Analysis of activities in the field of nano sciences and nanotechnologies

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Abstract

Nanotechnology is a very complex process, based on a number of scientific disciplines and activities and involves the production and use of materials at the particle level. Nanotechnology is a technology that deals with the study of processes and phenomena at the nanometer level. As this dimension describes the size of atoms or molecules, which is sometimes only a few nanometers, this means that research at this level is aimed at understanding the basic physical phenomena that occur at the atomic level. Nanotechnology also helps in researching the properties of new materials, their properties and structure. Thanks to the knowledge in nanotechnology, in addition to all the innovative products available today, much more can be expected in the future. As a technology that contributes to development in many scientific fields, it deserves to be presented the importance of nanoscience through numerous applications. The aim of this paper is to point out the importance of nanotechnology through its application. The paper presents the application of nanotechnology in many areas, not only in technical disciplines but also beyond.

Keywords: Nanotechnology, Food industry, Nano-particles, Human health.

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Introduction

Nanotechnology is a science that deals with the study of processes at the level of atoms and molecules, at the level of the nanometer the billionth part of a meter, where the behavior of materials is often different from the behavior at the macroscopic level. Nanotechnology today occupies an important place in science, because the knowledge it provides is expected to change in many areas, and these changes would make our lives easier and better. In addition to the innovative products that are on the market today, much greater development is expected in the future than today. Perhaps the greatest attention is focused on the field of medicine, where nanotechnological knowledge would enable healing from the most serious diseases [1]. In addition to medicine, nanotechnology offers the possibility of significant changes in other areas such as, for example, the food industry, where food production, control and quality would be raised to the highest level, which significantly affects human health. Given that nano-level testing techniques significantly influence the development of all scientific fields, getting acquainted with its application in many fields would be of great importance. This paper aims to present the application of nanotechnology in many fields, to point out the advantages and possible disadvantages, as well as to explain the impact of this scientific field on the future of technological development.

What are the Key H azads of Nanotechnology in F ood and Agriculture

Concerns about the use of nanotechnology in agriculture and food production are linked to further automation of food production, serious new dangers of toxicity to humans and the environment, and further loss of privacy when nano surveillance follows every step in the food chain. The failure of governments to enact laws that would protect the public and the environment from the risks of nanotechnology is a very serious problem. Nanotechnology in agriculture is based on the premise that we can improve efficiency and productivity by reorganizing seeds atoms, developing even more powerful agrochemicals, using high-tech surveillance to control farm conditions by electronics instead of humans, and further automating inputs for plant growth.

It is assumed that the application of nanotechnology in food processing can 'improve' the taste, texture, appearance, nutritional composition and durability of food by manipulating it at the atomic level. There have even been claims that this will bring food that will be ‘safer’. These assumptions are based on the mistaken belief that humans can reshape the natural world from atoms upwards and achieve better results. It is assumed that we can predict the consequences of our actions, even when we work with very unpredictable processes and forces such as quantum mechanics. Unfortunately, history teaches us that we are simply not very good at predicting the outcome of complex systems and is replete with examples of major health and environmental problems that have arisen because of early

response to early warning signs in the application of materials that arewere once considered 'miraculous', such as CFCs, DDT and asbestos [2].

This should lead us to the conclusion that the early warning signs associated with nanoparticles should be taken extremely seriously. There is a small but constantly growing body of literature on toxicology on the basis of which it is possible to conclude that, in relation to larger particles, nanoparticles are more reactive, more mobile and are more likely to be toxic to humans and the environment. Preliminary scientific research has shown that many types of nanoparticles can lead to increased oxidative stress which can lead to the formation of free radicals which in turn can cause cancer, DNA mutations and even cell death. Fullerenes–carbon nanoparticles–have been found to cause brain damage in trout perch, a species accepted by regulatory agencies as a model for determining ecotoxicological effects. In its report, the Royal Society of the United Kingdom acknowledged the serious risks of nanotoxicity and said that nanoparticulate ingredients should undergo a comprehensive safety assessment by the relevant scientific advisory body before their use in products can be approved. Despite this warning, there are still no laws regulating the use of nanomaterials in consumer products to ensure that they do not harm the health of the public that uses them, the workers who produce them or the ecological systems into which waste nanoproducts are discharged.

A smart package is being developed that contains nanosensors and antimicrobial activators that will be able to detect food spoilage and release nanoantimicrobes to extend the shelf life of the product, allowing supermarkets to store food even longer. The use of nanosurveillance in food packaging will also lead to new privacy concerns. With the increasing use of nanotechnology surveillance, the food industry will be able to track food from the meadow to the factory, supermarket and your plate. This will open up serious new privacy issues for which we are poorly prepared. It is alarming that despite the release of nanotechnology food and agricultural products into supermarkets and the release into the environment, governments around the world have not yet enacted any laws to control nanotechnology risks people in governments have been heavily bribed to take action against.

Marterials and Methods

Fight for healthy food in the future: A lternatives tonanotechnology

What will our food and technological future look like? We are in an epic battle to control our food sources. Corporate or community ownership, global or local, small or massive, reworked or complete–these are the paradigms we have to choose from. A key way to promote healthy, holistic agriculture is to support it by our choice when buying. Certified, organically grown food offers you better health, a cleaner environment and a way to support the future without nanotechnology food.

When buying personal care products, choose environmentally friendly ones from companies that claim not to use nanotechnology. There are a number of ways to help create a healthy nutritional future. Shop at the market or order packages directly from farmers [3]. Shop in organic products stores or in the organic part of the supermarket. Consider joining a collective garden or creating your own garden. Establish an organic vegetable garden in your local kindergarten or school. Read product declarations. Be involved and interested. Talk to your friends and family about the most important food issues for you.

Let companies know through their consumer lines that you are concerned about the use of nanotechnology in their products. Tell your politicians that you want to see that products containing nanoengineered ingredients are labeled, so you can make informed purchasing decisions. It is exciting to watch our mainstream media and our research and educational institutions discuss food policy. However, although unlabeled food products containing nanoengineered ingredients can already be purchased in our supermarkets, nanotechnology is just beginning to receive attention. There are no regulations that would protect the health of the public and the environment, and almost no corporate or public money is spent on studying the long-term consequences of manipulating our food at the atomic level. The similarity with the introduction of genetic engineering, with the added danger of a lack of regulatory oversight, is frightening [4]. We all need to become politically active about nanotechnology, just as we have done with genetic engineering. It is crucial to introduce a moratorium on the use of nanotechnology until we have regulatory systems to protect human health and the environment and until we have real public involvement in decision-making on the introduction of nanotechnology. We must also make sure that our government directs our hard-earned tax money to support the organic farming sector. Together, we can create a healthy food future for the benefit of our community, not corporate profits. Mind you, folks, these are fateful, decisive times.

Nanotechnology in the food industry

In the food industry, nanotechnology is used for a variety of purposes, including detecting bacteria in packaging or producing stronger flavors and colors, according to Foodproductiondaily.com. According to them, nano-particles are very "bioactive", ie they are quickly absorbed into human cells, tissues and organs. When absorbed, certain nanomaterials can prove toxic to the human body, which can result in increased oxidative stress, the group claims. Oxidative stress is thought to promote a wide range of chronic diseases, including cancer, cardiovascular disease, arthritis, diabetes, and neurodegenerative diseases such as Alzheimer's disease.

FOE also draws attention to the fact that nanotechnology can potentially destroy biodiversity and diverse food systems around the world. All manufactured nanomaterials must therefore undergo rigorous verification of their impact on health and the human environment and prove safe before being approved for commercial use in food products, food packaging, food contact materials or agricultural applications Figure 1 [5].

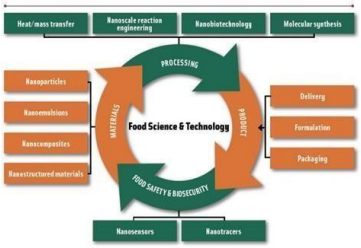

Figure 1. *Schematic representation of the application of nanotechnology in the food industry.*

Another major problem related to nanotechnology is the current misunderstanding of the public, since the commercial use of nanotechnology and nanomaterials in the food industry is surrounded by a veil of secrecy. Food manufacturers are blamed for keeping consumers unaware of whether they are using the technology or not, as they are not required to display special labels on nano products.

Some of the world's major food companies, including Kraft, Cadbury, Nestle and Unilever, use this technology in some ways, but many more may use nano-materials but are reluctant to talk about it. In addition to the requirement for mandatory labeling of “nano” food products, the FOE requires the food industry to involve the public in all aspects of decision-making concerning nanotechnology in food products and agriculture.

Biopolymer nanoparticles

Food biopolymers, such as proteins or polysaccharides, can be used to produce particle size. Using a coupling or separating interaction, one biopolymer sits on smaller nanoparticles. The nanoparticles can then be used as capsules for functional ingredients, for the purpose of protection, and for their release in response to various environmental influences. One of the most common components of biodegradable biopolymer nanoparticles are polylactic acids (PLA). Widely available from many manufacturers, PLAs are often used to encapsulate and deliver drugs, vaccines, and proteins, but they have their limitations: they are rapidly removed from the bloodstream, remaining isolated in the liver and kidneys [6]. Since their purpose, as a particle, is to transfer the active components to other parts of the body, it is necessary to join polylactic acids to components such as polyethylene glycol, in order to be successful in this view (Figure 2).

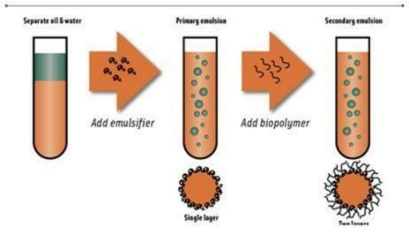

Figure 2. *Biopolymer nanoparticles.*

Nanoparticles and human health

There are a relatively small number of nanoparticles appropriate toxicological studies. It is assumed that they are in principle much more toxic than "classic" particles, first of all due to the larger specific surface area compared to total mass [7]. As the particle size decreases reactivity increases so the substance that is on a macro or micro scale inert can be very dangerous in nanoscale, perhaps because which would lead to an increase in “free radicals ”that can lead to inflammation and tissue damage or tumor growth in Figure 3.

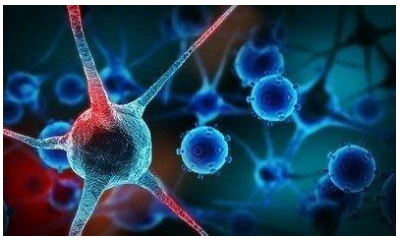

Figure 3. *Nano particles.*

Results and Discussion

Application of nanomaterials and nanotechnology can cause major social, ethical, environmental, but also health problems about their effect on exposed workers, population and environment are still he does not know enough, as testified and quotedappeal.

"We must be aware that nanoparticles are from such sources, such as diesel machines ... could have been the cause of death of thousands of people in the London smog in 1952, which requires a re-examination of that and subsequent air pollution with fatal outcomes."

Catastrophic air pollution poisoning which occurred in the valley of the river Mesa; in Donor, Los Angeles and New Orleans Posa Ricci in Mexico; several times in London in Yokohama and Tokyo, on Hondo Island and Kiyu-Shi in Japan; in Valsum near Düsseldorf, Germany; i to other parts of the world, they drew attention humanity to the perilous danger of air pollution. Maybe this suggestion.

Nanoparticles and nanotechnology because of their specific properties that are dangerous to the health of workers, create many uncertainties that arise because knowledge of the factors that are essential for predicting health risks, as which are: mode of exposure/ routes of entry into the body, movement through the body, reactionsorganism as a biological system, have not been sufficiently studied or known.

As is known, the body's reactions to external stimuli do not depend only on the toxicity and other properties of a substance, but and from the health condition of the exposed persons, from ways and places of entry into the organism, length exposures, lengths and weights of work, microclimate of working rooms, etc. Data on all these and other important facts, in this case, they are not sufficiently known.

Results of previous impact studiesnanoparticles on humans and the results of experiments on animals have for now only preliminary importance. The influence of a substance with a certain properties depends on the contact surface and duration of action of that substance on individual cells, tissues and organs and systems organism.

Nanoparticles spread in the body through blood. They are most often affected by cardiovascular, immune and central nervous system. They can to accumulate in certain organs and tissues and to damage biological processes and weaken immunity. Epidemiological studies of workers exposed to aerosols, including fine and ultrafine particles, warn of lung damage exposed workers, such as: symptoms impaired respiratory function, chronic obstructive pulmonary disease and pulmonary fibrosis. Some authors have found and lung cancer in workers exposed to certain ultrafine particles from diesel fumes machine, which has not been confirmed by other studies.

However, some epidemiological studies have found adverse health effects related toexposure to ultrafine fractions of air pollution. The role of the ultra is uncertain fine particles in relation to other air pollutants that cause the identified negative health effects.

Many experts, who have studied the potential dangers of nanoparticles, emphasize that it is safe for industrial use. countless hazardous substances the essential thing is to dose and keep them as low as possible despite the negative studies, numerous experts believe that the danger of nanoparticles, although not unimportant, it can still be prevented preventive measures.

There is evidence that nanoparticles are capable to destroy living cells. Despite this, scientists want to control nanoparticles and make them transfer drugs to the cell. But other scientists they think that will not be possible, because in some in cases nanoparticles themselves are destructive cells. But many experts and companies they believe that a solution will be found for that.

Influence of nano particles on the environment

Many nanoparticles that appear in by nature they are soluble in water and thus disperse in the environment. Nanoparticles weigh to agglomerate and change into larger ones microparticles. They are less reactive, less so mobile and to a lesser extent distributed. To prevent agglomeration, manufacturers very often they coat the nanoparticles, which makes them more reactive and more mobile. When nanoparticles reach water or air, they contaminate soil and groundwater. Global contamination occurs when particles they enter the water cycle. If the plants absorb nanoparticles, the food chain is contaminated through grain intake. If nanoparticles are not recycled or properly disposed of as waste, then they will contaminate the environment.

Bakilopte causes extensive damage brain in fish. Research on rats is found that these nanolobes are deposited in the kidneys and liver and excreted in the urine. High levels of nanoparticles have been found aluminum oxides inhibit the growth of several species edible plants. Nanoparticles usedfor the production of glass that is resistant to scratches and sunscreen lotions or used to neutralize polluted water, they can be released directly into watercourses and contaminate them [8].

Some authors cite a few general ones assumptions about possible dangers of nanoproducts to the environment and health:

- All forms of nanoproducts are potential dangerous
- Nanoproducts made of conventional materials represent a unique but mostly well-known risk or that risk may be foreseen
- Nanoproducts from new materials represent a new as yet undefined risk
- It is possible that, once they appear in the environment, some nanoproducts spread further, accumulate and remain there permanently present because they cannot be destroyed or removed.

Conclusion

With regard to the application of nanotechnology in food industry, promising results have already been developed in several areas including food manufacturing, packaging, safety and storage. The incorporation of nanostructures into final food products will improve different properties: protection and stability of functional food ingredient, bioavailability and shelf-life improvement, development of new consumer sensation and efficient delivery of bioactive substances into biological systems. The most widely applied nanocarriers consist of natural molecules, such as lipids, proteins or polysaccharides.

Nanotechnology is becoming increasingly important for the food industry. Numerous researches and applications have found their place especially in various areas of food production, new packaging materials and food safety monitoring. By incorporating nanoparticles into food contact materials, better properties of packaging materials are achieved, which affects better durability and quality of packaged food. The problem of long-term and demanding food safety control procedures can be improved by applying nanotechnology through the development of innovative devices and techniques that will facilitate the preparation of samples and their faster and cheaper analysis. In all this, special attention should be paid to the attitude of consumers towards food in which nanotechnology has been applied. The latest Eurobarometer survey conducted in 2010 showed that most Europeans are not against nanotechnology, and that they are generally poorly informed about the benefits and possible risks associated with the use of nanotechnology in the food industry Instructed by experiences related to GM food, timely public discussion of all participants, including consumers, producers, scientists, as well as responsible authorities, is crucial, through which the public will be informed about all aspects of the application of nanotechnology in food production. An important step is the adaptation of existing regulations that will clearly define the procedures for the introduction of such products on the market as well as the ways of their labeling.

It is completely indisputable that nanotechnology has many positive effects on food technology, such as certain food additives, new ways of food packaging and targeted pesticides and their reduced amount in use. Permitted and controlled use of this technology can have a positive impact on the economies of developing countries, especially to increase agricultural production and improve the quality of food, water and soil. We can benefit greatly from this new technology and its proper application in the future, so close cooperation between the economy and scientific institutions is needed.

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