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3D printing: A novel food processing technique

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Japan started manufacturing additives in the 1980s which subsequently led to the invention of stereolithography, also known as optical fabrication or resin printing. This is a 3D printing technology used to create a model or prototype by using layer-by-layer cross-linking chemicals. This technique forms a polymer to make up a whole three-dimensional solid structure. Over the years, many such techniques were invented under the name of 3D printing. The evolution of 3D printing led to its first bioprinter in the late 1990s. A 3D kidney was first printed using this bioprinter. As of today, 3D printers are finding their application in the automobile industry, including the printing of cars and aircraft. 3D printing has also found applications in food technology. It is used to print complex food models, create unique food patterns and fabricate food designs. They help in personalising meals and to improve the reproducibility of food. These printing techniques are categorised as binder jetting, extrusion-based printing and inkjet printing. The binder jetting technique involves bonding layers of powder. Before each layer of powder deposition, small droplets of binder liquid, with a diameter of less than 100 micrometres, are deposited over the previous layer and then exposed to heat to create mechanical strength. Chocolates and pizza in powdered form are printed using the binder jet technique. Further, in the extrusion-based printing method, layers of materials are fused to create an object. The materials to be fused are present in its glass transition temperature and a layer will be deposited on top of the previous layer. Confectionaries, chocolates, decorations made of sugar, and candies are printed using extrusion printing. The inkjet printing technique is a low pressure and low temperature process, where multiple layers of food materials (liquid or solid) are deposited through a nozzle. Before depositing another layer, the previous layer is cured using infrared or ultraviolet light. Chocolate, liquid dough, sugar icing, meat paste, cheese, jams, and gels are printed using the inkjet technique. 3D food printing can create food with personalised dietary requirements. Additionally, the appearance of the 3D-printed food can be customised. NASA is exploring ways to incorporate 3D printing into space to sustain the crew's dietary requirements. Therefore, 3D printing is a promising technique for creating meat analogues and in reducing food wastage.

Keywords: 3D Food Printing, Food Processing, Extrusion Printing, Inkjet Printing, Binder Jetting

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