



Lupin Allergy

Key points

- Lupin, like other protein containing foods (e.g. peanut, soybean, dairy or shellfish) may trigger an allergic reaction in a small percentage of the population.
- Some people who are allergic to peanuts may also react to lupin.
- Some Australian food companies are increasingly adopting voluntary allergen labelling for lupin.

This document provides information to raise awareness of lupin as a food allergen. It is based on information developed by the Department of Agriculture and Food in Western Australia (DAFWA) and the Centre for Food and Genomic Medicine.

What is lupin?

Lupin is a legume related to peanut and soybean and, like other high protein foods (e.g. egg and shellfish), may trigger an allergic reaction in a small percentage of the population. Lupin seeds have been used as human food since ancient times. For thousands of years pearl lupin (*Lupinus mutabilis*) has been consumed in the Andean Highlands, and seeds of white lupin (*Lupinus albus*) have been eaten whole as a popular, traditional, snack food of the Mediterranean region (lupini beans).

Increasingly, the narrow-leaved lupin, also known as Australian sweet lupin (*Lupinus angustifolius*) and white lupin are being used worldwide as a versatile, nutritional ingredient in food manufacturing (e.g. flour, emulsifier, meat extender) and as an alternative to genetically modified ingredients. The new sweet lupin varieties do not require soaking to remove bitterness (alkaloids) before use.

Lupin flour was officially introduced as a food ingredient in the UK in 1996, in France in 1997, and in Australia in 2001. Lupin flour is used in bakery products (added up to 20% of wheat flour), biscuits (up to 50%), pasta, sauces and in beverages.

Consumption of lupin is increasing as more people become aware of its value as a nutritious food. Lupin is uniquely high in protein (30- 40%) and dietary fibre (30%), and low in fat (4-7%). Nutrition and medical scientists are researching the health benefits of lupin, which could potentially play a role in combating obesity and its associated health problems of diabetes and heart disease.

Unfortunately, the potential health benefits of lupins have been compromised by the fact that a small percentage of people are allergic to lupin either through ingesting or inhaling lupin protein. In 1994, the first case of an immediate-type of allergic reaction after ingesting pasta containing lupin flour was reported in the United States. In Australia, cases of lupin allergy were first reported in 2004. However, many people may still be unaware of lupin as an emerging food allergen.

What foods contain lupin?

Lupin can be found in a wide range of food products including bread, bakery and pasta products, sauces, beverages and meat based products such as burgers and sausages. Gluten-free or soy-free products may sometimes contain lupin.

Lupin can be milled and ground into wholemeal-type flour to add protein and fibre to baked goods and noodles. The lupin kernel can be ground into kibble type products or milled into flour. Lupin protein isolates can be

added to products to improve their nutritional quality. Lupin is increasingly used as a protein replacement for genetically modified ingredients and for animal proteins (e.g. milk and egg white).

Lupin allergens are resistant to normal cooking procedures, including boiling, and microwave heating. A novel sandwich enzyme-linked immunosorbent assay for the detection and quantification of lupin in processed foods using a polyclonal rabbit anti-lupin antibody has been developed.

Lupin may appear on the ingredient label of manufactured foods, but it also may be used as an unlabelled ingredient in some foods, such as bread rolls or food sold in restaurants.

Food Standards Australia New Zealand (FSANZ) is currently working on a proposal which is considering the mandatory requirement of allergen labelling for lupin (Standard 1.2.3).

To make labels more helpful to allergy sufferers, some Australian food companies are increasingly adopting voluntary allergen labelling for lupin. Lupin is sometimes labelled as lupin flour, lupin flakes, lupinus, lupine, lupini or lupine beans.

What is food allergy?

Food allergy is an abnormal immune response to naturally occurring food proteins or derivatives that most usually involve immunoglobulin E (IgE). An individual must first be sensitised by exposure to the protein to develop antibodies, which then may react to further exposures.

Food allergies are not the same as food intolerances, which are generally caused by chemical agents (e.g. sulfites), or certain enzyme deficiencies (e.g. lactose intolerance). More than 160 foods are reported to cause allergies. About 5% of children and 2% of adults are estimated to suffer from food allergy.

The most common food allergy triggers are hen's egg, cow's milk, peanuts, tree nuts, seafood, sesame, soy, fish and wheat. Peanuts, tree nuts, seeds and seafood are less likely to be outgrown and tend to be lifelong allergies. Some food allergies can be severe, causing life threatening reactions known as anaphylaxis.

There is no evidence that lupin is quantitatively more potent an allergen than other foods. The range of severity of reaction to lupin is similar to that seen with other food allergens.

Symptoms of food allergy

Symptoms of an allergy to lupins can vary greatly between individuals and the reaction is not associated with toxicity.

Mild to moderate symptoms of a food allergy include:

- Swelling of lips, face, eyes
- Hives or welts
- Tingling mouth
- Abdominal pain, vomiting

More severe symptoms of food allergy include:

- Difficult/noisy breathing
- Swelling of tongue
- Swelling/tightness in throat
- Difficulty talking and/or hoarse voice
- Wheeze or persistent cough
- Persistent dizziness or collapse
- Pale and floppy (young children)

Like other food allergens, lupin has the potential to cause symptoms in people with no previous history of food allergy.

Some individuals with peanut allergy may cross-react to lupin since lupin is more closely related to peanut than other legumes.

There are no research reports that confirm the minimum amounts of lupin that could cause a clinical allergic reaction. Doses of lupin protein triggering clinical reactions in peanut-allergic individuals vary widely (from 50 mg to 1.6 g). Subjective symptoms have been reported to 0.5 mg of lupin flour. Allergic reactions were reported in 5 out of 6 children allergic to peanut at doses of lupin flour from 265 to 1000mg.

Lupin protein allergens

The major lupin allergen **Lup an1** (β -conglutin) has sequence similarities to the major peanut allergen **Ara h1**.

Generally, lupin allergens are resistant to thermal, chemical, and proteolytic degradation. However, the effects of different processing methods on the allergenicity of lupin have not been systematically investigated.

How common is lupin food allergy?

Over the past 20 years an increasing number of Australian and European populations have been exposed to a wider range of processed food products containing lupin based ingredients. It is likely that the incidence of lupin allergy in these populations will be similar to the incidence of other legume allergies once this population has been well exposed to lupin foods.

The prevalence of lupin food allergy is difficult to establish because of the scarcity of studies, but seems to be very low in the general population. It has been claimed that fewer than 1% of the population that have eaten lupin-based foods have been reported to show an immediate allergic reaction.

In the German population lupin allergy is suspected to be relatively uncommon since lupin sensitization occurred in only 2 of 92 (2%) of non-atopic subjects. Similarly, a Finnish study reported that lupin sensitization occurred in 25 of 1,522 patients (1.6%), and 7 of the 25 patients (0.4%) displayed clinical reactions. In the Netherlands, the estimated prevalence of lupin allergy was 0.27–0.81% among 1040 consecutive patients attending an allergy clinic with a suspected food allergy.

Confirmed reports of lupin allergy in Australia have been few. In South Australia from 2004-2009 there were 8 cases of acute allergy from lupin ingestion and not all of the individuals had peanut allergy. Further work is needed to establish the prevalence and significance of lupin allergy to help with risk management.

Potential co-reactions

Individuals who are allergic to peanuts may also co-react to legumes, including lupin. Lupin allergy has been reported in people who are sensitive to peanuts, as well those who are not allergic to peanuts or other legumes. There are conflicting reports, but more recent studies indicate that the incidence of individuals with co-reactivity to both lupin and peanut is probably lower than first thought.

Studies have identified potential co-allergic reactions between lupins and peanuts. A French study of 5,366 patients showed that 14.5% of adults and 17% of children with peanut allergy had cross-sensitisation with lupin. A UK study showed that sensitisation to lupin was observed significantly more often in peanut-allergic children and teenagers (34%) than in non-peanut-allergic patients (4%).

To confirm co-allergic reactions between lupins and peanuts, oral challenges to assess clinical symptoms have been conducted, but reports are conflicting about the significance. About 5% of people known to exhibit clinical symptoms of peanut allergy have been reported to show clinical symptoms when exposed to lupin. A UK study

found 15 of 47 (30%) peanut allergic children were sensitised to lupins and 4% showed clinical reactions when challenged orally. However, a French study reported that 11 of 24 (44%) peanut-allergic individuals were sensitized to lupin and when 8 of the 11 were given oral challenge tests with lupins, 7 (28%) developed clinical symptoms of lupin allergy.

Key messages for health professionals

- Refer patients at risk of anaphylaxis to a clinical immunology/allergy specialist or doctor with experience in food allergy management.
- Medical practitioners should complete the appropriate ASCIA Action Plan and provide adrenaline autoinjector prescriptions for patients if they are considered to be at risk of anaphylaxis.
- Education of patients (and their families/carers) about avoidance strategies and acute management is critical (e.g. label reading, eating out, ASCIA Action Plans, how to use the adrenaline autoinjector if one is prescribed).

Key messages for consumers

- The only way to manage a food allergy is by avoiding the food allergen.
- If you suspect you or someone you care for has a food allergy you should contact a doctor so you can be referred to a clinical immunology/allergy specialist or doctor with experience in food allergy for ongoing management.
- Currently, there is no law saying lupin must be on food labels however some manufacturers do now include it in the ingredient list.
- Always disclose your allergy and ask about allergen content when eating away from home.
- Always be vigilant for high risk situations where food may be cross contaminated by other customers (e.g. buffet meals, bulk bin food displays).

Key messages for food manufacturers, retailers and the food service sector

- Implement an effective allergen management plan.
- Train staff in food allergen risks, management and communication.
- Provide clear and accurate information on the allergen status of your product.
- Food manufacturers have a responsibility to manage the unintentional presence of food allergens.

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