Food Fortification- The Essence To Health

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Abstract- *The addition of micronutrients or supplements to food sources has been an age old concept.This method of nutritional supplementation has proved beneficial at community level*

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I. INTRODUCTION

Food fortification or enrichment is the process of adding micronutrients (essential trace elements and vitamins) to food. It can be carried out by food manufacturers, or by governments as a public health policy which aims to reduce the number of people with dietary deficiencies within a population. The predominant diet within a region can lack particular nutrients due to the local soil or from inherent deficiencies within the staple foods; addition of micronutrients to staples and condiments can prevent large-scale deficiency diseases in these cases

As defined by the **World Health Organization (WHO**) and the Food and Agricultural Organization of the United Nations (FAO), fortification refers to "the practice of deliberately increasing the content of an essential micronutrient, ie. vitamins and minerals (including trace elements) in a food, so as to improve the nutritional quality of the food supply and to provide a public health benefit with minimal risk to health", whereas enrichment is defined as "synonymous with fortification and refers to the addition of micronutrients to a food which are lost during processing

Main methods of food fortification:

1.Commercial and industrial fortification (wheat flour, corn meal, cooking oils)
2.Biofortification (breeding crops to increase their nutritional value, which can include both conventional selective breeding, and genetic engineering)
3.Home fortification (example: vitamin D drops)
Selected examples, involving a range of micronutrients, are briefly described below

Iron fortification

In Vietnam, 6-month efficacy trials have established that fortification of fish sauce with iron can significantly improve iron status and reduce anaemia andiron deficiency . The subjects were non-pregnant anaemic female factory workers who consumed 10ml per day of a sauce that was fortified with 100mg iron (as NaFeEDTA) per 100ml. reduced after 6 months in the group receiving the fortified sauce relative to the placebo control group.

In China, a series of studies have been conducted to assess the efficacy, effectiveness and feasibility of fortifying soy sauce with iron (in the form of NaFeEDTA). Daily consumption of 5mg or 20mg iron in the fortified sauce was reported to be very effective in the treatment of iron-deficiency anaemia in
children

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In an iron-deficient Indian population in South Africa, fortification of curry powder with NaFeEDTA produced significant improvements in blood haemoglobin, ferritin levels and iron stores in women, and in ferritin levels in men .

During the 2-year study, the prevalence of iron-deficiency anaemia in women fell from 22% to just 5%. Regrettably, well-designed trials of the impact of iron fortification of flour were lacking at the present time.

Vitamin A fortification

Trials conducted in the Philippines have revealed that fortification of monosodium glutamate with vitamin A produces positive effects on child mortality, and improved growth and haemoglobin levels in children . Later studies with preschool-aged children, who consumed 27g of vitamin A-fortified margarine per day for a period of 6 months, reported a reduction in the prevalence of low serum retinol concentrations from 26% to 10% . Wheat flour fortified with vitamin A and fed as buns to Filipino schoolchildren for 30 weeks had the effect of halving the number that had low liver stores of the vitamin

Multiple fortification

A number of trials have evaluated the efficacy of specially-formulated foods and beverages as vehicles for multiple fortification. In South Africa, for example, for GUIDELINES ON FOOD FORTIFICATION WITH MICRONUTRIENTS Fortification of biscuits with iron, β-carotene and iodine improved the status of all of these nutrients in schoolchildren . Vitamin A and iron status deteriorated during the long school holidays when the biscuits were not fed. Fortification of a flavoured beverage with 10 micronutrients increased serum retinol and reduced iron deficiency in Tanzanian schoolchildren, and also improved their growth rates . Similarly, in Botswana, regular consumption of a 12- micronutrient enriched beverage by school-aged children increased their weight gain and mid-upper arm circumference, and improved their iron, folate, riboflavin and zinc status .

Iodine fortification

Numerous studies, particularly from the developed world, have clearly established that salt iodization is an effective means of controlling iodine deficiency.

In the United States, large-scale iodization of salt in Michigan reduced the goitre rate from about 40% to below 10% . In the early 20th century almost all Swiss schoolchildren had goitre and 0.5% of the population had cretinism. When salt iodization was introduced in 1922, the prevalence of goitre and deaf mutism in children dropped dramatically. Since then, a sustained salt iodization programme has ensured an adequate iodine status among the whole Swiss population. Despite such convincing evidence in support of salt iodization, in as recently as 2003, it was estimated that 54 countries still have inadequate iodine nutrition (i.e. median urinary iodine < 100µg/l)

Iron fortification

The effectiveness of iron fortification has been demonstrated in several world regions. Iron fortification of infant formulas has been associated with a fall in the prevalence of anaemia in children aged under 5 years in the United States

In Venezuela, wheat and maize flours have been fortified with iron (as a mixture of ferrous fumarate and elemental iron), vitamin A and various B vitamins since 1993. A comparison of the prevalence of iron deficiency and anaemia pre- and post-intervention showed a significant reduction in the prevalence of these conditions in children . Fortification of milk with iron and vitamin C (ascorbic acid) in Chile produced a rapid reduction in the prevalence of iron deficiency in infants and young children . The effectiveness of the fortification of soy sauce with iron is currently being evaluated in a population of

Combined iron and iodine fortification

A randomized, double-blind effectiveness trial in Moroccan schoolchildren (n = 367) has demonstrated that the dual fortification of salt with iron and iodine can improve both iron and iodine status . Results of the 40-week trial, in which salt was fortified with iron at a level of 1mg Fe/g salt (as ferrous sulphate microencapsulated with partially hydrogenated vegetable oil) are summarized in In addition to improved iron status, by the end of the trial the ironfortified group had significantly lower thyroid volumes. Because iron is required
forthyroxine synthesis, iron deficiency reduces the efficacy of iodine prophylaxis. Thus, by supplying both iodine and iron, the impact of iodine fortification is maximized.

GUIDELINES ON FOOD FORTIFICATION WITH MICRONUTRIENTS

Vitamin A fortification

Fortification of sugar with vitamin A is a strategy that has been used extensively throughout Central America. Starting in Guatemala in 1974, and extending to other countries in the region in subsequent years, the effect of this programme has been to reduce the prevalence of low serum retinol values – from 27% in 1965 to 9% in 1977 . There is also evidence to suggest that sugar fortification substantially increases the concentration of vitamin A in breast milk .When the programme was temporarily discontinued in parts of the region, the prevalence of low serum retinol again increased. Vitamin A fortification of sugar is, however, still ongoing in Guatemala.

Folic acid fortification

The introduction of the mandatory fortification of wheat flour with folic acid in the United States in 1998 was accompanied by a significant reduction in the prevalence of neural tube defects and in plasma levels of homocysteine. (Elevated plasma homocysteine has been identified as a risk factor for cardiovascular disease and other health problems . Even though these outcomes may have been due to other factors, there was certainly an increase in folate intakes and an improvement in folate status among the population in the period immediately following the implementation of the new

legislation. Similar improvements in folate status have been seen after the commencement of folic acid fortification of wheat flour in Canada

Likewise, in Chile, a national programme of flour fortification with folic acid increased serum folate and reduced serum homocysteine in a group of elderly people .

Fortification with other B vitamins

Beriberi, riboflavin deficiency, pellagra and anaemia were relatively widespread public health problems during the 1930s in several countries, including the United States. In an attempt to reduce the prevalence of these conditions, a decision was taken to add thiamine, riboflavin, niacin and iron to wheat flour.

With the implementation of fortification programmes for these micronutrients during the early 1940s in the United States and in some European countries, these deficiencies largely disappeared While it can be argued that other factors – such as improved dietary diversity – also played a role, enriched flour continues to make an important contribution to meeting recommended nutrient intakes for the B-complex vitamins and iron in these and many other countries today.

Vitamin D fortification

The virtual elimination of childhood rickets in the industrialized countries hasbeen largely attributed to the addition of vitamin D to milk, a practice that commenced in the 1930s in Canada and the United States. However, there are some signs that rickets is re-emerging as a public health problem in these countries . In a recent study of African American women, a low intake of vitamin D fortified milk was found to be a significant predictor of a high prevalence of vitamin D deficiency . Vitamin D fortification of milk also reduces the risk of osteoporosis in the elderly, especially in higher latitude regions where levels of incident ultraviolet light are lower during the winter months .

II. CONCLUSION

Malnutrition can be prevented at a larger scale by following food fortification techniques that serves as a preventive care at community levels

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