

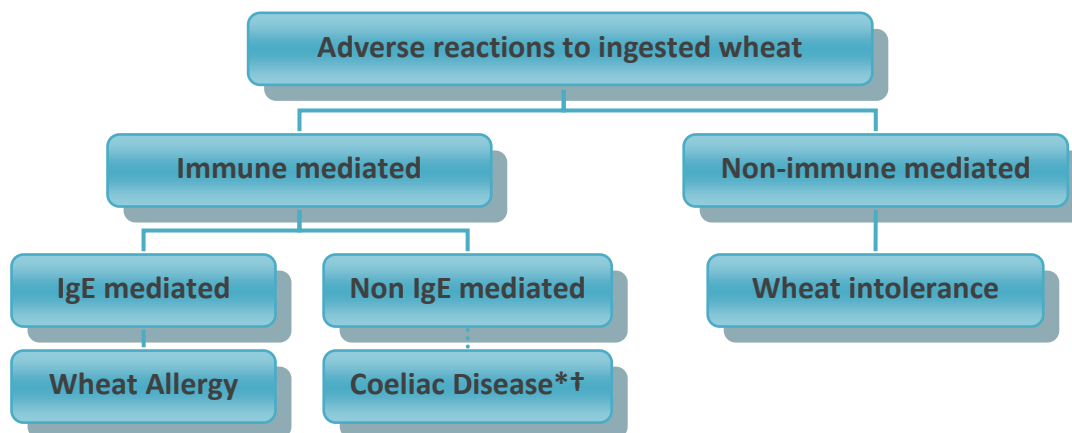
Flour Advisory Bureau Wheat Allergy and Intolerance Report

Summary

Research shows that up to 20% of people think they suffer from food allergy or food intolerance. However, evidence suggests that the real prevalence of food allergy and intolerance is much lower. It is unknown how many people truly suffer from wheat allergy or wheat intolerance, and how many people are avoiding wheat. However, the limited evidence available suggests that for wheat allergy and intolerance the pattern reflects that of food allergy and intolerance generally i.e. self-report is higher than the true prevalence. The prevalence of coeliac disease is better researched; evidence suggests that 0.8-1.9% of the UK population has coeliac disease. Wheat allergy, wheat intolerance and coeliac disease must be diagnosed by a qualified medical professional; self-diagnosis and other diagnostic tests are not reliable. Wheat avoidance can have a huge impact on nutritional intake (without appropriate dietary advice) and quality of life, and studies investigating these are urgently needed.

What is the difference between wheat allergy and intolerance?

Many people think that wheat allergy and wheat intolerance are the same thing. However, although both wheat allergy and wheat intolerance are used to refer to symptoms such as diarrhoea and vomiting, constipation, and bloating caused by wheat, they are very different. Food reactions to wheat can be classified broadly as food allergy, food intolerance and coeliac disease (Figure 1).



* The exact classification of coeliac disease and whether it should be classified as a non-IgE mediated allergy or a food intolerance is much debated in allergy and gastro-enterology communities.

†We acknowledge that there is another avenue of adverse reactions currently being investigated; that of gluten sensitivity (1).

Figure 1. Types of adverse reactions to wheat.

Wheat allergy

Food allergy is a reaction to food involving an antibody called IgE (Immunoglobulin E), which typically causes symptoms usually within 2 hours of eating the foods, which could range from mild to severe. Food allergy occurs because the body does not learn that the proteins present in a particular food, such as wheat, are harmless (2). When a person with wheat allergy eats wheat the body triggers an immune response – an allergic reaction. This reaction can cause a number of allergic symptoms, as described in Table 1.

Table 1. Symptoms of food allergy (3).

Skin symptoms	Hives/rash, itch, atopic dermatitis
Digestive symptoms	Swelling of the lip or tongue (angiodema), tingling in the throat, abdominal cramps, vomiting and diarrhoea
Respiratory symptoms*	Itchy, runny eyes and nose (periocular pruritis, conjunctivitis, rhinitis), symptoms of asthma including coughing and wheezing
Systemic reaction	Anaphylaxis - severe difficulty breathing, hypotension (very low blood pressure), nausea and palpitations

* Baker's Asthma is a form of wheat allergy, but the reaction is triggered by inhalation of the allergen rather than through ingestion in the diet (4).

The most severe allergic reaction triggered by food is called anaphylaxis. Anaphylaxis is potentially fatal, but so far there are no recorded deaths from allergic reactions to wheat (5).

Wheat intolerance

In contrast with food allergy, food intolerance does not involve the immune system. The exact mechanism of food intolerance is unclear in some cases, such as intolerance to wheat (6). Unlike food allergy, the symptoms of food intolerance tend to occur after a longer period of time, are usually less severe than food allergy and in most cases require ingestion of larger amounts of food than food allergy.

Coeliac disease

Other adverse reactions to wheat include Coeliac Disease. Like wheat allergy, Coeliac Disease is immune-mediated, but different antibodies are involved (4). Coeliac disease is a spectrum; there is a wide variation in symptoms experienced (Table 2) and also in the antibody serology and the degree of damage to the small intestine (7). Further, it has been suggested that some people may not have Coeliac Disease but might display Gluten Sensitivity, experiencing symptoms such as diarrhoea, although the mechanisms by which this might occur are still being investigated (1).

Table 2. Symptoms of coeliac disease (7).

Digestive symptoms	Diarrhoea, steatorrhoea, abdominal cramps, bloating, excessive flatus, weight loss, constipation, epigastric pain, heartburn
Haematological symptoms	Iron deficiency, B12 deficiency, folic acid deficiency
Liver symptoms	Abnormal liver biochemistry
Skin & mucous membrane symptoms	Dermatitis Herpetiformis (DH; skin blistering), hair loss, aphthous mouth ulcers
Rheumatological symptoms	Arthralgia (joint pain)
Bone symptoms	Osteoporosis, defective tooth enamel
Gynaecological symptoms	Late menarche, early menopause, infertility, recurrent miscarriage
Neurological symptoms	Ataxia, partial seizures, peripheral neuropathy
Other symptoms	Short stature, chronic fatigue, depression

A summary of the main differences between wheat allergy, wheat intolerance and coeliac disease can be seen in Table 3.

Table 3. Main differences between wheat allergy, wheat intolerance and coeliac disease.

	Wheat allergy	Wheat intolerance	Coeliac disease
Mechanism	Involves the immune system	Does not involve the immune system	Involves the immune system (different antibodies or immune cells than in food allergy)
Symptom onset	Immediate	Delayed	Delayed
Symptom severity	On a spectrum: mild to severe	Usually mild	On a spectrum: mild to severe
Dietary exclusion	All wheat-based products must be avoided	May be able to tolerate small amounts of wheat	All gluten containing products must be avoided

How many people think they have an allergy or intolerance to wheat?

In a large nationwide survey conducted in 1994, 20.4% of people in the UK reported that they had an allergy to any food, and only 0.9% of the respondents reported being allergic to wheat (8).

A more recent consumer tracking survey showed that 58.1% of the UK public either slightly or strongly agreed with the statement ‘Many people are allergic to the wheat in bread’ (9). Although this represents a fall from 2007 (65.1% of the public either slightly or strongly agreed), this suggests that a large percentage of the public still think of wheat allergy as a common illness. In this survey, the number of women reporting a food allergy or intolerance to any food decreased between 2001 (23.9%) and 2009 (21.3%). In contrast, however, the numbers of women reporting an allergy or intolerance to wheat actually increased between 2001 (4.3%) and 2009 (6.1%) (9: see Figure 2).

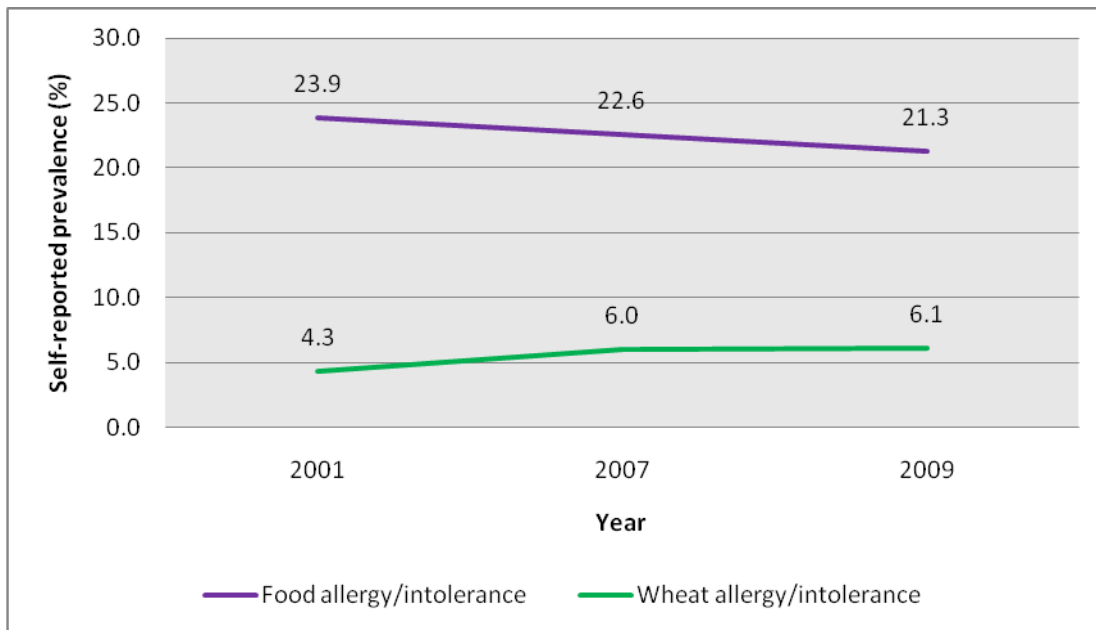
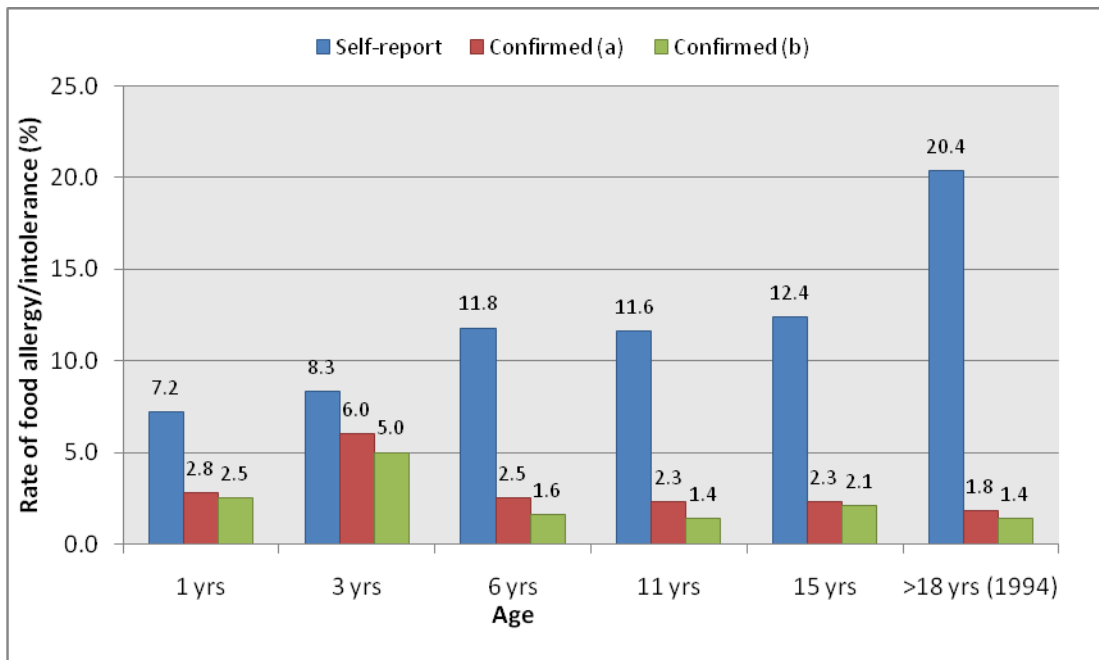


Figure 2. Rates of self-reported food and wheat allergy/intolerance in women (2001-2009).

Examining more recent trends (between 2007 and 2009) the data indicates that, despite a downward trend, the numbers of people reporting allergy or intolerance to any food has not changed significantly (in 2007, 19.0% and in 2009, 17.2%). This is also the case for reported wheat allergy or intolerance (in 2007, 4.3% and in 2009, 4.5%). In 2009, wheat was the most commonly reported food allergen, and those living alone and those aged 35-44 were most likely to report such an allergy or intolerance (9).

How many people are really allergic or intolerant to wheat?

Although many people believe that they have a food allergy, research suggests that in reality, this is confirmed in only a small number of cases. There is a clear discrepancy between the numbers of people who report that they have food allergy or food intolerance, and the numbers whose food allergy/intolerance can be confirmed by a medical diagnosis. This difference can be seen in Figure 3.



- a. Diagnosis confirmed by open food challenge and/or suggestive history and skin prick tests
- b. Diagnosis confirmed by double-blind placebo-controlled food challenges, a clinical diagnosis or suggestive history and positive skin prick tests

Figure 3. Prevalence of food allergy and intolerance: self-reported versus confirmed.

Published data on the prevalence of wheat allergy is scarce, but as shown in Table 2, only 0.2% of 3 year olds and 0.4% of 6 year olds have an allergy or intolerance to wheat with no confirmed wheat allergy or intolerance in 11 year old children and only 0.1% in 15 year olds. There is no published data on the levels of self-reported and confirmed wheat allergy and intolerance in the general population. However, a recent German study (10) found a prevalence of food allergy or intolerance to any food of 2.6%; of this number 14.9% had a confirmed allergy and 6.8% a confirmed intolerance to wheat (although those with coeliac disease may also be included in these numbers).

Table 2. Prevalence of self-reported and confirmed allergy to any food and to wheat.

Age group	Food allergy or intolerance		Wheat allergy or intolerance	
	Self-reported	Confirmed	Self-reported	Confirmed*
1 yrs	At 1yr: 7.2% (11)	≤1yr: 2.5-2.8% (11)	0.4% (11)	0.3% (11)
3 yrs	8.3% (12)	5-6% (12)	0.3% (12)	0.2% (12)
6 yrs	11.8% (13)	1.6-2.5% (13)	1.3% (13)	0.4% (13)
11 yrs	11.6% (14)	1.4-2.3% (14)	1.3% (14)	0.0% (14)
15 yrs	12.4% (14)	2.1-2.3% (14)	1.2% (14)	0.1% (14)
>18 yrs (1994)	20.4% (8)	1.4-1.8% (8)	0.9% (8)	-
>18 yrs (2009)	21.3% (9)	-	4.5% (9)	-

*Confirmed on the basis of a positive or negative skin prick test and performing food challenges over a one week period provided 4-6 portions of wheat in a blinded fashion i.e. both food allergy and intolerances were investigated in this trial.

Indeed, wheat allergy is less prevalent than Coeliac Disease; 1% of children (15) and 0.8-1.9% of adults in the UK have coeliac disease (16).

The paucity of information on diagnosed wheat allergy and intolerance and the discrepancy between reported and diagnosed wheat allergy and intolerance highlights the need for more research into this area. In addition more information is needed on the prevalence of other related adverse reactions to wheat or gluten such as gluten sensitivity. Most important, the role of adverse reactions to wheat in irritable bowel syndrome (IBS) needs to be investigated. Whether food hypersensitivity in IBS is due to food allergy or food intolerance is of much debate (17). Two thirds of IBS patients perceive their symptoms are related to food (18) (of which 14 – 60% report a problem to wheat) (19-24). However, true prevalence of adverse reactions to foods in large scale epidemiological studies has not been investigated.

The importance of a proper diagnosis

The figures above illustrate that many people who are avoiding wheat may be doing so unnecessarily. The number of people who are truly allergic to wheat is very small, with coeliac disease more common.

Excluding wheat from the diet without good cause and without appropriate medical advice, is undesirable for a number of reasons. Firstly, wheat is found in many foods including bread, pastry, pasta, noodles and biscuits, and contains important nutrients, namely: fibre, thiamine, riboflavin, niacin, calcium, iron, and folate (if fortified) (25). These foods also contain carbohydrate and fibre, which are essential to a healthy diet. Wheat should not be excluded without appropriate dietary advice on how to continue to maintain a healthy diet. This is especially important for children, who are more prone to nutritional problems when foods are excluded from the diet (26-28).

Secondly, eliminating wheat from one's diet can be difficult to maintain and make food shopping, meal preparation and eating out more difficult. This is particularly so in the case of wheat and gluten avoidance, as opposed to other foods, because wheat-based products form a key part of our diet with 76.4% of the UK population eating bread once a day or more (9). Finally, if wheat allergy or intolerance has been self-diagnosed there is a chance that the symptoms are in fact due to a different illness, which would remain undiagnosed and untreated.

How is wheat allergy diagnosed?

It is very important that food allergy or intolerance is properly diagnosed by a medical professional. A number of so-called Allergy Tests have not been found to be reliable (19, 29-31). For example, some Allergy Tests measure the amount of an antibody called IgG4 in a person's blood to diagnose food allergy or intolerance. However, this is not a valid method of diagnosis. Research indicates that people produce IgG4 in response to the foods they eat, so if someone has IgG4 to a particular food in their blood this means that they eat that food frequently. It does not necessarily mean that they are allergic or intolerant to that food (32).

Only qualified medical professionals are able to determine the source of adverse reactions to food. If a medical professional suspects that a patient's symptoms are caused by a food allergy they can use a number of tests to find out whether this is the case (Figure 4).

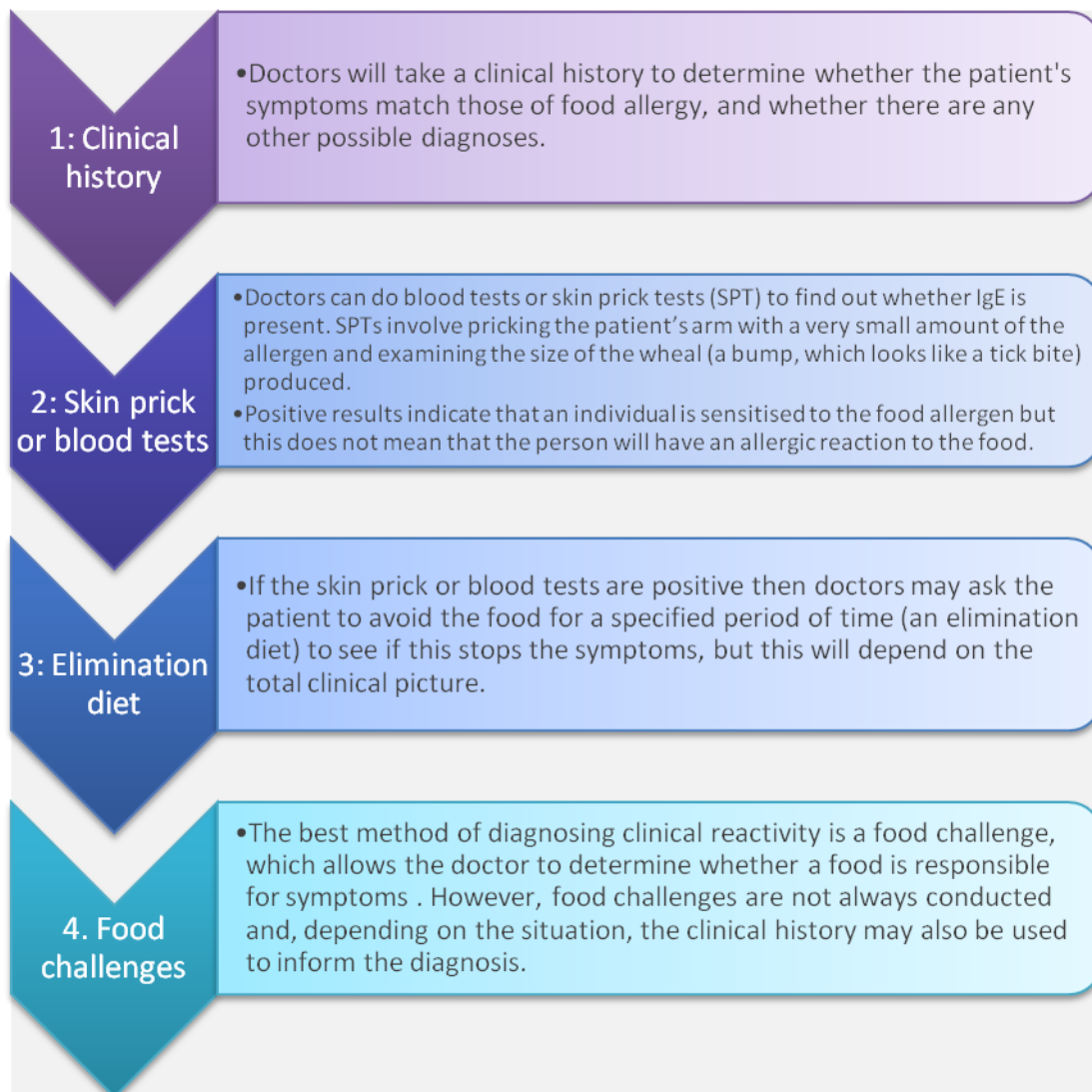


Figure 4. Diagnosing food allergy (33-34).

There are special considerations, however, when performing skin prick tests (SPT) with wheat allergens because there is a large proportion of cross-reactivity between the proteins in wheat and grass. This means that a number of people will show a wheal to both wheat and grass, even though only a small proportion will actually be allergic to wheat (11, 14). For example, Pereira et al (14) found that 72/80 fifteen year olds and 76/80 eleven year olds in their study who were sensitised to wheat were also sensitised to grass, and were tolerating wheat in their diet. Venter et al (12) also found that of the 8 three year olds in their study who had a positive SPT to wheat all also had a positive SPT to grass, and again, were tolerating wheat in their diet. Similar patterns have been observed elsewhere (13).

How is food intolerance diagnosed?

At present there are no validated tests for diagnosing food intolerance. The only way of diagnosing food intolerance is the avoidance of the food for a period of 4-6 weeks. If the symptoms improve, it is recommended the food should either be introduced at home or during a food challenge, over a period of at least 4 days (Figure 5). Many patients diagnosed with wheat intolerance may need further investigations in order to find out which mechanisms are involved in causing their symptoms. However, such investigations are not always possible.

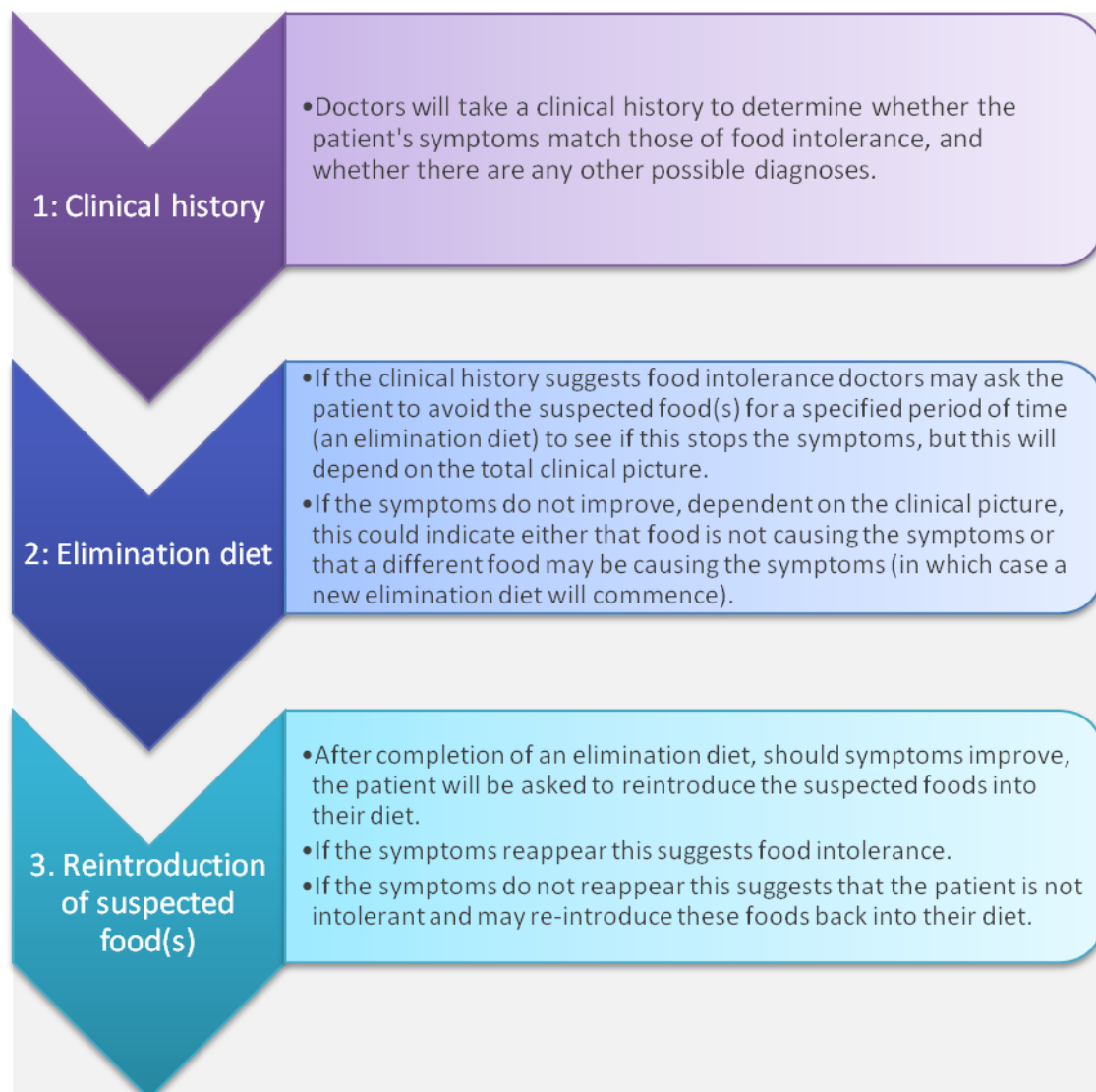


Figure 5. Diagnosing food intolerance (34)

Whichever method of diagnosis is used it is very important that it is conducted by a qualified healthcare professional.

How is coeliac disease diagnosed?

Again, it is very important that coeliac disease is properly diagnosed by a medical professional. If a medical professional suspects that a patient's symptoms are caused by

coeliac disease they can use a number of tests to find out whether this is the case (Figure 6). The possibility of gluten sensitivity (particularly in patients with Irritable Bowel syndrome) can not be diagnosed in the same way as CD and more research is needed in this area (1).

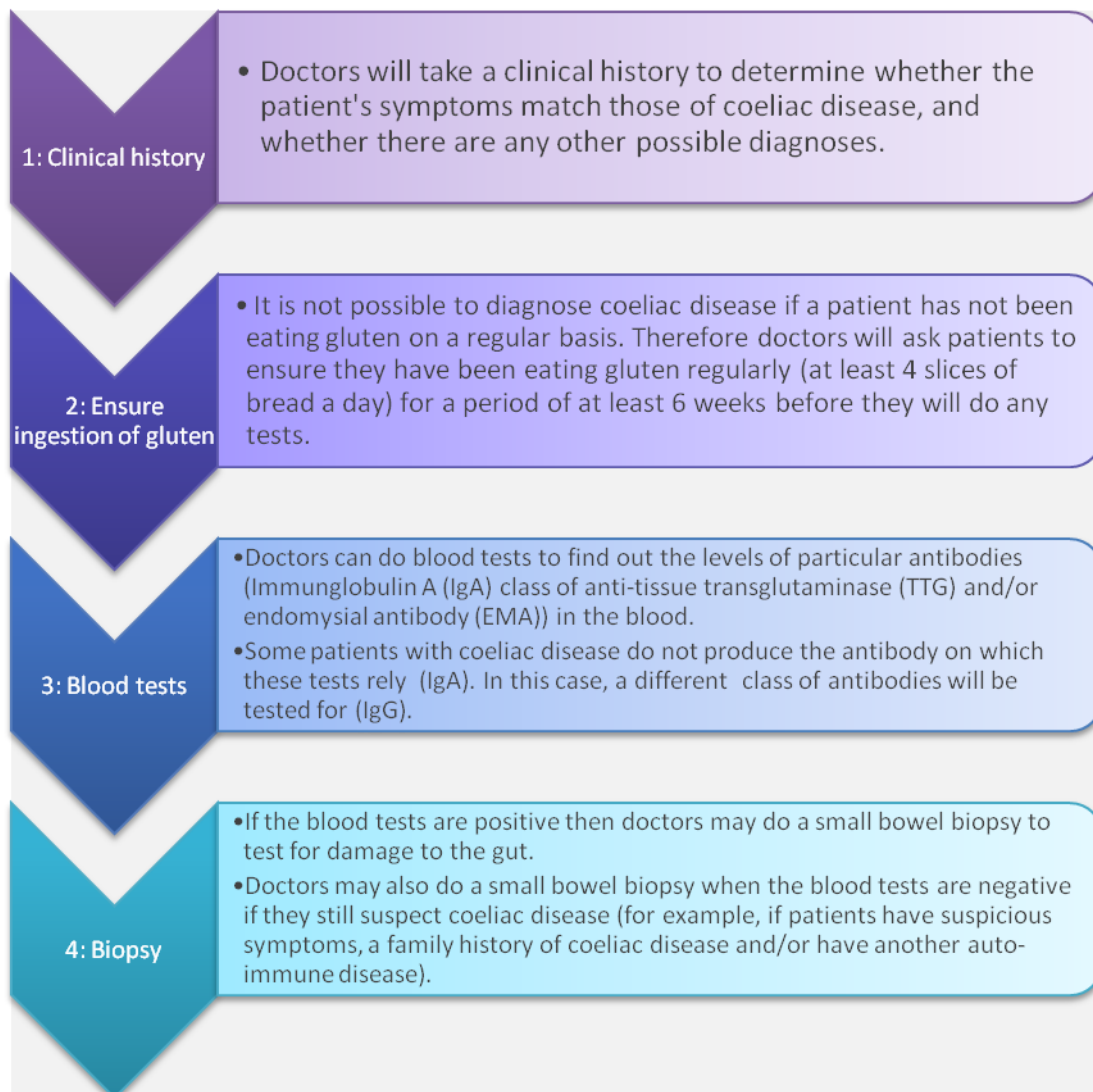


Figure 6. The diagnosis of coeliac disease (7).

Managing a wheat-free diet

What does wheat avoidance involve?

Anybody who needs to avoid wheat or gluten for medical reasons has to be careful to check the ingredients of all the foods they eat. However, the degree of avoidance necessary depends on the illness.

Wheat allergy

The only management plan for any food allergy involves avoidance of the allergen. Management of wheat allergy should involve the *strict* avoidance of wheat (33). Hence, those with wheat allergy need to be very careful to ensure that the food they eat does not contain wheat. The decision to allow small amounts in food should be made on an individual basis together with an allergist/dietician.

Avoiding wheat affects food shopping, meal preparation and eating out. Wheat is not only an ingredient in obvious foods, such as bread, but is also used in less obvious foods, for example, as a thickener in sauces and gravies. Someone who has wheat allergy should check the ingredients of all food products for wheat. In addition, the avoidance of barley, rye and oats may be required for some individuals with wheat allergy or intolerance who are also reacting to the cross-reacting proteins in these other grains (on the advice of a healthcare professional).

Wheat intolerance

Those with wheat intolerance may be able to tolerate a small amount of wheat without consequence and strict avoidance measures are not needed by most.

Coeliac disease

The only management plan for coeliac disease involves the *strict* avoidance of gluten (35). This is important since for those with coeliac disease there are long-term health implications associated with ingesting gluten, including being at greater risk of osteoporosis and lymphoma (7).

‘Gluten’ is a general term which refers to the alcohol-soluble proteins, including gliadins in wheat, hordeins in barley, secalins in rye and avenins in oats (36). Some products contain wheat but not gluten, and vice versa, so it is important those with coeliac disease check the ingredients carefully. Barley and rye must be avoided by those with coeliac disease, and oats may be tolerated by *some* individuals with coeliac disease (on the advice of a healthcare professional).

Like wheat avoidance, gluten avoidance affects food shopping, meal preparation and eating out. In addition to following the guidelines for wheat avoidance outlined in the wheat allergy section above, those with coeliac disease should also check the ingredients of all food products for gluten (wheat, barley and rye).

General wheat and gluten avoidance

‘Cereals containing gluten’ are one of the 14 allergens identified by the EU (37), which, by law, must be listed on food packaging if they are an ingredient in the product. So, if a product contains gluten, wheat or an allergenic wheat-based ingredient, it must be listed on the label. There are a number of different ways in which wheat may be listed on food products (Box 1):

Bran, cereal filler, farina, starch, vegetable protein, wheat, durum wheat, semolina, spelt, kamut, wheat bran, wheat gluten, wheat starch, wheat germ oil, hydrolysed wheat protein, triticale, bulgar wheat.

Box 1. Alternative names for wheat that may included in an ingredients list.

It is important that someone who has wheat allergy or coeliac disease checks the ingredients of all food products, even if they have eaten them safely before. The ingredients may change and manufacturers don't have to alert consumers to this on the packaging. Some products may have a box on the packaging which lists the allergens included in the food. These are optional so it is important to check the ingredients list even if there is no box on the packaging because the product may still contain wheat or gluten.

Advisory, or 'may contain', labelling is sometimes used by manufacturers. It is used when wheat is not an intended ingredient of the product to tell consumers that there is a chance that the product, or its ingredients, may have come into contact with wheat. However, avoidance of these products may not be necessary in the vast majority of those who have wheat allergy or intolerance.

Sometimes products include wheat/gluten as an ingredient but, by accident, they are not listed as an ingredient on the label. This product will be withdrawn or recalled. The Food Standards Agency (FSA) will issue an Allergy Alert (<http://www.food.gov.uk/safereating/allergyintol/alerts/>) to let allergic consumers know that there is a problem. The FSA also provide an e-mail or text alert service to let consumers know about products that have been subject to an allergy alert.

People who need to avoid wheat and/or gluten should also ask the ingredients of meals when eating out, whether at restaurants or other people's houses. The ingredients of restaurant meals are not listed on the menu and it is best to ask the waiting staff whether or not the food contains wheat and/or gluten, although sometimes it may be necessary to speak to the chef directly.

Maintaining a healthy diet

Wheat is found in many foods including bread, pastry, pasta, noodles and biscuits. These foods contain carbohydrate and fibre, which are essential to a healthy diet. Those who are allergic or intolerant to wheat, or who have coeliac disease, should be sure to check that their diet contains alternative sources of starch and fibre. Good alternatives to wheat can be seen in Box 2.

Corn, rice, potato, cassava, yam, quinoa, millet, gram (chick pea), sago, tapioca, amaranth, buckwheat.

Wheat free foods.

Barley, Rye and oats are tolerated by some individuals with wheat allergy or intolerance (on the advice of a healthcare professional). However, barley and rye **must be avoided** by those with coeliac disease.

Oats may be tolerated by *some* individuals with coeliac disease (on the advice of a healthcare professional).

Box 2. Alternative foods to replace wheat and gluten in the diet

What are the quality of life issues when avoiding foods?

Avoiding foods involves taking great care to check the ingredients of all meals (38). This can have an effect on quality of life:

- Parents of children with food allergies may feel anxious about their child's health and have extra demands placed on their time.
- Avoiding foods can also disrupt family activities and affect the social life of the family (39-43). For example, it can be more difficult for families to attend social occasions involving food, such as children's parties or going for family meals out.
- Children may feel anxious about what they eat.
- Teenagers in particular may find that avoiding foods can affect their social life (40, 44).

It is important that those with wheat allergy get good support from friends, family and health professionals, to help them manage the demands of maintaining a wheat-free diet. And again, it is important that people do not impose these issues on themselves unnecessarily.

What are the gaps in our knowledge?

It is clear from a recent survey that a number of people consider themselves to be intolerant or allergic to wheat and subsequently avoid wheat or wheat containing foods. Research suggests that wheat allergy or intolerance may not be that prevalent, with slightly more people having coeliac disease. However, more research is needed.

However, the above data clearly indicates the following gaps in our knowledge:

- *It is unclear what the general public understand about food allergy and food intolerance.*
- *It is unclear how many adults have a wheat allergy or intolerance, although we do know that:*
 - *Only 1.4-1.8% of adults have an allergy or intolerance to **any** food.*
 - *Wheat allergy is less prevalent than allergies to peanuts, tree nuts, egg and milk.*
 - *It is however, unclear in particular, how many adults have food or wheat intolerances.*
- *It is unclear what effect the avoidance of wheat, either supervised or unsupervised, has on the nutritional content of the diet and the quality of life of the person.*
- *It is unclear how many of those diagnosed with wheat allergy or intolerance may outgrow their allergy/intolerance.*

Summary

In summary, it is reported that many people think they may suffer from wheat allergy or wheat intolerance. However, research suggests that this does not reflect the real prevalence of wheat allergy and intolerance. Wheat allergy and intolerance are actually not as prevalent as commonly perceived. In children, research suggests that (dependent on age) between 0.0% and 0.4% have wheat allergy or intolerance. In adults we know that 1.4-1.8% of adults are allergic or intolerant to *any* food and that allergy or intolerance to wheat is less prevalent than allergies or intolerances to other foods. Wheat avoidance can have an impact on nutritional intake and quality of life, and studies investigating these are urgently needed.

References

1. Verdu EF, Armstrong D, Murray JA. Between Celiac Disease and Irritable Bowel Syndrome: The "No-Man's Land" of Gluten Sensitivity. *American Journal of Gastroenterology*. 2009;104:1587-94.
2. Sampson HA. Food allergy. Part 1: Immunopathogenesis and clinical disorders. *Journal of Allergy and Clinical Immunology*. 1999;103(5 I):717-28.
3. Sampson HA. Food allergy - accurately identifying clinical reactivity. *Allergy*. 2005;60(79):19-24.
4. Brisman J. Baker's Asthma. *Occupational and Environmental Medicine*. 2002;59(7):498-502.
5. Pumphrey RSH, Gowland H. Further fatal allergic reactions to food in the United Kingdom, 1999-2006. *Journal of Allergy and Clinical Immunology*. 2007;119(4):1018-9.
6. Ortolani C, Pastorello EA. Food allergies and food intolerances. *Best Practice & Research Clinical Gastroenterology*. 2006;20(3):467-83.
7. McCough N. The Role of Allergy and Intolerance in Coeliac Disease. In: Skypala I, Venter C, editors. *Food Hypersensitivity: Diagnosing and Managing Food Allergies and Intolerance*. Oxford: Blackwell Ltd.; 2009. p. 85-95.
8. Young E, Stoneham MD, Petrukevitch A, Barton J, Rona R. A population study of food intolerance. *Lancet*. 1994;343(8906):1127-30.
9. Kember Associates. NABIM: Results of a Consumer survey into attitudes towards Bread, Nutrition and Allergy/Intolerance 2009.
10. Zuberbier T, Edenharter G, Worm M, Ehlers I, Reimann S, Hantke T, et al. Prevalence of adverse reactions to food in Germany - a population study. *Allergy*. 2004;59(3):338-45.
11. Venter C, Pereira B, Grundy J, Clayton B, Roberts G, Higgins B, et al. Incidence of parentally reported and clinically diagnosed food hypersensitivity in the first year of life. *Journal of Allergy and Clinical Immunology*. 2006;117(5):1118-24.
12. Venter C, Pereira B, Voigt K, Grundy J, Clayton CB, Higgins B, et al. Prevalence and cumulative incidence of food hypersensitivity in the first 3 years of life. *Allergy*. 2008;63(3):354-9.
13. Venter C, Pereira B, Grundy J, Clayton B, Arshad SH, Dean T. Prevalence of sensitization reported and objectively assessed food hypersensitivity amongst six-year-old children: A population-based study. *Pediatric Allergy and Immunology*. 2006;17:356-63.
14. Pereira B, Venter C, Grundy J, Clayton B, Hasan Arshad S, Dean T. Prevalence of sensitization to food allergens, reported adverse reactions to foods, food avoidance, and

- food hypersensitivity among teenagers. *Journal of Allergy and Clinical Immunology*. 2005;116(4):884-92.
15. Bingley P, Williams AJK, Norcross AJ, Unsworth J, Lock RJ, Ness AR, et al. Undiagnosed coeliac disease at age seven: population based prospective birth cohort study. *BMJ*. 2004;328:322-3.
 16. National Institute for Health and Clinical Excellence. Coeliac disease: Recognition and assessment of coeliac disease. London: National Institute for Health and Clinical Excellence 2009. Report No.: NICE Clinical Guideline 86.
 17. Park MJ, Camilleri M. Is there a role of food allergy in irritable bowel syndrome and functional dyspepsia? A systematic review. *Neurogastroenterology & Motility*. 2006;18:595-607.
 18. Simren M, Mansson A, Langkilde AM, Svedlund J, Abrahamsson H, Bengtsson U, et al. Food-related gastrointestinal symptoms in the irritable bowel syndrome. *Digestion*. 2001;63:108-15.
 19. Atkinson W, Sheldon TA, Shaath N, Whorwell PJ. Food elimination based on IgG antibodies in irritable bowel syndrome: a randomised controlled trial. *Gut*. 2004;53(10):1459-64.
 20. Parker TJ, Naylor SJ, Riordan AM, Hunter JO. Management of Patients with Food Intolerance in Irritable-Bowel-Syndrome - the Development and Use of An Exclusion Diet. *Journal of Human Nutrition and Dietetics*. 1995;8:159-66.
 21. Hawthorn B, Lamber S, Scott D, Scott B. Food intolerance and the irritable bowel syndrome. *Journal of Human Nutrition and Dietetics*. 1991;3:19-23.
 22. Hunter JO, Workman EM, Jones AV. Dietary Studies. In: Gibson PR, Jewell DP, editors. *Topics in Gastroenterology*. Oxford: Blackwell Scientific Publications; 1985. p. 305-13.
 23. Symons P, Jones MP, Kellow JE. Symptom provocation in irritable bowel syndrome. Effects of differing doses of fructose-sorbitol. *Scandinavian Journal of Gastroenterology*. 1992;27:940-4.
 24. Bohmer CJ, Tuynman HA. The clinical relevance of lactose malabsorption in irritable bowel syndrome. *European Journal of Gastroenterology and Hepatology*. 1996;8:1013-6.
 25. Holland B, Welsh A, Unwin I, Buss DH, Paul AA, Southgate AT. McCane and Widdowson's *The composition of foods*. 5th ed. London: The Royal Society of the Chemistry and Ministry of Agriculture, Fisheries and Food.; 2000.
 26. Noimark L, Cox HE. Nutritional problems related to food allergy in childhood. *Pediatric Allergy and Immunology*. 2008;19(2):188-95.
 27. Fox AT, Du TG, Lang A, Lack G. Food allergy as a risk factor for nutritional rickets. *Pediatric Allergy and Immunology*. 2004;15(6):566-9.
 28. Christie L, Hine RJ, Parker JG, Burks W. Food allergies in children affect nutrient intake and growth. *Journal of the American Dietetic Association*. 2002;102(11):1648-51.
 29. Niggemann B, Gruber C. Unproven diagnostic procedures in IgE-mediated allergic diseases. *Allergy*. 2004;59:806-8.
 30. Zuo XL, Li YQ, Li WJ, Guo YT, Lu XF, Li JM, et al. Alterations of food antigen-specific serum immunoglobulins G and E antibodies in patients with irritable bowel syndrome and functional dyspepsia. *Clinical & Experimental Allergy*. 2007;37(6):823-30.
 31. Kleine-Tebbe J, Reese I, Ballmer-Weber BK, Beyer K, Erdmann S, Fuchs T, et al. No recommendation for IgG and IgG4 testing against foods. *Allergo Journal*. 2009;4:267.

32. Stapel SO, Asero R, Ballmer-Weber BK, Knol EF, Strobel S, Vieths S, et al. Testing for IgG4 against foods is not recommended as a diagnostic tool: EAACI Task Force Report. *Allergy*. 2008;63:793-6.
33. Sampson HA. Food allergy. Part 2: Diagnosis and management. *Journal of Allergy and Clinical Immunology*. 1999;103(6):981-9.
34. Venter C, Meyer R. The challenges of managing food hypersensitivity. *The Proceedings of the Nutrition Society*. 2010;Accepted for publication.
35. Parnell NDJ, Ciclitira PJ. Review article: coeliac disease and its management. *Alimentary Pharmacology & Therapeutics*. 1999;13:1-13.
36. Robins G, Howdle PD. Advances in Celiac Disease. *Current Opinion in Gastroenterology*. 2005;21:152 - 61.
37. European Union. Directive 2007/68/EC of the European Parliament amendment of Directive 2000/13/EC. *Official Journal of the European Union*. 2007;L310(11).
38. Munoz-Furlong A. Daily Coping Strategies for Patients and Their Families. *Pediatrics*. 2003;111(6):1654-61.
39. Sicherer SH, Noone SA, Muñoz-Furlong A. The impact of childhood food allergy on quality of life. *Annals of Allergy, Asthma and Immunology*. 2001;87(6):461-4.
40. Marklund B, Ahlstedt S, Nordström G. Health-related quality of life among adolescents with allergy-like conditions - With emphasis on food hypersensitivity. *Health and Quality of Life Outcomes*. 2004;2:65.
41. Ostblom E, Egmar, A-C., Gardulf A, Lilja G, Wickman M. The impact of food hypersensitivity reported in 9-year-old children by their parents on health-related quality of life. *Allergy*. 2008;63(2):211-8.
42. Primeau MN, Kagan R, Joseph L, Lim H, Dufresne C, Duffy C, et al. The psychological burden of peanut allergy as perceived by adults with peanut allergy and the parents of peanut-allergic children. *Clinical and Experimental Allergy*. 2000;30(8):1135-43.
43. Avery NJ, King RM, Knight S, Hourihane JOB. Assessment of quality of life in children with peanut allergy. *Pediatric Allergy and Immunology*. 2003;14(5):378-82.
44. Lyons AC, Forde EME. Food allergy in young adults: Perceptions and psychological effects. *Journal of Health Psychology*. 2004;9(4):497-504.

Contacts / Further Information:

Flour Advisory Bureau Press Office

Mars Webb/Philippa Taylor/Wendy Marshall/Lisa Egan, University of Portsmouth

mars@marswebbpr.co.uk	Tel: 077177 18063	Tel: 028 4483 2083
Philippa@grandunionpr.com	Tel: 07866 480700	Tel: 01442 824844
Lisa.egan@port.ac.uk University of Portsmouth Press Office	Tel: 023 9284 3748	To interview the report's authors Dr Heather Mackenzie or Dr Carina Venter
WendyMarshall@nabim.org.uk	Tel: 020 7493 2521	FAB Press Office

Websites

www.fabflour.co.uk