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Nanobots: An Application in Sustainable Packaging

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Abstract: ***Nanorobots have not been a technology that is too far from us. Leveraging on the capabilities that we have a microscopic view of not only medicine but industries like food, manufacturing, retail, etc. will be impacted by its presence. This study will help to understand how nanorobots can help in food industry and supply chain. An extensive research & innovation in this field will make sure we build up a more sustainable and a more efficient way of doing business.***

Keywords: Nanorobots, Technology, Supply Chain Management

1. Literary Review

According to Preeti Khulbe; Department of Pharmaceutical Sciences, Bhimtal campus, Kumaun University, Nainital, Uttarakhand, India Nanomedicine offers the prospect of powerful new tools for the treatment of human diseases and the improvement of human biological systems. Nanomedicine is the process of diagnosing, treating, and preventing disease and traumatic injury, of relieving pain, and of preserving and improving human health, using molecular tools and molecular knowledge of the human body.

In Journal of Colloid and Interface Science, Volume 363, Issue 1, 1 November 2011, Pages 1-24Nanotechnology may revolutionize the food industry by providing stronger, high-barrier packaging materials, more potent antimicrobial agents, and a host of sensors which can detect trace contaminants, gasses, or microbes in packaged foods.

In, Nanotechnology for Food Packaging and Food Quality Assessment, from Advances in Food & Nutrition Research Nanotechnology has paved the way to innovative food packaging materials and analytical methods to provide the consumers with healthier food and to reduce the ecological footprint of the whole food chain. Combining antimicrobial and antifouling properties, thermal and mechanical protection, oxygen, and moisture barrier, as well as to verify the actual quality of food.

2. Introduction

Nanobots, a fancier name for nanorobots has been extensively studied in medicine. It has been said to enter human bodies and can treat various variants of cancer cells. Also, to handle the movement of nanobots, doctors need to be extremely well-trained; studying on the complexities in a human body; it can result in various complexities but if handled by highly trained surgeons- we will be seeing surgeries without any tear in the body. These nanorobots or nanobots are of size 10^{-9}; exceedingly small to be seen from the naked eyes. These can be controlled with a nano camera that can give live images and can be useful for learning more about human body. The neuro complexities in our brain that is so complex, Doctors find difficult to perform surgery; this can be easily solved by nanobots. However, work is still going on in this field; and by 2030 we can see the start for nanobots in the largest hospitals present globally.

The use of AI has been exceedingly increasing from last few years, and this will be a bliss for nanobots when we are taking its consideration in food packaging. Be it thermal and microbial value of the food, or checking on the quality of food or even when we want to take into consideration of a sustainable packaging of the food.

The Food Industry

According to PECB[1], Large amounts of food is being wasted throughout the food supply chain; in primary production, during distribution and sale of food products, the preparation and serving of food in commercial and domestic environments. A study carried out by Harvard students even went on stating that a sustainable packaging can save almost 55% of the food.

Weste Management Hierarchy

Disruptive trends with the use of nanobots can be vital for giving a holistic product to the customer. Food industry has been suffering from the quality issues and when we talk about packaging and leveraging the products for an optimal supply chain, use of nanobots is important in coming days.

Nanobots- Food Processing

A 2019 study in the *Journal of Environmental Economics and Management* found that the implementation of a ban on plastic carryout bags in California led to a reduction of 40 million pounds of plastic through the elimination of plastic carryout bags but that Californians purchased 12 million pounds of plastic through trash bag purchases.[2] Not only carrying the food from one place to another is an issue but also creating a sustainable alternative of plastic is important. Nanobots can help with making the right alternative and optimizing it to its fullest. If a 1000-micron bag is being designed that is environmentally friendly, it will be less tensile than the normal plastic bag. Here is the need of nanobots to go deeper in R&I and help the researchers and manufacturers to make it more tensile. We have not been able to bring changes at a such micron view. But nanobots, of its very nature, can be our eye in this segment. They can help to view, bring changes and with help of AI even implement changes in the bag to make it more sustainable and more efficient for use. Unless and until we make a product that is an equal alternative of plastic it is not possible to remove it from its very existence. Bringing an ecological impact and not only healing ourselves but also helping nature who is effected by the normal plastic use. Nanobots can help us create plastic that will come down for ages.

Nanobots- Logistics

It will not be long enough to say that robots will be handling supply chain management. In Ocado, an Online Grocery-Delivery company has almost a web of 700 robots in its processing unit which delivers 65,000 customer orders a week; it caters America's largest retailer Kroger. But when we talk about nanobots we are taking into consideration something which is of ten powers minus nine, something that cannot be seen by a naked eye. The optimization of the logistics or when we say loading of the truck in layman terms; these bots will be able to leverage the optimal capacity of the truck. Making supply chain more efficient and probably greener. We often talk about having an efficient route of our logistics but is the vehicle carrying products to its maximum capability. For example, a truck has a capability of taking 1000 SKU's of American Cheese, but due to poor loading capabilities; it carried 800 SKU's only. The space that is left for 200 SKU's is wasted. Now this truck could have taken these 1000 SKU's having the same carbon footprint say x amount of footprint but now the carbon footprint will be x +x(200 SKU). This impact can be minimalised with the use of nanobots.

3. Summary

Nanobots have surely opened doors in not only medicine but in food processing, qualitative food maintenance and supply chain logistics implementation. We will be seeing a more efficient, a more disruptive technology for sure in the coming days as we have seen how technologies like AI,ML, Blockchain has disrupted our way of doing business similarly nanobots will open doors for another level of automation. An extensive research & innovation in this field will make sure we build up a more sustainable and a more efficient way of doing business.

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