Introduction

The number of people that suffers food allergy or food intolerance to some products is increasing. Approximately 15 million people in the United States have food allergies. The Food Allergy Research & Resource Program (FARRP) currently estimates the prevalence of IgE-mediated food allergies in the United States at 3.5 - 4.0% of the overall population (1). In children, it increased by 50 percent between 1997 and 2011. As for nuts, it is estimated that the prevalence of peanut and tree nut allergy in U.S. children more than tripled between 1997 and 2008 (2). In Europe, the prevalence of food allergy/intolerance in adults is approximately 5% (3). But first, it is necessary to clarify the difference between these two concepts: food allergy and food intolerance.

What is a Food Allergy?

Food allergies are caused by an adverse immune reaction (hypersensitivity) to certain food proteins, an abnormal response to a food induced by the body's immune system. When the immune system becomes sensitized to specific food antigens (usually proteins), food allergies occur (4). In adults, the foods that most often trigger allergic reactions are fish, shellfish, peanuts and tree nuts; in children, the list includes eggs, milk, peanuts, tree nuts, soy and wheat (5).

On the other hand, food intolerance is a hypersensitive reaction which is non-allergic, where immunological mechanisms have not been proven or are not responsible for the reaction (e.g. gluten or sulphite sensitivity and lactose intolerance). Causes of food intolerance include: absence of an enzyme needed to fully digest a food; irritable bowel syndrome; sensitivity to food additives; recurring stress or psychological factors; celiac disease. For example, lactose intolerance is caused by a deficiency of the digestive enzyme lactase and, although it may cause great discomfort, it is not life-threatening (2, 4).
## How Common are Allergies?

Adverse health consequences due to allergic reactions to food, including food intolerances, in Europe are estimated to affect about 1-3% of the population and about 4-6% in children (6). In the United States the data are similar, approximately 2% of adults and about 5% of infants and young children are affected (7). The prevalence of peanut allergy was estimated at 0.6% while the prevalence of tree nut allergies was estimated at 0.5% (2).

People diagnosed with a nut allergy have to avoid consuming the food or substance and read ingredient labels carefully. In people with nut allergies, common reactions may include:

### Skin
- Atopic dermatitis
- Urticaria
- Angio-oedema

### Respiratory tract
- Asthma
- Rhinitis

### Gastrointestinal tract
- Oral allergy syndrome
- Abdominal pain
- Colic, nausea
- Vomiting
- Diarrhea
- Constipation
- Bloating
- Gastro-esophageal reflux (heartburn)
- Enteropathies
- Failure to thrive

### Eyes
- Conjunctivitis
- Watering eyes

### Generalized (systemic)
- Anaphylaxis (with all its complications)

### Central nervous system
- Headache
- Abnormal behavior (ADHD), rare

## Diagnosis

Skin-prick tests and/or blood tests are the most reliable tools to determine the presence of allergen-specific immunoglobulin E, an antibody that binds to allergens and triggers the release of chemicals that cause the symptoms. If those tests are inconclusive, the allergist or immunologist may order an oral food test to see how the organism reacts to the suspected allergy-causing food (8).

## Labeling

There is no international legislation in relation to allergens and the list of allergens covered in the legal requirements is not exactly the same between countries. For example, the Codex Alimentarius Commission Committee on Food Labeling has listed the foods and ingredients that may cause severe reactions and most cases of food hypersensitivity. In section 4.2.1.4 of General Standards for the Labeling of Prepackaged Foods it states (9): “The following foods and ingredients are known to cause hypersensitivity and shall always be declared:

- Cereals containing gluten; i.e., wheat, rye, barley, oats, spelt or their hybridized strains and products of these;
- Crustacea and products of these;
- Eggs and egg products;
- Fish and fish products;
- Peanuts, soybeans and products of these;
- Milk and milk products (lactose included);
- Tree nuts and nut products;
- and Sulphite in concentrations of 10 mg/kg or more.”
The European Union Food Information to Consumers regulation requires packaged foods to have the allergenic ingredients information emphasized in the ingredients list, and food sold loose to have allergen ingredients information available. ‘Allergens’ refers to the 14 listed in the legislation and mentioned in the table below (10).

In the United States, the Food Allergen Labeling and Consumer Protection Act (FALCPA) identifies 8 allergens (7).

In Japan, there are 7 allergens (those listed) whose presence must be stated on the label. For others a warning is recommended but not obligatory.

### Key Aspects of Allergen Management

Food operators have to implement preventive measures to avoid or minimize the possibility of cross-contamination in the framework of their Hazard Analysis Critical Control Point (HACCP) plan, and food manufacturers must clearly label any product that contains an allergen (4). The use of dedicated equipment, part of the equipment or tools for the production with allergens is recommended, especially if they are not easy to clean. If it is not possible to use a dedicated line or equipment, there are other options such as performing specific cleaning and organizing the production taking into account the allergen content. The preventive measures, in particular the specific cleaning procedures, have to be validated to ensure their efficacy.

<table>
<thead>
<tr>
<th>Allergen</th>
<th>CODEX</th>
<th>EU</th>
<th>USA</th>
<th>JAPAN*</th>
<th>AUSTRALIA</th>
</tr>
</thead>
<tbody>
<tr>
<td>Cereals containing gluten</td>
<td>X</td>
<td>X</td>
<td>X</td>
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<td>X</td>
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<tr>
<td>Crustaceans</td>
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<tr>
<td>Eggs</td>
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<td>Fish</td>
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<td>Peanuts</td>
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<td>Soybeans</td>
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<td>Milk</td>
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<td>Nuts</td>
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<td>Sesame seeds</td>
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<td>Sulphur dioxide and sulphites</td>
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<td>Buckwheat</td>
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<td>X</td>
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</tbody>
</table>

Source: Silliker Ibérica SAU. (*) In Japan, there are 7 allergens (those listed) whose presence must be stated on the label. For others a warning is recommended but not obligatory.
There are some initiatives, such as the Voluntary Incidental Trace Allergen Labelling (VITAL®), which can help companies to perform their risk assessment. VITAL® establishes the threshold, based on scientific criteria, above which a precautionary statement must appear on the label. Where such regulations exist, the precautionary statement must comply with the food-labeling laws of the country.

Preventive measures validation can be difficult due to the following issues: The first is that current regulations do not establish a threshold (this is true for the most part although there are some exceptions; the sulphur dioxide and the sulphites threshold in the EU is 10 ppm, for instance), the second issue is that there are no official methods of allergen detection described in the regulations (11).

### New Findings

A landmark study called LEAP (Learning Early About Peanut Allergy) provided strong evidence that early introduction of peanuts may help prevent the development of peanut allergy in children. The study was published in 2015 and their results showed that in children between 4 and 11 months of age at high risk for peanut allergy, sustained consumption of peanut beginning in the first 11 months of life was highly effective in preventing the development of peanut allergy, compared with infants who avoided peanut consumption (12).

### Resources

- Centers for Disease Control and Prevention (CDC). Allergies.
- Food Allergy Research and Education (FARE). Tree Nut Allergy.

### References

1. Food Allergy Research and Resource Program. University of Nebraska.
10. EU Regulation No. 1169/2011 on the provision of food information to consumers (EU FIC).
11. Voluntary Incidental Trace Allergen Labelling (VITAL). The VITAL Program.

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