# Diagnosis and Management of food allergy

**Children and Young People's Allergy Network Scotland**

NHS National Services Scotland

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# 1. Introduction

## Diagnosis of food allergy

The following guidance is based on the best available evidence as detailed in the NICE Clinical Guidance 116 – Food allergy in under 19s: assessment and diagnosis. NICE 2011, updated 2018 (1)

## 1.1 Assessment and allergy-focused clinical history

### 1.1.1 Initial Recognition

Consider food allergy in a child or young person who:

- has one or more of the signs and symptoms listed in table 1, below (pay particular attention to persistent symptoms that involve different organ systems)

**OR**

- has had treatment for atopic eczema, gastro-oesophageal reflux disease or chronic gastrointestinal symptoms (including chronic constipation) but their symptoms have not responded adequately.

## Table 1: Signs and symptoms of possible food allergy

| IgE-mediated | Non-IgE-mediated |
|---|---|
| These arise within minutes to 2 hours | These arise after several hours or days |
| **The skin** | |
| Pruritus | Pruritus |
| Erythema | Erythema |
| Acute urticaria – localised or generalised | Atopic eczema |
| Acute angioedema – most commonly of the lips, face and around the eyes | |
| **The gastrointestinal system** | |
| Angioedema of the lips, tongue, and palate | Gastro-oesophageal reflux disease |
| Oral pruritus | Loose or frequent stools |
| Nausea | Blood and/or mucus in stools |
| Colicky abdominal pain | Abdominal pain |

| | |
|---|---|
| Vomiting | Infantile colic |
| Diarrhoea | Food refusal or aversion |
| | Constipation |
| **IgE-mediated** | **Non-IgE-mediated** |
| | Perianal redness |
| | Pallor and tiredness |
| | Faltering growth in conjunction with at least one or more gastrointestinal symptoms above (with or without significant atopic eczema) |
| **The respiratory system (Usually in combination with one or more of the above symptoms and signs)** | |
| Upper respiratory tract symptoms (nasal itching, sneezing, rhinorrhoea, or congestion [with or without conjunctivitis) | |
| Lower respiratory symptoms (cough, chest tightness, wheezing or shortness of breath) | |
| **Other** | |
| Systemic reaction (where more than one system involved, or reaction occurs at site other than where exposure happened - for example ingested food causing respiratory signs/symptoms, or inhaled allergen causing cardiovascular signs/symptoms), including anaphylaxis. | |

**Note: this list is not exhaustive, and the absence of these symptoms does not exclude food allergy.**

### 1.1.2 History and Examination

- Do not offer allergy tests without first taking an allergy-focused clinical history.
- A healthcare professional with the appropriate competencies (GP or other health care professional) should take a clinical history using the questions below.
- Based on the clinical history, physically examine the child or young person in particular for:
  - Growth and physical signs of malnutrition
  - Signs indicating allergy related co-morbidities (atopic eczema, asthma, and allergic rhinitis)

### 1.1.3 Allergy-focused clinical history

Ask about:

- Presenting symptoms and other symptoms that may be associated with food allergy (see table 1) including:
  - What the suspected allergen(s) is/are
  - Who has raised the concern and suspects the food allergy
  - The age at first onset
  - Speed of onset
  - Duration, severity, and frequency
  - Setting of reaction (for example, at school or home)
  - Reproducibility of symptoms on repeated exposure
  - What food and how much exposure to it causes a reaction
  - Any response to the elimination and re-introduction of foods.
  - Details of any foods that are avoided and the reasons why
  - Cultural and religious factors that affect the foods they eat
  - The child or young person's feeding history, including the age at which they were weaned, and whether they were breastfed or formula-fed (if the child is currently being breastfed, consider the mother's diet)
  - Details of any previous treatment, including medication, for the presenting symptoms and the response to this
  - Any personal history of atopic disease (asthma, eczema, or allergic rhinitis)
  - Any individual and family history of atopic disease (such as asthma, eczema, or allergic rhinitis) or food allergy in parents or siblings.

## 1.2 When to consider referral

If any of the following apply, consider referral to secondary or specialist care:

- The child or young person has had one or more acute systemic reactions or severe delayed reactions
- Severe eczema inadequately controlled by moderate strength topical steroids
- Possible multiple food allergies
- Symptoms that do not respond to a single allergen elimination diet
- Confirmed IgE-mediated food allergy and concurrent asthma.
- The child or young person has faltering growth in combination with one or more of the gastrointestinal symptoms listed in table 1
- Allergy tests are negative but there is a strong clinical suspicion of IgE-mediated food allergy
- There is persisting parental suspicion of food allergy (especially where symptoms are difficult or perplexing) despite a lack of supporting history

## 1.3 Food allergy is suspected: initial information to be offered

Offer age-appropriate information that is relevant to the type of allergy (IgE-mediated, non-IgE-mediated, or mixed). Include:

- The type of allergy suspected
- The risk of anaphylaxis (based on previous reactions and presence of co-factors e.g., asthma)
- Any impact on other healthcare issues such as vaccination (see Egg allergy)
- The diagnostic process, whether this is:
  - an elimination diet followed by a possible planned re-challenge or initial food reintroduction procedure (where felt to be safe)
  - skin prick tests and/or specific IgE antibody testing https://www.nhs.uk/conditions/food-allergy/diagnosis/
  - referral to secondary or specialist care

For further information see CYANS, Allergy UK and Anaphylaxis UK websites.

## 1.4 Diagnostic tests

### 1.4.1 IgE-mediated allergy is suspected

Offer a skin prick test and/or blood tests for specific IgE antibodies to the suspected foods and likely co-allergens. Base a choice of test on:

- The clinical history **and**
- The suitability for, safety of, and acceptability to the child (or their parent or carer) **and**
- The available competencies of the healthcare professional.

**Other points to note:**

- Tests should only be undertaken by healthcare professionals with appropriate competencies.
- Only undertake skin prick tests where there are facilities to deal with an anaphylactic reaction.
- Interpret the results of tests in the context of clinical history.
- Do not use atopy patch testing or oral food challenges to diagnose IgEmediated food allergy in primary care or community settings.
- Skin prick tests and IgE blood tests do not indicate severity of allergy, only probability.

(For interpretation of diagnostic tests in suspected IgE mediated food allergy, please see **Appendix 1**)

### 1.4.2 Non IgE-mediated allergy is suspected

- Try eliminating the suspected allergen for 2–6 weeks, then re-introduce. Consult a dietitian with appropriate competencies for ongoing elimination, particularly of key foods or multiple foods about nutritional adequacy, timings, and follow-up.
- Skin prick tests and specific IgE-antibodies are not predictive of non-IgE mediated allergy and should not be used.

### 1.4.3 Alternative diagnostic tools

Do not use the following alternative diagnostic tests in the diagnosis of food allergy or intolerance:

- Vega (electro dermal) test
- Applied kinesiology
- Hair analysis
- Specific lgG testing
- Skin prick tests and specific IgE-antibodies are not predictive of non-IgE mediated allergy and should not be used.

# 2. Management of food allergy

## 2.1 Allergen avoidance

The key to the management of food allergy is avoidance of the trigger allergen.

Children and their families should be offered specific advice on avoidance of the allergen concerned, taking into account socio-economic, cultural, and religious issues. The information to be offered can include:

- what foods/drinks to avoid that are likely to contain trigger allergen(s)
- how to interpret food labels
- the need to ask food providers about allergens in freshly prepared food as information on menus is optional
- alternative foods to ensure a balanced diet
- the duration, safety, and limitations of an elimination diet
- oral food challenge or re-introduction procedures, if appropriate, and their safety and limitations.

There are 14 food allergens for which a label as an ingredient is required on packaged foods. In addition, manufacturers may use statements such as “may contain” or “not suitable for” known as precautionary allergen labelling (PAL). Patients should be advised to read both ingredients and PALs. Advice on whether to avoid those with a PAL should be individualised. Patients with a high risk of anaphylaxis may be advised to avoid PAL food whilst those with pollen food syndrome (PFS) do not need to avoid these foods.

Avoidance of some allergens may be difficult and may put children at risk of inadequate nutritional intake (2,3).

Children and young people are at particular risk and should receive nutritional support and monitoring by a registered dietitian with appropriate competencies, if they:

- are allergic to staple foods, e.g., cow’s milk, wheat, soy
- have multiple food allergies
- have a food allergy and additional dietary restrictions, e.g., vegetarian diet.

### 2.1.1 Allergen avoidance during breast feeding

Food proteins from the maternal diet are detectable in breast milk (4,5) although in concentrations that may be of no consequence to most allergic infants.

Breast feeding mothers may be advised to exclude the food allergen to which their infant is sensitive from their own diet if their infant has symptoms whilst breast feeding or has moderate to severe eczema, although the evidence for this is poor (6,7).

If a mother is avoiding cow’s milk, she should receive advice from a registered dietitian and calcium supplementation.

## 2.2. Emergency Medications

### 2.2.1 Provision of adrenaline auto injector

An individual risk assessment should be undertaken to identify those at high risk of anaphylaxis for whom self-injectable adrenaline should be prescribed.

Adrenaline auto injector prescription (for sufficient numbers that 2 autoinjectors are available at all times) **is recommended** if there is:

- a history of previous suspected anaphylaxis based on food reaction with respiratory or cardiovascular symptoms
- a history of generalised allergic reaction to nut or peanut and co-existent asthma requiring regular preventer therapy.

Adrenaline auto injector prescription **may be considered** if there is:

- a generalised reaction to trace amounts of food (e.g., airborne food allergen or contact only via skin)
- a reaction to peanut or tree nut without anaphylaxis
- remoteness of home from medical facilities
- a food allergic reaction in a teenager
- Any other circumstances that might be considered to increase the risk of anaphylaxis

Adrenaline auto injectors should be prescribed by brand name to ensure that the patient receives the device they have been trained on.

### 2.2.2 Other Medications

- To alleviate symptoms of IgE mediated food allergic reactions an **oral antihistamine** should be prescribed for use after accidental ingestion of a food allergen and / or when symptoms of an allergic reaction arise regardless of whether allergen thought to have been ingested.

## 2.3 Management of further reactions

Families should be provided with:

- Education regarding prompt recognition of symptoms of anaphylaxis compared with those of a mild reaction, and appropriate management, as per written allergy plan.
- Training in the use of the particular self-injectable adrenaline device they have been prescribed. Reinforcement with scenario-based revision at every opportunity, and ideally not longer than at yearly intervals. Children and caregivers should be provided with contact details for patient support, e.g., CYANS website, Anaphylaxis UK, Asthma UK, National Eczema Society, Allergy UK.

## 2.4 Food allergy in schools

Families should check that Nursery and school staff have received training in allergen avoidance (not just at mealtimes, but also for treats and foods used as educational materials) and in the recognition and treatment of food induced allergic reactions. Ideally a

care plan should be in place agreed between family and nursery/school. An example School Healthcare Plan produced by The City of Edinburgh City Council is available here.

Parents can refer to the CYANS website 'School Information For Parents' for further information.

## 2.5 Personal allergy management plan

All children with IgE mediated food allergy should be provided with a personalized allergy management plan, to be used in all care situations including nursery and school, as this has been shown to reduce the frequency and severity of further food reactions (8, 9 ).

An example of a personalised allergy management plan can be found on the BSACI website.

## 2.6 Resolution of food allergy

- Families should be given an idea of whether the allergy is likely to resolve over time. Most infants and young children with food allergy to milk, egg, soy and wheat will eventually develop tolerance of these foods. However, only a small proportion of children with allergies to peanut, tree nuts, sesame and fish will eventually tolerate these by age 16.
- The time course of food allergy resolution varies by individual and may occur as late as the teenage years. A higher initial level of food specific IgE is associated with a lower rate of resolution of clinical allergy over time (10). Although food allergy is reported to resolve in a minority of food allergic adults, this may only reflect incorrect diagnosis.
- Children with food allergy should be re-evaluated at intervals to identify when tolerance has developed so that their diet does not remain unnecessarily restricted.
- Re-evaluation should include any history of accidental or intentional exposure and may require repeat food specific IgE and/or skin prick tests. Falling specific IgE or reduction in the size of skin prick test wheal may be a marker for the onset of tolerance to the food.
- If history and investigations suggest that a food allergy may have resolved, a risk assessment should be made to decide whether a food may be introduced at home, or a hospital-supervised challenge is required. This may depend on the food concerned, the severity of previous reactions and presence of additional risk factors such as Asthma.

## Box 1: Risk Assessment for Home Challenges

**The following patients are at higher risk and a hospital- supervised challenge should be considered in these cases:**

| | |
|---|---|
| • Children with previous food allergy symptoms that affected breathing (cough, wheeze or swelling of the throat e.g., choking), the gut (severe vomiting or diarrhoea) or the circulation (faintness, floppiness, shock) | • Children with multiple/complex allergy. |
| • Children who had a less severe reaction after only trace exposure. | • Children whose parents are unable to comprehend or adhere to protocol. |
| • Children on regular asthma preventative inhaler treatment and/or have poorly controlled asthma. | |

# 3. Cow's Milk Allergy (CMA)

*The following is based on the British Society of Clinical Immunology (BSACI) guideline for the diagnosis and management of cow's milk allergy (7)*

CMA is an allergy to proteins (not lactose, please see below) in cow's milk. It is the leading cause of food allergy in babies and children under 3 years. Almost all cases present before 12 months of age. The majority of children become tolerant by school age (BSACI guidelines Luyt et al) but tolerance may still develop into adolescence (10). A small proportion of children with IgE mediated cow's milk allergy will remain extremely sensitive to cow's milk protein and it is the commonest single cause of fatal food-induced allergic reactions in school-aged children (11).

## 3.1 Initial recognition of CMA

CMA may present with signs and symptoms of immediate IgE-mediated or delayed non IgE-mediated allergy or a mixed picture – see table 1.

- **IgE-mediated CMA** could typically present in a breast fed infant with angioedema, urticaria and wheeze at first exposure to cow's milk.
- In a **mixed picture** this infant would also have long standing eczema or loose stools.
- In **non- IgE-mediated CMA**, a degree of clinical suspicion is required since nonspecific GI symptoms are common usually without clear temporal association to milk ingestion, e.g., an unsettled baby with slow weight gain and loose stools.
- Non IgE mediated CMA can present with severe symptoms of vomiting and diarrhoea requiring hospital admission.
- Infants may present with symptoms of gastro-oesophageal reflux disease (GORD). Failure to respond to medical management for GORD may raise the suspicion of CMA, particularly if associated with other gastrointestinal or skin symptoms.
- There is no evidence that CMA is a cause of colic (cry fuss behaviour) alone without other symptoms.

## 3.2 Diagnosis of CMA

- An allergy-focused history is key to diagnosis and treatment.
- Allergy tests may be helpful in confirming the diagnosis and in future management decisions of IgE-mediated CMA.
- Allergy tests are of no help in non-IgE mediated CMA and diagnosis relies on a 2–6-week trial of milk (cow's milk protein) exclusion, followed by re-challenge (at home unless presenting symptoms severe).

## 3.3 Cow's milk/dairy free diet

### 3.3.1 Breast fed infants with CMA

Breast milk is suitable for most babies with cow's milk allergy and mothers should be encouraged to breast feed wherever possible. Most mothers do not need to restrict their own diet unless the infant has symptoms whilst breast feeding.

Cow's milk proteins can be detected in breast milk, and the concentrations are unlikely to cause symptoms in most allergic infants but may in a small number of babies. A trial of removal of cow's milk protein from the maternal diet may be considered where this is suspected. This may be for 2-3 weeks when symptoms are predominantly gastrointestinal but should be 6 weeks for eczema. This requires dietetic advice, and the mother will require calcium and vitamin D supplementation. Milk and dairy should then be cautiously re-introduced. If there was no improvement in symptoms on the maternal elimination diet, CMA is unlikely to be the cause of symptoms. Consider referral to dietitian, secondary or specialist care. If symptoms resolve on elimination but return when cow's milk is reintroduced, continue breast feeding and restart the maternal exclusion diet.

### 3.3.2 Weaning

Infants who have responded to milk exclusion should be weaned onto a milk-free diet at the recommended age of around 6 months, but not before 17 weeks. Initial simple advice can be given by the health visitor, but more detailed advice may be required depending on local pathway from a registered dietitian with appropriate competencies by 9 months of age. This is essential where other food allergies are suspected.

### 3.3.3 Choice of milk substitutes for infants

For infants under 1 year, milk is the major source of nutrition so a nutritionally complete, prescribed infant formula is essential if breast feeding is discontinued.

**First line formulae**

The majority of infants with CMA tolerate an extensively hydrolysed formula (EHF) based on milk proteins. These formulae meet strict guidelines stating that they do not cause allergic reactions in 90% of infants with CMA (12).

**Second line formulae**

10% of infants with CMA either do not respond to an EHF or initially respond and then relapse. These infants require a formula based on amino acids (AAF). Clinicians may also opt to use these products for infants with severe/anaphylactic reactions or young infants with nutritional issues related to an enteropathy.

**Soya formulae**

These are not recommended for infants under 6 months since soya formula contains phytoestrogens. A proportion of infants with CMA will also react to soya.

**Other milks**

Infants under 1 year require an infant formula as their main milk source. Other animal milks, oat, rice or nut milks are therefore unsuitable. Lactose-free formulae and "comfort" milks contain cow's milk protein so an infant who has been on such feeds has not had a trial of a cow's milk free formula.

**Children over 1 year**

Older children still requiring milk exclusion should be assessed by a dietitian with appropriate competencies. Advice will include which milk substitutes are suitable and whether a calcium supplement is needed.

### 3.3.4 Re-introduction of milk

The majority of infants and children with CMA will eventually achieve tolerance and return to a normal milk containing diet. Non-IgE mediated CMA tends to resolve earlier with the majority resolving by 1yr (13). However, IgE-mediated CMA may extend into adolescence (14). Pre-school children should be assessed every 6-12 months from 1 year of age for suitability of re-introduction.

For **non-IgE reactions** most infants will remain on a milk-free diet for at least 6 months with milk re-introduction considered around 1 year of age. These children can have milk re-introduced at home unless initial symptoms were severe, e.g., repetitive vomiting, or diarrhoea with dehydration or shock. Re-introduction should start with less allergenic forms and then progress up the “milk ladder” with increasingly allergenic forms introduced as tolerated. See Appendix 2 for further information on home challenge and reintroduction of cow's milk.

Children who had **IgE-mediated reactions** with respiratory or cardiovascular symptoms or with a diagnosis of asthma should be offered challenge in a hospital setting. Repeat specific IgE and skin prick tests may be used to inform the timing of a challenge. Use local cow's milk reintroduction protocol.

### 3.3.5 Management

Advice should be given on milk avoidance as in section 2.1 above. For IgE mediated allergy, emergency medicines should be provided as in section 2.2 above, along with education in management of further reactions including anaphylaxis as in section 2.3 and a written allergy plan as in section 2.5. Information about nursery/school care should be given as in section 2.4.

## 3.4 Lactose Intolerance

Lactose is the carbohydrate present in mammalian milk, including human breast milk, cow’s, goat’s, and sheep’s milk. Standard infant formulae also contain lactose. Lactose is digested by the enzyme lactase found in the brush border of the villi in the small intestine. Lactose intolerance results when there is a relative lack of this enzyme resulting in symptoms of excessive flatus, abdominal pain and bloating with watery, frothy diarrhoea.

**Lactose intolerance is not immune mediated and therefore not an allergy. It cannot cause symptoms or signs outside the gastrointestinal tract.**

Worldwide many people of non-Caucasian background have a degree of lactose intolerance after weaning.

Traditionally they self-select a diet low in lactose. Secondary lactose intolerance is seen where the gut lining has been damaged, most commonly following gastroenteritis. It is generally short lived, lasting a few days to a few weeks and resolves without treatment.

Infants and children with an enteropathy caused by CMA may have transient associated lactose intolerance.

# 4. Egg allergy

Egg allergy is common in infancy with a prevalence estimated at around 2% at 2yrs and 0.1% in adults. It presents most commonly after the first apparent ingestion of egg with rapid onset of urticaria and angioedema; severe reactions with significant respiratory symptoms are uncommon (5-10% in challenge studies). Ingestion of raw or lightly cooked egg may trigger more severe clinical reactions than well cooked egg (15, 16).

*The following refers predominantly to type-1 IgE mediated allergy to egg and is based on British Society for Allergy and Clinical Immunology guidelines for the management of egg allergy (18).*

## 4.1 Diagnosis

- Diagnosis is made by the typical history of rapid onset of urticaria and /or angiooedema / vomiting / wheeze (usually within minutes) after ingestion of egg. It is supported by evidence of sensitisation to egg (SPT wheal ≥3mm or egg specific IgE>0.35).
- Specific IgE levels and skin prick testing both have poor predictive value as a screening tool and should only be carried out if there is a clinical suspicion of egg allergy.
- A SPT wheal to egg white of 5mm or greater has a high specificity for clinical allergy. It is not possible to identify a single cut-off value for egg specific IgE which is diagnostic for egg allergy at all ages.
- A food challenge may be necessary to confirm or refute a conflicting history or test results but in practice is not commonly required.
- SPT wheal size and specific IgE level do not predict the clinical severity of egg reaction.

## 4.2 Management

Advice should be given on egg avoidance as in section 2.1 above. Emergency medicines should be provided as in section 2.2 above, along with education in management of further reactions including anaphylaxis as in section 2.3 and a written allergy plan as in section 2.5. Information about nursery/school care should be given as in section 2.4.

(Please see patient information leaflet: egg allergy for information on egg avoidance. https://www.cyans.scot.nhs.uk/health-care-professionals-2/patient-information-leaflets-2/)

## 4.3 Resolution of egg allergy

The natural history of egg allergy is for the majority to resolve spontaneously over time, often by school age, but egg allergy may extend into adolescence to resolve. Eventual resolution is most likely in children with a history of milder reaction (cutaneous symptoms only), lower SPT wheal size and lower level of egg white specific IgE (15). Reduction of specific IgE and SPT wheal over time increases the likelihood of tolerance (16).

Resolution of egg allergy usually occurs in stages starting with tolerance to well cooked egg (e.g., cake), then lightly cooked egg (e.g., scrambled egg) and finally by raw egg (17). Children who tolerate cooked egg may still react to raw or undercooked egg (19).

The speed with which egg allergy resolves can vary greatly between individuals and therefore the timing and appropriateness of re-introduction should be individually assessed. Re-introduction should not be attempted within 6 months of a significant reaction to egg.

Children with a history of severe egg reaction are more likely to have persistent allergy and should have avoidance and re-introduction guided by a specialist.

Low risk patients, please see Box 1 for further information – those who have had mild reactions (only cutaneous symptoms) on significant exposure (e.g., a mouthful of scrambled egg) without concurrent asthma may have well-cooked egg (e.g., sponge cake) introduced from the age of about 12 months at home. If this is tolerated regularly in good amounts, then gradual staged re-introduction of lightly cooked egg according to an egg ladder may be considered.

The following patients are at higher risk and a hospital-supervised challenge should be considered in these cases:

- Children with previous egg allergy symptoms that affected breathing (cough, wheeze or swelling of the throat e.g., choking), the gut (severe vomiting or diarrhoea) or the circulation (faintness, floppiness, shock)
- Children who had a less severe reaction after only trace exposure.
- Children on regular asthma preventative inhaler treatment and/or have poorly controlled asthma.
- Children with multiple/complex allergy.
- Children whose parents are unable to comprehend or adhere to protocol.

### 4.4 Vaccinations

All children with egg allergy should receive measles, mumps, and rubella (MMR) vaccination and this can be given in the community with the standard precautions. Children who have experienced an allergic reaction to the MMR vaccine itself should be assessed by a paediatric allergy service before a second dose can be considered.

Most children with egg allergy can safely be vaccinated with the live attenuated nasal influenza vaccine (LAIV) (Fluenz Tetra) in any setting (including primary care and schools). The exception is children who have had anaphylaxis to egg requiring intensive care support. These children should receive the LAIV in a hospital setting. Egg allergic children who have another condition that contraindicates LAIV should be offered an inactivated influenza vaccine with a zero or low ovalbumin content (<0.12micrograms/ml) except those who have had anaphylaxis to egg requiring intensive care who should be referred to a specialist for assessment (20).

The yellow fever, tick-born encephalitis and some rabies vaccines also contain measurable egg protein and children requiring these should be referred to an allergy specialist.

## 5. Peanut and Tree Nut Allergy

The following is based on the BSACI guideline: Peanut and Tree Nut Allergy (21)

- Peanut and tree nut allergies are characterised by IgE mediated reactions to nut proteins.
- Peanut is a member of the legume family which also includes pulses such as peas, beans, lentil, and lupin.
- Tree nuts are a separate family including almonds, brazil nuts, cashew, hazelnuts, macadamia, pecan pistachio and walnuts.
- Some foods sound related but are not considered part of the tree nut family, including coconut, pine nut, chestnut, tiger nut, corn nut. Allergy to these foods is possible but much less common.
- Some patients may be allergic to only peanut or a single specific tree nut but allergy to both peanut and one or more tree nuts is common, and it is common to be allergic to a number of different nuts. There is no way to predict this so testing for multiple nuts is usually required.
- Primary nut allergy affects 2% of children and 0.5% of adults in the UK. Over recent decades the prevalence has increased significantly (22).

Infants with severe eczema and / or egg allergy have a higher risk of developing peanut allergy and advice for preventing food allergy in these high-risk infants is available from BSACI. (Early Feeding Guidance - BSACI)

**Phenotypes**
There are two types of IgE mediated nut allergy:

1. **Primary nut allergy** is most common and is characterised by systemic and often severe reactions. Patients have specific IgE against the major storage proteins e.g. Ara h2 for peanut.

2. **Pollen food syndrome** (also known as oral allergy syndrome) is a distinct disorder, usually mild, with isolated oral / pharyngeal symptoms to nuts or fresh fruit/vegetables, in the context of hayfever or pollen sensitisation. Serum specific IgE is directed against heat-labile proteins homologous to those in pollen, e.g., Ara h8 for peanut. It can usually be distinguished clinically from primary nut allergy.

Primary nut allergy tends to present most commonly in the first five years of life, often after the first known ingestion, with typical rapid onset IgE mediated symptoms. This contrasts with PFS where patients have often previously consumed the nut without symptoms prior to developing hay fever, and then present with food allergy later in childhood.

## 5.1 Risk factors for severe reactions (anaphylaxis)

A previous severe reaction in a patient is a risk factor for future severe reaction (24). Most patients with mild reactions do not go on to have severe reactions. A clinical history of asthma increases the risk of anaphylaxis (25). The majority of severe non-fatal and fatal accidental reactions occur in teenagers and young adults (26)

## 5.2 Diagnosis

The clinical diagnosis of primary nut allergy is made by the combination of a typical clinical presentation and evidence of nut specific IgE, shown by either positive SPT or specific IgE to whole peanut.

The typical clinical presentation is rapid onset of IgE-mediated symptoms within minutes of ingestion, the severity of reaction often relates to the quantity ingested. Initial symptoms are likely to be oral itching and lip swelling -abdominal pain, vomiting, urticaria and angioedema may follow. Severe reactions may include stridor, hoarseness, dysphagia, wheeze, breathlessness, hypotension, and collapse. Nut allergy is the commonest cause of anaphylactic death in teenagers and young adults (23).

The magnitude of skin prick test or specific IgE result relates to the probability of clinical allergy but is **not** a useful predictor of severity of future reactions.

A skin prick test wheal of ≥8mm or specific IgE ≥15KU/L to peanut is highly predictive of clinical allergy. Similar cut-off values are not available for tree nuts. Test results should be interpreted in the context of clinical history.

Pollen food syndrome can usually be diagnosed by the typical history of mild oral / pharyngeal itching without systemic symptoms in an individual who is also sensitised to grass or tree pollen (usually with typical hay fever symptoms). If there is any doubt, measurement of specific IgE to the peanut components Ara h2 and Ara h8 can be helpful. Ara h2 is the major peanut allergen and sensitisation to Ara h2 combined with a clinical history makes primary peanut allergy highly likely. Isolated sensitisation to Ara h8 is suggestive of food pollen syndrome.

Diagnostic challenges are usually not necessary but may be used to confirm or refute the diagnosis when history and test results are conflicting.

## 5.3 Management

Nut allergy is likely to be a long-lived disease; nut avoidance advice is the cornerstone of management.

Patients and their families should be provided with a comprehensive management plan including avoidance advice, patient specific emergency medication, an emergency treatment plan and training in administration of emergency medication. Regular retraining is required.

Staff within schools and early years settings require appropriate training in managing allergic reactions.

### 5.3.1 Allergen avoidance

Nuts are required to be highlighted in ingredient lists. Children and families should be reminded of the need to ask food providers about allergens in freshly prepared food as information on menus is optional.

See 2.1 above for advice on precautionary allergen labelling.

### 5.3.2 Nut specific advice

Individuals may be allergic to peanut alone, specific tree nuts or both. Some individuals who are allergic to peanut may also be sensitised to other legumes e.g., lentils, pea, soya.

There is also co-sensitisation between certain tree nuts: allergy to cashew nut is commonly associated with allergy to pistachio, similarly walnut and pecan nuts.

**Medical management – see 2 above**

### 5.3.3 Natural history

Studies have shown that approximately 20% of children with peanut allergy outgrew their allergy by age 4 yrs (27). A decreasing SPT response predicted tolerance. In a longitudinal study spontaneous resolution predominantly occurred by age 6yrs and was unlikely beyond 10yrs (28).

### 5.3.4 Prevention of nut allergy

Early introduction of peanuts into the weaning diets of atopic infants at high risk of peanut allergy can prevent the development of peanut allergy (29).

### 5.3.5 Immunotherapy

Nut allergy can lead to significant psychological burden as well as social and dietary restrictions that may affect quality of life.

Peanut oral immunotherapy can induce desensitisation but not tolerance in peanut-allergic children (30). This can only be undertaken under careful medical supervision, and it is likely that patients need to include peanut regularly in their diet or continue an immunotherapy agent long-term to prevent reactions following accidental exposure to small amounts of peanut. There is currently no approved clinical service for peanut immunotherapy in Scotland.

## 6. References

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# 7. Appendix 1 - Interpretation of diagnostic tests in suspected IgE mediated food allergy

Skin prick tests and measurement of serum specific IgE can both be used to demonstrate sensitisation to a specific food allergen; however, neither is diagnostic of food allergy in the absence of a history of reaction. They are not useful as screening tools and should only be undertaken when there is a clinical suspicion of food allergy after taking a careful history (1, 2).

SPT wheal size of ≥3mm (BSACI5) or serum specific IgE>0.35KU/L support a clinical diagnosis when taken with a good history of reaction to the food concerned. SPT wheal size is correlated with the likelihood of clinical allergy and 95% positive predictive threshold (wheal size above which there is a >95% chance of clinical allergy) which have been described for the common allergens (3-5). Wheal sizes, however, can be influenced by factors such as age, skin reactivity and reagents used and so 95% positive predictive values may not be generally applicable in different populations and clinical settings.

Specific IgE levels also correlate with likelihood of clinical allergy and 95% specificity thresholds have been described for the majority of major food allergens (3). Although serum specific IgE levels and SPT wheal sizes generally correlate with the likelihood of clinical allergy, they do not correlate with or predict the severity of allergic reaction to a food (3, 6-10).

If there is diagnostic uncertainty, it may be useful to perform both skin prick and specific IgE blood testing (11-13). In recent years it has become possible to measure specific IgE antibodies to individual allergen components within a food (e.g., Ara h 2 in peanut). These techniques may improve the diagnosis of clinical allergy in the future but there is currently insufficient evidence to recommend their use in UK primary care (11).

An oral food challenge is the most specific test for food allergy. A double blind, placebocontrolled challenge is considered the gold standard diagnostic test for the diagnosis of food allergy, but it is time consuming and expensive. Open or single blinded food challenges are generally used in clinical practice. All food challenges expose the patient to the risk of severe allergic reaction. A food challenge is indicated when there is a discrepancy between SPT or serum specific IgE results and the history or when a SPT or specific IgE result is positive but less than the 95% positive predictive threshold in a patient who has not yet introduced the food into the diet. In these situations, food challenges should be performed in a hospital setting where facilities are available for emergency treatment of severe reaction (2). They are also useful in diagnosing the point at which a food allergy has been outgrown and the food can now be tolerated. The decision on whether such a challenge should be performed in hospital or can be done at home should be based on an individual risk assessment, please see Box 1 for more information.

# 8. References (Appendix 1)

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# 9. Appendix 2 - Information on home introduction of cow's milk

Children where milk has caused symptoms such as eczema, urticaria, vomiting, diarrhoea and poor weight gain may be safely challenged at home.

**Children with a history of more severe, usually immediate type allergic reactions should be challenged in a hospital day case setting**. **E.g.**

- Children with a reaction that affected breathing (cough, wheeze or swelling of the throat, choking
- Severe vomiting or diarrhoea
- Faintness, floppiness, or shock
- Children who had a less severe reaction after only trace exposure
- Children on regular asthma preventative inhalers and/or poorly controlled asthma
- Children with multiple allergies
- Children whose parents are unable to understand or adhere to the plan.

By 1 year of age around 70% of babies may achieve tolerance and can return to a normal diet. This can be a gradual process with some children only achieving partial tolerance of milk that has been cooked.

In general, consider challenge around 1 year of age or after 6 months on a milk exclusion diet.

**Planning the Challenge**
Choose a time when your child is well, if your child has eczema choose a time when the skin is relatively good.

Do not give antihistamine medicines e.g., Piriton, Ucerax before or during challenge days.

Choose a time during the week when you can observe your child for a few hours. Note down any reactions, which may be different from the original symptoms. If at any time you feel your child is reacting stop the challenge and discuss with your doctor or dietitian.

**Challenge**

- Give each dose all at once, don't spread it out over the day.
- If you are anxious about the challenge rub a little of the food just above your child's lip, if there is no reaction after 30 minutes continue with the challenge.
- If your child has any symptoms such as skin rash or lip swelling give antihistamine medicine e.g., Piriton.
- If your child reacts at any stage continue with whatever was previously tolerated and discuss with your dietitian or doctor.
- As each stage is tolerated, the food in question can now be included in the diet.

**Stage 1 Baked Milk**

- Choose a biscuit that contains milk e.g., Malted Milk
- Start with 1 teaspoon or a small bite of biscuit
- Double the amount over the next few days until your child is eating a whole biscuit for 5 days. You can now include cakes and other baking that contains milk

**Stage 2 Boiled Milk**

- Bring a small amount of cow's milk to the boil and cool
- Start with 1 teaspoon and double the quantity every day for 5 days.
- Add to some formula or food if your child refuses the milk from a spoon
- Alternatively use custard you have made by boiling milk with custard powder

**Stage 3 Yogurt / Fromage frais**

- Start with 1 teaspoon and double every day until a whole pot is tolerated for 5 days
- You can then introduce hard cheese like Cheddar and Gouda

**Stage 4 Uncooked milk (ordinary pasteurised milk)**

- Start with a teaspoon added to food and double up every day, the challenge is complete when 150 ml of milk has been tolerated for 5 days.
- All milk containing foods can now be eaten.