Review on Nanotechnology & Its Future Aspects

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Abstract: - Nanotechnology is a new technology just in its infancy and being researched in labs all over the world. In principle any device that is manufactured to a nano-meter or even micro-meter scale would be considered to be nanotechnology. Nanotechnology refers to technology that is on a very small scale (atomic levels). It it not to be confused with what you see in science fiction films, as the science or technology has yet to be invated. Nanotechnology at the moment involves working with molecules to be able to produce simple molecular devices such as switches, transistors and simple data storage devices. In this review paper, our objective is to studied about Nanotechnology & its future aspects.

Keywords: - Nanomedicine, Nanotoxicology.

I. INTRODUCTION

The idea of nanotechnology was first proposed by a physicist named Richard Feynman in 1959. Feynman never technically used the term “nanotechnology” or “nanite” but he gave a speech called “There’s Plenty of Room At the Bottom” in which he talked about how we would one day be able to manipulate atoms and molecules and actually craft them into whatever we wanted them to be. He then went on to discuss the possibility of us, in the distant future, creating extremely small machines that would serve as tiny tools. This idea was considered completely radical at the time but as the years rolled by, we now see nanotechnology as a very real and potential technology in the near future.

Nanotechnology, the science of the small. Nano is Greek for dwarf, and nanoscience deals with the study of molecular and atomic particles, a world that is measured in nanometers (billionths of a meter or 10^-9 ). Nanotechnology is a field of applied science focused on the design, synthesis, characterization and application of materials and devices on the nanoscale. Nanotechnology is a sub classification of technology in colloidal science, biology, physics,chemistry and other scientific fields and involves the study of phenomena and manipulation of material at the nanoscale, in essence an extension of existing sciences into the nanoscale. Two main approaches are used in nanotechnology: one is a "bottom-up" approach where materials and devices are built up atom by atom, the other a "top-down" approach where they are synthesized or constructed by removing existing material from larger entities.

One of the problems facing nanotechnology is the confusion about its definition. Most definitions revolve around the study and control of phenomena and materials at length scales below 100 nm and quite often they make a comparison with a human hair, which is about 80,000 nm wide. Some definitions include a reference to molecular systems and devices and nanotechnology 'purists' argue that any definition of nanotechnology needs to include a reference to "functional systems".

II. NANOTECHNOLOGY IN HUMAN HEALTH CARE

The health impact of nanotechnology are the possible effects that the use of nanotechnological materials and devices will have on human health. As nanotechnology is an emerging field, there is great debate regarding to what extent nanotechnology will benefit or pose risks for human health. Nanotechnology's health impact can be split into two aspects: the potential for nanotechnological innovations to have medical applications to cure disease, and the potential health hazards posed by exposure to nanomaterials.

Many in the medical world are examining the potential of nanomedicine. Nanomedicine, the application of nanotechnology to human healthcare, offers numerous potential pathways to improving medical diagnosis and therapy and even to regenerate tissues and organs. It holds out the possibility of personalised yet more affordable healthcare while at the same time offering an improved quality of life for everyone.

A. Nanomedicine

Nanomedicine is defined as the application of nanotechnology to medicine. It encompasses the use of submicrometer-sized tools for the diagnosis, prevention and treatment of diseases, for better understanding the complex underlying pathophysiology of diseases, and for improving the quality of life of patients.

The use of nanotechnology in medicine offers some exciting possibilities. Some techniques are only imagined, while others are at various stages of testing, or actually being used today.

Nanotechnology in medicine involves applications of nanoparticles currently under development, as well as longer range research that involves the use of manufactured nano-robots to make repairs at the cellular level (sometimes referred to as nanomedicine).

One application of nanotechnology in medicine currently being developed involves employing nanoparticles to deliver drugs, heat, light or other substances to specific types of cells (such as cancer cells). Particles are engineered so that they are attracted to diseased cells, which allows direct treatment of those cells. This technique reduces damage to healthy cells in the body and allows for earlier detection of disease.

For example, nanoparticles that deliver chemotherapy drugs directly to cancer cells are under development. Tests are in progress for targeted delivery of chemotherapy drugs and
their final approval for their use with cancer patients is pending. One company, CytoImmune has published the results of a Phase 1 Clinical Trial of their first targeted chemotherapy drug and another company, BIND Biosciences, has published preliminary results of a Phase 1 Clinical Trial for their first targeted chemotherapy drug and is proceeding with a Phase 2 Clinical Trial.

B. Nanotoxicology

Nanotoxicology is a branch of bionanoscience which deals with the study and application of toxicity of nanomaterials. Nanomaterials, even when made of inert elements like gold, become highly active at nanometer dimensions. Nanotoxicological studies are intended to determine whether and to what extent these properties may pose a threat to the environment and to human beings. For instance, Diesel nanoparticles have been found to damage the cardiovascular system in a mouse model. Calls for tighter regulation of nanotechnology have arisen alongside a growing debate related to the human health and safety risks associated with nanotechnology. The Royal Society identifies the potential for nanoparticles to penetrate the skin, and recommends that the use of nanoparticles in cosmetics be conditional upon a favorable assessment by the relevant European Commission safety advisory committee. Andrew Maynard also reports that ‘certain nanoparticles may move easily into sensitive lung tissues after inhalation, and cause damage that can lead to chronic breathing problems’.

III. APPLICATION OF NANOTECHNOLOGY

Today’s nanotechnology harnesses current progress in chemistry, physics, materials science, and biotechnology to create novel materials that have unique properties because their structures are determined on the nanometer scale. Some of these materials have already found their ways into consumer products, such as sun screens and stain-resistant pants. Others are being intensively researched for solutions to humanity’s greatest problems — diseases, clean energy, clean water, etc. Other work is aimed at developing a roadmap for productive nanosystems, in which a path is sought from today’s nanotechnology capabilities to advanced future systems in which molecular tools will build useful materials, devices, and complex systems to atomic precision. Nanotechnology is also being applied to or developed for application to a variety of industrial and purification processes. Purification and environmental cleanup applications include the desalination of water, water filtration, wastewater treatment, groundwater treatment, and other nanoremediation. In industry, applications may include construction materials, military goods, and nano-machining of nano-wires, nano-rods, few layers of graphene, etc.

Nanotechnology will play a big role on all of our lives in the very near future in everything ranging from clothes to medicine. Below are a few things that will benefit your life based on the wonderous possibilities of nanotechnology. Examples of products that are produced currently using nanotechnologies include:

- Sunscreens and cosmetics;
- Longer-lasting tennis balls and light-weight, stronger tennis racquets;
- Stain-free clothing and mattresses;
- Polymer films used in displays for laptops, cell phones, digital cameras;
- Coatings for easier cleaning glass;
- Bumpers and catalytic converters on cars; and
- Protective and glare-reducing coatings for eyeglasses and cars.

Examples of materials developed with nanotechnology include the following engineered nanomaterials:

- Carbon buckyballs or fullerenes;
- Carbon nanotubes;
- Metal oxide nanoparticles (e.g., titanium dioxide); and
- Quantum dots, which are nanoscale semiconductor materials (e.g., cadmium selenide).

IV. FUTURE OF NANOTECHNOLOGY

The future of nanotechnology is completely uncharted territory. It is almost impossible to predict everything that nanoscience will bring to the world considering that this is such a young science.

There is the possibility that the future of nanotechnology is very bright, that this will be the one science of the future that no other science can live without. There is also a chance that this is the science that will make the world highly uncomfortable with the potential power to transform the world.

The future of nanotechnology could improve the outlook for medical patients with serious illnesses or injuries. Physicians could theoretically study nano surgery and be able to attack illness and injury at the molecular level. This, of course, could eradicate cancer as the surgical procedures would be done on the cellular base.

Cancer cells would be identified, removed, and the surgical implantation of healthy cells would soon follow. Moreover, there would be an entire nano surgical field to help cure everything from natural aging to diabetes to bone spurs. There would be almost nothing that couldn’t be repaired (eventually) with the introduction of nano surgery.

The future of nanotechnology could very well include the use of nanorobotics. These nanorobots have the potential to take on human tasks as well as tasks that humans could never complete. The rebuilding of the depleted ozone layer could potentially be able to be performed.

V. CONCLUSION
Nanotechnology is already quietly expected within the scientific community to be the answer to the world’s problems. Just like the previous answer to the world’s problems the human element cannot be factored in until the future becomes the present. Above we studied about future & application about nanotechnology. Overall, Nanotechnology will play a big role on all of our lives in the very near future in everything ranging from clothes to medicine. Below are a few things that will benefit your life based on the wonderous possibilities of nanotechnology.

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