‘Well on Wheat?’ Detailed backgrounds

Of all grains, wheat is most widely cultivated worldwide. With over 700 million tons annually wheat is third among all cereals in total global food production, behind maize and rice. The demand for wheat for human consumption is also increasing globally, including in countries, which are climatically unsuited for wheat production, due to the adoption of western-style diets. Wheat is relatively rich in micronutrients, including minerals and B vitamins, and supplies up to 20% of the energy intake of the global population (1). Nevertheless, an ever-increasing demand for gluten-free and wheat-free products has developed in recent years. Apparently, social media statements that gluten and wheat cause overweight and health problems, as well the new consumer ‘Free from’ trend play a major role in this development.

About 95% of the wheat that is grown and consumed globally is modern bread wheat (*Triticum aestivum*), a relatively new species, having arisen in southeast Turkey about 11.000 years ago (2). Cereal (including wheat) proteins that may cause allergies and intolerances (including coeliac disease) have been reviewed in the context of reducing the incidence of such diseases (22). Based on the recent analysis of alpha amylase trypsin inhibitors (ATIs) genes it has been ***suggested,*** that ATIs in cereals may be low or even absent in ancient Einkorn wheat (19, 20), compared with modern bread wheat. It has additionally been suggested that ATI’s may be involved in the etiology of celiac disease.However, celiac disease affects only 1-2% of the population and wheat allergy is very rare, affecting only <0.2% of the population.

Accordingly, the question arises why so many individuals (>30% in the USA, >15% in Australia, increasing numbers in other regions) say to feel more comfortable on a gluten-free or wheat free diet. Several popular nutritional diets such as the Paleolithic diet (6-9) and diets more recently proposed by Davis, in “*Wheat Belly”* (10) and Perlmutter in “Grain Brain (21), have suggested that wheat consumption has adverse health effects leading to numerous chronic diseases. Such suggestions are based on different hypotheses relating adverse health effects to wheat gluten, wheat lectins and wheat protein digestion-derived opioid like peptides, including impacts on eating behavior. With this, the authors of these books follow a recent trend to relate the cause of Western chronic diseases to one specific type of food or food component, rather than to multi-factorial causes including food overconsumption and inactive lifestyle in general (11, 12). In this context, Irritable Bowel Syndrome (IBS) is often associated with wheat intake. IBS is a prevalent (~10% of the general population) functional GI disorder, with 70% of IBS subjects indicating their symptoms to be food-related with wheat considered to be the major player. The evidence and potential underlying mechanism

supporting a clear wheat intolerance is however limited. Still, many patients limit their wheat intake.

The wheat grain contains many hundreds of individual proteins, which may have structural, metabolic, protective or storage functions (as reviewed by Shewry et al., (3)). They include the gluten proteins, which are the major storage components and may account for up to 80% of the total grain protein (4). Higher intakes of whole grain products, which in the U.S. and Europe are mainly based on wheat, are associated with reduced risks of type 2 diabetes, cardiovascular disease, some types of cancer as well as a more favorable weight management (5). For the general population whole grain consumption in general should be considered as healthy, helping to reduce chronic disease risk significantly (24).

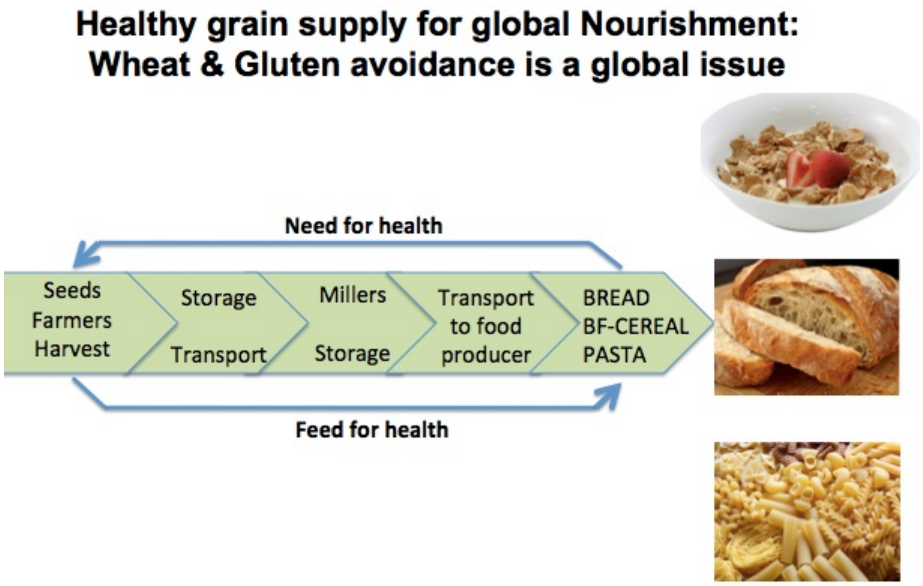
As reviewed recently (13, 14) hard data about adverse human health effects of wheat components such as gluten and lectins (beyond coeliac disease and wheat allergy; 22), including aspects of weight management and insulin resistance are not available. On the other hand, there are currently no grounds to advise the general public to not consume this common dietary staple. This conclusion is further supported by the outcome of recent work in which it was observed that individuals who consumed recommended amounts of (whole)-wheat had the least amount of abdominal fat accumulation (15). In contrast, authors of a few recent scientific publications in animals and humans do raise potential concerns about wheat consumption. For example, in one study in rats, excluding gluten from the diet showed a favorably impact on reducing fat tissue increase (16). The authors concluded that gluten exclusion may help to reduce body weight and can be a new dietary approach (in humans) to prevent the development of obesity and related sickness. The latter however is a conclusion, which, lacking any supporting human data, seems rather premature.

Other work aimed to study the effect in humans of Khorasan wheat (Kamut, a putative ancient grain related to “ancient” tetraploid durum wheat), replacing “modern wheat in the diet”, on cardiovascular risk parameters (17). Based on the obtained data it was concluded that a replacement diet with ancient wheat products could be effective in reducing disease risks. The publication gave no information on the recipe of the products and the way they were processed before consumption, giving rise to many questions. In a more recent study the same research group, (18) studied the effects of consuming organic, semi-whole-grain products derived from Triticum turgidum- subsp. turanicum (ancient wheat), replacing a modern wheat based diet, on irritable bowel syndrome (IBS) associated symptoms and inflammatory/biochemical responses. The authors reported a significant improvement of gastrointestinal symptoms after the ancient wheat intervention period. In addition, a significant reduction was observed in inflammation markers. Also in this study no data were presented about the product recipes and

the processing and final composition of the products. Although the authors stated that ancient wheat resulted in improvements, it cannot be excluded that compositional changes as a result of food processing may have played a role. The latter examples are explicitly taken into consideration by anti wheat and anti-bread proponents in the social media.

More or less simultaneously, it has been suggested that a high content of FODMaPs (fermentable oligo-, di-, monosaccharides and polyols) plays a role in intestinal intolerance (23). HOWEVER, these carbohydrate compounds are not specific to bread wheat, and also occur in many other foods. Roughly 6% of the general population seems to benefit from a gluten-free or wheat-free (read also: low-FODMaP) diet, although the degree of the benefit (as well as the severity of the original symptoms) is not well described. Based on the findings listed above, the cereal supply chain is being blamed to feed the world with sick making cereal products, much based on flawed interpretations of research data and/or statements of blogging activists.

Thus far NO SOLID COMPARATIVE DATA are available on ancient vs. modern grains and the effects of their specific processing e.g. in bread making, let alone on the influence of consumption on gastrointestinal and general wellbeing. In the light of the information given above we have made a CALL for ACTION to address related questions and research gaps. This call concerns the entire cereals/grains supply chain.



We believe that studies addressing the effect of wheat-based foods, "as consumed part of a typical daily human diet", is the only way to obtain reliable data that are useful for optimizing appropriate food processing and product development as well as for dietary recommendations. Related to the matters addressed in the section above, we consider that there is AN

URGENT NEED to perform COMBINED LINES OF RESEARCH addressing the following prime and secondary research questions:

1. Study and define the compositional changes that take place during the processing steps from Grain kernels➔ flour ➔dough / ➔ product ready for consumption, as well as compositional changes during the processing of vital wheat gluten and when required effects of using specific proteases to “detoxify gluten”
2. Study and define the impact of the consumption of wheat foods of fully known composition on metabolism, gut integrity and well being in individuals with sensitive bowels (IBS patients)
3. Study and define the impact of personal consumer beliefs of wheat – gluten avoidance on the perception of gastrointestinal symptoms and wellbeing.

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