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NANO PARTICLES AND THEIR EFFECTS ON HUMAN BODY AND ENVIORNMENT

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ABSTRACT

Nano, extremely small, which can be translated to one-billionth. Nanosciences and Nanotechnology involve the ability to see and control individual atoms and molecules, have created tremendous zeal among the researchers and scientists all across the world. Nanotechnology encompasses science and technology and involves modeling, measuring, imaging, and manipulating matter at the nano-scale. The development of nanoscale structures has the potential to revolutionize industries, including electronics, medicine, and consumer products. The rapidly increasing interest among various research and development needs of nano-domain have spurred the growth in areas such as nano-electronics, biotechnology & health delivery system and commerce in general.
Nanotechnology provides the tools and technology platforms for the investigation and transformation of biological systems. Since elements of the nano-scale behave differently than they do in their bulk form, so some nano-particles can be toxic. Some doctors worry that the nano-particles are so small, that they could easily cross the blood-brain barrier (a membrane which protects our brain from harmful chemicals in the bloodstream). The effect of nano-particles on the body is difficult to predict and not easily understood and the long-term effects on our health and well-being are quite unknown. Therefore, any new nano-material must be carefully tested to ensure it is safe to use.

Keywords- *Nanotechnology,NanoScience,NanoScale,toxic, effects on health.*

I. INTRODUCTION

Nanotechnology is the ability to measure,design,and manipulate at the atomic,molecular levels on a scale of about 1nm to 100nm in an effort to understand,create and use material structures,devices and systems with fundamentally new properties and functions . It is a rapidly growing science of producing and utilizing Nano-sized particles that measure in nanometers.All biological and man-made systems have their first level of organization at the nanoscale where their fundamental properties and functions are defined.The goal in Nanotechnology can be described as the ability to assemble molecules into useful objects hierarchically integrated along several length scale and then after the use ,disassemble objects into molecules.Nature already accomplishes this in living systems and in the environment. This review aims to give a comprehensive summary of what is known today about possible impacts of Nanoparticle toxicology to public health. On the other hand, studies in the development of nanoparticles toxicity raise various ethical questions concerning safety, possible risks and side effects of nanoparticles.This paper also highlights the need for caution during the use and ethical aspects of such manufactured nanomaterials to prevent unintended environmental impacts.

II. NANOSCIENCE AND NANOTECHNOLOGY

Nanoscience is concerned with Nanomaterials, i.e. materials that are at least one of the dimensions of about 1 to 10 nanometers. The word ‘nano’ comes from the Greek word “nanos” meaning dwarf. The term nano is the factor 10-9 or one billionth. Just to get a feeling of the size, we note that the diameter of one hydrogen atom is 0.1 nm. Five atoms of carbon would occupy a space about 1 nanometer wide. It would take 5 million carbon atoms to make a dot as big as the period at the end of this sentence. The width of a DNA molecule is 2.5 nm. These reduced dimensional systems have novel electronic, chemical, mechanical and optical properties.

III. MANUFACTURING OF NANO PRODUCTS

Engineering based on new generations of microscopes and measuring techniques, new processes and tools to manipulate matter at an atomic level, nanopowders that are sintered into bulk materials with special properties that may include sensors to detect incipient failures and actuators to repair problems, chemical-mechanical polishing with Nanoparticles, self-assembling of structures from molecules, bio-inspired materials and bio structures.

A nanotech-based manufacturing system, on the other hand, could build weapons , gray goo, or anything else it was programmed to produce. The solution, then, is to regulate nanofactories; products are far less dangerous.

If it can be done safely, widespread use of Nanotech manufacturing looks like very good idea for the following reasons:

- The ability to produce duplicate manufacturing systems means that manufacturing capacity could be doubled almost for free.

- A single, self-contained, clean-running Nanofactory could produce a vast range of strong, efficient, carbon-based products as they are needed. Emergency and humanitarian aid could be supplied quickly and cheaply.
- Many of the environmental pressures caused by our current technology base could be mitigated or removed entirely.

- The rapid and flexible manufacturing cycle will allow many innovations to be developed rapidly.

IV. POTENTIAL HARMFUL EFFECTS OF NANOPARTICLES

The term nanotechnology is so broad as to be ineffective as a guide to tackling issues of risk management, risk governance and insurance.A more differentiated approach is needed regarding all the relevant risk management aspects.With respect to health, environmental and safety risks,almost all concerns that have been raised are related to free, rather than fixed manufactured nanoparticles.The risk and safety discussion related to free nanoparticles will be relevant only for a certain portion of the widespread applications of nanotechnologies. Epidemiological studies on ambient fine and ultrafine particles incidentally produced in industrial processes and from traffic show a correlation between ambient air concentration and mortality rates. The health effects of ultrafine particles on respiratory and cardiovascular endpoints highlight the need for research also on manufactured Nanoparticles that are intentionally produced. In initial studies, manufactured Nanoparticles have shown toxic properties. They can enter the human body in various ways, each vital organ via the blood stream, and possibly damage tissue. Due to their small size, the properties of Nanoparticles not only differ from bulk material of the same composition, but also show different interaction patterns with the human body.A risk assessment for bulk materials is therefore not sufficient to characterize the same material in Nanoparticulate form.The implications of the special properties of Nanoparticles with respect to health and safety have not yet been taken into account by regulators. Nanoparticles raise a number of safety and regulatory issues that governments are now starting to tackle. At present, the exposure of the general population to Nanoparticles originating from dedicated industrial processes is marginal in relation to those produced and released unintentionally e.g. via combustion processes.

The exposure to manufactured Nanoparticles mainly concentrates on workers in nanotechnology research and nanotechnology companies. Over the next few years, more and more consumers will be exposed to manufactured Nanoparticles. It is inevitable that in future manufactured Nanoparticles will be released gradually and accidentally into the environment. Studies on bio persistence, bio accumulation and Eco toxicity have only just started.

V. FINDINGS

1. Nanoparticles may cross cell membranes and other target sites such as liver,heart or blood cells due to their small size.
2. The three major characteristics of Nanoparticles that are relevant for affecting health are
    i. Size-Relatively more molecules are present on the surface ,this may be one of the reasons why Nanoparticles are more toxic than larger particles of the same composition.
    ii. Chemical composition and surface characteristics -The toxicity of Nanoparticles depends on their chemical composition, but also on the composition of any chemicals adsorbed onto their surfaces.
    iii. Shape-Although there is little definitive evidence, the health effects of Nanoparticles are likely to depend also on their shape. A significant example is nanotubes, which may be of a few nanometres in diameter, but with a length that could be several micrometres.
3. The potential route of inhaled Nanoparticles in the body is the olfactory nerve.Nanoparticles may cross the mucous membrane inside the nose and travel to the brain through this nerve.
4. Persistent insoluble Nanoparticles may cause problems in the environment.
5. Nanopowders are used in sunscreen,lotions,sunglasses,sports goods ,media uses etc.

VI. NANOREMEDIATION

Using nano-sized reactive agents to degrade or immobilize contaminants is termed Nanoremediation.. In soil or groundwater Nanoremediation, nanoparticles are brought into contact with the contaminant through either *in situ* injection or a pump-and-treat process. The Nanomaterials then degrade organic contaminants through redox reactions or adsorb to and immobilize metals such as lead or arsenic. In commercial settings, this technology has been dominantly applied to groundwater remediation, with research into waste water treatment.Research is also investigating how anoparticles may be applied to cleanup of soil and gases.Nanomaterials are highly reactive because of their high surface

area per unit mass, and due to this reactivity Nanomaterials may react with target contaminants at a faster rate than would larger particles. Most field applications of Nanoremediation have used nano zero-valent iron,

which may be emulsified or mixed with another metal[i] to enhance dispersion.That nanoparticles are highly reactive can mean that they rapidly clump together or react with soil particles or other material in the environment, limiting their dispersal to target contaminants.Some of the important challenges currently limiting nanoremediation technologies include identifying coatings or other formulations that increase dispersal of the nanoparticle agents to better reach target contaminants while limiting any potential toxicity to bioremediation agents, wildlife, or people.

VII. CONCLUSION

Nations are focused on this emerging technology in particular and serious researches as well as industry efforts are being made. Nanoparticles are being studied so that they could remove or destroy toxic substances from the environment.The environment will also benefit from nanotechnology with the improvement of the efficiency of renewable energy. Atoms bonded together specifically could convert water with sunlight to hydrogen. Nanotechnology will benefit many industries, including health and medical industry.Nanoscale devices with a diameter less than 100nm can enter the cells to interact with DNA and proteins as well as monitor and diseases or abnormalities. This way it is possible to detect cancer when the earliest molecular changes.

Nanotechnology is being harbingered as the next enabling technology that will redesign the future of several technologies, products and markets. Developments of nanotechnology, such as nano dRAM chips, nano dot storage, nano technology in sports, smallest nano tube transistor, nano to speed up the internet, storage punch card, applications and future of this tiny technology which commands the future era.

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