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Editorial

Futuristic Nutrition Era: 3d Printing

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Urbanisation and industrialisation in the last century paved the way for today's climate crisis, leading to the extinction of many fauna and flora and the degradation of renewable resources. Also, the world's expected population of 9 billion in the next 20 years, triggered a growing need for sustainable ways to produce personalised, nutritious and healthy food [1]. 3D food printing technology is an innovative approach which lies at the front stage of evolution in food and nutrition technology in this regard.

3D printing is an additive manufacturing process that creates three dimensional objects by depositing layers of intended material [2]. It has been used in a wide range of industries such as aerospace, military, textile, medicine, bioenginering, automotive, construction, packaging and food since 1980s [3,4]. In the food industry, 3D printing has a potential to obtain personalized food products with specific sensorial properties, texture, shape, and nutritional profile [4]. This cutting-edge concept is not only reshaping the way we prepare and consume food, but also offers a unique opportunity to improve our understanding of nutrition.

The advantages of this technology that make it so exciting for nutrition science include the fact that it enables environmentally sound, sustainable, traceable and personalised food production, as well as being recognised as a practical solution to ensure equitable food distribution around the world [5]. It can be addressed to all consumers, with priority given to the elderly, young children and people with disabilities and health deficiencies [5].

The production of soft textured foods for the elderly with chewing and swallowing problems is possible with 3D printers such as "smoothfood" that is produced by Biozoon Food Innovation. In addition, with this technique, the components of the food can be adjusted to balance the nutritional value. Thus, not only the nutritional needs of individuals with dysphagia are met, but also adequate nutrients are supplemented in an enjoyable and acceptable form [3,6]. For this purpose, 3D printers can be easily preferred in care homes where elderly and/or specially treated patients are located [7].

Another niche application of customized nutrition is developing foods for people who suffers from allergies, celiac disease, diabetes, hypertension, or obesity and people with spesific dietary habits such as vegeterians, pregnants or sportsman [8,9]. Individually tailored ready to eat foods are also so useful for people who travels to isolated areas for a long periods of time such as scientists, astronauts or soldiers [8]. Furthermore, it is possible for people in the 3rd World countries with limited access to food to be adequately fed by 3D printing technology [8].

3D printers can produce attractive biofunctional snacks including nutritous components such as fruits, vegetables and legumes in the form of superheroes, animals, or spaceships. This let us both improve the eating habits of children and ensure that paediatric patients enjoy their food [6,10]. It is also possible to produce high-protein foods by 3D printers. In several studies, milk proteins, processed cheese, egg white protein, and insect extracts were used as a printing material. Also, Anukiruthika., *et al.* (2020) evaluated freeze- dried mushroom powder and wheat flour for a snack, whereas NOVAMEAT obtain a 3D-printed steak with chicken or beef sensory characteristics from a mix of vegetable proteins extracted from rice, pea, and seaweed [6,11].

Another appealing use of 3D printing is to obtain probiotic foods against gastrointestinal disorders. Zhang., *et al*. (2018) and Liu., *et al*. (2020) succesfully produced cereal and potatoe based foods enriched with high number of beneficial microorganisms, respectively [12,13]. Except probiotics, other biofunctional ingredients can be combined in the receipe of 3D printed foods such as a sugar-free chocolate [14].

In an age where personalized health and nutrition choices are paramount, 3D food printing has emerged as a powerful tool for tailoring meals to individual needs, becoming an exciting frontier in the quest for healthier and more sustainable eating habits. Although the issue of food safety needs to be clarified through interdisciplinary studies, 3D food technology continues to lay the foundations for a more nutritious future.

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