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Tackling the world's 'hidden hunger'

The role of fortification and biofortification in the food and beverage industry

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Tackling the world's 'hidden hunger'

The word 'malnutrition' often paints a picture of a famine-ridden third-world country where food insecurity is chronic and malnutrition is a persistent public health problem. A less-known fact is that micronutrient malnutrition is almost as widespread in industrialised nations, owing to convenience-driven lifestyles and diets of poor nutrient to calorie ratio. WHO have raised concerns about this phenomenon which they have named the 'hidden hunger'. In this white paper, Dr Tamara Markovic explores fortification and biofortification opportunities.

The most common forms of micronutrient malnutrition are iron, vitamin A and iodine deficiency[1]. The Association of UK Dietitians reports that approximately 3 million people in the UK, who suffer from preventable conditions caused by undernourishment, cost the NHS in excess of £13 billion per year[2]. To quote Koning[3]: "hunger has become a problem of poverty amidst plenty", where increased access to food does not necessarily mean a better diet.

Malnutrition in the developed world is linked to insufficient intake of micronutrients, such as vitamins and minerals, and can be easily prevented by dietary diversity. Although a Marie-Antoinettesque argument would be "Let them eat kale" – "Qu'ils mangent du chou", many socio-economic factors impact an individual's ability to access nutritious food, with a key factor being income.

A recent survey by the UK-based consumer group 'Which?' found that, out of all foods on offer in 5 major UK supermarkets, 53% were processed foods such as confectionery, pizzas and high-in-sugar soft drinks; these are generally considered to offer less nutritional diversity and benefit than fresh products. Consumer behaviour is influenced by supermarket practices, with 3 out of 10 people claiming that they struggle to eat healthily due to healthier foods being generally more expensive[4]. Food lacking nutritional diversity makes its way to dinner tables, thus pushing the obesity and diabetes statistics with each wave of price inflation. It seems that problems,

[1] WHO (2006) Guidelines on food fortification with micronutrients (http://www.who.int/nutrition/publications/micronutrients/GFF_Part_1_en.pdf)

[2] The Association of UK Dietitians Food Fact Sheet (https://www.bda.uk.com/foodfacts/MalnutritionFactSheet.pdf)

[3] Koning et al. (2008) NJAS – Wageningen Journal of Life Sciences 55(3):229-292

[4] The Guardian (4 August 2016) Supermarket price promotions targeting less healthy food, survey finds (https://www.theguardian.com/money/2016/aug/04/supermarket-price-promotions-targeting-less-healthy-food-survey-finds)

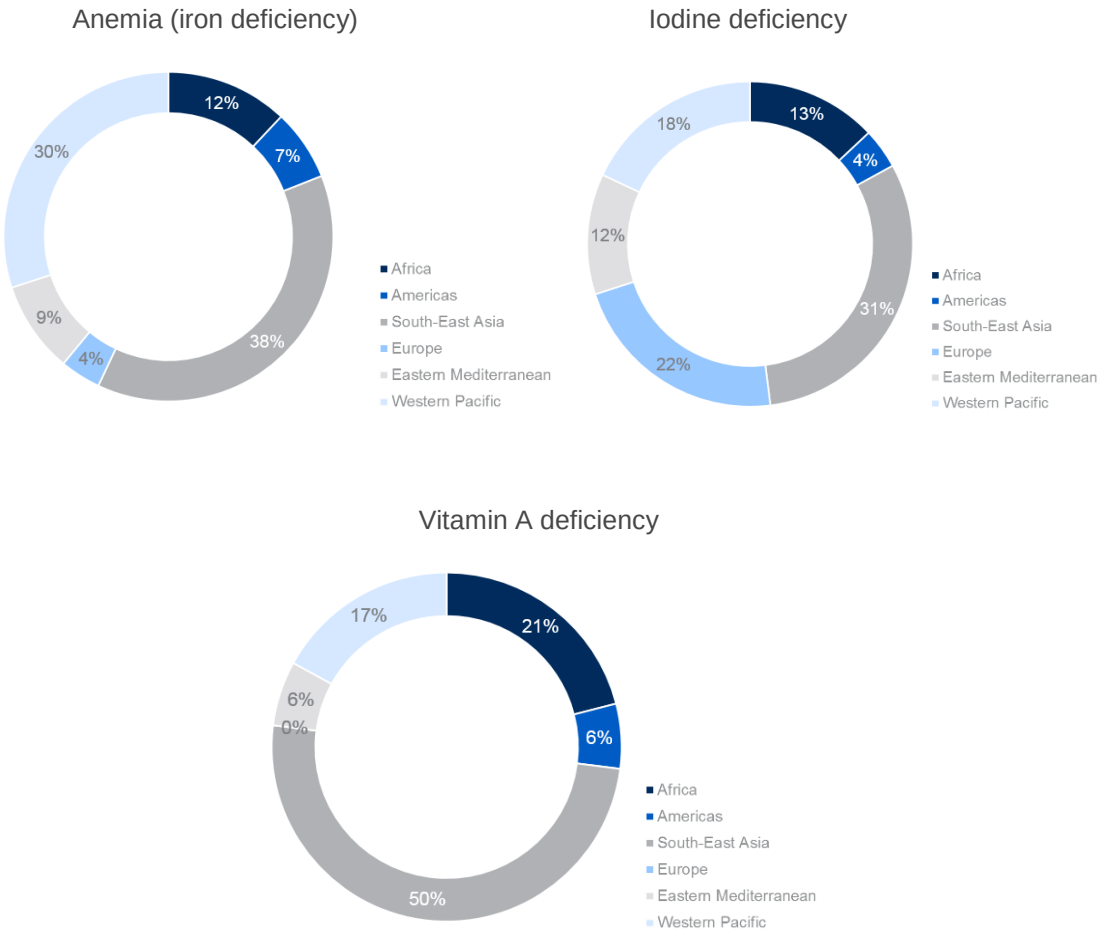

Fig. 1: The three most common forms of micronutrient malnutrition globally – iron, iodine and Vitamin A deficiency. It is estimated that at least 30% of worldwide population is affected, with the majority coming from developing countries. The charts show a breakdown of the global prevalence of the three major micronutrient deficiencies by WHO area.

Source: WHO (2006) *Guidelines on food fortification with micronutrients*.

once only associated with developing countries, are being felt closer to home.

Fortification at point of processing

Scientific efforts, assisted by government policies, are now focussing on ways to tackle the world-wide malnutrition problem. Fortification during staple food processing is one effective solution to improve the nutrition of the population in both developed and developing countries.

Across the world, there are governmental initiatives for both mandatory and voluntary fortification of staple foods with deficient micronutrients. These include milk and milk products (e.g. in the US, India, Mexico, Sweden, Middle Eastern countries under Gulf Cooperation Council (GCC)), margarine (e.g. in Australia and New Zealand), salt (e.g. in EU Member states, Turkey, Morocco), flour (e.g. in Argentina, Mexico, UK, Nepal, Vietnam), and other products from cereals (e.g. rice in Philippines and Papua New Guinea). The economic benefits of such practices are significant; not only does it reduce the pressure on public health services, but it also ensures children receive the nutrients they

need to grow up to be strong and capable individuals, able to achieve their full potential.

Fortification has its critics, due to possible over-exposure to certain micronutrients, which could be dangerous[5,6,7], its cost-effectiveness[8] and the general consumer demand for less-processed foods[9]. In developing countries, fortification initiatives often do not find a way to those most endangered, who can't count on dietary diversification for sufficient nutrient nourishment.

Breeding nutrition into the plant

Major scientific efforts have been invested into biofortification. World Health Organisation (WHO) defines biofortification as the process to improve the nutritional quality of food crops by agronomic practices, conventional plant breeding, or modern biotechnology. Biofortified plants are specifically designed to contain more nutrients naturally, and thus metabolic conversion and utilisation of nutrients is more efficient compared to fortified foods. It is thought to be an innovative and a sustainable solution to tackle the widespread malnutrition.

Two examples of successful biofortification science – African orange-fleshed sweet potato (OFSP) and Golden Rice, both with the mission to mitigate vitamin A deficiency, have met with different levels of acceptance. While OSFP varieties (which have been produced by conventional breeding methods) are considered a major success and widely accepted[10], the transgenic Golden Rice grain still has a long way to go before being invited to a consumer's dinner table. Regions where a rice-based diet is prevalent are the most affected by vitamin A deficiency (Figure 1) due to the low nutrient content of rice and unavailability and/or unaffordability of year-round vegetables rich in beta-carotene (e.g. carrots or tomatoes). Although a serving of either the fortified OFSP potato or Golden Rice per day provide similar levels of beta-carotene, gene technology utilised to biofortify crops, such as is the case with Golden Rice, is very unpopular. Moreover, divided opinions among national regulatory bodies on GMOs – their safety, traceability and labelling – make the way of the above-mentioned grain much harder.

From fortification legislation across the globe, to the status of GM labelling legislation to understanding regional nutritional requirements, whatever your fortification question, Leatherhead's regulatory and nutrition teams are on hand to help.

[5] Blank et al. (1995) Am J Public Health 85(5):656-659 (http://www.ncbi.nlm.nih.gov/pubmed/7733425)
[6] Gupta et al. (2014) JIMSA 27(4):236-237
[7] Nordic Council of Ministers (2003) TemaNord 2003:502 (http://folk.uio.no/runeb/pdf%20filer/Vitamin%20A%20toxicity.PDF)
[8] Horton (2006) J. Nutr 136(4):1068-1071
[9] http://www.fooddive.com/news/less-is-more-trend-toward-fewer-ingredients-to-continue-in-2016/410063/
[10] Hotz et al. (2012) J. Nutr. 142: 1871–1880

How Leatherhead can help

Leatherhead's Regulatory department of over 30 advisors, covering all major international markets are on hand to help with any fortification legislation and labelling questions. Our Nutrition team are experts at scanning the nutrition landscape to stay up to date on the latest fortification research, regulation and guidance.

About the author

Dr Tamara Markovic is a Regulatory Analyst at Leatherhead Food Research and has a keen interest in crop biofortification technologies following her PhD in Biogeochemistry at Imperial College London. Tamara is a member of the Global Regulatory Team, and provides council on food legislation topics for diverse markets such as the EU, West Balkans (Croatia, Slovenia, Serbia, Bosnia and Herzegovina, Montenegro and FYR Macedonia), Japan, Australia and New Zealand. She is passionate about science and innovation, with extensive experience in multidisciplinary projects and finding the best possible science and regulatory solution for clients.

About Leatherhead Food Research

Leatherhead Food Research provides expertise and support to the global food and drink sector with practical solutions that cover all stages of a product's life cycle from consumer insight, ingredient innovation and sensory testing to food safety consultancy and global regulatory advice. Leatherhead operates a membership programme which represents a who's who of the global food and drinks industry. Supporting all members and clients, large or small, Leatherhead provides consultancy and advice, as well as training, market news, published reports and bespoke projects. Alongside the Member support and project work, our world-renowned experts deliver cutting-edge research in areas that drive long term commercial benefit for the food and drink industry. Leatherhead Food Research is a trading name of Leatherhead Research Ltd, a Science Group Company.

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