

Can fortification improve the quality of food?

Fortification is the addition of certain nutrients to food in which the nutrient is naturally not present or only present in low amounts. It is one food-based strategy to prevent micronutrient deficiencies, i.e. lack of a vitamin and/or a trace element, or to improve micronutrient supply. The most common fortified food is iodised salt. Another example is the fortification of margarine with vitamin A. Fortification of food has a clear nutritional targeting.

If certain nutrients are deficient in the daily diet of people a number of options can be considered. People with a deficiency need a supplement of the nutrient in kind of pills, syrups or capsules. But the most natural way for preventing nutrient deficiencies is a diverse and balanced diet; it provides all nutrients corresponding to the needs. Folic acid, for instance, can be taken up in sufficient quantity from a diet rich in fruits, vegetables, dairy products, fruit juices, and the occasional consumption of liver and other folate-rich food items.

Plant breeding's objective is to enrich the nutrient content of food plants – either conventionally or by genetic engineering. The internationally most debated example is 'golden rice' which is a product of the genetic engineering of rice plants leading to a certain amount of β -carotene in the product. Besides potential risks, the bioavailability of this precursor of vitamin A from rice is unknown up to now.

When can fortified food be useful?

Fortification as one strategy to overcome micronutrient deficiencies (especially iron, iodine, vitamin A) worldwide has its place amongst the different options. In a slum area of an Indian

The best way to prevent malnutrition is a diverse and balanced diet. Where this is not possible, fortification can help.

city, like Colcata or Mumbai, it makes little sense to advertise for healthy diets based on vegetables grown in home gardens. Under these conditions as well as in refugee camps, the distribution of fortified food can be suggested. Examples for successful fortification programmes are iodised salt, folate-enriched wheat flour, iron-fortified rice, vitamin A-fortified margarine and oils: each under specific social, geographical, economic circumstances.

A number of aspects have to be considered before a given food is fortified with a certain nutrient (Mertz W. *Nutr Rev* 1997; 55:44-49):

- 1 The intake of the nutrient is below the recommended intake in the vast majority of the population.
- 2 The food to be fortified is consumed by most people in amounts which sufficiently contribute to the dietary supply.
- 3 The fortification process does not cause an imbalance of essential nutrients.
- 4 The nutrient to be added through fortification is stable under correct storage and use.
- 5 The nutrient is bio-available from the food.
- 6 An excessive intake of the relevant nutrient does not lead to adverse effects.

The success of a fortification programme depends on the target population that can afford to purchase the fortified food. However, in rural Cambodia for example, most people have little or no money and rely on locally grown food; they do not have access to food which is processed in big factories. One answer to such a condition is the so-



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called 'in-house'-fortification. In recent years 'spreads' have been introduced as a means of improved provision of micronutrients. These spreads are composed of essential micronutrients and stabilisers. After families prepare their meals in the usual way they add the spread immediately before serving – like friends of Italian kitchen do with Parmesan cheese on noodle dishes.

Fortification is to be considered as one strategy to prevent micronutrient deficiencies and to improve the provision of certain nutrients which are less consumed than would be desirable. The success of fortification programmes depends on the right assessment of the situation of the consumer and the right application of the principles of selection and processing of the food. Where applicable fortification is a short and medium term measure, its effect ends with the end of the programme if the consumers are not able or have not learned to eat a balanced diet at this point. Therefore, fortification should always be embedded into long-term strategies aiming at either bridging the gap between micronutrient needs and their availability or securing the permanent access to fortified food.