Food fortification: Optimising food's goodness

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Food fortification can be used to increase the micronutrient content of foods or to replace nutrients lost in food processing, thus playing a valuable role in preventing dietary deficiencies. We look at how fortification can benefit both individuals and population groups, whilst remaining an area of controversy.

With the vast array of food now on offer to most Europeans, dietary deficiencies should be a thing of the past. However, certain micronutrients remain critical, including iodine, folic acid, calcium and vitamin D. So, should Europeans be eating more micronutrient-rich foods, or should foods that Europeans eat in large quantities be fortified with micronutrients? Both approaches have their merits, and looking to the past tells us why.

But before we move on, it is worth defining what fortification actually means. It is defined as "the practice of deliberately increasing the content of an essential micronutrient, i.e. vitamins and minerals (including trace elements) in a food, so as to improve the nutritional quality of the food supply and provide a public health benefit with minimal risk to health."[1]

The past

Historically, widespread deficiencies of iodine and vitamin D were seen in Europe, making goitre and rickets commonplace. Goitre indicates severe iodine deficiency, but a degree of mental impairment can occur even when deficiency is mild. An effective strategy to control iodine deficiency has been the iodisation of salt.[2] Since the introduction of iodised salt in 1922, Switzerland has reduced its high goitre rates dramatically and today maintains an adequate level of intake in its population. A similar success story was told by countries fortifying milk with vitamin D, almost eliminating childhood rickets.[3] Likewise, mandatory fortification of margarine with vitamins A and D to mirror amounts found in butter, for which it is commonly used as a substitute, has helped establish what is termed nutritional equivalence.[1] In other words, people switching from butter to margarine will maintain their intake of these essential nutrients. It should be noted that despite these efforts, vitamin D has over the last five years re-emerged as a major public health issue, with effects on a range of medical and health factors besides the well known function of the mineralisation of bone and teeth, and a debate regarding appropriate recommendations is ongoing.[3,4]

The present

A more recent fortification strategy has been the addition of folic acid to flour, primarily in an attempt to reduce neural tube defects. This became mandatory in the US in 1998, but is voluntary in Europe. Mandatory fortification is controversial due to concerns over potential increased bowel cancer risk.[5] One of the disadvantages of food fortification is the possibility of over-consumption of a nutrient by particular groups.[6] A key feature of fortification, therefore, is calculating the optimum amount of nutrient to be used.

It needs to be effective but safe. A recent study has shown that the nutrient intake from supplements and fortified foods differs considerable from country to country in Europe and that the nutritional inadequacy in European children merits further enrichment of foods currently consumed with selected micronutrients.[7,8] Strict regulations exist within European Union law, controlling the level of micronutrients added to food and covering their use as fortificants.[9]

Fortificants need to be in a form the body can use easily. Iron is a good example. It comes in two forms – haem iron (animal food sources) and non-haem iron (animal and non-animal food sources). Iron from animal foods such as meat, fish and poultry is much better absorbed than iron from non-animal sources like vegetables. Iron added as a fortificant is in the form of non-haem iron but its use in the body can be improved. Vitamin C (e.g. from citrus fruits) and animal proteins (meat/poultry/fish) enhance the absorption of non-haem iron.

Fortified foods can fill certain nutrient gaps, yet they do not replace the need for a healthy, balanced diet comprising a variety of foods. Fortification can be self-limiting due to high levels of additional nutrients altering the taste and appearance of a food. A diet providing the optimal level and balance of nutrients is potentially worthless if it does not look or taste good enough to eat. However, in general fortified foods users show better nutrient adequacy levels attained through commonly consumed foods compared to non users. This effect may be related to a higher nutritional awareness among users of fortified foods.

Whilst widespread fortification programmes have proved successful at a population level, a targeted approach for those with specific nutrient requirements can be useful, and reduces the risk of over-supplying nutrients to those without increased needs. Nutrition labels can provide guidance as to the amount of specific nutrients contained in a given food.

The future

Efforts are on-going to decipher the relationship between dietary needs and genetic make-up so that one day nutrient recommendations may be made on an individual basis. Furthermore, nutrient stability and absorption within fortified foods are continuously being improved. Together with refined and standardised methods to accurately assess dietary supply, they pave the way for a personal approach to optimising nutrient intake.

References

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