

# Personalized Nutrition in Food Allergy

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## Abstract

**Background :** Food allergies have been increasing in people worldwide especially in infants and children. Allergic reactions can be mild, but can be so severe to the point where a person can pass away from their allergic reaction. Since there is now a wide spectrum of disorders from food allergies, more awareness on personalized approaches need to be cultivated based on a patient's unique allergic reactions..**Objective :** This is a review on common allergies, allergic reactions and how personalized nutrition in food allergy is an important component for the safety of all individuals experiencing food allergy. **Method :** Using credible studies and trusted sources, information on the susceptibility, symptoms, and prevention of each allergy type are summarized within this literature review for better accessibility. **Result :** The most common food allergies are cow milk, eggs, peanuts, fish, shellfish, wheat, soybeans, and tree nuts which are often found from infancy or childhood. They share multiple common symptoms as well as prevention and treatment. Symptoms include gastrointestinal diseases, respiratory diseases, and anaphylaxis. As for treatment, medicines such as antihistamines that can be used as an acute treatment for a mild allergic reaction and epinephrine for anaphylaxis. However, prevention has to be varied and personalized based on an individuals' needs.

**Keywords :** Personalized nutrition, food allergy, susceptibility, symptoms, prevention

## Introduction

Food allergies have been increasing in people worldwide especially in infants and children. In recent years, allergic reactions to foods and new food allergic syndromes have appeared. With different types of allergies comes many complications in the health of different individuals. Allergic reactions can be mild, but can be so severe to the point where a person can pass away from their allergic reaction [1].

Since there is now a wide spectrum of disorders from food allergies, more personalized approaches need to be cultivated based on a patient's unique allergic reactions or phenotype. Many factors such as dose, dietary habits and preferences and baseline nutritional assessment should be taken into account when advising a patient with food allergies[2]. With the variety of allergic reactions based on an individual, a personalized approach to the patient affected by food allergy has to be available as the reactions might seem like they are the same even though they are not [3]. This review will focus on the most common types of allergies found in infants, children and adults worldwide. Using credible studies and trusted sources, information on the susceptibility, symptoms, and prevention of each allergy type are summarized here for better accessibility.

### Defining Food Allergy

Food allergy is an anomalous immune system response from different kinds of foods [4]. Immune systems in the human body functions to keep the body healthy. The immune system fights infections or any dangers that may come into the body, and when the system considers a certain kind of food as a danger, an allergic reaction will occur. This can cause light to severe symptoms like stomach pains, vomiting, diarrhea, hives, asthma, breathing difficulties, etc. [5].

### Prevalence of Food Allergy

Food allergies occur mainly during periods of infancy and childhood, but can also continue into adulthood. However, most children eventually outgrow their allergies and develop a tolerance later in life. Food allergies affect between 4%-8% of children and between 1%-2% of adults [6]. Food allergies are typically seen in young children especially under 5 or 6 years old more commonly than older people [7].

## Types of Food Allergies

### Food Allergy: Cow Milk

#### Prevalence

Infants and young children are the likeliest group of people to be allergic to cow milk proteins with the estimated population prevalence to be between 2% and 3% during the first year of life [8]. Allergic symptoms to cow milk can begin around the first few months of infancy and as the child grows, at around 6 years of age, they develop a tolerance to cow milk. According to Høst, children with cow milk protein allergy outgrow the allergy approximately 45-50% at 1 year, 60-75% at 2 years, and 85-90% at 3 years of age [9].

#### Symptoms

Symptoms of cow milk allergy are categorized as slow onset symptoms and rapid onset symptoms [10]. Slow onset symptoms include diarrhea, hematochezia, abdominal cramps, and colic which occurs within a few hours or days. Rapid onset symptoms include, urticaria/hives, wheezing, itching, angioedema, coughing, shortness of breath, vomiting, and anaphylaxis which occurs within an hour [11].

#### Prevention & Treatment

The most effective prevention method is the elimination of cow milk from the diet. For infants or young children, alternatives are breastmilk, hypoallergenic formulas, soy-based formulas, or alternative sources of milk whether from animals or nuts [12]. As for treatments in case of an allergic reaction, there are medicines such as antihistamines that can be used as an acute treatment for a mild allergic reaction [17] and epinephrine for anaphylaxis [13]. Tolerance or oral immunotherapy is also considered a recent treatment for milk allergy. This is when a patient ingest increasing amounts of milk allergen regularly to be desensitized and potentially become tolerant to cow milk [14]. However, building up tolerance for certain food allergies should be under strict care of a medical professional and personalized based on the person's needs and symptoms.

## **Food Allergy: Eggs**

### **Prevalence**

Infants and young children are the likeliest group of people to be allergic to eggs with 1%-2% children affected and only approximately 0.5% in adults [15]. Allergic symptoms to eggs develop during the stage of infancy and often, as the child ages, they will begin to develop a tolerance for eggs by themselves. According to Savage, using the Kaplan-Meier analysis, the predicted resolution in 4% of patients with egg allergy by age 4 years, 12% by age 6 years, 37% by age 10 years, and 68% by age 16 years [18].

### **Symptoms**

Symptoms of egg allergy include vomiting, abdominal pains, diarrhea, and urticaria, but can also be severe enough to affect the respiratory system. Severe reactions include the narrowing of airways or swelling of the throat which can be indicated by horse cries, change in voice pitch, stridor, coughing, or wheezing.[21] Eggs can cause anaphylaxis, although it is an uncommon symptom, but it can still occur and may continue to persist in certain individuals although most people outgrow this by the age of ten [20].

### **Prevention & Treatment**

The best prevention method is to avoid digestion of egg protein intake. Eggs are widely used in all types of dishes as well as manufactured goods. To spot whether a product uses eggs, there will be a food-ingredient label that states whether a product contains any eggs or egg proteins. However, some groups of people can be tolerant to cooked eggs and, if so, uncooked eggs should be avoided. [16] As for treatments in case of an allergic reaction, there are medicines such as antihistamines that can be used as an acute treatment for a mild allergic reaction [17] and epinephrine for anaphylaxis [13]. Oral tolerance can also be a way to treat allergic reactions to food. Building up tolerance for certain food allergies should be under strict care of a medical professional as an effective form of therapy is not yet founded [19].

## **Food Allergy: Peanuts**

### **Prevalence**

Peanut allergies are prominent in both children and adults, more so in children, but more severe in adults. According to Sydney Local Health District, 2% of children and 0.5% of adults have a peanut allergy [22]. Allergic symptoms often appear early in life with an unlikely chance that it will be outgrown, although possible as shown in a study from Leung in which about 21.5% of patients became tolerant to peanuts and many affected individuals outgrow it [24].

### **Symptoms**

Symptoms of peanuts include urticaria, erythema, angioedema, wheezing, stridor, coughing, dyspnea, throat tightness, and nasal congestion being the most common. Rarer symptoms include vomiting, diarrhea, abdominal pain, hypotension, arrhythmia, and as severe as anaphylaxis and cardiac arrests. The symptoms of peanut allergy are also more severe than other food allergies [23].

### **Prevention & Treatment**

The best prevention method in case of an infant is to allow them to consume peanuts early in life to lower the risks of developing a peanut allergy [26]. However, if the peanut allergy persists then the best way is to avoid foods containing peanuts. Since peanuts are used as an ingredient in many dishes and manufactured goods, be aware of food-ingredient labels which will state whether a product contains peanuts of any kind. As for treatments in case of an allergic reaction, epinephrine can be administered as a treatment for acute allergic reactions to peanuts [13]. Medicine such as antihistamines can also be used to aid the allergic reaction, but has to be used along with epinephrine [17]. The patient should be brought to a hospital afterwards. Tolerance can also be a way to treat allergic reactions to food. Building up tolerance for certain food allergies should be under strict care of a medical professional especially for peanuts since a severe allergic reaction could occur and patients would need to be able to readily access emergency care and medications [25].

### **Food Allergy: Fish**

#### **Prevalence**

Fish allergy tends to be more common in adults and teenagers rather than young children. According to Sicherer, the rates for fish allergy in children were significantly lower than that for adults with 0.2% in children versus 0.5% in adults [27]. However, fish allergy seems to depend on how the fish is processed, the fish's species, and an individual's eating habits [28].

#### **Symptoms**

The symptoms of all fish allergy are mostly gastrointestinal, but can also cause urticaria even though it is unlikely [30]. Other symptoms can include rashes, worsening of atopic dermatitis, swelling of the lips, tingling of the throat and mouth, runny nose, tightening of the throat, stomach pain, vomiting, diarrhea, asthma exacerbation and anaphylaxis [31].

#### **Prevention & Treatment**

The best prevention method for fish allergy is to strictly avoid foods that contain fish [29]. Many dishes and manufactured goods contain fish, so be aware of the food label to make sure that there is no digestion of fish. As for treatments for an allergic reaction caused by fish, epinephrine and antihistamines like diphenhydramine or loratadine can be used as emergency medicine [32]. Tolerance is generally not developed for fish allergies as about 80% of patients who are diagnosed for this allergy after a decade continue to experience allergic reactions from fish [33].

### **Food Allergy: Shellfish**

#### **Prevalence**

Shellfish allergy tends to be more common in adults rather than children in which children have a rate of fish allergy of about 0.5% versus 3% for adults [27]. This type of allergy also involves genetics and geographical factors unlike other allergies but is still relatively common. In a study by Wang, it is shown that children with shellfish allergy are also more likely to be Black, Hispanic or Latino with symptoms or parental history of asthma [35]. In another study by Davis, shellfish allergy appears to be more prominent in the Asia-Pacific region such as Singapore where shellfish allergy predominates [34].

#### **Symptoms**

Most symptoms of shellfish allergy include mild urticaria, rashes, stomach pain, vomiting, diarrhea, itching, and angioedema of the lips, mouth and pharynx with gastrointestinal being the most common [36]. The most severe reaction is anaphylaxis which can be fatal [37].

#### **Prevention & Treatment**

The best prevention method is to cut out shellfish from a diet. Shellfish is not as often to be used in manufactured foods, but being aware of labels is still important to prevent allergic reactions from shellfish. As for treatments for an allergic reaction caused by shellfish, epinephrine and antihistamines like diphenhydramine or loratadine can be used as emergency medicine [32]. For shellfish allergies, tolerance can also be a way to prevent allergic reactions. However, building up tolerance should be under strict care of a medical professional and personalized according to an individual [38].

### **Food Allergy: Wheat**

#### **Prevalence**

Wheat allergy is more common in children than adults with more than half of children that have had wheat allergy developing a tolerance and outgrowing the allergy by the age of 16 according to Cianferoni [40]. For children, a study from Welsh shows a prevalence of wheat allergy in children of around 0.4% [39].

### Symptoms

Symptoms of wheat allergy include urticaria, rashes, nasal congestion, headaches, breathing difficulties, cramps, nausea, vomiting, diarrhea, and anaphylaxis which can be life-threatening [41].

### Prevention & Treatment

The best prevention method for wheat reaction is to avoid dishes and manufactured foods that contain wheat. Food-ingredient labels state whether a certain product contains wheat or not. As wheat allergy can also be induced by exercise and can lead to anaphylaxis, it is also not recommended to exercise right after consuming wheat [42]. As for treatments in case of an allergic reaction, there are medicines such as antihistamines that can be used as an acute treatment for a mild allergic reaction [17] and epinephrine for anaphylaxis [13]. Tolerance or oral immunotherapy can be a way to stop allergic reactions to food. Although further studies are still needed there are cases where people can develop a tolerance. [43] So, building up tolerance for certain food allergies should be under strict care of a medical professional to make sure the therapy is personalized correctly to the patient.

## Food Allergy: Soybean

### Prevalence

Soybean allergy is more common in infants and children than in adults. According to Katz, the prevalence of soybean allergy in the general population is only around 0.5%, while it can reach up to 12.9% in children [44]. Soybean allergy typically develops during early stages of childhood and around half of children with this allergy normally outgrow them by the age of 7 making soybean allergy rarer in adults [45].

### Symptoms

Symptoms of soybean allergy include skin symptoms, oral symptoms, respiratory symptoms, gastrointestinal symptoms, and neurological symptoms [46]. This includes nausea, vomiting, diarrhea, runny nose, cough, wheezing, weakness, gastrointestinal distress, dyspnea, cardiovascular or cutaneous symptoms, and anaphylaxis rarely [47].

### Prevention & Treatment

The best prevention method for soybean is to avoid dishes and manufactured foods that contain soybean by viewing ingredient-labels. Other methods include thermal processing, enzymatic degradation and fermentation of soybean to lessen the chance of an allergic reaction to occur. Certain kinds of immuno-modulators like vitamin C may also prevent the symptoms of soybean allergy and anaphylaxis from occurring. [48] A severe allergic reaction such as anaphylaxis can be treated with epinephrine [13]. Methods to decrease the immuno-reactivity of soybean proteins are currently being studied to prevent anaphylaxis caused by soybean-induced allergy [49].

## Food Allergy: Tree nuts

### Prevalence

Tree nut allergy is really common and has increased in children during the last few years. Tree nut allergy is often seen more in children than adults, quite severe and varies by region. The prevalence of tree nut allergy is around 1%-4.9% worldwide [50]. Studies conducted by Weinberger show that many children have tree nut allergy more now in the present and that it is rarely overgrown with only 10% of people with tree nut allergy developing a tolerance [51].

### Symptoms

Symptoms of tree nut allergy includes urticaria, swelling of lips, tingling feeling of the throat and mouth, runny nose, tightening of the throat, cramps, stomach pain, nausea, vomiting, and anaphylaxis. Specifically for tree nut allergy, anaphylaxis can commonly occur as an allergic reaction which is extremely dangerous because it can be fatal [52].

### Prevention & Treatment

There is currently little information on the prevention methods for tree nut allergy. However, a prevention method for tree nut allergy can be to avoid eating dishes or manufactured goods containing any kinds of tree nuts. Ingredient labels state whether a product contains nuts that might potentially cause an allergic reaction, so be mindful of them [53]. To treat anaphylaxis that can be caused by tree nut allergy, epinephrine can be administered [13].

### Conclusion

The most common food allergies include cow milk, eggs, peanuts, fish, shellfish, wheat, soybean, and tree nuts. The symptoms from food allergies vary in severity, duration, and type. However, they do share symptoms relating to the gastrointestinal tract and respiratory system. The common prevention for food allergy is the avoidance of that food which is specific to each individual and requires a personalized nutritional diet plan. As for mild allergic reactions, there are medicines such as antihistamines which can help treat the symptoms; for anaphylaxis, epinephrine can be administered to be a first-aid treatment.

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