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Short Communication

Food Preparation, Storage, and Packaging Innovations Using Nanotechnology

Zhang Li*

Department of Nanotechnology, University Science and Technology, Nanjing, China

DESCRIPTION

The primary objective of nanotechnology is to understand, manipulate, and create devices and systems with remarkable functionalities and qualities at the atomic, molecular, and supramolecular levels. Several fields, including biological, chemical, mechanical, and electronics engineering, are combined in the field of nanotechnology. This technology involves the construction, characterization, manufacture, and manipulation of structures, devices, and materials with a minimum length dimension of 1-100 nm size. When the particle size is decreased below this threshold, the resulting material exhibits physicochemical properties that are significantly different from those of macro scale materials made of the same ingredient. A new level of involvement is supposed to be produced by nanoparticles, which are thought to be tiny things that behave as a single entity with individual attributes and performance. Nanoparticles appear to have higher chemical and biological activity, catalytic behaviour, penetrability, enzymatic activation, and quantum features compared to bigger particles (with the same composition) because of their increased surface area and mass transfer rates. The size, characteristics, and structures of nanomaterials are used to classify them. The desirable physiochemical characteristics of such nanoparticles with a high surface volume ratio include solubility, bioavailability, diffusivity, optics, colour, strength, intoxication, magnetic, and thermodynamics [1,2].

Alternative methods of food processing have been offered by nanotechnology, which has improved physicochemical properties and increased nutritional stability and bioavailability. Nanoparticles are employed in a wide range of industries because of their outstanding microscopic properties, which include a greater surface area, high reactivity, small particle size, high strength, quantum effects, and ductility. The modernisation of the pharmaceutical and medicine distribution industries is similar to that of the food and agricultural sectors. Studies on the synthesis, classification, applications, and evaluation of nanomaterials have facilitated scientific innovation to improve and modify the entire agri-food sector in new decades due to their distinctive characteristics that differ from their bulk materials, such as physicochemical and biological characteristics. A wide range of innovative products with improved food quality qualities, such as texture, taste, sensory properties, stability, etc., have been produced as a consequence of the use of nanotechnology in the food systems. By using Nano sensors to detect infections or contamination in food throughout manufacture, processing, packing, storage, and transport, nanotechnology is used in the food industry to improve food security. However, the use of modified nanoparticles in food products undoubtedly increases oral nanoparticle exposure in humans. A significant source of human exposure to nanoparticles is oral intake of food that has been improved with nanoparticles and ingestion of nanoparticles that have migrated from packaging. According to several study, ingesting nanoparticles has been associated with a number of biological effects, including the induction of oxidative stress responses, DNA damage, and protein denaturation. In multiple studies, oral exposure to nanomaterials particularly solid nanoparticles has been associated to harm to secondary organs and the gastrointestinal system. This highlights the necessity for careful consideration when applying nanoparticles to food. As a result, prior to implementing sufficient monitoring of nanoparticles in food, it is imperative to determine the level of exposure and create effective ways to research the toxicity and food safety of nanoparticles [3,4].

Processing of food nanostructured materials

Direct applications include the incorporation of nanostructured materials directly into the food matrix, as well as the indication of their presence. Another application involves the addition of preservatives, aromas, antioxidants, colouring agents, and bioactive ingredients like polyphenols, omega-3 fatty acids, vitamins, and different kinds of food components. Indirect applications for nanostructured particles include the hydration of lipids utilising clever packing techniques or the use of properly designed nanostructured catalysts. The use of nanotechnology in food processing has largely improved food texture, encapsulated food additives or ingredients, produced

Correspondence to: Zhang Li, Department of Nanotechnology, University Science and Technology, Nanjing, China, E-mail: zhangli789@gmail.com

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unique tastes and sensations, controlled flavour release, and increased nutritional content's bioavailability. Throughout the food processing and production process, nanotechnology is employed to create and improve foodstuffs and commodities [5].

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