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Micronutrients, food fortification, and human health

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Micronutrients consist of vitamins, minerals, and trace elements which are essential for health. The key micronutrients are iron, vitamin D, iodine, and vitamin A. Deficiency in any of these causes a unique disorder. These disorders affect half the world's population with global public health implications. A better understanding of micronutrients, their chemistry and interactions would enable the development of cost-effective interventions for overcoming deficiencies. Micro- and macro-nutrient (malnutrition) deficiencies are linked to poverty and predominantly affect low-income minority groups. Common causes are inadequate dietary intake, poor access to healthcare, healthcare disparities, parasitic burden, unaffordability of nutritious food, household food insecurity, and intestinal absorption and environmental issues. Micronutrient insufficiency impairs multiple physiological functions and poses serious threats to health and development, particularly in pregnant women and children. The cost of adding vitamins and minerals to food is low (between 0.5% and 2.0% of the cost of a typical staple food). Nutritional interventions should be done through public health/nutritional education and food fortification programs through the health and non-health sectors (e.g., non-profit organizations). The cost for formulations that include vitamin A and D, iron, zinc, and folic acid is approximately US $10.0/metric ton. If an individual consumes 100 grams of such foods each a day (37 kg/year) the cost of fortification for the final product is US $0.42/person/year. For more complex formulations, such as the World Food Program (WFP) Corn Soy Blend (CSB Plus), the cost is US $1.0/person/year. The WFP calculates a minimum normal "food basket" cost of approximately US $0.30/person/day, or US $110/person/year, less than 1% of the food in the basic food basket. Because the requirements for micronutrients vary in each country, it is necessary to develop knowledge-based, locally relevant food-fortification programs, guidelines, recommendations, and policies.

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Extraction, identification and valorization of plant waste polysaccharides

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Plant processing based waste materials are assumed to be a good source of polysaccharides. It is known that polysaccharides called food gums and food hydrocolloids have various applications depending on their usage purpose in industry. Food wastes coming from plant material are basically composed of cell wall material and it can be classified as cellulose and cell wall matrix filler called pectin, hemicellulose and xycloglucans which are used as thickener, stabilizer, emulsifier texture enhancer, and as a dietary fibre source in food industry. Obtaining usable polysaccharides (PSs) from waste material requires partial hydrolysis and extraction. Especially widely produced and processed foods such as wheat, nuts, corns etc., are good source of PSs. These types of PSs in plant cell wall are extremely heterogeneous having acetyl units and interconnection with cellulose and lignin by hydrogen bonds and covalent bonds, respectively. To obtain PSs from cell wall matrix, it requires breaking bonds by means of alkali treatment, steam explosion treatment, ultrasonication, microwave, and organosoly extraction. Ultrasound is a novel technique and obeys "Green Chemistry" concept due to helping chemical reduction and energy saving. Extraction procedure mainly covers steps such as pre-treating, extracting, separating by means of ethanol. Identification of PSs requires several analytic, colorimetric, spectroscopic and chromatographic methods. In general view Thermogravimetric Analysis (TGA), Fourier Transform Spectroscopy Attenuated Total Reflectance (FTIR-ATR) and Nuclear Magnetic Resonance (NMR) are useful methods for determining type and composition of extracted PSs.

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