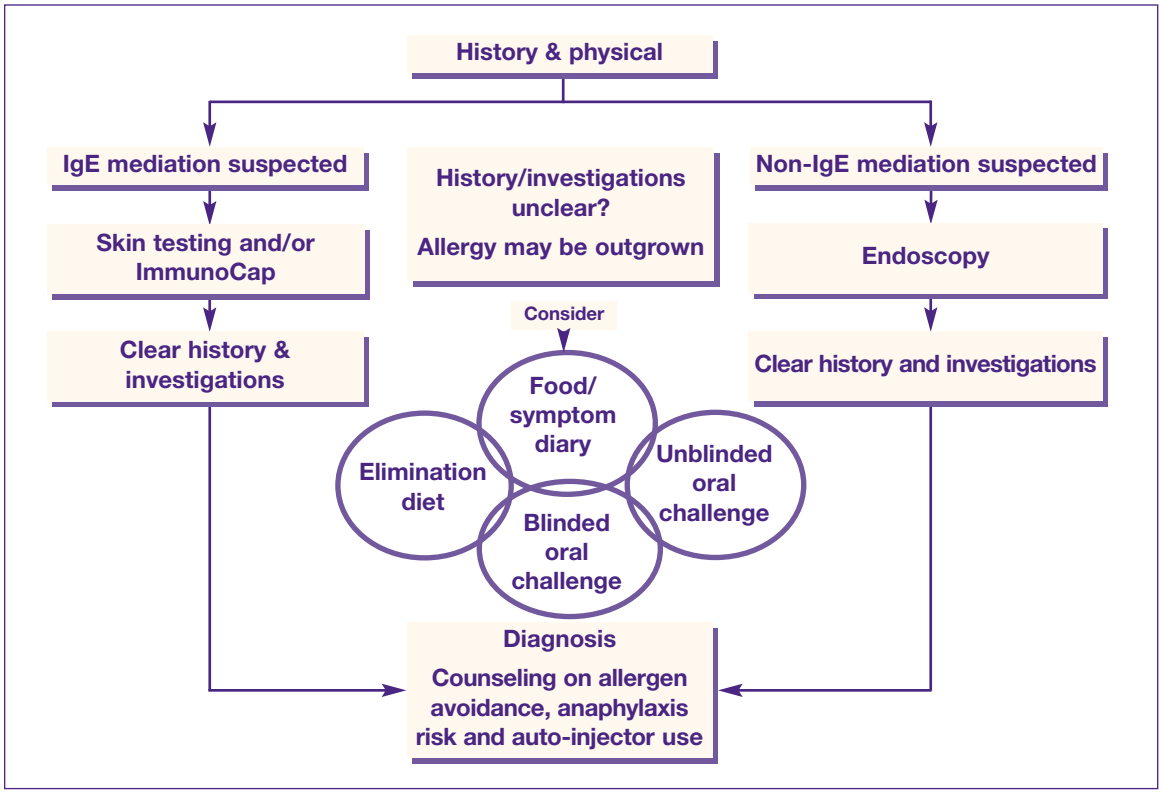

Figure 3. Work-up of food allergy

Take-home message

- Food allergy presents as well defined symptoms based on immunological mechanisms
- Proper diagnosis of food allergy is essential and requires a detailed history, skin testing and/or ImmunoCap
- Food challenges should be done where appropriate. In this way, those who are truly allergic can receive proper education and treatment, whereas those who are not, do not have to avoid foods unnecessarily
- Children often outgrow milk, egg, wheat, and soy allergy. Allergy to peanut, tree nut, fish and shellfish is generally life-long
- Food avoidance is the mainstay of treatment. An auto-injector should be used in the case of an accidental exposure

How is food allergy treated?

There is currently no treatment for food allergy. The only way to prevent an allergic reaction is to avoid the allergenic food(s). In the case of accidental exposure, the treatment of choice is auto-injectors. Antihistamines are a second-line treatment only.

Patients and caregivers must be educated on avoidance of food allergens, recognition of allergic symptoms and early management of anaphylactic reactions. Individuals are required to read labels carefully, watching for hidden ingredients such as "spices", "natural flavor", and "may contain" warnings. All food-allergic patients should have a MedicAlert identification bracelet or necklace, carry an epinephrine autoinjector and have a written emergency plan in case of exposure.

cme

For references please contact: cme@sta.ca