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Food Nanotechnology and Its Applications in Modern Food Systems

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Abstract

Food nanotechnology involves the application of nanoscale science and engineering in food production, processing, and packaging. It offers innovative solutions for improving food safety, quality, shelf life, and nutrient delivery. Nanotechnology has the potential to transform traditional food systems into more efficient and functional industries. This article discusses the role of food nanotechnology in modern food science and food technology.

***Keywords:** Food nanotechnology, Nanomaterials, Food safety, Nutrient delivery, Food innovation*

Introduction

Food nanotechnology applies nanoscale materials and processes to improve food quality, safety, and functionality. Nanomaterials possess unique physical and chemical properties that differ from their bulk counterparts, making them valuable in food applications [1]. These techniques reduce thermal degradation of nutrients and sensory attributes. Scientific research has demonstrated that non-thermal technologies effectively control microbial contamination while maintaining fresh-like characteristics of foods [2]. These methods support the production of minimally processed products with extended shelf life [3]. Non-thermal processing also contributes to energy efficiency and sustainable food production. Advancements in equipment design and process optimization have improved the industrial feasibility of non-thermal technologies [4]. Regulatory frameworks guide the safe implementation of these processes in food production systems [5]. Thus, non-thermal food processing represents a promising direction for future food preservation technologies. [5]. Therefore, bioactive compounds represent a vital intersection between nutrition, food science, and preventive healthcare [2]. Bioactive compounds are non-nutrient components in foods that influence physiological processes and promote health. These substances include polyphenols,

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flavonoids, carotenoids, peptides, and phytosterols, which exert protective effects against various diseases. Their biological activity makes them valuable components of functional foods. Therefore, bioactive compounds represent a vital intersection between nutrition, food science, and preventive healthcare.

Conclusion

Food nanotechnology offers transformative potential for improving food safety, quality, and nutritional functionality. Through responsible research and regulation, nanotechnology can support sustainable and innovative food systems. Continued scientific exploration will define its long-term role in the future of food science.their role in sustainable and innovative food systems. Continued scientific research and regulatory oversight will strengthen the credibility and impact of nutraceuticals in global health systems. When used responsibly and regulated effectively, they contribute to product stability and consumer satisfaction. Ongoing research and regulatory oversight are essential to ensure the safe and beneficial use of food additives in the global food industry.

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