ABSTRACT:

Nanotechnology play a prominent role in our economy. Used of nano materials increased poses potential human health risk. Therefore it is critical to understand nature and origin of the toxicity imposed by nanomaterial. This paper discusses synthesis, characterization and toxicity of metal oxide nanoparticle. There are two toxicities are in vitro and in vivo of its oxide. These oxide are discussed including a consideration of a factor important of safe use of these nanomaterials. In these article toxicity of metal oxide are widely use in industry and bio technology. Nanoparticle toxicity is related to the oxidative stress and alteration of calcium homeostasis cellular signally events. Nano technology is express to address the toxicological activities of nanoparticles and there products to determine whether and to human health, and define as the study of the mechanism of the toxic effect of nanoparticles on living organism. The help of knowledge of nanotoxicological study will be the base for designing safe nano materials in different biological system. These paper consist of the section with the brief introduction, the synthesis of metal oxide nanoparticle. Nonotoxicity of metal oxide of nanoparticle etc.

Keywords: Nanotoxicity; metal oxide nanoparticles; biogenic nanoparticles; Cytotoxicity;

INTRODUCTION:

Metal oxide nanoparticles have wide application in technology field. There use as semiconductor electroluminescent or thermo electric material, but they are also use in bio medical application as a drug delivery system or treatment and diagnosis and in environmental applications. The classical methods for obtaining metal oxide nanoparticle are based on physical techniques that employ hazardous and negative effect on the environment. The metal oxide nanoparticle produce increase recently because no well process for development of engineered material. [1] The study of nano technology involves the control of matter on atomic and molecular scales.

Nano sized materials are increasingly used in the fields of industry, science, pharmacy, medicine, electronics, communication and consumer products. The “nano” is derived from the Greek word “nanos” meaning “dwarf” [9]. A nanomaterial (NM) defined as a substance with at least one dimension <100 nm in length. There are numerous nano-sized materials in our life. They can take different forms such as tubes, rods, wires or spheres. Depending on their origin, they can be categorized as either engineered or incidental NMs. Engineered nanoparticles (NPs) are particles generated to use the size-related properties inherent in the nanoscale (e.g. conductivity, spectral properties, biodistribution). Incidental NPs, are defined as particles either from unintended anthropogenic sources (e.g. combustion derived) or of natural origin (e.g., particles generated in forest fires). Engineered NMs including NPs and nanofibres are also categorized into four classes which
Nanotechnology is being applied in diverse fields, including extensions of conventional device physics a new approaches based upon molecular self-assembly, the development of novel materials with dimensions on the nanoscale, and even the direct control of matter on the atomic scale. The application of nanotechnology in biology (nanobiotechnology) encompasses development of nanomaterials for delivering and monitoring biologically active molecules, disease staging, therapeutic planning, surgical guidance, neuro-electronic interfaces, and electronic biosensors.

Nanotoxicology is the study of the toxicity of NMs. It has emerged only recently, years after the beginning of nanotechnology that is considered one of the key technologies of the 21 century, when numerous NMs had already been introduced into some industrial processes and consumer products. Donaldson et al. [10] quoted “discipline of nanotoxicology would make an important contribution to the development of sustainable and safe nanotechnology”. Growing concerns about the nanotoxicology were derived from prior experiences with air pollution [11] and asbestos [12]. Nowadays many NPs, for example carbon nanotubes which are much smaller than asbestos, might have asbestos-like effects on cells.

Nanotoxicology is an emerging field that builds upon previous work on airborne particle toxicity. Given (1) fixed particle mass, (2) unitary density, and (3) particle surface bioreactivity, nanoparticles possess better tissue penetration and higher biological potency than coarse (2.5–10 μm) and fine (<2.5 μm) particles.[2] The increasing the production and use of metal oxide nanoparticles in numerous application leads to adverse effect on health.

Silver nanoparticles are the most studied metallic nanoparticles but their cytotoxicity and genotoxicity are not full understood [5,6]. The toxicity of more complex nanostructures, such as graphene and carbon nanotubes, is also uncertain [7]. This review describes the biogenic synthesis of important metal oxide nanoparticles and their cytotoxicity in vivo and in vitro. The safety implications and environment effects of these nanoparticles are also discussed.

ii) NANOTOXICITY OF METAL OXIDE NANOPARTICLE:

Few paper have reported these nanoparticles have been investigget. The literature discusses the synthesis and characterization of metal oxide nanoparticle. The metal oxide nanoparticles develop applications either by biogenic or classical method and investigation of environmental toxicity of these nanoparticle . Nanotoxicology of these material should be further characterized.

A) Bismuth Trioxide (Bi₂O₃) Nanocrystals

Bismuth trioxide is not toxic to human tissue ionic bismuth is reduce by sodium borohybrid is then oxidized at high temperature. NO report have described the toxicity of Bi₂O₃ nanoparticles which indicates necessity of investigating this area of nanotoxicology

B) Cobalt oxide (Co₃O₄) Nanocrystals

Demonstrated the toxicity of (Co₃O₄) in BEAS-2B cells which are model of areaway epithelium of normal lungs tissues. (Co₃O₄) nanoparticles induces cytotoxicity morphological transformation and genotoxicity in Balb3T3 cells. Previous reports suggested that commercial bare (Co₃O₄) nanoparticles associated to a protein corona. Lower in vitro toxicity was absorb while simulating both Th1 and Th2 in vivo antibody responses which indicate that (Co₃O₄) nanoparticles may be use as vaccine adjuvant[13]. That’s why easily finding for biogenic (Co₃O₄) nanoparticles because they are naturally capped with protein the biogenic synthesis process.

C) Iron oxide (Fe₂O₃, Fe₃O₄) Nanoparticles

Magnetide (Fe₃O₄) and Hematide(Fe₂O₃) are iron oxide nanoparticles have us for biomedicile and industrial application[14,15]. The toxicity of iron oxide can be attributed to the ROS induction of oxidative stress. Most paper have describe the vitro and vivo toxicity of chemically synthesized iron oxide nanoparticles. This result demonstrated the bio technological and nanotechnological potential of bacterial magnetic nanoparticles.

D) Antimony Oxide (Sb₂O₃) Nanoparticles

Antimonytetroxide(Sb₂O₃) is primarily use in rubber, paper, pigments, adhesives, plastics among other materials. Previous paper reported the toxicity of (Sb₂O₃) of nanoparticles
on the proliferation of human hematopoietic progenitor cells. Antimonet trioxide treatment was associated with the induction of ROS and differentiation markers.

E) Silica (SiO₂) Nanoparticles
The toxicity of commercial available SiO₂ nanoparticles was investigated in the RAW 264.7 mouse macro phage cell line. Nanotoxic effect of (SiO₂) nanoparticles was significantly attenuated by the capalasetreatments which indicates the oxidative stress mechanism for toxicity of silica nanoparticles.

iii] BIOGENIC SYNTHESIS OF METAL OXIDE NANOPARTICLES:
This section describes the biogenic green approaches to synthesize different nanoparticles. These particles are important for technological, biomedical and environmental applications.

A) Cobalt Oxide (CO₂O₄) Nanocrystals
The classical methods of synthesis are solvothermal and thermal decomposition and the use of templates. These synthetic routes are costly, time-consuming and toxic. Previous paper describe the synthesis of CO₂O₄ nanoparticles using marine bacterium Brevibacteriumcasei in which the study of quantitative and qualitative analyses that were conducted during the biogenic synthesis indicated the synthesitvity of the micromechanical properties of cells to the surrounding toxic environment[16].

B) Copper Oxide(Cu₂O) Nanoparticules
Copper oxide (Cu₂O) nanoparticles (10–20 nm) were synthesized at room temperature using the baker’s yeast Saccharomyces cerevisiae[17]. Copper and copper oxide nanoparticles are used in optical and electronic application and are a promising antimicrobial agent. Application of biogenic synthesis of copper based nanoparticle describe in various research paper. Copper oxide nanoparticles were obtained by reduction of copper sulfate by the reductase enzymes of the microorganism. The biogenic synthesis of copper oxides was performed using Penicilliumaurantiogriseum, P. citrinum and P. waksmaniiisolated from soil[18].

C) Antimony Oxide(Sb₂O₃) Nanoparticules
As an inorganic semiconductor compound, antimony (III) oxide (Sb₂O₃) has several applications in technology and in chemical catalysis[19]. Jha et al. [20,21] reported the low-cost reproducible biosynthesis of Sb₂O₃ nanoparticles at room temperature in the presence of baker’s yeast (S. cerevisiae). Different characterization techniques revealed the formation of nanoparticles in a face-centered cubic unit cell structure, with an average size of 3–12 nm [20].

D) Titanium Dioxide (TiO₂) Nanoparticules
TiO₂ nanoparticles have important environmental, technological and biomedical applications [22,23]. Jha and Prasad [24] reported the reproducible room temperature biosynthesis of TiO₂ nanoparticles (10–70 in size) by Lactobacillus sp. that were obtained from yogurt and probiotics tablets. In the presence of suitable carbon and nitrogen sources, lactobacillus or yeast cells interact with a TiO(OH)₂ solution to produce TiO₂ nanoparticles (8–35 nm) with few aggregates. Lactobacilli have a negative electrokinetic potential, which is suitable for the attraction of cations, a step that is required for the biosynthesis of metallic nanoparticles.

E) Uraninite (UO₃) Nanoparticules
The reduction of soluble uranium salts by microbial agents represents an important part of the geochemical cycle of this metal and highlights a mechanism for the bioremediation of uranium contamination[28,29]. Nanoparticles of UO₂ are important for nuclear applications. The average particle size was 3 nm, as determined by high-resolution transmission electron microscopy (HRTEM) and X-ray absorption spectroscopy.

iv] CONCLUSION:
These nanoparticles have been considered for diverse applications in biotechnology, catalysis, environmental bioremediation, optics, electronics, and cell energy and in the medical and pharmaceutic sciences. The applications of metal oxide nanoparticles have recently increased. The biogenic synthesis of metal oxide nanoparticles has emerged as an attractive alternative. Metal oxid nanoparticles can be obtained from different organisms such as plant extract, fungi, bacteria, algae, and actinomycetes [30]. This work reports the recent development in the use of green methods to obtain different types of metal oxide nanoparticles that can be used in a wide range of applications.
To use metal oxide nanoparticles (either synthesized by traditional or green methods), it is necessary to investigate their potential toxicity. The effect of metal oxide nanoparticles on humans and the environment is a topic that has received increasing interest and debate [31]. The reviewed literature indicates that the potential toxicities of these nanomaterials have not been completely addressed. Most research focuses on the toxicity of chemical or physical synthesized metal oxide nanoparticles. There are few reports that characterize the nanotoxicity of biogenic metal oxide nanoparticles. Based on published papers, the clearly determination of similarities and differences, in terms of toxicity, of metal oxide nanoparticle obtained by traditional methods and by biogenic routes can be considered complex. This complexity is due to the different routes of nanoparticles synthesis, their different size, presence or absence of capping molecules, diverse kinds of toxicity evaluation tests, and lack of deeper studies of nanotoxicity of biogenic nanoparticles. Therefore, the potential toxic effects of biogenically obtained nanoparticles should be investigated further.

The literature suggests that nontoxicity is related to (i) the possible release of (toxic) ions from metallic nanoparticles and (ii) the oxidative stress caused by the intrinsic characteristic of the nanoparticle (morphology, surface charge, size and chemical surface composition) [31]. Further studies are required to understand these mechanisms. Finally, the toxicity of nanoparticles can differ depending on the experimental method employed [31]. Nanoparticles themselves can interfere with many tests, and it is often necessary to adapt the protocol to obtain reliable results [32,34]. A standardization of toxicity protocols, long-term study of nanoparticle toxicity and the fate of these nanomaterials in human tissue and in the environment need to be further investigated.

REFERENCES: