

**"Our daily bread:  
facts and misconceptions about nutritional values and health."**

Fred Brouns

The history of bread stretches far back into the past, helping to raise masses of people. More recently, however, a sudden notion has cropped up, particularly among those susceptible to fear-mongering news on social media, that eating wheat and bread causes physical and mental symptoms.

A large number of suppositions have been made on the adverse effects of cereals on public health, both on the internet as well as by authors of popular diets and books such as the "Paleolithic diet", "Wheat Belly" that got translated in many languages, and "The Grain Brain". The argumentation generally put forward is mostly based on a one-sided selection of corresponding literature, often related to animal experimentation or to the results of test-tube research conducted in a lab, and therefore difficult to be translated directly to the situation man finds himself in.

Proponents claim that we, humans, have only been eating cereals for the past 10,000 years, ostensibly too short a time for "our genes to adapt", resulting in a plethora of diseases. Another claim is that modern bread wheat has been genetically modified, resulting in its containing far more "pathogenic components" than the older "non-modified" cereals, which, supposedly, is to result in leaky gut, causing a multitude of ailments and symptoms.

BUT what are the FACTS?

- Archaeological finds in Africa prove that our very early predecessors ate a diet primarily based on plants, tubers, grasses and seeds. Cereals belong to the grass family with seeds, that grew there at that time would, most likely have been eaten by them. After all, cereals contain protein, starch and other nutrients. The lack of evidence thereof (for the simple reason that no archaeological finds have been made to that effect) is not proof of the fact that this was not the case. By contrast, there is evidence to suggest that we consumed a diet in which cereals had a daily contribution, far further back than assumed 10,000-year mark. Wheat, rye, and barley, for example, were a significant part of the Neanderthal diet as far back as 45,000 years ago and there is robust evidence from finds in Italy and Israel that people had already been baking the first types of bread on a regional level in the late Paleolithic age.
- Modern bread wheat (hexaploid) only appeared in nature approx. 11,000 years ago, coming from a spontaneous cross-pollination (hybrid) between a diploid and tetraploid cereal variety. It is often put that older cereal types contain little or no gluten compared to modern bread wheat. This, however, appears to be incorrect, as both the old diploid wheat (Einkorn) and the tetraploid wheat varieties (Emmer, Durum) contain gluten. Moreover it appears that the oldest ancestor (150,000-500,000 years), *Aegilops tauschii*, contains the D genome that is also present in Einkorn and in modern bread wheat, known to be responsible for the production

of a gluten protein fragment (toxic epitope) that causes most reactivity to people that may develop celiac disease. (see figure). In addition, it was recently very well shown that the total gluten content of modern wheat types is in fact slightly lower than that of the old wheat varieties. This is in contrast to the starch content, which has slightly increased over time.

- The reasons why eventually only a several dozen cereal varieties were selected for large-scale use out of over 100,000 species include grain size, resistance to pathogens and insects and the degree of threshability, meaning whether the grain can easily be separated from the chaff. In this regard, modern (hexaploid) bread wheat seemed to give farmers far greater yields and by virtue of economic reasons became the preferred cereal variety, thus “conquering” the farming world.

Fig 1: genome history of cereals (© F. Brouns. Adapted from Charmet.G. Wheat domestication, C.R.Biologies 334 (2011) 212-220)

- Claims have also been made connecting wheat germ lectins to physical symptoms, in part as they are able to agglutinate to cells, which may cause damage. Lectins are different proteins to gluten and should not be confused with one another; they primarily play a role in natural plant defence against insects. It has been shown that the supposed harmful effects of lectins, through binding (agglutination) to the cells of the intestinal wall, are completely eliminated by heat exposure such as during cooking or baking.
- Although at present the reasons and underlying mechanisms are unclear, some people who suffer from irritable bowel syndrome, but are not coeliac nor have a wheat protein allergy, seem to benefit from avoiding cereals that contain gluten (wheat, rye, barley and spelt). Recent studies have shown that this may be due to protein components other than gluten (amylase trypsin inhibitors (ATIs) a natural crop protective protein against invaders). Further study is being done in this field and likewise the development of a greater variety of gluten-free foods for the benefit of people who really need that is also recommended. In addition, more and better research is required to identify which protein components cause which symptoms in certain people and how this can best be diagnosed.
- There is NO evidence that the consumption of whole grain products in the general sense should contribute to disease or illness. On the contrary, a daily intake of whole grain products reduces the risk of: Type-2 diabetes, Cardiovascular diseases, and Colon cancer. The foregoing does NOT, however, apply to the consumption of (“refined”) white flour products. By far the largest share of the micronutrients contained in the grain is “packed” in the fibre matrix and germ and these nutrients are removed during the fractionation of white flour.

- Based on the available scientific data, there is a general consensus that there is no data that justifies an overall negative recommendation against the consumption of wheat and other cereals that contain gluten for all of us. As such, recent recommendations (2015-2016) from the relevant authoritative organisations (WHO-World Health Organisations, the Dutch Health Council (Gezondheidsraad), Voedingscentrum (Nutrition Centre) Nederland, the Belgian Superior Health Council (Hoge Gezondheidsraad), European Society of Cardiology, Nordic Dietary Recommendations (Scandinavian countries), UK Standing Advisory Commission on Nutrition (SACN), the American FDA/USDA, and many others) unanimously include a recommendation for increased consumption of **whole grain products**, along with more vegetables, fruit.

### **Four social media myths about bread:**

#### **Myth 1: The increase in wheat consumption is causing an increase in our body weight, which leads to obesity and chronic diseases related thereto, such as diabetes and cardiovascular diseases**

- The argument implies a causal link between an increase in wheat products and an increase in the numbers of obese patients. Such a correlation, however, may not be ascribed a causal relationship without justification. There is, for example, also a correlation between the national consumption of chocolate and the number of Nobel prize winners from a given country. In this example, no one would consider winning a Nobel prize to be related or a result of chocolate consumption. “Naturally, overeating of calories would result in obesity, however, this is not simply down to wheat or cereal products. Even Asia, where diets include high rice intakes and relatively low wheat consumption, is seeing a steady increase in patients suffering from obesity. Moreover, countries such as Italy and Turkey, where very large quantities of wheat (pasta, bulgur, bread) are part of the diet, have only begun to see a more rapid increase in obesity levels over the past 2 decades.”

#### **Myth 2: The starch in wheat differs from the starch in other products rich in fibre and consequently results in an unwanted rise in blood sugar levels**

- The starch present in our plant foods generally consists of two different types of glucose chains, namely amylopectin and amylose. The ratio of amylopectin (70-75%) and amylose (20-25%) in the various starchy foods are practically the same and, as such, cannot be a deciding factor to cause an adverse increase of blood sugar levels after wheat consumption as has been suggested. To put things in perspective, robust scientific research has shown that the consumption of bread always results in lower blood glucose levels compared to a similar intake of boiled or baked potatoes or most boiled white rice types.

**Myth 3: Whole wheat bread has a glycaemic index (GI) that is even higher than that of sugar**

- The international GI value for sugar has been established at 67, which is close to the GI value of white bread (GI=70). Whole wheat bread has a GI value of 65.9. The foregoing values differ only very slightly from one another, but are lower than the GI values of other starch products such as white rice (73) and mashed potatoes (85) (see table below).

Product	Carbohydrate (g/100g)	GI (glycemic index)	Serving (g)	GL (glycemic load)
Deep-fried potato	20	85	200	34
Boiled potato	17	78	200	27
Table sugar (saccharose)	100	65	35*	23
White wheat bread	48	75	35	13
Banana	20	51	120	12
Whole wheat bread	39	74	35	10
Apple	13	36	120	6

**Myth 4: Wheat opioids are so addictive that people lose control of their eating habits, resulting in overeating and overweight.**

- The term “opioid” refers to certain gluten protein fragments (peptides) that cannot be digested and, as such, remain intact in the intestine. An opioid-like activity was previously observed after scientists injected the substance into the brains of rats, which is why the term gliadorphins (gliadin fragments with a morphine-like effect) was coined. A simple fact that is overlooked, in this instance, is that the human small intestine is unable to take up these long gliadorphin peptide chains. As such, it is impossible for gliadorphin to reach the brain intact – other than through a direct injection into the brain. In addition, there is no scientific evidence to support the claim that gliadin increases appetite, nor have any withdrawal symptoms been observed in the absence of this protein. In fact, based on recent meta-analysis, it can be concluded that regular consumption of whole grains is positively associated with better weight management.

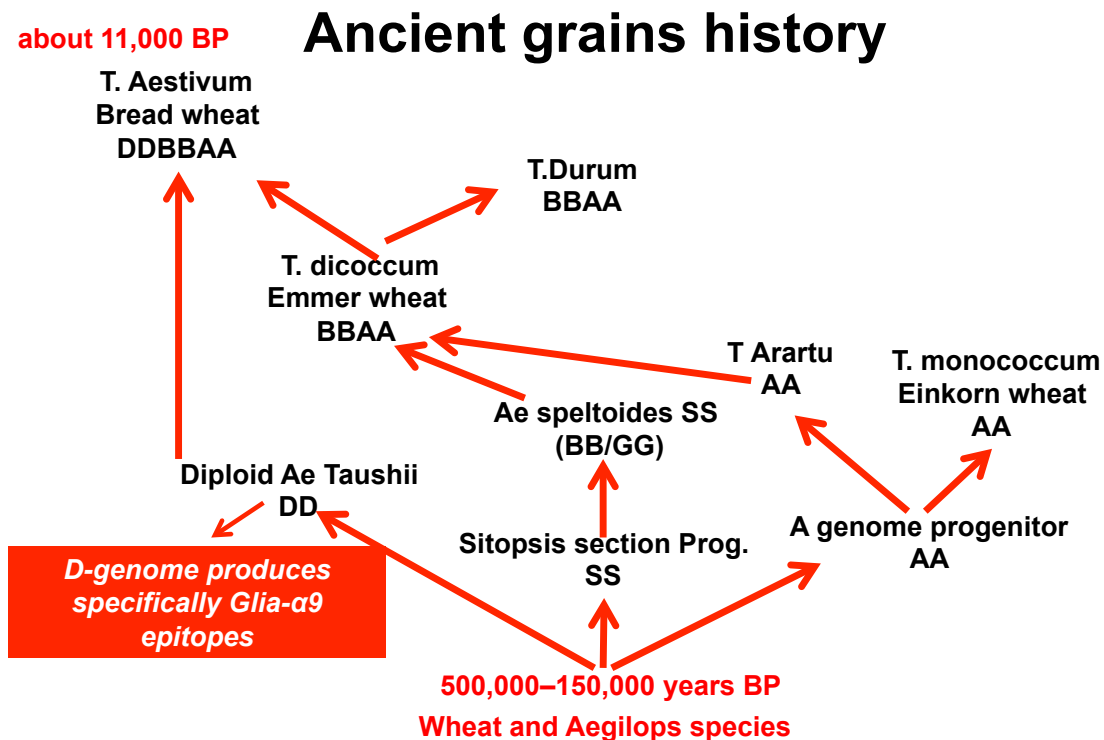


Fig 1

### References

1. Peter R. Shewry, Till K. Pellny and Alison Lovegrove (2016) Is modern wheat bad for health. NPLANTSq.97.
2. Dr. Hetty C van den Broeck, Dr. Luud JWW Gilissen and Prof. Dr. Fred JPH Brouns. Wheat and gluten intolerance, An overview of the latest scientific insights and possible solutions for the bakery sector. ICC white paper. March 2016
3. Richtlijnen voor voedingsvezel inname Nederland. Nederlandse Gezondheidsraad 2016.
4. Raymond Cooper. (2015). Re-discovering ancient wheat varieties as functional foods. Journal of Traditional and Complementary Medicine. 5. 138e143 .
5. Van Buul V. en Brouns F. Tarwekiem-lectinen en gezondheid: de wetenschappelijke waarde van een negatief consumptie advies betreffende (volkoren) tarweproducten met een hoog lectine gehalte Vlaams tijdschrift voor voeding en diëtetiek jaargang 39 nr 3 2013.
6. Van Buul V. en Brouns F. Effecten van tarweconsumptie op onze gezondheid. Ned Tijdschr voor Voeding & Diëtetiek | 2013;68 (2) 7-10
7. Brouns F.J.P.H, van Buul VJ and Shewry P.R. Does wheat make us fat and sick? Journal of Cereal Science 58 (2013) 209e215
8. Shewry p.R and Hey S. Do "ancient" wheat species differ from modern bread wheat in their contents of bioactive components? REVIEW; Journal of Cereal Science 65 (2015) 236e243