



What's driving the rise in dietary wheat sensitivity?

- Wheat and gluten sensitivity is familiar to many and seems to be on the rise. Changes in wheat composition and baking methods are seen as likely culprits.
- Drs Dai Suter and Ferenc Békés, two specialists in cereals science, have investigated if this is the case.
- Years of breeding wheat for higher yields have decreased the grain's protein content.
- To maintain baking quality, breeders have therefore increased the glutenin and decreased the gliadin content of the protein.
- The researchers find that, overall, it seems increased dietary exposure to gluten, fructans, and changes to baking technology are responsible for the increased sensitivity.

There are few components of the human lifestyle more susceptible to the vagaries of fashion than diet and nutrition. Popular media tout the latest 'research' suggesting what is healthy, and self-styled healthy-eating gurus promote their latest diets, usually at the expense of some or other 'enemy' of the human gut. Gluten is a current whipping boy, and the rise in numbers embarking on gluten-free diets is buoyed by claims that modern wheat variants are particularly villainous. Two specialists in cereals science have investigated what could be to blame for the increasing prevalence of dietary sensitivity to wheat.

Dr Dai Suter and Ferenc Békés have developed a particular interest in cereal intolerances. Such intolerances vary. For those with coeliac disease, gluten – a structural protein found in certain cereal grains – can trigger an autoimmune response, making them seriously ill without total avoidance of gluten, with long-term consequences.

The chemistry 'mechanism' behind this is known; less so that of non-coeliac gluten and wheat sensitivities. In fact, the epidemiology of wheat and gluten-related disorders is still a work in progress, hampered by the fact that we don't consume pure gluten. Drawing on

their extensive research and many studies from other leading researchers, Suter and Békés have compiled a clearer picture of what is behind the increase in dietary sensitivity to wheat (Figure 1).

Shorter fermentation times
In Suter's native Australia, an estimated 0.5%–2% of the population has coeliac disease. Yet, up to 20% are following a gluten-free diet, probably believing it is healthier and that wheat-related grains are best avoided, especially the more 'modern'

grains. Suter and Békés have examined the genetic protein composition and health-related attributes of so-called 'ancient'

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wheat grains and compared them with the wheat used in today's commercial baking;

Disorder	Prevalence	Reactive components in wheat
Celiac disease	0.5%-2%	α, γ- and ω-gliadins, HMW and LMW GS, CM3 and O.1 9 ATI
Wheat allergy	Wheat allergy	α, γ- and ω-gliadins, HMW and LMW GS, CM3 and O.1 9 ATI
	Baker's asthma	ATIs, LTPs, serpins, peroxidase
	Atopic dermatitis	α, γ and ω gliadins, HMW and LMW GS
	Urticaria	LTPs, CM3 ATIs, gliadins and glutenins
Anaphylaxis	ω-5 ω-1,2 g gliadin, LMW GS	
Nonceliac wheat sensitivity	1.1%-6.5%	ATI, Fructans, gliadins glutenins
Irritable Bowel Syndrome	11.5%-14.1%	Fructans

Figure 1. Prevalence of a range of wheat-related disorders and the components in wheat which the authors have found to be responsible.

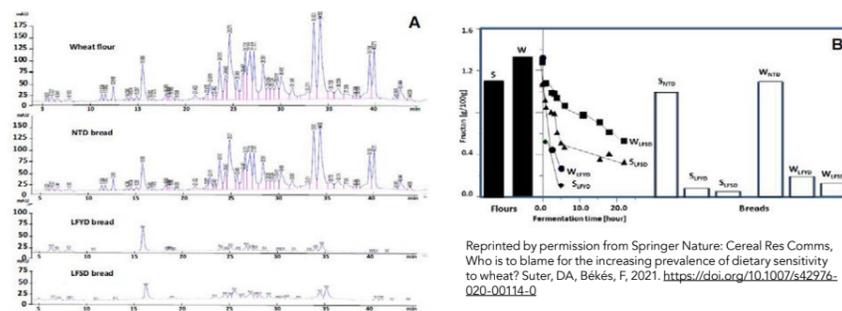


Figure 2. The alterations in gliadin proteins (A) during different breadmaking processes (NTD – no time dough, LFSD – long fermentation yeasted, and LFSD – long fermentation sourdough) when compared with wheat flour (top graph). The alterations in fructan contents (B) when compared with wheat and spelt (S) flours is shown in the reduction of fructans in the doughs during fermentation over time (see graph) and in the finished breads (bar chart).

the results counter the accusations. They have uncovered that over the last 120 years of growing wheat, continued plant breeding to increase yield and functional quality has inadvertently resulted in lowering compounds hazardous to people with coeliac disease.

If this is the case, why the significant uptick in dietary sensitivity to wheat and a marketable preference for ancient grains more common in artisanal baking? Perhaps the answer lies in the method of baking. Until the early 1980s, most commercial bakeries used yeast with long fermentation times – up to eight hours – to make bread. This changed with adoption of the ‘no-time dough’ process that significantly reduced dough fermentation to about an hour and allowed quicker turnaround times, reducing production cost. Suter and Békés have shown that this affected the chemistry of the bread.

While glutenin and gliadin – the gluten proteins of wheat grains – are partly resistant to intestinal enzymes and can produce a coeliac response, other components of wheat can trigger intolerances and allergies and therefore be considered potentially harmful. Alpha amylase-trypsin inhibitors (ATIs) are a

class of proteins tasked with defending wheat from pests, but unless adequately de-sensitised when the wheat is processed for food, they can interfere with the gut’s absorption of the wheat.

All wheats – so-called ‘ancient’ and modern varieties – also contain a myriad of short-chain carbohydrates – collectively called FODMAPS – that are poorly absorbed in the intestine and are prone to absorbing water and fermented in the large bowel. A chief

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culprit among these FODMAPS are fructans present in wheat – sugars that, when they ferment in the large bowel, can produce the symptoms of irritable bowel syndrome such as abdominal bloating and distension, flatulence, diarrhoea, and constipation. But wheat isn’t alone in harbouring FODMAPS; they’re found in many other supposedly ‘healthy’ foods, including garlic, onions, and Jerusalem artichokes.

The researchers undertook their own comparison of modern short-fermentation baking with yeasted long-fermentation and traditional sourdough baking using the same wheat and spelt flours. Their results (Figure 2) clearly showed that, with the longer fermentation, approximately 90% of the fructans have been destroyed and the gliadin protein content has dramatically reduced.

Hard to hide from gluten

Importantly, according to Suter and Békés, the fermentation process in bread making is a critical component in managing the wheat’s harmfulness to those susceptible; they show that it takes at least four to six hours of fermentation to reduce any possible harmful effects posed by gluten proteins and FODMAPS – significantly longer than that used by most modern bakeries. What’s more, this is as true for commercial yeast-based baking procedures as for more ‘traditional’ sourdough baking. This could be why people claiming a dietary sensitivity to wheat extol the virtues of the older types of wheat popular with artisanal bakeries. It is not their difference from modern wheat flour but the fermentation time that counts: such bakeries typically employ a longer fermentation time of 12 to 24 hours.

However, if the shorter fermentation times of modern commercial baking have less of a tempering effect on the possible harmful effects of wheat, that is balanced by the overall lowering of the harmful gluten compounds through successful wheat breeding. So, it’s not the actual wheat per se, that is responsible for the increasing prevalence of gluten sensitivities. Suter and Békés point to the uncomfortable truth that although the gluten content of modern wheat has declined, our overall exposure to gluten has increased. Gluten is a common additive in many foods and is routinely added to non-artisanal bread doughs. It is also a thickening agent used to bulk various processed foods, including vegetarian meat substitutes. So, it’s hard to hide from.

There is good news. The research and detailed scientific literature analysis by Suter and Békés point to a possible solution for those with a dietary sensitivity to wheat. There is much anecdotal evidence that many people with this sensitivity can tolerate and enjoy sourdough breads and long-fermentation yeasted breads. There is a great opportunity for researchers to carry out a full clinical trial to confirm these findings and provide information more widely for those with wheat sensitivity. Continued research into developing healthier wheat cultivars and using proper processing technology akin to slower fermentation could provide a range of foods that are better for the gut of sensitive consumers.

Personal response

Your research provides a clearer picture of the possible reasons for the rise in wheat sensitivity. What is, for you, the standout insight, and why?

It is not caused through the introduction of modern wheats or changes to the gluten structure and composition as proposed in several books. It is quite clear from our research and others that the change in fermentation time has a significant effect on the content of fructans (FODMAPS) and on the gliadin content. It is also clear since the 1970s that the addition of dried gluten across the food chain has significantly increased the content of unfermented gluten in the diet.

What can be done to correct the growing perception that wheat is harmful?

Apart from coeliacs, who only represent a minor portion of those consumers avoiding wheat and gluten, significant anecdotal evidence suggests that those consumers currently avoiding wheat and gluten products can safely consume bakery products made with long fermentation. A clinical trial is required to confirm these findings. The outcomes can be communicated widely and, if they confirm the anecdotal findings, could lead to an increased amount of long-fermentation bakery products in place of gluten-free products which are poor in nutritional health benefits. This would allow those consumers currently avoiding wheat products to enjoy wheat and other cereal breads and enhance their nutritional health.

Do you think the ubiquity of gluten and gluten sensitivity will ultimately force food producers to seek alternatives?

No. A clinical trial is required to assess the percentage of those reacting to wheat who could safely tolerate long-fermentation bakery products. Depending on the result, many of those reacting to wheat may no longer require gluten-free products. This may reduce the requirement for gluten-free bakery products except for the small number required for coeliacs and those identified in the clinical trial that could not tolerate long-fermentation bakery products.

Where should cereals science focus in developing wheat cultivars to address shifting consumer demands?

The amount of protein and toxic epitopes is not dependent on genetics but rather on the environment during crop growth. Research is required to understand the relationship between changes in the environment and harmful substances. For example, the effect of climate change. Ancient wheats have been shown not to reduce harmful effects in their own right; however, many ancient wheats have gluten and fructans compositions which make them a good starting material for new research for breeders to cross with bread wheats with the potential to reduce harm for those with wheat sensitivity.

Details



Dr Dai Suter

e: daisuter1@gmail.com



Dr Ferenc Békés

e: firinc47@gmail.com

Bio

Dr Dai Suter has nearly 40 years of experience as a research director for a multinational milling and baking company in Australia before retiring in 2014. He continues to have an interest in the dietary nutritional contribution of cereals and a special interest in cereal intolerances.

Dr Ferenc Békés is a member of the Hungarian Academy of Science and has spent 50 years in food protein and lipid research. His main interest is the relationship between functional and nutritive properties and chemical composition of cereals.

Collaborators

- Dr Chris Florides, Murdoch University, Australia
- Dr Katalin Acs, Cereal Research Non-profit Ltd, Szeged, Hungary
- Matt Durrant, Berkelo Bakery, Sydney, Australia
- Geoffrey Brown, Buckwheat Enterprises, Parkes, Australia

Further reading

Suter, D, Békés, F, (2020) [Who is to blame for the increasing prevalence of dietary sensitivity to wheat?](#) *Cereal Research Communications*, 49, 1–19

