

Investigating wheat allergy and intolerance

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Wheat exclusion diets can have a significant impact on an individual's health. Ana-Kristina Skrapac, Specialist Paediatric Dietitian, Chelsea & Westminster Hospital, explores the differences between wheat allergy and intolerance, diagnostic tests and appropriate management in order to guide health professionals to advise patients appropriately so that fewer individuals avoid wheat for no reason.

Perceived vs diagnosed allergy

Wheat provides an important source of essential amino acids, vitamins, minerals and dietary fibre, and is the most widely grown crop used for human food¹. However, wheat products have been linked to adverse reactions in a minority of the general population including allergy, intolerance and coeliac disease.

A well-documented discrepancy between perceived and diagnosed food allergy shows that up to 20% of the UK population believe they have a food allergy² whereas diagnosed food allergy affects only 5-6% of infants and children^{4,5} and 3-4% of adults⁵. Published data of the true prevalence of wheat allergy in adults is scarce but up to 5% report an allergy or intolerance³. Estimates suggest that actual prevalence of wheat allergy is around 0.3%⁵ or 0.4%^{5,7} in children, less than the 1% of people in Western Europe⁶ with coeliac disease.

Wheat allergy can be either immediate (IgE-mediated) or delayed (non-IgE-mediated) with symptoms varying in severity from mild to life-threatening⁸.

IgE-mediated wheat allergy

Children: Wheat allergy is more common in infants and children and is known as one of the 'big eight' food allergens. Together these account for approximately 90% of all food allergies causing a range of symptoms (see table 1)⁵.

Atopic children are at greater risk of developing a food allergy^{9,10} whereby eczema and family history of allergy have been found to be strong independent risk factors¹¹. Wheat allergy is often associated with an allergy to more than one food allergen (co-reactivity)¹⁰. Furthermore, cross-reactivity between cereals is high, whereby a strong positive correlation has been found between wheat and barley¹². Recent studies have found that most children exhibiting symptoms of wheat allergy are able to tolerate wheat by adolescent age^{13,14}.

Table 1: Symptoms of IgE-mediated food allergy⁹

Skin symptoms	Hives/rash, itch, atopic dermatitis
Gastrointestinal symptoms	Swelling of the lip or tongue (angiodema), tingling of the throat, abdominal cramps, vomiting, diarrhoea
Respiratory symptoms	Itchy, runny eyes and nose (periocular pruritis, rhinitis) symptoms of asthma
Systemic reaction	Anaphylaxis

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Adults: IgE-mediated wheat allergy has also been described in adults⁸. The two forms that have been most extensively researched are respiratory allergy and wheat-dependent exercise-induced anaphylaxis (WDEIA)¹⁵. Wheat-induced respiratory allergy is the second most widespread occupational allergy in the UK¹. Symptoms occur after the inhalation of flour and dust during grain processing, hence it is commonly referred to as “Bakers Asthma”. WDEIA affects a minority of individuals who exhibit symptoms of anaphylaxis during exercise after the consumption of wheat¹⁵. Typical age of onset is during adolescence to the third decade of life although case reports have been described in children¹⁵. The pathophysiology is not well understood although mechanisms have been proposed relating to increased gut permeability during exercise¹⁶. Individuals with WDEIA are advised to avoid eating wheat for a least 12hours prior to any exercise¹⁷.

Diagnosis of IgE-mediated Wheat Allergy

An experienced clinician should always make diagnosis of a food allergy. The gold standard remains the double-blind placebo-controlled oral food challenge⁹. However, a detailed clinical history together with skin prick tests (SPT) and serum food-specific IgE blood tests are most commonly used. Correct interpretation of SPT and food-specific IgE results is crucial (see table 2). SPTs have high negative predictive accuracy and are useful in *excluding* IgE-mediated food allergy whereas positive SPTs suggest the presence of clinical food allergy¹⁸. Food-specific IgE provide information regarding sensitisation and suggest the likelihood of an individual reacting to particular allergens.

It is important to note that the positive predictive value for SPT and specific IgE for wheat is less than 50%¹⁹ suggesting false positive results are common. Cross-reactivity between grass pollen and wheat allergen is high²⁰ which contributes to poor predictive values and suggests that individuals with grass pollen allergy can have high specific IgE values to wheat but tolerate wheat well in their diet. If deemed appropriate, a food challenge can be helpful in assessing an individual’s tolerance to wheat.

Table 2: Guide to interpreting allergy tests¹⁷

Test	Cut-off	Interpretation
Specific IgE	> 26-80	Reaction highly probable
	0.35 – 80	Reaction probable
	<0.35	Reaction unlikely
SPT	>3mm	Reaction probable

Dietary advice for IgE-mediated wheat allergy

Patients should be advised by a specialist dietitian. All sources of wheat in the diet should be strictly avoided and patients should be educated regarding wheat-free substitutes. Even small amounts of wheat in manufactured foods (such as thickeners or fillers) may cause an allergic response. Gluten-free products may be unsuitable for wheat allergic individuals. Due to the high cross-reactivity between wheat and barley, advice regarding barely avoidance

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or food challenge is also important. Rice and corn are regarded as the best substitutes for those with IgE-mediated wheat allergy¹².

Starch Alternatives for a Wheat-Free diet

Corn, rice, potato, cassava, yam, quinoa, millet, gram (chickpea), sago, tapioca, amaranth, buckwheat
Barley*, rye, oats

**high cross-reactivity between wheat and barley*

Non-IgE-mediated wheat allergy

A number of Non-IgE-mediated conditions in which wheat allergy may be implicated, along with other possible food allergens such as milk, soya, egg, rice and oats, include Food Protein Induced Enterocolitis Syndrome (FPIES)²¹, Eosinophilic colitis (EC) and oesophagitis (EO). Individuals with non-IgE-mediated food allergy also tend to have a co-existing atopic condition²². These conditions are characterised more commonly in infants and young children, however, diagnosis of EO in adults is increasing due to increased recognition of the condition²³.

Symptoms include severe vomiting and diarrhoea in paediatric cases of FPIES, causing hospitalisation. Similarly, abdominal pain, vomiting and diarrhoea are common symptoms in EC²² whereas dysphasia and food impaction are common symptoms in both adults and children with EO²³. Diagnosis can be difficult due to the fact that symptoms can be delayed up to 48hours and SPT and specific IgE are often negative. Diagnosis is usually confirmed clinically when resolution of symptoms are observed on removal of the suspected food allergens²¹. Endoscopic mucosal changes can also be noted in EC and EO.

Treatment includes use of an extensively hydrolysed or amino-acid based formula. Feeding advice by specialist dietitians includes strict dietary avoidance of the suspected food allergen(s). Foods challenges are commonly performed in hospital to re-assess tolerance which is usually achieved in early childhood²¹.

Coeliac Disease (CD)

An autoimmune condition triggered by the binding of gluten peptides to immune cells instigating an inflammatory response in the gastrointestinal tract^{1,6}. Symptoms may include diarrhoea, constipation, iron deficiency anaemia and weight loss. Diagnosis is made by endoscopy and biopsy by a gastroenterologist. Management includes strict elimination of wheat and all forms of gluten from the diet. Specialist dietary advice from an experienced dietitian is recommended and membership to the Coeliac Society UK encouraged.

Wheat intolerance

Thought to be non-immune mediated, wheat intolerance is often reported in individuals with Irritable Bowel Syndrome²⁴. Symptoms may be delayed and

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less severe and may include bloating, diarrhoea or constipation. There is no defined diagnostic test, therefore, diagnosis is usually made following an exclusion diet for 4-6 weeks with subsequent reintroduction and evaluation of symptoms. It is important that healthcare practitioners advise individuals to gradually reintroduce wheat after an elimination phase as most wheat intolerant individuals can tolerate small amounts.

Summary table

	Wheat allergy	Wheat allergy	Wheat intolerance	Coeliac disease
Mechanism	IgE- mediated immune response	Non-IgE cell-mediated immune response	Non-immune mediated	Non-IgE mediated immune response
Symptom onset	Immediate	Delayed	Delayed	Delayed
Symptom severity	Mild to severe spectrum	Mild to severe spectrum	Usually mild	Mild to severe spectrum
Dietary advice	Strict avoidance of all wheat-based foods	Strict avoidance of all wheat-based foods	May be able to tolerate small amounts of wheat	Strict avoidance of all gluten containing food product

Conclusion

As health care professionals we may be faced with many individuals perceiving they have an allergy or intolerance to wheat. Both IgE-mediated and non-IgE cell mediated forms of wheat allergy may have severe and life-threatening symptoms and specialist treatment from trained professionals is essential. Symptoms of wheat intolerance are usually mild with individuals often tolerating some wheat product in their diet. Understanding the differences between wheat allergy and intolerance, and appropriate use and interpretation of diagnostic tests are pivotal in providing evidence-based advice to patients.

References

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