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A stealth health approach to dietary fibre

Average dietary fibre intakes have increased little in the past twenty years in many countries, including the USA[1]. Multi-million-dollar campaigns promoting fruits, vegetables, whole grains and other foods high in fibre have delivered only small changes in diets[2], and consumers have not changed from traditional staples to whole-grain options[3]. UK millers report that consumption of whole-wheat bread has actually declined over the past decade (P. Shewry, personal communication). In the US, white flour, which is lower in fibre than whole-wheat flour, accounts for nearly 40% of the fibre intake[4]. We believe that as motivating consumers to change food choices has proven difficult, changing food itself — a so-called stealth health approach — could be a useful strategy to increase fibre in the foods people choose to eat.

Socioeconomic status, education, accessibility, nutrition, tradition, ethnic and cultural preferences all inform food choice. But the most important food attributes are sensory — colour, texture and taste — and these can be influenced by food chemistry. Consumers recognize that whole wheat bread appears and tastes different to white bread.

Food science has the potential to deliver more nutrients of concern in commonly eaten ingredients while preserving consumers' food experiences. The enrichment and fortification of commonly ingested foods with vitamins and minerals known to be at risk in a population is a strategy that governments use to address nutritional insufficiencies. With such a strategy, consumers' food experience remained unchanged and the inadequate nutrient intake was addressed. In the US, for example, iodine was added to salt to address goiters, and enriching and fortifying refined grains with B vitamins such as niacin eliminated the pellagra that was formerly endemic in southeastern states. The addition of folic acid to cereal grain products reduced spina bifida and birth defects in North America by nearly 50%. As the addition of fibre can dramatically impact the texture and palatability of foods, this creates challenges for the food scientist and the plant breeder that were not seen with previous enrichment or fortification.

Breeders are making exciting progress by identifying and crossing types of wheat with naturally (non-genetically modified organisms; non-GMO) higher-than-average levels of different types of fibre, creating a palette of food applications and nutrition choices for millers and bakers. Wheat experts have compared cultivars and identified those that naturally deliver high levels of the major fibre component in the starchy endosperm of the grain. The starchy endosperm is the part of the grain used to make refined (white) flour and its major fibre component is called arabinoxylan[5,6]. By selecting wheat genotypes with higher levels of arabinoxylan, breeders can increase fibre levels in whole-grain foods and also increase the total fibre content in white flour by about 25% compared with currently popular cultivars resulting in up to 3 grams per day of additional fibre[7]. Future efforts to increase arabinoxylan should deliver an increase of 50% in the total fibre content of white flour, with a corresponding effect on whole-grain products. Many modern high-yielding cultivars contain more arabinoxylan than older types, indicating that there is no significant yield drag[8] and hence no effect on cost of production, while evaluation of cultivars and breeding lines with high and low arabinoxylan in the UK has shown similar performance to currently commercially popular wheat cultivars when producing the most common grain food in America: white bread.

Several research programmes are also breeding cultivars with increased amylose[9,10], a component of starch that is resistant to digestion in the small intestine in processed foods and therefore contributes to the fibre fraction. High-amylose wheat cultivars are already commercially available and some breads and other grain-based foods are found in some markets[11].

More research is needed. For example, more nutritional research is needed to determine the physiological roles of arabinoxylan and of resistant starch and other types of fibre when consumed both individually and in combination as part of various foodstuffs and diets. Food intake studies are needed to quantify their impact on total dietary fibre nutriture and to test whether this effort reduces the sizeable 'fibre gap'. Food science research is needed to better understand their functional role in food applications. To create an aligned food supply chain, resources must be made available for widespread planting and food production of higher-fibre grains. Groups that recognize the value of increasing dietary fibre for public health should fund high-fibre grain development and implementation. A collaboration among agri-food, government, health care, and researchers could ensure that key stakeholders, including farmers and consumers, benefit without an impact on consumer prices.

Organizations incentivizing grain fibre must be clear about what they are purchasing. For acceptance by all sectors — agriculture, industry, bakers, millers, nutritionists and food professionals — standards must be developed for operations, commercial agreements and communication. These standards should be determined by key stakeholders, including agricultural and nutrition scientists, farmers and other members of the agri-food and nutrition supply chain, health-care professionals, community leaders and regulators. The socioeconomists connected with these groups can provide data and analytic models to prioritize required grain breeding, food science, nutrition, and health-care research, development and implementation; identify any unintended consequences; and measure health and economic impacts. Together, such a coalition could agree on appropriate or required standards and other methods of coordination.

For the wheat supply chain, efforts to improve the nutritional content of key staple foods can also contribute to brand loyalty, bolster industry perception and demonstrate a desire to be socially responsible.

The US Dietary Guidelines Committee[4] designated dietary fibre a "nutrient of concern" and recommended increased consumption. Recent studies showing differences in fibre amounts in various wheat cultivars provide a basis for agri-food technology and related infrastructure for stealth health to increase fibre in desired foods. Government, health care, and other organizations who understand the importance of dietary fibre to nutrition and public health should incentivize this increased fibre incorporation.

The Coalition for Grain Fiber, the first initiative of a recently established non-profit, gathers more than 60 international scientists and professionals committed to transforming the food industry by prioritizing the role of nutrition in overall health. The Coalition for Grain Fiber is adopting the approach described in

an article by the Foundation for Innovation in Healthy Food[12], with detailed planning for the effort already begun. This approach has the potential to reduce the fibre gap, and mitigate chronic disease risk and appreciably decrease health-care costs. It also has the potential to benefit all socioeconomic groups, while not requiring a change in consumer behaviour.

Fibre may be available from many sources today — but it remains an insufficient part of people's diets. Good science and stealth health can change that.

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Competing interests

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