Role of Nanotechnology in Food Sector

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Abstract:
Nanotechnology is a new emerging technology which has applications in different areas like it plays an important role in food sector and is used during food processing and food packaging. Nano-food may provide proper nutrient supplements like iron, vitamins, proteins and essential minerals. Nanotechnology is also self-assured to develop quality food packaging materials and can reduce plastic use. Scientists also going to develop nm sized salt grain particles that may increase surface area; hence our food materials require very less salt to give our taste buds that will cure high blood pressure. Beer bottles made by Plastics are used by many brewer SABMiller that contain a layer of nano-particles of clay that easily separable and filled more space in walls of beer and makes it harder for fizzy CO_2 to free from the beer or for O_2, that spoil the flavor of beer. There are many Government stakeholders and agencies to determine limitations and release demonstrative prescription and proclamation, as early as possible before -food packaging by nano materials that may have considerable impacts on health of human being. This review focused on the availability of nano-food packaging, processing and their supplements in the current market.

Keywords: Nano-food, food packaging materials, food processing, food supplements.

INTRODUCTION

There is huge welfare of nanotechnology in food sector to expand productivity of many crops by using pesticides, fertilizers, compost etc. Nanotechnology has many bio-logical properties like antimicrobial activities against many phyto-pathogens like bacteria, virus, fungi etc. It is a new bio-logical field that emerges due to concord of nano-sized molecules that have many biological tasks. There are many types of nano-materials used to check many phyto-pathogens and elevate the crop productivity like nano-Ag, Cu, Zn, Mg, Au etc. Nano atoms are used in food prosessing and packaging materials that approved by US Food and Drug Administration. Nanotechnology has created nano-biodegradable materials for food packaging and has revolution in agriculture and food industries.

Nanocapsules are used as nano-sized ingredients, additives, nutritional supplements (Momin *et al.,* 2013). Nanoparticles can enter body so assessment of potential risks to human health is urgently needed. Halliday (2007) stated that European Union regulations for food and food packaging have assigned safety parameters and certain risk evaluation should be met before to introduce nano-food to the market. In US, nano-foods and most of the food packaging are regulated by the USFDA (Badgley *et al.,* 2007) whereas in Australia, nanofood ingredients and food additives are regulated by Food Standards Australia and New Zealand (FSANZ), under the Food Standards Code (Hodge and

Bowman, 2006). In many other countries, incomplete food safety regulations are introduced due to poor information and systems about exposure, availability and toxicity to human. In fact there is urgent need for international regulation system for the use of nano-particles in food industries. There are many research groups that develop new "on demand" foods that will nourish the cells when required. Nano-capsules may be incorporated into food to deliver the essential nutrients.

International Biodelivery Sciences developed nano-cochleates (50 nm coiled nano-particles) which can be used to deliver lycopene, vitamins and omega fatty acids more efficiently to cells, without affecting the colour or taste of food. The Wageningen BioNT (Bionanotechnology) Centre will concentrate on sensing and diagnostics of food quality, safety and delivery of nutrients and encapsulation, micro and nanodevices for (bio) chemical and physical processing. Consumer database of nanotechnology has produced by The Woodrow Wilson International Center (US) and more than 15 items have identified that have a direct relation to the food industry. There are many nanoparticles that are used to improve flavor, nutritional quality, stability, color shelf life at the time of food processing. Recently S_iO_2 and T_iO_2 oxides have been permitted as food additives (E551 and E171, respectively) (EFSA, 2000). Several nano and micro-structured assemblies of nanoparticles have been designed for encapsulation of food ingredients, food additives and other nutritional supplements (Augustin and Hemar, 2009).

Food packaging is largest commercial application in food sector (Chaudhry *et al.*, 2010). Food packaging materials like films, carbon nano-tubes, nano-coatings etc. are helpful in the production of new food packaging materials with having antimicrobial, antioxidants and flavors properties and increase shelf life (Chaudhry *et al.*, 2008; Mihindukulasuriya and Lim, 2014; LaCoste *et al.*, 2005; Krishna *et al*,. 2005; Weiss *et al.*, 2006; Sekhon, 2010; Souza et al., 2016).

Bayer company produce a transparent plastic film called Durethan which contain clay nano-particles, these particles disperse through the plastic and block O_2, CO_2 and moisture and keep food and meat fresh for long duration. Clay particles make the plastic long durable, lighter and heat resistant used in plastic bottles to extend the shelf life of malt beverages upto 6-18 months.There is a new packaging films called Hybrid system that is enriched with many nano-particles and reduce the O_2 entrance and remove moisture and food become out of reach from spoilage (Bayer Polymers).

CONCLUSION AND DISCUSSION

There are lots of benefits of nanotechnology in the society as food systems (Sugunan and Dutta, 2004). If we are going to introduce new technology that should have an ethical responsibility to the unforeseen risks which may come along with the tremendous positive potential. Public awareness leads to better acceptance of this emerging technology. In future, nanotechnology in food industries may be called Molecular Food Manufacturing industries.

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