Nanotechnology at its peak: flexibility and efficacy of nanosensors in food safety

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Abstract

Food spoilage concerns from ethical, social, economic, and environmental points of view because of its direct link to food insecurity. At every stage of the value chain, food products are subject to spoilage due to the loss of freshness resulting from contamination caused by flaws in the traceability or adulteration events. The existing quality controls and detection methods are time-consuming, and need a significant amount of sample concentration, expertise, and expense. Nanotechnology, particularly nanosensors, could be a game-changer in identifying food contaminants such as pathogens, allergens, or pesticides. Nanosensors are a promising tool for food quality assessment, as they are selective, sensitive, and reliable devices capable of real-time monitoring. Nevertheless, we must consider the uncertainties surrounding nanotechnology, including the unawareness of nanomaterials and their toxicity. Also, consumers' perspectives, the feasibility of implementation, and cost-effectiveness must be considered for the future applications of these devices. Yet, intensive evaluation and validation by regulatory organizations responsible for food safety control and monitoring are crucial for their continuous development and implementation. It is essential to continue researching to ensure the growth of nanotechnology. This communication focuses on the most current research on the potential advantages of this cutting-edge technology of applying nanosensors to detect biological and chemical contaminants in food samples.

Keywords: nanosensor, nanotechnology, food safety, food spoilage, contaminants.

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