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Journal of Pharmaceutical & Health Sciences

Aims & Scopes

Journal of Pharmaceutical & Health Sciences is the official journal of the Pharmaceutical Sciences Branch, Islamic Azad University (IAUPS), Tehran, Iran. This peer-reviewed and multi-disciplinary journal publishes research reports, editorials and review articles on all aspects of the pharmaceutical sciences and health with strong emphasis on originality and scientific quality. The editors welcome articles in multidisciplinary expertise, ranging from

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Acknowledgements: All contributors who do not meet the criteria for authorship should be covered in the acknowledgement section. It should include persons who provided technical help, writing assistance and departmental head who only provided general support. Financial and material support should also be acknowledged.

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Shah M, Cunningham MJ. Toxicogenomics. In: Gad SC, ed. Handbook of pharmaceutical biotechnology. 1st ed. Hoboken, NJ: John Wiley & Sons, Inc., 2007:229-51.

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Davis TM, Yeap B, Bruce DG, Davis WA. Lipid-lowering therapy protects against peripheral sensory neuropathy in type 2 diabetes. Presented at: 67th Scientific Sessions. American Diabetes Association Annual Meeting, Chicago, IL, June 22, 2007.

MONOGERAPH IN ELECTRONIC FORMAT
Tamoxifen. DRUGDEX System. Greenwood Village, CO: Thomson Micromedex, expires 2007 Dec 31 (accessed 2007 Jan 11).

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Nanotechnology Standardization, National, International Activities and Challenges Ahead

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In the road towards a shift from a resource-based economy to a knowledge based one and in harmony with her fourth 5-year national economic development plan, Islamic Republic (IR) of Iran has set nanotechnology as one of her top priorities. During the last ten years, by developing and implementing a comprehensive national initiative program, Iran could achieve a remarkable growth in science generation (8th rank in the world) and commercialization of different types of nanoproducts. To support the latter, Iran nanotechnology standardization committee (INSC) was set up at 2006, i.e., shortly after establishment of the relevant committee (TC229) in ISO. Till now, INSC has published 15 national standards and has accomplished 2 international standards and another one currently underway in ISO/TC229. Further, two other nanostandardization committees have also been established in the ministry of health and agriculture as well. Moreover, Iran nanosafety network was set up in 2012 with the aim of networking researchers, experts, research institutes and industrial units active in this field to support the development of EHS-related standards and guidelines. On the other hand, apart from ISO/TC229, other important international authorities have also taken serious steps for the development of required standards in various fields. Despite, such activities, the ideal situation is still far away, especially in case of EHS-related issues of nanoproducts. For sure, the materialization of the future huge market expected for safe, responsible and green nanoproducts will mainly rely on the development of relevant standards. In my talk, I will introduce the achievements of INSC and other international bodies and discuss the challenges ahead.

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Nanoscience, Nanotechnology, and What We Know About How Nanomateirals Affect the Local, Regional, and Global Environment

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Naturally occurring nanoparticles have been one of the principal geochemical and biogeochemical reactants of Earth during its long history. Yet these ubiquitous materials have largely escaped our close scrutiny until very recently. They are illusive and difficult to study. They have properties that change significantly with their exact size, shape, aggregation state, and surrounding environment. In the past, it has not even been clear how they accumulate, disperse, and move around the planet, nor even for sure what their major sources and sinks are. If we use them to help us understand anthropogenic nanomaterials that are in the environment by design or by accident, and we certainly should, then we need to know more about them. As a start, we have now compiled and derived a global budget for naturally occurring inorganic nanoparticles, including an assessment of their sources and sinks, as well as their fluxes between various Earth compartments (atmosphere, continents, continental shelves, and open oceans). In addition, these kinds of budgets provide a basis for fundamental understanding such as residence and transfer times between compartments. Specific findings include the following: 1) the primary producer of Earth's inorganic nanoparticles is soil through terrestrial weathering processes. 2) Rivers, and to a lesser extent glaciers, bring 0.1% to 0.01% of the Earth's continental nanomaterial reservoir to the continental edge/ocean margins each year. 3) Only about 1.5% of this material makes it to the deep oceans due to aggregation and settling in saline ocean margins; and 4) the airborne and waterborne inputs of nanominerals and mineral nanoparticles to the open oceans are very similar. These kinds of results, along with a much better understanding of the characteristics of naturally occurring inorganic nanoparticles via direct observation in the field coupled with laboratory studies, provide a useful foundation upon which to predict the behavior and fate of manufactured nanoparticles, many of which are very similar to naturally occurring varieties. Even when specific correlations between naturally occurring and manufactured nanoparticles cannot be made, important clues in manufactured nanoparticle behavior in complex environments can be obtain by observing natural systems.

Random Acts of Material Toxicity: Molecular Basis, Challenges and Solutions

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Nanomedicine encompasses enabling technologies to achieve and facilitate earlier and more precise disease diagnosis, effective targeted therapies (eliminating side effects), better therapy and monitoring. Can Nanomedicine be personalized for prognosis, diagnosis and drug treatment? At large and from a high risk–high gain perspective, this requires a heroic integration of multifaceted health nanotechnology platforms with genomics and epigenomics knowledge together with computational approaches. But how and where do we start? Immunological reactions to man-made nanomaterials and nanomedicines are particularly notable. Provisions in innate immunity gene profiling for nanomedicine risk assessment and safety may serve a good starting point, and forms the centre of this discussion.

Research Strategies for Safety evaluation of Nanomaterials

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As a growing and widely applied science, nanotechnology has a global socioeconomic value. On one hand, the Engineered Nanoparticles (NPs) provide unprecedented technical capabilities which enable them to perform absolutely novel tasks in technology and science. Unfortunately, on the other hand, just the same new qualities can concurrently undesired intrinsic features, which sometimes lead to harmful interactions with exposed organisms. Workers in all countries face new risks from manufacturing applications nanometer-scale atomic structures known as nanomaterials. The outstanding features of nanomaterials are: Size, Surface, Adsorption and Reactivity. Nanoscale: Size range typically between 1 nm and 100 nm.

At the moment it is unclear whether the benefits of nanotech outweigh the risks associated with environmental release and exposure to nanoparticles. We need to develop and design experiments very differently to determine, how nanoparticles behave compared to traditional environmental pollutants.

Similar to technologically based research, in safety research we also need a shift away from pure fundamental research to a new direction which facilitates the implementation of results in risk-oriented and comprehensive assessments (or recommended actions) and the covering of the relevant toxicological endpoints. Agencies like OECD, US-EPA, NIOSH also working to establish safety perameters for nanomaterials and trying to develop internationally harmonised methods and strategies.

On the basis of these considerations the present talk will deal with the Research strategies to

evaluate the toxic potential of Nanomaterials

Biotic and Abiotic Stress: Different Changes on Energy Profile of Human Epidermal Keratinocyte Cells

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SiO2 one of the most interested nanoparticles, use in the study of nanomaterial safety. Monodispersity is the most important factor considered in nanoparticle's toxicity. Human epidermal keratinocyte cells are one of the defense blocks of body against aggressive agents such as pathogens and xenobiotic materials. Presence of these agents in the cells can effect on cell proteome and alter the energy profiles of them. Proteins and their fold changes under nanoparticles and virus treatments were extracted from references. Protein sequences were extracted from NCBI database (www.ncbi.nlm.nih.gov). Numbers of amino acids in each sequence had calculated with CLC Main Workbench V. 6.6.2. Amino acid costs (ATP). Finally, the protein folding multiplied in numbers of ATP. Protein networks had constructed based on string database (www.string-db.org). Our data suggested that most energy reduction happened under the cell treatment of micro scale, 15 nm and 30 nm materials, respectively. Nanoparticles decrease energy profile of keratinocyte cells, while biotic stress shows increments. Abiotic stress could severe effect on energy production pathways and decrease the energy source of cells. But biotic stress had lesser effects on energy production pathways. Numbers of proteins that change its expression folding under abiotic stress was lesser than biotic stress. It seems cells energy decrease in abiotic stress was the important factors in cell death. Position in network and protein cost was another factor that important at alteration of energy profile of cells.

Nanoscience and Nanotechnology: Environmental and Human Health Implications

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This is a review on the current understanding of Nanotechnology and knowledge gaps in relation to environmental and human health implications. I will review key aspects of nano-toxicology and transformation of nano materials in the environment with a focus on analytical difficulties for environmental samples.

Colloidal Silver Nanoparticles: a Hazardous Threat to the Aquatic Environment

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Nanomaterials can release into the aquatic environment from emerging consumer nanoproducts. Nanoscale silver (nAg) is the most nanomaterial used in consumer products. In the present study acute aquatic toxicity of a colloidal form of silver nanoparticles, which is one of the most productive nanomaterials in Iran, was investigated in two fish, an amphibian and a crustacean species in accordance with OECD guidelines for the testing of chemicals. According to the results, the 96h median lethal concentrations (LC50) of mentioned colloid to larval Rainbow trout (Oncorhynchus mykiss) and juvenile zebra fish (Danio rerio) were 0.71±0.16 and 0.014±0.001 mg/L respectively; also the 48h LC50 of this chemical to the marsh frog tadpoles (Rana ridibunda) was 0.055±0.004 mg/L; In addition the 48h median effective concentration (EC50) of this material to the water flea neonates (Daphnia magna) was 0.002 mg/L. According to the present results, this colloidal silver nanoparticles should be classified according to EEC (European Economic Community) as "very toxic" and also according to GHS (Globally Harmonized System) of classification and labeling of chemicals as "category acute 1" to tested aquatic organisms. Since colloidal silver nanoparticles can be dangerous to aquatic organisms, inhibiting the accidental or intentional entrance of colloidal nanosilver into the aquatic ecosystems should be carefully considered. New methods also are needed to develop for preventing release of nAg from consumer products as well as treatment of the wastewater containing nanomaterials before entering to the environment.

Nanomaterials Monitoring a Solution for Safety and Environmental Health

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Today, significant portion of Iran's research potency focused on nanotechnology due to its importance, versatile potentials and functions. Therefore considerable successes have been achieved. Nanotechnology is so extensively investigated that many groups composed of even school students' function in this area. On the other hand, safety in this field also attracted so much attention of scientific society. However, it should be considered that safety instructions must be implemented in laboratories and industries seriously and also safety culture should be promoted in the public. But about these two recent subjects, there are serious weaknesses. Research Institute of Applied Sciences, as an organization working in the field of nanotechnology, has been faced with them. This institute presents operational solutions to solve this problem in the framework of definition of strategy in monitoring nanomaterials. The necessity of strategy definition for monitoring nanomaterials from production and import origins to final consumer, disposal of their waste, regulation of specifications profile and necessary permissions will be discussed in this paper. Also the importance of comprehensive roadmap development for reducing health and safety hazards and environmental damage caused by excessive, unnecessary and lawless usage of nanomaterials will be investigated.

Synthesis of Chitosan Nanoparticle as Potential Environmental Health for Biomedical Applications

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Chitosan is a linear polysaccharide composed of 2-amino-2-deoxy-d-glucan. In terms of frequency, availability, cheapness and specially because of being among polysaccharides that have Nitrogen-containing functional group, chitosan is considered to be unique. Chitosan was modified to nano-chitosan by an ionic-gelation method with ammonium heptamolybdate. 0.5 g chitosan was dissolved in 2% acetic acid solution under constant magnetic stirring at room temperature and drop wise 5 ml ammonium heptamolybdate tetrahydrate with the concentration of 2 g/l to 50 ml of chitosan solution. The chitosan NP was obtained by centrifugation at 16,000 rpm after dried with dried CO2 for 30 min. For food, pharmaceutical, medical and agricultural applications, nono toxicity and biocompatibility of materials are also required. To respond to the growing public health and environment awareness, the material should be biodegradable, and prove economical and inexpensive. Chitosan is biocompatible, biodegrading to harmless products and nontoxic; it shows physiological inertness and remarkable affinity for proteins, hemostatic, fingistatic, antitumoral and anticholesteremic. It is also eco-friendly and safe for humans and the natural environment.

Designing Nano-Shields for Occupational Health and Safety for Nuclear Laboratories Users

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We attempted to design shields of nano-particles made from this kind of nano-particles. of course, in designing these materials, made according to this technology, we must pay attention to features such as reducing weight and increasing inflexibility that it to prepare them for producing neutron shield suite for laboratory users, patients under exposure etc. according to the importance of safety for nuclear users, we have tried to design and simulate nano-shields for increasing safety for nuclear centers laboratories users. In this study 20 shielding layers were designed and located one by one at a distance of 20cm from a neutron source, by using MCNP4c code. All of the layers had 100*100*5 mm dimensions, and composed of Poly Vinyl Chloride (PVC), Di Octyl Phthalate (DOP) and a neutron absorber (B4C and Cd). The neutron absorber material used in the layer that was designed to be the spheres with the radius 60, 80, 100, 200, 300, 400, 500 and 600 nm respectively, which were distributed uniformly in the shielding layer. The obtained results showed that B4C is best neutron absorption in comparison to the other nano-particles. The results showed that the out flux decreased when neutron shield was used from B4C with the radius 100 nm.

Effect of Biodegradable Nanocomposites in Reduce of Pharmaceutical Wastes

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Researches in nanotechnology has expanded dramatically during the past decade and intensified recently due to medical researches that attempt to provide new therapeutic methods based on nanotechnology principles aiming help the lives and healthiness of human being. Potential of nanotechnology to penetrate the frontiers of knowledge in most areas of science is extremely attractive. In this situation, it is possible that this technology because of the rapid growth and expansion, diversification and leveraging different conditions including social, economic, security and human health, will increase the ethical and legal effects of medical interventions; so that these can lead to severe conflicts. Therefore, it appears that addressing various aspects of ethical issues in nanotechnology and its related researches is very important. It seems that till now, no sufficient and complete studies about exposure to nanomaterial and their gradual accumulation in the body have been conducted and evaluation about emerging biological responses has not been implemented. On the other hand, still many unknown particles realize the great need for research in this field. Therefore, it is essential that all ethical precautions for using nanomaterial should be considered. The four basic principles of medical ethics which will be mentioned below are adaptable to general ethical principles, regardless of cultural differences and different nationalities and so on. In this paper we present an ethical discussion of important issues and recent achievements in the field of nano-medicine including Nano Drug Delivery and Nanobotes according to four basic principles of medical ethics: Respect for autonomy, Beneficence, Non-Maleficence and Justice, and finally, coordination and approval of or opposition between them is expressed.

SbCl5-SiO2: Safety and Eco-Friendly NanoCatalyst for the Green Synthesis of Quinoxalines

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Due to the growing concern for the adverse influence of the organic solvents on the environment, solvent-free organic reactions have attracted the attention of chemists. Green chemistry as applied to chemical processes can be considered as a series of reductions (energy, auxiliaries, waste, etc.) and should always lead to the simplification of the process in terms of the number of chemicals and steps involved. The use of inorganic solid acids as heterogeneous catalyst have received considerable importance in organic green synthesis because of their ease of handling, enhanced reaction rates, high selectivity and easy separation of the products that such processes permitting the recycling and reuse of catalyst with operational and economical advantages. The quinoxaline core is presented in many drugs with anti tumor, anticancer, antiamoebic, anticonvulsant, antimalarial, anti inflammatory–antioxidant and antiprotozoal activity. In continuation of our investigation on application of solid acids in organic green synthesis, we have used nano SbCl5.SiO2 for the green synthesis of quinoxalines by condensation of benzil with o-phenylenediamine under solvent-free conditions. The use of nano SbCl5.SiO2, with high surface area and uniform pore size, as heterogeneous acid catalyst may be appropriate for the green synthesis of quinoxalines in good to excellent yields. The effect of solvent, molar ratio of reactants, amount of catalyst, reaction temperature and time were investigated.

Simultaneous Comparing of Silver Nano Particles with Hopcalite Absorbent for Sampling and Determination of Mercury Vapors in Air

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Mercury is the one of the most toxic metals that damages the nervous system and kidneys. The high vapor pressure of mercury combined with the potential toxicity makes good control measures necessary to avoid exposure in human and workplace air. A novel sorbent based on silver nano particles (SNP) were synthesized for sampling and determination of mercury vapors in workplace air. This sorbent compared with hopcalite absorbent (HS) in NIOSH 6009. In bench scale set up, mercury gas generated and carried out under flowing argon gas (0.2 L min-1, 99.98%) from the air simulation system (ASS) and then pass through SNP (0.02 mg) and HS as a sampling adsorbents. Mercury vapor was desorbed from SNP by electric heater at 212oC and determined by cold vapor atomic absorption spectrometry (CVAAS). In the presence of O2 and H2O, results indicated that about 97% of the Hg0 could be sampled by SNP for 1 mg /m3 Hg0 at 25oC. The results of SEM, XRD and TEM showed that the SNP adsorbent have beneficial surfaces for sampling of Hg0. Pre-concentration factor (PE) and limit of detection(LOD) were 165 and 1ngL-1 respectively. In the present work, SNP adsorbent have synthesized and used as adsorbent for sampling and pre-concentration mercury vapor from ASS. The sampling efficiency for

SNP and HS sorbents were 97.4% and 66% respectively. The SNP sorbent was used many times (35) for sampling with high precision and accuracy (%RSD=5%). Validation of methodology was confirmed using MC3000.

Increasing Researchers' Safty during Production of Nanoparticles with Biosynthesis of Iron Oxide Nanoparticles

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Not only physical and chemical nanoparticles production methods create environmental pollution but also are dangerous for researchers who are producing nanoparticles. Iron oxide nanoparticles are one example of useful nanoparticles which are used in medicine especially in cancerous tumors treatment with hyperthermia method and are used as contrast factor in MRI. Fungi are extremely good candidates in the synthesis of metal nanoparticles because of their ability to secrete large amounts of enzymes.The aim of this study was biosynthesis of iron oxide nanoparticles by fusarium oxysporum in order to decrease the dangers of physical and chemical methods. At first, fungi was cultured in a specific medium then, was put in a special medium with iron compounds, four days later, the iron oxide nanoparticles production of this fungi was checked. XRD and UV-Visible spectrophotometry methods were used to check nanoparticles production and their features. The nanoparticles size was 28 nanometers. As a result, this biologic method has the potential to replace chemical and physical nanoparticles production methods.

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Application of Project Management Knowledge Tools for Biosafty Management of Emerging Research Projects Products

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There are significant concerns about Environmental, Health, and Safety (EHS) risks posed by nanomaterials including potentially harmful effects on water, atmosphere, beneficial soil microbes and the digestive systems of earthworms – essential engineers in maintaining soil. In this study we highlighted the facilitative role of system approach and project management knowledge to achieve effective approach for reducing the burden of potential biosafety hazards of engineered nanomaterials. According to system approach, the project planning methods and PMBOK standard, we used a combination of Logical Frame Approach (LFA) and different types of Work Breakdown Structure (WBS), as a method for defining and planning of nanotechnology related research project entitled "Magnetic Nano-Matrices for Biological products Purification." The results showed the efficacy of systematic and process-model-based project defining and planning of nanotech research projects results. In LFA structure the need of preferred recipe for each nanomaterial waste management was highlighted as a main output. This preferred recipe can be used as a useful strategy to reduce the impacts of EHS risks regarding research projects on emerging technologies. For the first time we suggested a nanomaterial synthesis recipe should be delivered as an output in all the nanotechnology projects. The authors achieved to this risk management frame work with the help of LFA tool. This show how project management knowledge tools can potentially provide a path to comprehensive determine all research project outputs especially those that are needed to reduce uncertainties with respect to the potential EHS effects of nanomaterials.

Four Principles Approach to Ethics of Nanotechnology in Medicine (Nanomedicine)

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There is a growing interest in utilizing renewable resources as a functional biopolymer in a broad range of scientific areas such as pharmaceutical, biomedical, agricultural, food, cosmetics, wastewater management and environmental field. Recent developments indicate a great increase in the publication of use biodegradable nanocomposites in decrease of waste pharmaceutical product. There are also used as an environment friendly plastic, although their market is still limited due to its higher cost and slow degradation rate as compared to the waste accumulation rate. One of the most important biodegradable nanocomposites used in pharmaceutical industry is poly (lactic acid)/silica nanocomposite. In this work, the mechanical and biodegradable properties of the poly (lactic acid)/silica nanocomposite and blending of starch / ploy (lactic acid) composites were examined. According to obtained result, degradation of nanocomposite pharmaceutical packaging in soil burier is faster than starch / ploy (lactic acid) composites. Furthermore, the rate of degradation is determined in enzymatic condition that shown nanocomposite is efficient significantly in reduce pharmaceutical wastes.

Acute toxicity of Colloidal Silver Nanoparticles in Aphanius dispar

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Rising trend of production and use of nanoparticles has increased the possibility of their release into the aquatic environments. Therefore, knowing toxic effects of these materials on aquatic organisms is of great importance. The objective of this research was to study the acute toxicity of colloidal silver nanoparticles (CAgNPs) through determining the lethal concentrations in the euryhaline teleost, Aphanius dispar. Toxicology experiments were conducted for 96h in freshwater according to the OCED 203 standard protocol. Fish mortality was recorded every 24h after exposure to different concentrations of CAgNPs and then the data were analyzed using the US EPA Probit analysis program. Based on the results, the estimated 96h LC50 of CAgNPs was 59.876 mg/L. Accordingly, the tested CAgNPs should be classified according to GHS (Globally Harmonized System of Classification and Labeling of Chemicals) as “category acute 3” for Aphanius dispar; this means that presence of CAgNPs in the environment of this fish is detrimental and therefore its release into the aquatic ecosystem should be carefully considered. Keywords: Colloid, Silver nanoparticles, Nano-Ecotoxicology, Aphanius, Lethal concentration.

Estimation of the Stiffness Reduction of Defective Carbon Nanotubes

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The existence of defects in the structure of carbon nanotubes, if not properly considered, results in lower properties of the structure which can in turn lead to serious reduction of the safety of the nanostructure in biological applications. These defects include atom vacancies, stone-wales defect, as well as doping of foreign atoms to the structure of carbon nanotubes. This paper studies the methods for simulating these defects computationally, using the finite element method and characterizing the influence of different extents of these specific defects on the properties of single-walled carbon nanotubes. For that, perfect structures were created and characterized and then the defects were introduced randomly to the structures. The elastic properties of the defective structures were obtained and compared with the ideal structure. The results show that the existence of any kind of the mentioned imperfection in the structure of carbon nanotubes lowers the structure's properties significantly and makes it more vulnerable. Furthermore, this study provides for the first time a good estimate of the influence of the defects involved with carbon nanotubes, which may have safety implications, on their structural properties that has advanced application in production of advanced nanocomposites, carbon nanotube-reinforced materials, as well as nano-bio-applications such as being used as a scaffold fiber or for drug delivery systems.

Effects of toxicity of Zinc Oxide Nanoparticles on Sugarcane Stay Alive in the Mini-Bioreactor Periodic

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Today nanotechnology is rapidly developing and may significantly impact have on industry, society and the environment. Nanoparticles will inevitably interact with plants and these interactions such as uptake and accumulation in plant biomass will greatly affect their fate and transport in the environment. The goal of this project is to investigate the effect of toxic nano zinc oxide on micro propagation and stay alive of sugarcane. An experiment in a completely randomized design with four concentrations of nano zinc oxide (0, 25, 50, 100 ppb) in three replications was performed. Seedlings derived from lateral and terminal buds of sugarcane in vitro were cultured in the bioreactor. Nutrient medium MS containing 3 mg BAP and 0.2 mg NAA and 30 g of sucrose and nano zinc oxide in the form liquid for propagation in the bioreactor with immersion cycle of once every 8 hours for 10 minutes was used. The results showed that nano zinc oxide had negative effect on micro propagation factors of sugarcane including germination, fresh weight, dry weight and propagation rate and chlorophyll content of plants that is indicating photosynthesis of plant and stay alive of sugarcane reaches to zero in 100ppb concentration .Immersion 10 minutes per 8 hour attract more nanoparticles to the surface of leaves and toxicity in plant

Investigation of Nanosilver Deposition in Edible and Inedible Organs of Broillers Carcass

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Nanosilver is silver nanoparticle that shows antimicrobial activity against some Bacteria, Viruses, Protozoas and Fungi, so they are recommended by producers for managing pathogenic organism in human, animal and plants. An important feature of these administrations was using nanosilver in poultry industry. The producers recommend owners of broiller farms for oral, aerosols and contact usage of nanosilver 2 ppm to 40 ppm. As nanosilver like the other nano materials could be accumulated in the tissues and causes some problem for human, so in a clinical trails some of these broiler were studied for nanosilver residues detection in their edible and inedible organs. Samples collected from muscles of femur, breast, heart, Gizzard, also skin, liver, lung, kidney, spleen and rectal stool for analyzing nanosilver accumulation. The technique of examination were using MNSR which nuclear reactor bombarded the samples by neutrons and make active isotopes of nanosilver, so based on the duration of the irradiation and its half life the kind and amount of nanosilvers were reported as PPb. Regarding to the results, amounts of residues for muscles of femur, breast, heart, Gizzard, also skin, liver, lung, kidney, spleen and stool were 172.5, 168.5, 144.2, 132.5, 194.0, 185.0, 160.0, 147.8 and557.5 ppb respectively. In ANOVA ($p>0.05$) the residues of rectal stools were different with the others, but FDA doesn't permit any nanoparticls in the diets.

Investigation of Toxicity of Urea Coated Iron Oxide Nanorods in Contaminated Water on Cell Cycle and Invivo Study in Rat.

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Currently iron oxide nanostructures have many applications in drug delivery, imaging and also industrial filed such as solar thermal energy. In most cases, the used nanostructures are buried in well. Diffusion of nanoparticles through the well water causes them to become infected. It has adverse effect on human health and environment. The main objective of this study was in vitro effects of iron oxide nanorods on physiology cell life cycle and invivo effects of the nanorods on kidney and liver in rat. The urea coated iron oxide nanorods were synthesized by co-precipitation method. Transmission and scanning electron microscopy were used for determination of the size and shape of nanostructures. The cell viability of iron oxide nanorods and apoptosis were investigated by using MTT assay and flow cytometry respectively. The serum iron of rat was measured 24 hr after injection of iron oxide nanorods (560μg/ml/kg) via tail vein. Pathological studies on liver and kidney was carried out by light microscopy, after tissue processing steps and standard Prussian blue staining. The results show the mentioned nanorods cause death of cells. According to flow cytometry, cellular granulity was increased and size of the cells was reduced. Therefore apoptosis was induced by nanorods. It was not observed any changes on cell cycle phases affected by nanorods remarkably. Iron levels in blood serum were increased after 24 hr compared to the control. Pathological studies did not show deposition of iron on kidney and liver of rat. It seems, low doses of nanorods are safer compared to high doses.

Physiological Responses of Rainbow Catfish (Pangasius Hypophthalmus) Fed on Dietary Nucleotide Exposed to Silver Nanoparticles

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Silver nanoparticles (AgNPs) have wide applications in various industries including fisheries and aquaculture because of the antimicrobial activity. The waste water of these industries is entered to the aquatic ecosystem and could cause stress in aquatics. Nucleotides are intracellular low molecular weight compounds that can avoid negative effects of stress. The aim of this study was to evaluate the physiological responses of rainbow catfish fed on nucleotide against stress caused by AgNPs. 20 individual catfish (average size 12 g), fed on 0.75 nucleotide for 10 weeks were selected and half of them were exposed to 20 μg/L AgNPs (average hydrodynamic diameter 54.8 nm) under constant-renewal condition for 10 days. The rest were kept under the same condition without any exposure to AgNPs as control. At the end of first and tenth days of exposure, blood samples were taken and some primary hematological parameters were evaluated. In both sampling times, there were no significant differences in red blood cell counts (RBC), hematocrite and hemoglobin between groups ($P>0.05$). At tenth day, significant reductions in hemoglobin and hematocrite were observed in fish treated with AgNPs in comparison to day 1 ($P<0.05$), although, there were no significant reduction in RBC ($P>0.05$). Significant reduction in some hematological parameters after 10 days exposure may reflect stress induction of AgNPs in the catfish, there is no sign of ability of nucleotide to deal with the stress.

Phytotoxicity Effects of Nanosized SiO2 on Pear Plant

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The objective of the this research was to compare nanosized SiO2 at different concentrations such as 10, 100, 500 and 1000 mg L1 for evaluation of phytotoxic effects on pear seedling in early growth stage. Biomass allocation, growth and physiological and biochemical parameters were surveyed as index. During the experiment period, gas exchange parameters were not affected by SiO2 NPs. After 14 d of irrigation with the nanoparticles, xylem water potential and relative water content negatively affected while, leaf membrane stability very slightly increased with adding the nano particles. Any significant increase or decrease in the biomass allocation and root length of pear plants was not observed in different concentrations of SiO2 NPs comparing to control. Increased SiO2 NPs levels caused an increase in peroxidase and catalase activity. Although the performed experiments did not show any acute toxic effects of adding of SiO2 in irrigation to pear plant, the finding should be confirmed with other experiments with longer duration and high exposure concentrations before a final conclusion in this issue can be made.

Proteomics Study of Oxidative Pathway Response to Silver Nanoparticles in Bacillus thuringiensis

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One of the best ways of understanding the AgNPs-bacteria interaction mechanisms is studying protein expression under the treatment. The proteins expression variation, which is also control some reactions such as oxidative stress, cell wall and DNA/RNA direct damage, can provide evidence to confirm or reject the hypothesized mechanisms. To study the hypothetical AgNPs-bacteria interaction, the action of colloidal AgNPs against Bacillus thuringiensis (isolate from Oryza sativa L. rhizosphere) was investigated by a proteomic approach (2-DE and NanoLC/FT-ICR MS identification). Responsive (up/down regulated) proteins were identified. Cellular detoxification enzymes involved in response to ROS or metal casual toxicities are one of the expression modification proteins. The expression pattern of oxidative pathway proteins including superoxide dismutase, thiol peroxidase, Alkylhydroperoxide reductase and universal stress protein were studied. AgNPs stress can accelerate production and detoxification of ROS determining factor of oxidative stress and cell damage. The sulfur containing functional group of proteins such as thiol peroxidase will have a greater ability to interact and trap AgNPs. Proteome results showed an expression increased in metal detoxification enzyme. The enhanced expression of ferric uptake regulation protein implied an occurrence of silver toxicity in the ionic or nano form, in which the metal binding enzymes cannot be regularly worked. The increment of peroxidase and detoxification enzymes implies a toxic impact of the production of ROSs and metal toxicity in the presence of AgNPs.

Toxicity of TiO2 Nanoparticles in Daphnia Magna: Non Toxic in the Short Term, Versus Toxic in the Long Term

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Following use, nanomaterials may be released to the natural environment and distributed to various environmental components. They may affect a variety of organisms including aquatics, which illustrates the importance of aquatic nanotoxicology studies. Currently the most produced engineered nanomaterial is TiO2 with up to 10,000 tons of worldwide production. The aim of the present work was to study the toxicity of dispersed TiO2 nanoparticles (nTiO2) in an aquatic planktonic crustacean, Daphnia magna. Acute (48 hour) and chronic (21 day) toxicology tests were conducted in accordance to the OCED standard guidelines. According to the results of short term experiments, although the nTiO2 particles were highly ingested by the D. magna and accumulated under the carapace and on the external body surfaces, but these particles was non lethal to Daphnia, even up to a concentration of 200 mg/L. Thus it was not possible to estimate the 48h LC50 (median lethal concentration). However, according to the results of long term studies, nTiO2 (at tested concentrations of 25, 50, and 100 mg/L) have toxic effects to Daphnia such as increased mortality, growth retardation, and reduce the number of offspring. In general, the results show the importance of test duration in nano-ecotoxicology studies, especially in the case of nanomaterials such as nTiO2 which don't show their toxicity in short term.

Biocompatibility and Cytotoxicity of Novel Amino-Alkanoic Acid Coated Super-Para Magnetic Nanoparticles

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Super-paramagnetic nanoparticles (SPIONs), applied in drug delivery studies, are generally comprised of a magnetite core which might be coated with biocompatible molecule. One of the important characteristics of the synthesized SPIONs is their toxicity that strongly depends on the chemistry, concentration and the proposed pharmaceutical application for the target SPIONs. In our previous studies, amino acid coated SPIONs were synthesized and evaluated for their biocompatibility and toxicity. In this work, some amino-alkanoic acids were basically synthesized and coated on magnetic core to characterize in vitro and in vivo behavior of the obtained amino-alkanoic acids coated SPIONs (NPLs) at therapeutic doses comparing to the preliminary naked SPIONs. The introduced NPLs might improve gene and drug delivery, due to their physical properties which support biosafety. Therefore, in vitro cytotoxicity effects of the obtained NPLs were analyzed conducting MTT assay on a human hepatocellular carcinoma cell line (HepG2). The cell culture results showed that NPLs did not only have toxic effect on HepG2 cell but also stimulate their growth. Hence, All NPLs were nontoxic to HepG2. In addition, NPLs did not affect the surface phenotype or morphology of HepG2. Then the most biocompatible NPL on HepG2 cell line was selected. The results demonstrate that NPLs are fully biocompatible and could be useful tools for human cell labeling, bio-imaging and drug delivery.

Effects of Silver Nanoparticles on the Carcass Characteristics, Some of Hematological Parameters and Antioxidant Enzyme Activities in Laying Japanese Quails

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Silver nanoparticles are emerging as one of the fastest growing product categories in the nanotechnology industry with focus on antibacterial, antifungal and Antivirus activity. This study was conducted to investigate whether the silver nanoparticles would influence the carcass characteristics, some of hematological parameters and antioxidant enzyme activities in laying quail. A total of 60 female quail were randomly divided into 20 experimental cages, three birds in each cage and each treatment was offered to 5 replicates at random, and treatments included 0, 12, 36 and 108 ppm of silver nanoparticles in drinking water from one-day old to 13 weeks age. The results showed that the relative liver weight was decreased in treatments receiving 36 and 108 ppm of silver nanoparticles ($p<0.05$) and other carcass characteristics have not been affected ($p>0.05$). The liver enzyme aspartate aminotransferase has been increased dramatically in 108 ppm treatment compared with other treatments and control ($p<0.01$). Total antioxidant capacity, malondialdehyde formation in liver and serum were significantly increased in two treatments: 36 and 108 ppm, ($p<0.05$). Base of these results, Silver nanoparticles causes disorders of liver and increases induction of stress oxidative in laying Japanese quails.

In Vitro Cytotoxicity of Cross-Linked Chitosan Mat Containing Semellil Extract as a Wound Dressing: Effect of Crosslinkers Utilized

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Chitosan-based electrospun mats loaded with Semellil extract, have a good potential for wound dressing application, because of excellent properties of chitosan and using the Semellil extract, a new phytotherapeutic drug. Due to potential toxic effects of common crosslinking reagent, glutaraldehyde, it is desirable to provide a crosslinker agent with low toxicity. In the present study, a naturally occurring crosslinking agent (genipin), which has been used in herbal medicine and in the fabrication of food dyes, was used to crosslink the Semellil-loaded chitosan nanofibers. The genipin-cross-linked chitosan mats, were compared with the glutaraldehyde-cross-linked nanofibers, in terms of, in vitro cytotoxicity, swelling and degradation rate properties. The results of tripan-blue staining show that genipin-cross-linked-mats had a significantly less cytotoxicity than the mats used glutaraldehyde. Moreover, it was found that the genipin-cross-linked chitosan nanofibers have a decreased swelling ratio and slower degradation rate. In conclusion, crosslinking by genipin can improve biocompatibility of the dermal patch and also, its lower degradation may be caused to sustained release of drug from nanofibers.

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Modulation of Cytotoxicity of Different PAMAM Dendrimer-Cholesterol Micellar Nanoparticles Following Incorporation into Stealth Liposomes

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Stealth (PEGylated) liposomes is characterized by a very long-circulation half-life, favorable pharmacokinetic behavior and lower toxicity. A novel nanosystem called dendrosome was developed for drug/gene delivery applications based on incorporation of the micellar nanoparticles of cholesterol-PAMAM conjugates into Stealth liposome structure. The cytotoxicity of conjugates before and after insertion into the liposomes was assayed. Cholesterol conjugations of different generations of PAMAM dendrimer (G1, G2, and G3) were synthesized. Micellar-dispersion was prepared by probe-sonication and critical micelle concentration (CMC) was determined by pyrene-assay. Nanoliposomes were prepared by thin-layer hydration and extrusion method. Lipid-mixing was studied by mixing micelles with fluorescent-liposomes. Particle size of dendrosomes was determined by particle size analyser. MTT-assay was performed to study the effect of lipophilic conjugation on cytotoxicity of PAMAM (G1, G2, and G3) in HepG2 cell-line. Furthermore, the effect of conjugates incorporation into Stealth liposome was studied for dendrosomes prepared at different amine/Lipid mole ratio. Cholesterol-PAMAM conjugates were successfully synthesized according to TNBS-assay and 1H-NMR results. Conjugates formed micelles which CMC was 10-50μg/ml. They incorporated into the liposomal structures which extent was dependent on micelle concentrations and PAMAM-generations. The average size of dendrosomes was about 140nm. The cytotoxicity of PAMAM was potentiated following conjugation that depended on the generation of PAMAM. The cell viability was found higher for Cholesterol-G2. The cytotoxicity of the conjugates attenuated drastically after incorporation into the liposome at N/L ratios of 0.6 – 3.4. It was found negligible for G2-dendrosomes. It was concluded that Stealth liposomes can reduce cytotoxicity of the incorporated amphipathic nanoparticles.

In Vitro Cytotoxicity of PLGA-PMBH Nanoparticles Containing Anticancer Drugs]

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PLGA is a widely used polymer for fabricating 'nanoparticles' because of its suitable properties, and hence has been the centre of focus for developing drug-loaded nanoparticles for cancer therapy. The functions of Albumin that we expect, is to stealth NPs from white blood cell and lengthen the blood circulation timeA nano precipitation method was employed for the formation of drug encapsulated (PLGA–PMBH) NPs, then albumin was conjugated on the prepared NPs surface by maleimide attachment to sulfhydryl groups (cysteines) of albumin. The physicochemical properties of NPs like size, zeta potential, surface morphology, and invitro drug release, were studied. The goal of the present study was to produce high quality NPs copolymer PLGA decorated by albumin on its surface. The average diameters of the NPs ranged from 170 to 220 nm, zeta potential values was about -10. A biphasic release of Paclitaxel was observed for all colloidal suspensions, after a burst effect in which about 60% (w/w) of the loaded drug was released a sustained release profile for about 10 days was observed. The conjugation of albumin was evaluated by IR, and UV. At the highest surface coverage, BSA is calculated to essentially cover the NP surface area. As can be seen the cytotoxicity of PLGA-HSA-PTX NPs was significantly higher than that of free PTX and PLGA-PTXNPs. Moreover, PLGA-PTX NPs have significantly more cytotoxice effect than PTX.

Antitoxic Effect of Mgo Nanoparticles against Chlorpyrifos in Human Lymphocytes in Vitro

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Chlorpyrifos (CP) is a broad-spectrum, chlorinated organophosphorus insecticide. Production of reactive oxygen species (ROS) and induction of oxidative stress is a major mechanism of toxicity of CP. In the current study, the anti oxidative role of MgO nanoparticles was examined in the CP-treated human lymphocytes. Methods: We evaluated the viability of cells and their ability to produce myeloperoxidase (MPO), lipid peroxidation (LPO), total antioxidant potential (TAP) in the lymphocytes exposed to logarithmic doses of MgO nanoparticles (0/1, 1, 10, 100 μg/ml) in the presence of CP, after 3-day incubation period. Result: Our results indicate a meaningful reduction in the mortality and the levels of MPO and LPO by use of MgO nanoparticles. Furthermore, the results show a significant increase in the levels of TAP in the human lymphocytes. MgO nanoparticles at concentration of 100μg/ml induced an impressive increase in TAP in the lymphocytes. Conclusion: In conclusion, results confirm protective and positive effects of MgO nanoparticles in prevention of CP-induced toxicity in the lymphocytes.

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Carbon Nanotubes Noxicological Effects on Respiratory System

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Carbon nanotubes draw many scientists attention because of their huge potential of industrial applications. However, there is little information available concerning the toxicological properties of this material. Despite of Nanoparticles' remarkable role in toxicity, which is highly important for toxicologists, specifically in respiratory diseases, knowledge of the toxicity's effects is confined. Lung toxicity will occur at high doses of single or multiple-wall carbons, but low dose causes inflammation in the lungs. CNTs have recently been explored as an important drug delivery system and are considered for use in numerous technological applications. It is recommended that the issue regarding toxicity of CNTs (both single and multiple-wall) be resolved on priority before taking up any venture in the pharmaceutical and medical fields. The MTT test indicated a diminution of cellular viability in response to carbon nanotubes as soon as 24 hours after the beginning of the experiment, for the highest concentrations (50 and100 microg/ml) SWCNTs have a diameter ranging from 0.7 to 1.5 nm. Intratracheal instillation of SWCNTs in the lungs of rats resulted in the formation of lung granulomas and produced mortality in 15% of instilled rats within 24 hours post installation due to the enhanced blockage of the large airways.

Cell Toxicity of Naked and Polymer-Coated Iron Oxide Nanoparticles

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Superparamagnetic iron oxide nanoparticles (SPIONs) have potential biomedical applications such as magnetic drug delivery and targeting, enhanced resolution magnetic resonance imaging, tissue repair, cell and tissue targeting. A coating layer can prevent the agglomeration of the particles, increase the circulation time, and provide biocompatibility. In the present study, the effects of nanoparticle size and coating on the magnetic properties and cell toxicity were studied. SPIONs were synthesized via a co-precipitation technique using ferrous salts with a Fe3+/Fe2+ mole ratio equal to 1.75. Poly (lactide-co-glycolide) (PLGA) has been used as the nanoparticle coating material, owing to its high biocompatibility. A double W/O/W emulsion method was used for preparation of polymer-coated SPIONs. MTT assay was used to investigate the cell biocompatibility/toxicity effects of the samples. The synthesized nanoparticles were characterized by various analytical techniques. TEM, SEM and PSA were used for size and morphology characterization. To quantitatively measure cell cytotoxicity, proliferation or viability of the particles, a simple MTT assay was used. The SPIONs exhibits superparamagetic behavior. SPIONs with the same amount of magnetic saturation can be achieved by controlling both the concentration of PLGA and particle size. Based on the SEM and TEM results, decreasing the PLGA concentration in organic phase favors significant decrease in PLGA-coated SPION nanoparticles. From the MTT assay results, it is observed that the biocompatibility of the nanoparticles, based on cell viabilities, can be enhanced by polymer coating. This causes growth of the particle hydrodynamic size and causes lower cell toxicity effects.

Changes Caused by the Toxic Effects of Nanoparticles on ALT and AST in Homeing Pigeon

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Nanotechnology is rapidly growing with nanoparticles produced and utilized in a wide range of commercial products throughout the world. These broad applications however, increase human exposure and thus the potential risk related to their short- and long-term toxicity. Pigeons as one of the most important biological indicators are used in toxicology studies. Many birds have bio diversity and presence in many pollution places, there is possible pollution with nanoparticle, like silver nanoparticle in their body. In the current study, the possible negative impact of nanosilver particles (Ag-NP) at two concentrations 75 and 150 ppm was evaluated for 14 days in homing pigeon (Columba livia). The concentrations of Ag-NP were fed by oral gavage to helping pigeons for three times in day. The results showed that silver nanoparticles increases dependent-concentration in biomarker blood levels including ALT and AST as a biomarker of liver necrosis. It can be concluded that activation increase in blood biomarkers such as ALT and AST in pigeon's blood serum, indicates lipid peroxidation and oxidative stress in hepatocytes cellular structure which causes inactivation and in most cases apoptosis in the liver tissue.

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Comparative Toxicity of SiO2 and SiC Nanoparticles in Healthy Adult Mice

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Various nanotoxicity research have been done on assessment of nanoparticles toxic effects, however few comparative investigations exist. Therefore, in this investigation, a comparative study was done in order to evaluate the oral toxicity of SiO2 and SiC nanoparticles. Twelve male Rats (Wistar), aged 6-8 weeks were divided into three groups with four mice in each group. The biochemical levels of 20 different serum parameters were assessed. Moreover, a small piece of Liver, kidney, lung, and testis was used for pathological experiments. In all mice exposed to nanoparticles, the serum albumin and total protein were significantly lower ($p<0.05$) than the control group, however the serum LDL and LDH showed increased levels ($p<0.05$). The Ca2+, Creatinine, and total Ca2+ were significantly lower than the control group in all mice treated with SiC NPs, however the serum AST represented increased levels. Furthermore, in all mice exposed to SiO2 nanoparticles, the serum Urea, HDL, and Cholesterol were statistically higher ($p <0.05$) than the SiC and control groups. The pathological lesions in the liver (cellular necrosis), lung (serous inflammation, severe hyperemia in alveoli), kidney (serous swelling in the renal glomeroulus, hydropic degeneration in epithelial cells, necrosis in renal cells, and distention of bowman) and testis (necrosis, congestion and decrease in spermatozoid cells) were found in all treated mice. According to our findings, exposure to SiO2 and SiC NPs can produce severe toxic effects on the biochemical system and different tissues, especially kidney, liver, and lung.

Cytotoxic Effect of Gold Nanoparticles on Epidermal Carcinoma Cell Line in Photodynamic Therapy

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Unique properties and biocompatibility of GNPs has been reported by many researchers. However, there are still some considerations about biocompatibility of GNPs. Researchers make use of cytotoxic effect of nanoparticles in some cancer treatment as an adjuvant. The goal of this study was to determine the optimum conditions for use of GNPs to enhance the efficacy of aminolevolenic acid (ALA) in photodynamic therapy. Colloidal Gold nanoparticles were synthesized by using chemical reduction method in 3 different sizes. Size, morphology and concentration of nanoparticles were studied by using TEM and UV-Vis spectroscopy. The cytotoxic effect of all nanoparticles with different concentrations on epidermal carcinoma (A437) cell line was studied by using MTT assay. The effect of different sizes and concentrations of GNPs on efficiency of PDT was studied with 5-ALA as a photo-synthesizer. The interaction of gold nanoparticles with cell culture moieties were investigated by using UV-Vis Spectroscopy. Results showed nanoparticle aggregation and signs of coating on nanoparticles due to cell culture moieties. Smaller nanoparticles exhibited higher phototoxicity and dark cytotoxicity in comparison with larger nanoparticles on human epithelial carcinoma cells. Simultaneous application of gold nanoparticles in ALA-PDT process lead to increasing efficiency of ALA drug and this effect was stronger in the case of smaller nanoparticles.

Cytotoxic Effects of Iron Oxide Nanoparticle on Human Umbilical Vein Endothelial Cells

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The extensive applications of nanomaterials in different branches of science have caused many concerns of their potential hazards for humans and animals. However, it is important to study the toxic effects of nanoparticles on biological system. Up to our knowledge, cytotoxicity of iron oxide nanoparticle with respect to human umbilical vein endothelial cell (HUVEC) remains unclear. Endothelial monolayer delicately balances regulatory pathways controlling thrombosis, cellular proliferation, inflammation, and oxidative stress. Atherosclerosis is known to be an inflammatory process that is associated with a dysfunctional vascular endothelium. In the present study here, we exposed several concentrations (1, 0.1, 0.01, 0.001 and 0.0001 g/l) of iron oxide nanoparticle on HUVEC for several time intervals and evaluated cytotoxic effects of iron oxide nanoparticle with respect to MTT assay and light microscopy. The results of this study showed 1 and 0.1 g/l of iron oxide nanoparticle inhibited cell proliferation. There are no cell proliferation significant changes in other concentrations of iron oxide nanoparticle. Iron oxide nanoparticle also induced cell shrinkage, cell blabbing and cell retraction in high concentrations. In conclusion, inhibition of cell proliferation of human umbilical vein endothelial cells by iron oxide nanoparticle is dose-dependent.

Cytotoxicity of Nanoparticles as a Benefit for Tumor Killing in Radiotherapy

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Toxicity of nanoparticles has been assessed in many different contexts: exposition of workers to uranium particles, lung uptake of combustion particles exhausted by vehicles, and more recently, the uptake of carbon nanotubes or bucky-balls at working places. The toxicity of nanoparticles is strongly related to the reaction of the immune system, especially to the uptake by macrophages and granulocytes. But the toxicity has an advantage for human being in the field of medicine: killing tumors. Accompaniment of radiation therapy with a high atomic number nanoparticle, Hydroxyapatite, and usage of coatings that can sensitize the cells to treatment, chitosan coatings, along with 2-Deoxy-D-Glucose, as a tumor cell glycolysis inhibitor, was used for increased ratio of tumor killing. According to the previous study on the synergistic effects of 2-Deoxy-D-Glucose in radiation therapy of T47D and SKBR3 breast cancer cell lines and thereby obtaining Sensitive Enhancement Ratio (SER) = D0 (D0 of irradiation group)/ (D0 of irradiation+2DG group) for T47D and SKBR3cell lines, 1.14 and 1.16, respectively, it can be anticipated some more increasing on SER following the combined nanoparticle treatment in our study. As a radiosensitizer, may increase the treatment ratio in cancer therapy and also by diminishing the side effects of single modality treatments due to decreased dosage of the modalities in the combined treatment. Using of toxic nanoparticles as a combined therapy in tumor treatment can have double faced affection on killing the tumor cells.

Dermal toxicity of Some Sanosilver Commercial Products of Iran's Market in Albino Rabbit

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Silver nanoparticles have come up as potent antimicrobial agent and are being evaluated in diverse medical applications ranging from silver based dressings to silver coated medical devices. We aimed in present study to test and compare the dermal toxicity of three different nanosilver containing disinfectants albino rat model and associate the findings with size and other physicochemical properties .According to the OECD 404 guideline, 3 commercial products which were already characterized in 3 different sizes were applied under the concentrations 50, 100, 1000, 2000 and 4000 via nanosilver skin patches on the shaved skin of young female albino rabbits. All skin reactions were recorded in 3 min, 1, 4, 24, 48 and 72 hours from application and compared with the control group. Although short term observations did not show any significant changes in weight of animals, clinical signs and macroscopic changes, but dose-dependent histopathological abnormalities were detectable in skin of all test groups. The toxicity manifestations were dry skin, scaling and erythema in different dose dependent scores. It seems that nanosilver has the potential to provide target organ toxicities in a dose- and time-dependent manner.

Effect of Zinc Nanoparticles on Arsenic-Induced Hepatotoxicity in Rats

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The aim of present study was to assess the effect of zinc nanoparticles on arsenic-induced hepatotoxicity in rats. Four groups of rats were used as group1: control; group2: sodium arsenite; group3: zinc nanoparticles; group4: sodium arsenite + zinc nanopraticles. Drugs were intrapritoneally administrated for 10 days. The serum of rats was collected and analyzed biochemically. Liver tissue was routinely processed for histopathological examination. Biochemical results showed significantly decrease of ALT, AST and ALK by zinc nanopraticles. Also histopathological study revealed improvement of hepatic changes by zinc nanoparticle. Thus zinc nanopraticles has protective effect on arsenic-induced hepatotoxicity probably by antioxidant action.

Evaluation of Cytotoxicity Effect of Nano Graphene-Oxide on Bacteria: Escherichia coli and Bacillus cereus

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Nanotechnology is having an impact on several aspects of our life and there is a rapidly growing list of benefits and applications of nanomaterials. Nano Graphene-Oxide (GO) is one of these great promising nanomaterials which can be used in antibacterial application area and based on literature, the mechanism of antibacterial activity mainly estimated to be oxidation and membrane-disrupting. Two bacteria, Escherichia coli and Bacillus cereus were purchased from Pasteur Institute of Iran. The disk diffusion antibiotic sensitivity testing performed and the Minimum inhibitory concentration (MIC) and the minimum bactericidal concentration (MBC) of the GO were measured after 6 hours incubation and compared with the MIC and the MBC of control antibiotics Ciprofloxacin and Tetracycline. Statistical Analysis was performed on the resulting data in Excel and SPSS programs. The loss of both bacteria viability progressively goes up with the increases of GO. For the Escherichia coli, viability percentages were 0, 0, 12, 19, 32 and 57 for 0, 15, 25, 50 and 75 and 100 mg/ml concentrations respectively. For the Bacillus cereus, viability percentages were 0, 0, 10, 15, 34 and 51 for 0, 15, 25, 50 and 75 and 100 mg/ml concentrations respectively. The potential of GO as a strong antibacterial agent was proved in this experiment. This great promise could be used in many application fields and technologies which have some advantages against regular antibiotics such as lower and easier produce, safer and not causing any resistance in bacteria.

Hepathotoxic Effect of Nanosilver in Broiler Chickens

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Silver nanoparticles can destroy bacteria, viruses and fungi; therefore, it is recommended as a disinfectant and can be used as a drug in the treatment of some non-curable viral disease in livestock. The aim of the present investigation was to study the effects of nanosilver induced toxicity on the liver of broiler chickens. This study was carried out on 240 one-day-old male broiler chickens (Ross 308) in a completely randomized design (CRD) in four treatments at 0 (control), 4, 8 and 12 ppm levels of silver nanoparticles that was added daily to the drinking water with four repetitions within 16 separate cages and 15 birds in each pen. At the end of the experiment (day 42), 32 chicks were randomly selected and slaughtered thereafter, H&E, terminal deoxynucleotidyl transferase dUTP nick end labeling (TUNEL) staining and light microscope was used to examine livers. Liver histopathology and H&E staining showed dose depended changes such as fatty degeneration, sinusoidal congestion, central vein dilatation, necrosis in hepatocytes and fibrosis. TUNEL staining showed significant ($p<0.01$) increase of apoptotic cells in groups 3 (8 ppm) and 4 (12 ppm). Data were statistically analyzed using ANOVA. Lesions and apoptotic cells in groups 3 (8 ppm) and 4 (12 ppm) were more severe than in group 2 (4ppm). It can be concluded that higher concentrations of nanosilver (8 and 12 ppm) can induce sever lesions in chickens liver.

In vitro toxicological Evaluation of Nanoparticles

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With the development of nanotechnology, its applications in various disciplines of science are also improve so that we can witness the widespread use of nanomaterials in medical and pharmaceutical fields. Nanomaterials are structures with at least one dimension of 100 nano meter or less. By reducing the size of particle until nano range, its properties will be changed. These changes can induce toxic effect on the environment. One of these environments is in vivo environment. Thus study of the toxic effects of nanomaterials is one of the most important issues which must be investigated before its application. In this review we try to investigate toxic effect of nanoparticles which are used in the body. At first, the experiments which could be useful to detect the toxic effects of nanoparticles are described. These experiments include testing for effects of nanoparticles on coagulation (prothrombin time (PT), activated partial thromboplastin time (APTT), plasma recalcification time (PRT), thrombelastograph parameters (TEG)), complement activation, platelet activation, red blood cell aggregation, hemolysis and whole blood viscosity measurements. Then the experiments that are used for cytotoxicity evaluations, such as MTT assay, reactive oxygen species (ROS) generation, LDH assay and neutral red uptake are reviewed.

Investigating the Effects of Particle Size and Chemical Structure on the Cytotoxicity and Bacteriostatic Potential of Nano Hydroxyapatite/Chitosan/Silica and Nano Hydroxyapatite/Chitosan/Silver; as a Substitute Bone Biomaterial

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The restoration of defective bone tissue and complications related to surgery and fracture site infection are major concerns in orthopedic surgeries whereas the development of osteoconductive and bacteriostatic composites are critically needed. CT/n-HAp powder containing of Ag and Si were prepared by an in-situ hybridization method. The aim of this work was to elucidate the effect of size, surface roughness and chemical structure of mentioned nanocomposites on cytotoxicity and bacteriostatic activity via osteoblast cells and Escherichia Coli, respectively. Particle size, surface roughness and bioactivity of nanocomposites were investigated by XRD, AFM and SEM, respectively. Bioactivity test was studied using bovine serum albumin. ROS production and bacterial colony counting test, MTT assay and LDH release were performed as bacteriostatic and biocompatibility tests. The results showed that CT/n-HAp/Ag with smaller particle size (10±0.09 nm) than CT/n-HAp/Si (18±0.14 nm) exhibits higher cell viability and bacteriostatic activity, lesser ROS production and LDH release from cell plasma membrane. According to these data, it might be supposed that smaller CT/n-HAp/Ag is well assimilated to human cells. Besides, the integration of Ag into the nanocomposite inhibits release of Ag+ and prevents cytotoxic potential on cells. Higher cytotoxic effect of CT/n-HAp/Si might be related to ROS production of the nanocomposite. In conclusion, the strong bone regeneration potential of CT/n-HAp and good biocompatibility and bacteriostatic activity of CT/n-HAp/Ag indicated that it can reduce the risk of infection in site of surgery and serve as potential bacteriostatic bone filler in site of infected bone fracture.

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Perturbation in Microtubules Dynamic Stability: A Possible Mechanism of Aunps Toxicity

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Implementation of Gold nanoparticles (AuNPs) is a two edge sword in different aspects of medicine including diagnosis and treatment. Understanding the mechanisms underlying the toxicity of AuNPs, could specify the exact areas of its applications in medicine. We were aimed to determine the effects of AuNPs on MTs (MTs) as a possible mechanism of its toxicity. Two neuroblastoma cell lines besides normal fibroblast cells and MTs which was purified from the brain of sheep were treated with various amounts and concentrations of prepared AuNPs. The effect of AuNPs treatment on MTs polymerization was tracked through UV-Vis spectrophotometer and electron microscopy. MTT assay and fluorescent detection of cells at cellular level was utilized to determine the toxicity of AuNPs on three examined cell lines. AuNPs induced death in more than 50% of all types of neural and fibroblast cells. Besides dose dependent toxicity of AuNPs on MTs polymerization, it was demonstrated that the addition of AuNPs in earlier stage of polymerization process was associated with more disruption in MTs assembly. It is proposed that AuNPs may interact directly with MTs via their opposite charges or indirectly through affecting MTs associated proteins (MAPs) or other proteins playing pivotal roles in MTs assembly. However, the same toxicity effect of AuNPs on both normal and cancer cells may be indicative of limited capability of using it in cancer therapy. More auxiliary investigations are warranted to uncover the exact mechanism of AuNPs toxicity on MTs

Severe Toxic Effects of ZnO Nanoparticles on Liver, Kidney and Lung

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Nanoparticles are defined as small objects that have at least one dimension in the range of 1-100 nm. Compared to particles in micro scale, nanomaterials due to their small size and large-specific surface area show different degrees of biological effects. Increasing numbers of studies demonstrated that many types of nanoparticles have toxic effects mainly on Liver, Kidneys, and Spleen tissues in this study; we extended previous studies to evaluate the oral toxicity of ZnO nanoparticles and their possible effects on different serum-elements and sexual hormones. The histopathological changes have been examined as well. Significant increase of Alanine Aminotransferase and Aspartate Aminotransferase activity in all mice exposed to ZnO nanoparticles mean that these nanoparticles can cause hepatic injury. Hepatocyte necrosis and other pathological observations also confirmed liver damage. Moreover, Glomeruli segmentation, hydropic degeneration in epithelial cells, necrosis of epithelial cells in tubules, and swelling in epithelial cells of proximal tubules were found in all kidney tissues which demonstrated that ZnO nanoparticles have severe toxicological effects on kidney. Serous inflammation, severe hyperemia in alveoli, and edema were observed as pathological findings in lung which prove that the lung is the third target tissue of the ZnO nanoparticles. Symptoms of vomiting, loss of appetite, severe lethargy demonstrate that ZnO nanoparticles have serious toxicological effects in vivo. The biochemical and pathological examinations more reveal that lung, liver, and kidney are target organs for these particles.

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Study of Cytotoxicity of Zinc Oxide Nanoparticle on Madin-Darby Canine Kidney Cells

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Zinc oxide nanoparticle is used in cosmetic products. Unfortunately, biological toxicity and safety of this nanoparticle remain unclear. Up to our knowledge, cytotoxicity effects of zinc oxide nanoparticle in Madin-Darby canine kidney cells (MDCK) remain unclear. In this investigation, we exposed several concentrations (10, 100, 200, 500 and 1000 nM) of zinc oxide nanoparticle on Madin-Darby canine kidney cells in several time intervals. Then, we analyzed cell proliferation abnormalities following zinc oxide nanoparticle exposure using colorimetric MTT assay. Moreover, microscopic changes in cell were investigated. The findings of this investigation demonstrated 200, 500 and 1000 nM concentrations of zinc oxide nanoparticle can induce cell proliferation inhibition. We also observed no cell proliferation significant abnormalities in low concentrations of zinc oxide nanoparticle. High concentrations of zinc oxide nanoparticle also induced cell damage including cell rounding and cell death. The findings presented in this paper demonstrated zinc oxide nanoparticle can inhibit cell proliferation of Madin-Darby canine kidney cells in high doses and damage cell wall. However, zinc oxide nanoparticle probably has renal toxicity in humans and animals.

Synthesis of Dicarboxylic-Functionalized Mesoporous Silica and Applying in Organic Dyes Removal

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Annually more than 700 million tons of dyes are used in the various industries for example the manufacturing of cosmetics, pharmaceuticals, and food and dyeing industries. Among the available dyes, using the reactive dyes in the flow of the textile industry has been identified as the most problematic compounds for the vita cycle due to their high reactivity and non-biodegradable. In this industry, 5-10% of the used dyes enter to the wastewater without the dye removal process. Of the developed techniques, the usage of the adsorption process is known as the most effective technique for remediation, because of its high efficiency and desirable rate. The use of mesoporous silica materials has been increased significantly as the adsorbent for the elimination of pollutants during recent years. In this research, the surface of hexagonal mesoporous material (HMS) was functionalized by a silane containing reactive anhydride groups according to the post method for the first time. The initial substrate and the modified adsorbent were characterized by XRD, BET, FTIR, TEM and SEM techniques. The synthesized adsorbent was exploited for the removal of malachite green (MG) as one of the most consumption dyes and the toxic compound that not be destruction by biological factors and exacerbated imbalances in the environment. According to the results, Freundlich model provides an accurate correlation with adsorption data. In addition, thermodynamic parameters confirmed the accomplished adsorption is an endothermic process. Finally, the kinetic studies are found to follow second-order rate equation and the effect of initial pH was also investigated.

A Safe Method in the Preparation Magnetite Nanoparticle for Medical Applications

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Currently, there are few magnetic materials used as magnetic micro and nanocarriers in biomedical and biotechnological applications. Iron oxide and especially magnetite (Fe3O4), are mostly used in such applications, either as a background material for magnetic. Magnetic nanoparticles in diluted aqueous suspensions are an important tool in medical diagnostics as contrast agent for magnetic resonance imaging (MRI).The presence of the particles at a given site can alter the contrast of certain types of cells by several orders of magnitude, making visible objects that were hitherto difficult to image. Some of other applications are hyperthermic treatment for malignant cells, site-specific drug delivery and also the recent research interest of manipulating cell membranes. Biomineralization involves the formation of inorganic materials under the influence of proteins, carbohydrates and lipids.The formation of magnetite (Fe3O4) particles by magnetotactic bacteria is one example of biomineralization process. In this study a new method was proposed for preparation of Fe3O4 from ferrous salt in aqueous solution and air as a cheap and safe oxidizing agent. The products are magnetite with various in particle size. In This new method the particle size distribution and morphologies of magnetite are similar to maganetosom formation (Fe3O4) in magnetotactic bacteria. Therefore this method is a safe method and the products are non toxicity. In this research, we compared properties of magnetites prepared here with magnetite nanocrystal that was applied in medical.The properties of products are characterized by X-ray powder diffraction, IR spectra, Scanning electron microscopy and Vibrating sample magentometery.

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Characterization of Magnetic Nanoparticles for Molecular Gene Therapy via Small Interfering RNA in Cancer Cells

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The success of small interfering RNA (siRNA) in molecular gene therapy of thetargeted gene depends upon cariers ability to efficiently deliver therapeutic agent to cells with minimal toxicity and most biocompatibility. In this study, a potential carrier for efficient delivery was assessed by siRNA encapsulating into Iron oxide magnetic nanoparticles (Fe3O4) modified with biodegradable polyester nanoparticles consisting of poly (DL-lactic/glycolic acid) PLGA and poly ethylene glycol PEG. Iron MNPs and PLGA– PEG 6000 self-assemble diblock copolymers were synthesized, then designed siRNA against target gene, were encapsulated with magnetic copolymers using the w/o/w in-water drying method. Transmission electron Microscope (TEM), Fourier transform infrared spectroscopy (FTIR) and Scanning electron Microscope (SEM) used for magnetic nanoparticles copolymers characterization determination before and after of gene encapsulation. Colorimetric cell viability assay was utilized to evaluate cytotoxicity effects of siRNA-magnetic copolymers and free nanoparticles against normal and cancerous cells. Quantitative techniques were used for drug activity evaluation in groups. TEM and SEM analysis resulted magnetic nanoparticles size less than 50 nm and nanoparticle/siRNA size 80-100 nm. Colorimetric cell viability assay demonstrated that magnetic copolymers enhanced delivery in cancerous cells. Data analysis with SPSS showed that the rate of target gene expression in equivalent concentrations with magnetic copolymers/ siRNA was lower than free siRNA in comparison (P=0.001). This study characterized the magnetic nanoparticles modified with PLGA-PEG copolymers as biocompatible, biodegradable distinct delivery systems for siRNA delivery and long term insolubility, low dosage drug as an efficient treatment.

Effect of Silver Nanoparticles and Hydro Alcoholic Extract of Cucurbita Pepo on Histopathological Changes of Liver from Skin Burns in Mice

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Heat shock caused by burns can lead to increased free radicals. On the other hand, silver nanoparticles can also cause the production of free radicals. In 72 mice at first the burn area 1/5 ×1/5 was created and then divided into nine groups (8 males /group) of control, positive control, 3 groups received 125,250and 500PPm dose of nano silver, 3 groups received different concentration of hydro alcoholic extract of Cucurbita Pepo 25%, 50%, 70% and at the latest a group received pumpkin 25% with 125ppm nano silver. After the end of treatment liver, tissue samples were stained with hematoxylin–eosin. Administration of different concentrations of silver nanoparticles led to destruction of the liver lobules, hepatocytes, central vein and the portal triad. Between groups receiving Cucurbita Pepo, the group receiving 50% of the extract led to minimal abnormalities in liver tissue. Conclusion: Silver nanoparticles cause stress oxidative by free radicals production. Antioxidant agents could result in hurmfull of free radicals. Cucurbita Pepo extract can be effective in reducing these complications so it can be effective on liver tissue quality.

Green Method for Extraction Nanofibre Cellulose from Linter Pulp

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Nanofibrillated cellulose is a new biomaterial having astonishing intrinsic properties. It was first used in nanocomposites for its environmentally friendly nature and its mechanical reinforcement property with the size decrease from bulk biomass cells to nanofibrils. However, owing to its other properties, such as biodegradability, low density, worldwide availability, low price and modifiable surface properties, it has found various other uses and is particularly used in high-value applications and as a potential excipient in the production of pharmaceutical dosage forms such as tablets. The aim of this study was to isolate cellulose nanofibers by green mechanical method (ultrafine grinder), from linter dissolving pulp in three distinct stages: Initially, raw materials were immersed in distilled water for 2 h. then it was dispersed in water with 3% concentration by using mechanical varying blender (England) at medium speed for 15 min. Afterwards, the suspensions were refined by PFI mill at 10000 rpm in 12% cons. Finally fiber is separated mechanically into nanofibers using ultrafine grinder at 1500 rpm and 2% consistency. Their morphological properties were characterized by atomic force microscopy (AFM) and optical microscopy. Crystallinity index and thermal properties was studied by X- Ray Diffractometry (XRD) by Thermo Gravimetric Analysis (TGA) respectively. Cellulose nanofiber had diameter less than 100 nm, as measured from AFM. By extraction of NFC, crystallinity index (CI %) is decreased as compared to linter pulp. Also TGA result showed low amount of weight loss in NFC toward linter pulp.

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Synthesis Gold Nanoparticles with Amino Acid and their Effects on Rat's Amygdaloid nuclei in the Elevated Plus-Maze Test

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Nanoparticle's surface modification with typical coating agents, such as surfactants and polymeric materials, prevent nanoparticle aggregation, decrease the toxicity, and increase the solubility and the biocompatibility in a living system. For this purpose, we report a novel strategy for the synthesis of aqueous stable gold nanoparticles (GNPs) by using Argenine Amino acid as the reducing and coating agent. To verify physical characterization and chemisorption properties of gold nanoparticles coated with Argenine (GNPs-Arg), FTIR (Fourier Transform Infrared Spectroscopy), TEM (Transmission Electron Microscopy), DLS (Dynamic Light Scattering) experiments have been used. The reasulte showed that argenine was absorbed on particle's surfaces led to particle sizes of 24.3±0.5 nm. On the other hand, amino acid coated Nanoparticles were injected into the Brain Ventricle. Rat's behavior due to the function of injected nanoparticle was examined by Elevated plus–maze. The results demonstrated a increase in time spent in open arms (%OAT) and ratio of entries into open arms (%OAE) which we belive it is directly related to reducted animal fear. To test the dose dependency, the rats brain were injected different amount of nanoparticles.Animal fear in the plus–maze was decreased by increasing nanoparticle concentration.

Synthesis, Characterization and Biodistribution of a Novel Thiomer and In Vivo-In Vitro Evaluation of Mucoadhesive Nanoparticulated Thereof

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The aim of this study was to develope a new kind of thiolated chitosan using meso- 2, 3-Dimercapto succinic acid (DMSA) as a mucoadhesive nanoparticulate system in drug delivery studies. The resulting polymer conjugate displayed 121.4 and 92.9 μmol thiol groups per gram. Nanoparticles (NPs) were generated by in situ gellation of the thiomer chitosan (CS-DMSA) with tripolyphosphate (TPP). The mean hydrodynamic diameter of TPP chitosan nanoparticles was around 260 nm and positive zeta potential is capable of forming covalent bonds with thiol sub-structures of the mucus glycoprotein. The morphologies of TPP-chitosan microparticles were examined with scanning electron microscopy. It seems that TPP-chitosan NPs may become a potential delivery system to control the release of drug. Biodistribution evaluation of NPs showed a large amount of uptake by RES until 4h but orally delivered mucoadhesion studies of polymeric NPs indicated suitable mucoadhesive effectiveness. Thiolated chitosan nanoparticles show a two-fold higher zeta potential (I), improved stability (II) and more than doubled mucoadhesive properties (III) than corresponding unmodified chitosan nanoparticles. Therefore, they seem to be advantageous over ionically crosslinked chitosan nanoparticle.

Adsorptive Removal of Aromatic Contaminants from Aqueous Solutions by Modified Mesoporous Silica

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Polycyclic aromatic compounds are ubiquities environmental contaminants and have been widely studied due to their potential carcinogenic and mutagenic. In this study adsorption of acenaphthylene and phenanthrene from aqueous solutions by amino functional mesoporous silica SBA-15 materials was examined. NH2-SBA-15 was prepared via hydrothermal method and the properties of this adsorbent were characterized by X-ray diffraction (XRD) and Fourier transforms infrared (FTIR) spectroscopy. Adsorption equilibrium isotherms and adsorption kinetics experiments were carried in a batch system. The experimental isotherm data were analyzed using Langmuir and Freundlich isotherms. The isotherm models which best represented the data obtained were the Langmuir model with r2 = 0.976 and 0.986 for acenaphthylene and phenanthrene, respectively. The results from Langmuir isotherm indicated that the capacity of NH2-SBA-15 for the adsorption of acenaphthylene (1.4 mg g-1) was higher than that for phenanthrene (0.76 mg g-1). The adsorption kinetics was tested for the pseudo-first order and pseudo-second order kinetic. Two adsorbates showed similar behavior regarding kinetic rates after 24 h of contact time. The adsorption kinetics data best fitted the pseudo-second-order kinetic model with r2 = 0.750 and 0.984 for acenaphthylene and phenanthrene, respectively.

Mechanism of Nitrate Reduction by Iron Nanoparticles in The Presence of MnO2

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Nitrate is a common pollutant in many of the surface- and ground-water resources that its high concentration may adversely influence human and the environment health. Development and characterization of remediation methods, including application of iron nanoparticles (FeONps), is thus very relevant. In this research, the effect of adding MnO2 in the FeONps – NO3 – H2O systems was investigated to enlighten further the mechanism of nitrate reduction. Hence, the effect of MnO2 concentration on the amount of reduced nitrate and produced ammonium was measured in three mediums, i.e. FeONps, FeONps – MnO2, and MnO2, in a range of initial nitrate concentration (0-150 mg/L). Experimental results indicated that addition of MnO2 reduces nitrate reduction, where electron availability is limited. As such, in 150 mg/L initial nitrate concentration and at MnO2 to Fe0Nps molar ratio of 1 to 1.6, about 71% of initial nitrate concentration was reduced. While, at the absence of MnO2, nitrate reduction was about 82%. Results also indicated that an increase in MnO2 concentration in Fe0Nps – MnO2 system reduces ammonium concentration relatively. This effect could be related to the higher redox potential of Mn4+ than NO3-. This difference in redox potential decreases Fe2+ contribution in nitrate reduction by converting Mn4+ to Mn2+ in expense of Fe2+ to Fe3+. Less transformation of nitrate to ammonium and more transformation of nitrate to nitrogen gas are therefore expected.

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Removal of Phosphate from Aqueous Solution by Nano Zeolite-Y and Surfactant-Modified Zeolite (SMZ)

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The development and manufacture of an adsorbent to remove phosphate ion for the prevention of eutrophication in lakes are very important. Surfactant-modified zeolites (SMZ) have drawn recent attention as sorbents due to their removal of multiple types of contaminants and low material cost. In this study, the ability of surfactant-modified zeolite (SMZ) and nano zeolite–y to remove phosphate from aqueous solution was investigated. The surface of nano zeolite-Y was modified with a quaternary amine surfactant hexadecyltrimethyl ammonium-bromide (HDTMA-Br). Effects of various experimental parameters (phosphate concentration, pH, amount of nano zeolite-Y and contact time) were investigated and optimal experimental conditions were ascertained. With increase in amount of nano zeolite-Y and contact time, removal efficiency increased. But with increasing of initial phosphate, removal efficiency decreased. Both the Freundlich and Langmuir isotherm models could describe the adsorption equilibrium of the phosphate onto the nano zeolite-Y. The Langmuir isotherm showing the better agreement of the two ($r2 > 0.9974$). Pseudo first-order kinetic models fits well with experimental data ($r2>0.9635$).

Sulfonated Starch Nanoparticles as a New Biocompatible, Safe and Nontoxic Catalyst

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In recent years nanoparticles (NPs) have drawn considerable attention for their small size and customized surface. The usage of NPs such as heterogeneous catalyst has gained significant role in organic synthesis, but increasing research has revealed that NPs may have toxicities. So many researchers have prepared nanoparticles using natural and nontoxic compounds such as chitosan, dextran, gelatin, alginate, albumin and starch. Starch is a natural, renewable, biodegradable and nontoxic polymer. The high amount of hydroxyl groups in the starch backbone allows the polymer to bind to different groups. In view of the emerging importance of starch as green and safety support, we prepared starch nanoparticles and used starch nanoparticles as a substrate to produce an efficient acid catalyst. Sulfonated starch nanoparticles can be easily prepared by the reaction of 5 g starch nanoparticles with 1 g chlorosulfonic acid. In this work, we wish to report a new nanocatalyst. This new nanocatalyst is safe and efficient because of the ability to recover and reuse from the reaction mixtures, minimal generation of environmentally unfriendly waste and the low cost.

Investigation on the Biocompatibility of Self-Assembling Peptide Nanofibers

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Self-assembing peptide nanofibrs containing several motifs of functional proteins involve in cell signalling and attachment. Recently, they have been widely studied due to their many advantages in tissue engineering and drug delivery and is expected to continue. These nonofibers form injectable hydrogel systems. In this study their biocompatibility was investigated. (RADA)4 and (RADA)4 containing laminin (R-LA) and bone homing peptide motifs (R-BMHP2) were synthesised via solid phase synthesis method and purity was evaluated by Reverse phase HPLC. Then, they self-assembled to nanofibers using addition of cell culture medium. To investigate ROS production and pH, DPPH in methanol and DI water were applied, respectively. We further investigated biocompatibility via MTT assay, LDH, DAPI staining, Bcl2 gene expression (on human endometrial stem cells) to determine cytotoxic effects on mitochondria, plasma cell membrane and chromosome. DPPH assay data showed although there were no significant differences between ROS production of these nanofibers but H+ concentrations in R-LA solution was higher than other oligopeptides. MTT assay showed that although cells encapsulated into nanofibers had higher cell viability than 2D cell culture but R-LA exhibited higher toxic effects on mithochomdria. LDH and DAPI staining showed R-LA and (RADA)4 exhibited highest damaging effect on plasma cell membrane and chromosome, respectively. Bcl2 was over-expressed in cells encapsulated into BMHP2. There is no significant difference between Bcl2 gene expression of (RADA)4 and R-LA. Based on our results pH might be a critical damaging factor and eventually addition of extra buffer to medium will decrease their adverse effects on cells.

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Optimization on Preparation Condition of Zataria Multiflora Boiss Essential Oil Liposomes Prepared by Mozafari Method Using Response Surface Methodology

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Concerns for occurrence of food-borne disease and harmful impacts of chemical preservatives encouraged usage of natural preservatives. Essential oils (EO) have been known for their biological activities for many decades and they could replace toxic synthetic fungicides. However, essential oils are unstable and susceptible to degradation in the presence of oxygen, light and temperature. So, attempts have been made to preserve them through encapsulation in various colloidal systems such as microcapsules, microspheres, nanoemulsions and liposomes. The purpose of this study was to optimize the formulation of EO Zataria multiflora Boiss. Encapsulation of EO in liposomes was conducted by Mozafari method. Response surface methodology based on central composite design was applied for formulation optimization. Phosphatidyl choline (PC (proportion (1-3%), phosphatidyl choline /EO ratio (0.25-1%), temperature (30-50°C), mixing time (20-60min) were selected as the independent variables while the encapsulation efficiency as dependent variable. The results were used to estimate the coefficients of model and to find the optimal preparation conditions with maximum encapsulation efficiency. The results indicated that the PC proportion was the most significant parameter on encapsulation efficiency. Applying a desirability function method the optimum parameters were: PC proportion of 2.5%, PC/EO ratio of 0.81, and temperature of 35°C and time of 42min. At this optimum point, encapsulation efficiency was found to be 54.5%, which verified with carrying out confirmatory experiments.

Reduction Formaldehyde Emission from Particleboard by Nanoclays

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In 1992, the California Air Resources Board identified formaldehyde as a toxic air contaminant based primarily on the determination that it was a human carcinogen with no known safe level of exposure. The International Agency for Research on Cancer (IARC, 2004) conducted an evaluation of formaldehyde and concluded that there is sufficient evidence that formaldehyde causes nasopharyngeal cancer in humans. Formaldehyde can be free on the material or bonded in different ways to the chemical structure. Wood-based panels such as plywood, medium density fiberboard (MDF) and particleboard and the resins used like urea-formaldehyde (UF), melamine- urea formaldehyde (MUF), and phenol-formaldehyde (PF) are the main sources for formaldehyde. The aim of this research was decreasing formaldehyde emission from particleboard by nanoclays. For this purpose, different amount of nanoclays (0.5, 1 and 1.5 wt %) was added to UF resin and the prepared resins were used in particleboard manufacturing. Then physicochemical properties of resin as well as formaldehyde emission and internal bond of the manufactured panels were determined according to standard methods. The results indicated that addition of nanoclay greatly influence on prepared UF and particleboard properties. Greater mechanical properties could be obtained by increasing nanoclay from 0.5 to 1.5 wt%. Also based on finding this research, formaldehyde emission content from particleboard greatly was reduced by addition of nanoclays to UF resin.

TEM Extracted Image Nano-Descriptors: a Key to Nanoparticles Toxicity

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In 1992, the California Air Resources Board identified formaldehyde as a toxic air contaminant based primarily on the determination that it was a human carcinogen with no known safe level of exposure. The International Agency for Research on Cancer (IARC, 2004) conducted an evaluation of formaldehyde and concluded that there is sufficient evidence that formaldehyde causes nasopharyngeal cancer in humans. Formaldehyde can be free on the material or bonded in different ways to the chemical structure. Wood-based panels such as plywood, medium density fiberboard (MDF) and particleboard and the resins used like urea-formaldehyde (UF), melamine- urea formaldehyde (MUF), and phenol-formaldehyde (PF) are the main sources for formaldehyde. The aim of this research was decreasing formaldehyde emission from particleboard by nanoclays. For this purpose, different amount of nanoclays (0.5, 1 and 1.5 wt %) was added to UF resin and the prepared resins were used in particleboard manufacturing. Then physicochemical properties of resin as well as formaldehyde emission and internal bond of the manufactured panels were determined according to standard methods. The results indicated that addition of nanoclay greatly influence on prepared UF and particleboard properties. Greater mechanical properties could be obtained by increasing nanoclay from 0.5 to 1.5 wt%. Also based on finding this research, formaldehyde emission content from particleboard greatly was reduced by addition of nanoclays to UF resin.

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Removal of Food Red 17 from Aqueous Solution Using an Nano Anionic Polymeric Urethane Absorbent (APUA)

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This paper is a report on an original research which investigated the effect of a number of experimental parameters on the removal of Food Red 17 (FR17) from an aqueous solution using Anionic polymeric Urethane Absorbent (APUA) as an adsorbent. The optimum value of adsorbent dose was found to be 35 mg L-1. Further, maximum dye removal took place at pH3 and 45 °C. The fourth parameter, stirring the solution during the treatment, also resulted in significant removal improvement. The amount of FR17 adsorbed on APUA surface was quantified using the Langmuir equation. UV irradiation was also found to have a positive effect on the removal process. The efficiency of the treatment was verified using FT-IR spectrometry results for APUA, FR17, and APUA-FR17. Finally, the adsorbent was subjected to SEM characterization.

Nanoparticles Analyzing in Raw Foods using MNSR

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Today's along the new nanoparticles production, their residues evaluation for their toxicity is important, Regarding to the FDA: "Non nanoparticles must be in the food materials", Nanoparticles enter the organs by oral routs, aspiration and or via skins of the body, some nanoparticles are produced naturally and during routine activities like the fuels of the cars, cooking and toasting the foods or during storms;also some nanoparticles are synthetic like nanosilver, which used for their disinfecting characters in health ,agriculture (fish and poultry breeding)and threads industry ;An important item for nanoparticles, is detection and evaluation accumulation in the body and tissues. Due to the very small size of nanoparticles ,their detection in the tissue are important and critical ,so some techniques like the atomic absorption, Gas chromatography and GC-mass could be used, these techniques are limited and in some cases such as nanosilvers or nanozinc in raw food materials of fish/poultry meats and vegetables are not effective ; so in this cases using nuclear industry is OK, Miniature Neutron Source Reactor can be use for qualitative and quantitative analysis of nanoparticles with a high sensitivity and specificity as nanoparticles of Ag, Cu, Zn ,As and Fe as ppb. In MNSR the neutrons bombard the samples and make their isotopes which regarding the half life's the nanopartcles is distinguishable.

Fate of Zinc Oxide Nanoparticles during Anaerobic Digestion of Wastewater and Post-Treatment Processing of Sewage Sludge

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The rapid development and commercialization of nanomaterials will inevitably result in the release of nanoparticles (NPs) to the environment. As NPs often exhibit physical and chemical properties significantly different from those of their molecular or macrosize analogs, concern has been growing regarding their fate and toxicity in environmental compartments. The wastewater–sewage sludge pathway has been identified as a key release pathway leading to environmental exposure to NPs. In this study, we investigated the chemical transformation of two ZnO-NPs and one hydrophobic ZnO-NP commercial formulation (used in personal care products), during anaerobic digestion of wastewater. Changes in Zn speciation as a result of postprocessing of the sewage sludge, mimicking composting/stockpiling, were also assessed. The results indicated that "native" Zn and Zn added either as a soluble salt or as NPs was rapidly converted to sulfides in all treatments. The hydrophobicity of the commercial formulation retarded the conversion of ZnO-NP. However, at the end of the anaerobic digestion process and after postprocessing of the sewage sludge (which caused a significant change in Zn speciation), the speciation of Zn was similar across all treatments. This indicates that, at least for the material tested, the risk assessment of ZnO-NP through this exposure pathway can rely on the significant knowledge already available in regard to other "conventional" forms of Zn present in sewage sludge.

Synthesis and Characterization of Zinc Oxide Nano Powder and Its Surface Coating for Wastewater Treatment

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Recent nanotechnological advances suggest that metal oxide nanoparticles (NPs) have been expected to be used in various fields, ranging from catalysis and opto-electronic materials to sensors, environmental remediation, and biomedicine. Among metal-containing NPs, ZnO NPs have the third highest global production volume after SiO2 and TiO2 NPs [3]. In this study, synthesis of nano-sized Zinc oxide powder was performed and followed by calcination at 3 different temperatures for 2h in a furnace. Then, size and morphology of the Nanoparticles (NPs) were characterized using FT-IR, XRD and SEM. Coating on nanoparticles was carried out using Citrate, neutral and anionic surfactant. The ability of the modified NPs was investigated for removal of dye pollutant from aqueous solution. Finally, in order to obtain best condition for adsorbent, many factors, potentially affecting the decolonization of dye such as dye concentration, pH, contact time, time of irradiation of ultrasonic and the amount of adsorbent were investigated and optimized. 2-level Fractional Factorial Design (FFD) was used to identify best conditions in this reaction. The modified NPs were applied successfully for removal of dye pollutant from aqueous solution.

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Nano Heavy Metals Detection in Intrinsic Water Breeded Salamonidae Fish

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Iran is going to be the first producer of breeding ring bow and salmo trutta , These fishes need water with some quality of TDS, Salts and heavy metals, in current years the falling down waters decreased severely and most parts of country goes to become dried, therefore the quality of the intrinsic waters decreased and the TDS, Salts as as much as heavy metals become concentrated ,meanwhile some breeders have to use the wastage waters of some factories which inherently are contaminated with heavy metals in nano dimentions., in current study some breeded salmon fishes in these types of waters are examined for heavy metal deposition in their meats. The samples were prepared from the muscles and used for distinguishing the residues of nanoparticles of Zn, Fe, Cu, as and Al. The metod of detection were bombarding the samples with neutron in the MNSR for analyzing the irradiation of the activated possible isotopes of elements. Regarding to the results the average nanoparticle residues for Zn, Fe, Cu, as and Al respectively were 55.69, 40.7, 18.12, 0.42 and 247.05 ppb

A Method for Safe Application of Nanoparticles in Adsorptive Removal of Heavy Metals from Effluents

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Heavy metals including copper are toxic for creatures at specific dozes. The unique properties of various nanoparticles (NPs) like being adsorptive make them a superior choice for removing pollutants and heavy metals from effluents. However, there always will be the risk of NPs entrance into the environment which may lead to further pollution. This work tries to introduce a safer method of utilizing iron oxide NPs as an additive for preparation of polyethersulfone (PES) nanocomposite membrane. Phase inversion method was applied for preparation of membranes. During phase inversion process NPs mixed with dope solution are fixed in solidified polymeric membrane. Results for Cu (II) removal indicate that the fabricated membranes are capable of removing Cu (II) over 80%. The long term tests indicate the durability of mixed matrix membranes which well verify stability of membrane structure and NPs in its matrix. As a conclusion, mixing NPs with polymeric membranes can be a useful, safe and environmentally friendly way in removal of heavy metals from effluents.

Nanotoxicology – Challenges for realistic pedictions!

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The expectation rises high that nanomedicine, the use of nanotechnology and nanomaterials and their particular properties will provide the solutions for some of the most pressing health problem in future. Actually nanomaterials and nanoparticles are under evaluation or even approved for use in humans. The vision of the new "intelligent" drug delivery systems presented by a combination of multiple features such as targeting, immune tolerance, an improved biokinetics, and high drug load squeezed into the nanometer scale.

On the other hand and despite all the promised benefits the excessive use and hence distribution of nanoscale materials in the environment or in off-target organs raises concerns regarding potential adverse effects or to be more clear potential toxicity and risks coming for the unique properties of the novel materials and hybrids. I will give an overview of the identified challenges preventing a realistic prediction of toxicity of nanomaterials. Moreover I will show that and how nanotoxicology differs from conventional toxicology.

State-of-the-art detection, characterization, and monitoring of nanomaterials in complex environmental media: air, water, organisms, and soil

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Nanomaterials are very difficult to study analytically due to their complex, changing behavior, as well as their exceptionally small size and heterogeneity. When these nanomaterials, whether naturally-occurring or synthetic, are in an environmental compartment, such as in air, water, soil, or an organism (from bacteria to humans), problems in detection, characterization, and monitoring are further compounded. Perhaps these are the most challenging materials detection and characterization tasks that scientists and engineers have ever faced. What we do with our instruments is equivalent to studying, from the orbiting International Space Station, the inner-workings of a single light bulb placed at the surface of the Earth. Fortunately, the capabilities of imaging and spectroscopic tools have advanced dramatically over the last half century, and today these tools are being effectively used to achieve things that were once thought to be literally impossible, such as ways to detect single molecules or even single atoms or photons. In this talk, we will look at a variety of the latest tools for imaging, and for chemical/structural analysis, of nanomaterials in complex media that are the most helpful in driving our science forward. These tools will include (for imaging and chemical analysis) the latest, state-of-the-art electron, x-ray, ion, and light-based microscopes and spectrometers. Examples include FIB/nanoSIMS, darkfield hyperspectral imaging, nanoCT scanners, STM/AFM, environmental SEM, synchrotron-based imaging and analytical techniques, and especially TEM/HRTEM/EELS/EDS along with aberration correction and electron tomography.

Toxic effects of silver nanoparticles polluted water on red blood cells (RBC) of common carp (Cyprinus carpio).

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Silver nanoparticles are used in various industries such as medical devices, which can easily enter the aquatic environment and may have toxic effects on different organs of aquatic animals. The present study was carried out to study the toxic effects of silver nanoparticles polluted water on Red Blood Cells (RBC) of common carp (Cyprinus carpio). In this study, nanosilver with 10-50 nm in size and concentration of 10, 25, 50 and 100 microgram per liter (PPM) were used. Morphological changes of RBC were studied by using Neutral Red Retention Assay (NRR) technique at the intervals of 15, 30, 60, 90, 120, 150, and 180 minutes following addition of Neutral Red (NR) to the RBC. The results were compared with a control group and recorded. The findings indicated that the nanosilver with 10 PPM concentration had no toxic effects on RBC, but in 25 PPM, cell damage was observed so that in 50 PPM, destruction of RBC increased and in the 100 PPM, cell lyses was prominent. It is concluded that Nanosilver with less than 25 PPM of concentration have no histopathological effecs on RBC however, toxic effects of nanosilver on RBC is increased with increased concentration and duration of exposure of RBC to the nanosilver.

The effects of dietary nano zinc oxide on blood zinc level and some related enzymes activity in Markhoz goat kids

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The aim of this study was to investigate the effects of nano zinc oxid (nZnO) on blood zinc level and two related enzymes activity in Markhoz goat kids. Eighteen male Markhoz goat kids aged 6-7 months in a completely randomized design were allocated into 3 treatments including zero (control), 20 and 40 ppm zinc from nZnO source and fed with a basal diet (containing 22.12 mg Zn/kg DM) for 70 days. The nZnO as a zinc supplementation were added to the basal diets and were offered daily at 08:00 and 17:00 h in two equal portions. Blood samples were taken on days 1, 35 and 70 of the experiment before morning feeding via the jugular vein. The samples were analyzed for plasma zinc concentration (in an air-acetylene flame on an atomic absorption spectrophotometer), alkaline phosphatase (ALP) and lactate dehydrogenase (LDH) enzymes activity of the serum (using commercially available kits with an Auto Chemistry Analyzer). The results showed that nZnO did not affect plasma Zn concentration and serum ALP of the kids in our experiment. For treatment 2 in day 70 the activity of LDH was found significantly higher than other treatments. The results showed that the levels of 20 and 40 mg Zn/kg DM from nZnO source had no effect on plasma zinc level and serum ALP and LDH activity in Markhoz goat kids fed a diet containing 22.12 ppm zinc.

Safety of silver nanoparticles as antimicrobial food packaging materials

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Silver nanoparticles may also make an appearance in commercialized food packaging materials in the future. Unfortunately, the effect of this increase in the use of nano scale silver on human health and the environment is unclear, so generalized conclusions about the effects of AgNP exposure via food-relevant routes of exposure remains limited. Very little work has been done to assess the ability of nanoparticles to migrate through rigid polymer environments and cross over the packaging/food interface. A release kinetics study was also performed in ethanol 10% (v/v) for 20 days to study the gradual release of Ag+to the simulant 40C. Embedded AgNPs may diffuse from food packaging into foods at detectable levels only when the particle radius is very small (1 nm), when the packaging is comprised of a polymer with relative low dynamic viscosity (e.g., polyolefins such as LDPE, HDPE and PP), and when there are no significant interactions between the particles and the polymer. Controlled release of additives to their surrounding environment is an important feature in many applications, particularly for food packaging and pharmaceuticals. The control of the antimicrobial agent release from packaging films is critical to preserve food products against microbial growth. In summary, the combination of the antibacterial properties of silver nanoparticles with polymers shows high potential to improve functional active properties with important implications in the development of new biodegradable materials for fresh food packaging applications.

To investigate the effect of functionalization on the toxicity of carbon nanotubes

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Despite the great benefits of carbon nanotubes (CNTs), their high toxicity profiles have limited the usage of them in clinics. Functionalization is one of the most important processes, which needs to be applied before using CNTs in any in-vitro or in-vivo study. Short and long SWCNTs were functionalized with different techniques. FTIR, UV-VIS spectroscopy, TEM and Raman spectroscopy were used to prove the successful coating of SWCNT. The effect of pristine and functionalized SWCNT was investigated on the magnitude of its toxicity. Different concentrations of short and long SWCNT were prepared and functionalized. The effect of each functionalized SWCNT was investigated on the MCF7 and HT29 cell lines. Toxicity of different concentrations of conjugated Octa-Ammonium-POSS on the SWCNT pristine and functionalized with carboxylic acid was investigated. SWCNT-COOH (5hrs functionalization) was further functionalized with POSS and its effect was monitored on both cell lines. Generally, treatment of SWCNTs with acid significantly decreased the toxicity of SWCNT in comparison with pristine SWCNT. The longer SWCNT stayed in contact with the acid, the less toxic profiles were detected. Also, the minimum effect on both cell lines could be obtained once the Octa-Ammonium-POSS was conjugated on SWCNT. The results also demonstrated that long SWCNTs, produced more toxicity to the cells compared with the short ones. Octa-Ammonium-POSS is biologically very friendly and not toxic to the cells. Using SWCNT that is functionalized

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with -COOH and functionalized with Octa-Ammonium-POSS would reduce the toxicity in comparison with SWCNT-COOH or SWCNT-Octa-Ammonium-POSS.

Size and time dependent ROS generation of ZnO nanoparticles under different UV irradiation conditions

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Nanomaterials have widely been used in the field of biology and biomedicine, such as diagnosis and cancer therapy. One of the interesting nanoparticles in medicine and industry are quantum dots witch possessing unique tunable optical and targeting properties. ZnO is a quantum dot which belongs to the group II–VI semiconductors and has a wide energy gap and a large exciton binding energy. Nano-scaled ZnO is also a photocatalyst that could generate ROS such as hydroxyl radical and superoxide under irradiation, which, make it possible to induce double strand breakage (DSB) of the DNA and has a wide range of cellular toxic effect. In this study ZnO nanoparticles were prepared by wet chemical methods; using different conditions to synthesis different size ZnO nanoparticles with a narrow size distribution (from 2 up to 5nm). UV-VIS spectroscopy and the taut plot application have been used to size determination. ROS generation of different-sized ZnO nanoparticles was assessed by DPPH as a radical scavenger molecule, in dark and under 3, 5, 10 min UVC (k = 254 nm) irradiation conditions which was provided by a germicidal lamp witch its average intensity is 0.1 mW/cm2 at the working plane. A significant increase in ROS generation was observed due to the size elevation and augmented irradiation time, and observed that ZnO nanoparticles caused a time and size-dependent ROS generation even in a short-range size changes. This study provides preliminary guidance for the development of anti cancer agents with optimization of ZnO nanoparticle sizes.

The development and application of nuclear-physical methods for study of inorganic nanomaterials' biokinetics

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The development of nanotechnology and the rapid increase in the volume of products containing nanoparticles (NPs) raises the problem of ensuring their safety for humans and the environment. One of the keys issue in solving this problem is to study the biokinetics (absorption, biodistribution, metabolism and excretion) of nanomaterials in animals and humans. The basis of these investigations is the quantitative measurement of NPs' mass content in biological samples. The difficulty of these measurements manifested in quantitative measurements of NPs' content in complex, multi-component, heterophase dispersed systems, which are the tissues of living organisms. The development of nuclear-physical methods (NPMs) for quantitative measurement of NPs' content in different media began in NRC "Kurchatov Institute" since 2008. The point of these methods is to create a radioactive label in the studied NPs by their exposure to a thermal neutron flux from the research reactor and subsequent gamma spectrometric analysis of the samples containing these labels. The options, including innovative elements, for the practical application of NPMs are briefly described. Together with Institute of Nutrition of the Russian Academy of Medical Sciences NPMs was used for quantitative measurements of the parameters of the uptake in the gastrointestinal tract and the distribution in tissues and organs of Ag, Au, Se, ZnO NPs in rats, including investigation of the degree of blood-brain and placental barriers overcoming.

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Synthesis of nano-fibrous mats using electrospinning method and determining their efficiency for nanoaerososls removal

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Nowadays, Nanofiber filtration is drawing great a interest because of its large surface collection area as well as low air resistance. Electrospinning is a fabrication process that uses an electric field to control the deposition of polymer fibers onto a target substrate. The objective of this study is to investigate the filtration of nano-aerosols (70–700 nm) using nanofiber filter for evaluating the filtration efficiency and drop pressure across the filter. Nylon 6 fibers with mean diameters in range of 20–100 nm range were prepared by Process. TSI Electrospray Aerosol Generator, model 3480, was used to generate nanoparticles, with the various sizes from 70 to 700nm. The filter efficiency was evaluated by measuring the particle number concentration both before and after the filter, using a Particle Measuring system Models Micro LPS DAS of Boulder Company. The experimental results demonstrated that the fibers and pore size of synthesized nanofibers provide a good uniformity with the fiber diameter ranging from 20 to 70 nm. Our results revealed that the maximum permeability electrospun filters was related to 100 nm particles that were selected as MPPS in this media. Considering the particles size distribution it was found that with increasing the velocity, the permeability and these pressure drops were increased and the quality factor was decreased. The synthesized nano-fibrous mats offer a high efficiency and can be carried out in related industries such as nanomaterials research laboratories and clean room. Keywords: Nanoparticles, Nanofiber media, Performance, Quality factor

Silver Nanoparticles-Oryza sativa L. root interactions; Microscopic and Imaging Mass Spectrometry Study

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Silver nanoparticles (AgNPs) are potent antibacterial agents and used to preserve and treat disease casual agents in the agricultural fields. The tissue uptake and penetration of nanoparticles on plants can be studied based on indirect evidence of the entry of nanoparticles into living cells and process changes in plant cells, texture and function. These variations may be the changes to the root dynamic in cell wall and the integrity of the tissue, increased the production of related metabolites like lignin, phenolic compounds, et. Or up/down regulations of proteins that affect the defense cycles and the plant assimilation of carbohydrates contents. To quantify and provide the phenolic compound profiling of plant extract were monitored by LC/MS method and special staining methods. Moreover, the penetration of AgNPs into the cell wall and their accumulation on cell organelles were monitored using transmission electron microscopic method as well as the MALDI/IMS. The study of nanoparticle, their distribution and the consequences can monitor by tissue staining followed by microscopic methods or matrix assisted laser desorption ionization Imaging mass spectrometry (MALDI/IMS). Images of treated tissues in combined with the variations on plant material assimilation and metabolite profiling showed AgNPs strong effects on root cells and texture. Exposure to AgNPs made the variations on the phenolic compound profiling, increase the lignin production; weaken the cell wall dynamics and/or its destruction.

Methodological aspects of the health risk assessment in application to nanosafety

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Results of the health risk (HR) assessment are needed to support decisions on safety ensuring of nanotechnologies and practical use of nanomaterials/nanoparticles (NM/NPs), including establishment of safety standards. To meet these needs HR assessment' tools are developed using the great experience in the development and application of these tools for other sources of harm, accumulated during the last decades. Three-level' scheme of development and application of HR assessment methodology is proposed: general, specific and simplified methods. The general method (GM) serves as a basis for development of a specific method, applicable to the corresponding concrete harm source, development and justification of simplified methods. In this approach the specific method consists of two parts: 1) the general HR assessment method, 2) exposure – response dependences (ERDs) for the harm source considered in the form of age-cause-specific death or diseases coefficients, Such structure of HR assessment methodology in its full development makes specific methods being more transparent and comparable as well as safety decisions on the basis of HR assessment for different harm sources. The principal GM' points are described including: definitions and calculation formulas for basic quantities, risk indices for different applications and exposure scenarios (single and extended), risks' competition, uncertainty analysis, etc. The proposal was made concerning the special risk index for the risk standardization and comparison. The problems of ascertaining exposure doses and ERDs for NM/NPs are shortly considered.

Fabrication and Optimization of Electrospun Polyacrylonitrile (PAN) Nanofiber for Application in Nanoparticle Filtration

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Electrospunpolyacrylonitrile fibrous membranes have been widely adopted in filtration due to small fiber diameters, and large specific surface areas. Since small fibers in the submicron range are well known to provide better filter efficiency at the same pressure drop, in this work the electrospinning parameters were optimized to achieve small fibers. It is our objective to use the empirical model to guide our future experiments and to spin uniform nanfiber for future applications in nanoparticle filtration. Materials and Methods: For optimization, design of experiment made via Design-Expert V7 was employed. Optimization of electrospinning parameters (supplied voltage, polymer concentration, and collector distance) was conducted through the Response Surface Methodology (RSM). Solution concentrations of 2-7 wt %, applied voltages 15 - 22 kV and nozzle–collector distance 10-20 cm were set as boundary values of understudy parameters. Results: During 15 experimental runs, fibers with diameter ranging from 580 nm to 4300 nm were obtained. ANOVA results revealed that linear model is statistically significant for response: fiber diameter. In this case all three variables including concentration, electric field, and tip-to-collection distance are significant model terms. Regression analysis revealed quantitative relations of fiber diameters, that is: Diameter of fiber (nm) = -2082.49894 +502.95780× Concentration (%, w/w) +184.28394 × Voltage (Kv) -132.55548 × Distance (cm). The optimum parameter combination consists of voltage of 20 kV, weight percentage PAN of 2 wt%, and distance 10 cm. Conclusion: Based on these results, optimal conditions could be obtained for predetermined diameters and morphologies for electrospunfibers.

Pitfalls in the assessment of the toxicity, mutagenicity and genotoxicity of nanoparticles in vitro: Case of gold and silver nanoparticles

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Toxicity of nanoparticles in vitro is assessed using tests that are conventionally developed for chemicals. These include lactic dehydrogenase (LDH) test, as an indicator of cellular membrane disruption, the 3-(4,5-dimethyliazol-2-yl)-2,5-diphenyltetrazolium bromide (MTT) or the sodium 3,3′-[1(phenylamino)carbonyl]-3,4-tetrazolium]-3is(4-methoxy-6-nitro) benzene sulfonic acid hydrate (XTT) tests as well as adenosine triphosphate (ATP), as a measure of the enzymatic activity of cellular mitochondria, and also 5,5',6,6'-tetrachloro-1,1',3,3'-tetraethylbenzamidazolocarbocyanin iodide (JC-1) as a measure for mitochondrial membrane potential. The ability of nanoparticles to produce Reactive Oxygen Species (ROS) is assessed using the dye, 2', 7'-dichlorofluorescein (DCF) assay and the genotoxicity and mutagenicity of nanoparticles are assessed using the Ames test, Comet assay and the chromosome aberration test in Chinese hamster ovary (CHO) cells. Finally, the effect of nanoparticles on gene induction is assessed using gene microarrays for which RNA extraction and quantification is a necessary step. These tests were therefore implemented to assess the toxicity, mutagenicity, and genotoxicity of gold (AuNPs) and silver (AgNPs) nanoparticles. Results have indicated that both AuNPs and AgNPs, have interfered with all the toxicity tests. On the other hand, AuNPs and AgNPs showed no interference with the LDH toxicity assay and also with the chromosome aberration test. In conclusion, detection systems of conventional toxicity assays are generally optical in nature and rely on absorbance, luminescence or fluorescence to quantify the products. Nanoparticles such as AuNPs and AgNPs with Surface Plasmon Resonance (SPR) properties may interfere indirectly with the assay by altering the absorbance, luminescence or fluorescence read-outs.

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Development of International Standards for Nanotechnologies

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With the rapid increase in the number of nanotechnology based consumer products containing silver, gold, carbon, zinc oxide, titanium dioxide, and silica nanoparticles, the population potentially exposed to such nanoparticles is also increasing, including workers in nanotechnology-based industries being exposed to manufactured nanoparticles and the general public being exposed to nanoparticles liberated from products. In the case of manufactured nano-sized particles, exposure can occur in ambient air or the workplace during their production, use, and disposal, making this a concern for public and occupational health. Notwithstanding, there are currently few generally accepted methods and standards of toxicology testing for nano-sized particles. Accordingly, the development of international standards for safe nanotechnology and the use of these standards for the toxicity testing, workplace management, and hazard communication become more important. For an accurate evaluation of the health effects of nanoparticle inhalation, nano-sized particles need to begenerated and transported to a test environment with experimental animals to investigate the short- and long-term inhalation toxicity. Thus, the metal particle nanoparticle generation standard (ISO 10801) based on the evaporation and subsequent condensation of metal (silver and gold in this case) is capable of providing a consistent particle size distribution and stable number concentration suitable for short- or long-term inhalation toxicity studies. When conducting inhalation toxicity studies of nano-sized particles, it is also important to monitor the concentration, size, and distribution of the nano-sized particles in the inhalation chamber. Therefore, standard ISO 10808 suggests a battery of tests for monitoring the inhalation toxicity testing chamber, including a Differential Mobility Analyzing System (DMAS) to measure the particle number, size, distribution, surface area, and estimated mass dose, as well as a morphological examination using Transmission Electron Microscopy (TEM) or Scanning Electron Microscopy (SEM) and an Energy Dispersive X-ray Analyzer (TEM-EDXA) to determine the chemical composition. Conventional mass dose monitoring and other physicochemical monitoring are also included if deemed a necessary parameter for determining the toxicity. Recently we have submitted another international standard (ISO 19601) to provide nano-object aerosol generation methods for inhalation toxicity testing. Many labs are expected to use this standard when designing nanomaterial inhalation toxicity testing for nanomateirals. The development of international standards for safe nanotechnology and the use of these standards will provide reliable and harmonized approach for risk assessment of nanomaterials.

Nanomedicine under the Microscope – Ten Current Critical Issues

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There is enormous excitement and expectation regarding nanomedicine as it continues to influence the pharmaceutical, device and biotechnology industries. Currently, nanomedicine is poised at a critical stage as numerous market forces and drivers are dictating a change in pharma's quest for discovering, developing and delivering novel therapeutics due to numerous challenges ranging from revenue losses due to patent expirations on blockbusters to enhanced regulatory oversight to an ever-increasing challenge from generic manufacturers. In the process, these forces are altering the drug landscape. Clearly, new ground rules and competitive business strategies are needed in the post-blockbuster era. As a result, pharmaceutical companies are turning to miniaturization and nanotechnology to enhance or supplement drug target discovery and drug development.

As nanomedicine gains a firmer foothold and progress at various levels (technical, legal, societal, ethical) continues, there are certain issues that have come to the forefront. These need to be discussed and tackled. With this backdrop, my presentation will briefly address these ten current critical issues:

Issue 1: Definition of "nano"
Issue 2: Safety and Toxicity
Issue 3: Lack of Effective Coordination
Issue 4: US FDA + Baby Steps = Regulatory Uncertainty?
Issue 5: Are Most Nanoproducts combination products?
Issue 6: New Drug Application (NDA) or Abbreviated New drug Application (ANDA)?
Issue 7: The US Patent Office and Patent Law issues
Issue 8: What are the Unintended Consequences?
Issue 9: What are the Ethical Issues?
Issue 10: What about Biosimilars and Nanosimilars?

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Interaction Studies of Silver Nanoparticle and Environmental Samples

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Special characters of nanoparticles (NPs) can affect most organisms and biological systems. It is well known that the biological fluids that have proteins interact with NPs. It is proposed when the NPs enter into a cell or biological fluid, they are surrounded with proteins. The metabolite profiling of biological systems will also affected directly or following the proteome variations. Industries are producing wide varieties of silver nanoparticles (SNPs) as an antibacterial agent with different physical properties for medical devices, orthopedic or dental graft materials, topical aids for wound repair, clothing, underwear and socks, textile products, and even washing machines with little low concern to their side effect. In this study, at first the interaction of SNPs and peptidoglycan of S. aureus cell wall and release of muramic acids as biomarker for determination of potency of SNPs has been investigated (1,2). Then, the behavioral variations of the bioactive molecules (like enzymes and metaboilites) to microorganism (like E. coli, B. cereus, S. aureus, B. thurigiensis) and plants (like O. sativa) cause the significant variations and toxicological features in the interaction with SNPs were subjected for the metabolite and proteome profiling study and the spatial attention to protein corona formation/changes (3-5).

Toxicology of Engineered Nanomaterials: A new paradigm

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The increasing use of nanomaterials in consumer, therapeutics and industrial products has aroused global concern regarding their fate in biological systems, necessitating the demand of parallel risk assessment. Engineered nanomaterials (ENMs) fall in the transitional zone between molecular and particle level and give rise to unique properties yielding many technical challenges, which impede nanotoxicity studies. These include - determining appropriate doses corresponding to human and environmental exposures (as in vivo an in vitro experiments should mimic natural exposure conditions); dispersion of nanoparticles and consequently preparing stable suspensions of the nanoparticles for in vitro and in vivo experiments; assessment of appropriate dose metric (particle mass, surface area or number) in nanotoxicity studies for correct exposure-dose-relationship is still debatable. Moreover, unlike classical toxicity studies, to understand the mode of action of nanomaterials toxicity, a complete characterization (chemical composition, size, shape, crystal structure, surface area, surface chemistry, surface charge, solubility, state of agglomeration) of the ENMs is needed. In addition, to assess the cytotoxicity and genotoxicity of ENMs, appropriate modifications in the existing methods need to be made to get more reliable data. Further to assess the exposure in human population the existing biomarkers of effect and exposure also need to be validated. Our studies have attempted to address these challenges while assessing the toxicity of ZnO nanoparticles in human cell lines as well as bacteria.

Quantum dot-related genotoxicity perturbation can be attenuated by PEG encapsulation

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Nanomaterial-biosystem interaction is emerging as a major concern hindering wide adoption of nanomaterials. Using quantum dots (Qdots) of different sizes (Qdot-440 nm and Qdot-680 nm) as a model system, we studied the effects of polyethylene glycol (PEG) thin-layer surface modification in attenuating Qdot-related cytotoxicity, genotoxicity perturbation and oxidative stress in a cellular system. We found that uncoated Qdots (U-Qdots) made of core/shell CdSe/ZnS could indeed induce cytotoxic effects, including the inhibition of cell growth. Also, both the neutral comet assay and γH2AX foci formation showed that U-Qdots caused significant DNA damage in a time- and dose-dependent manner. In contrast, results from cytotoxicity analysis and γH2AX generation indicate minimal impact on cells after exposure to PEG-coated Qdots. This lack of observed toxic effects from PEG-coated Qdots may be due to the fact that PEG-coating can inhibit ROS generation induced by U-Qdots. Based on these observations, we conclude that the genotoxicity of Qdots could be significantly decreased following proper surface modification, such as PEG encapsulation. In addition, PEG encapsulation may also serve as a general method to attenuate nanotoxicity for other nanoparticles.

Resistance of the Erwinia Carotovora Subsp. Betavasculorum to Nanosilver in in Vitro Culture of Sugar Beet

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Silver (Ag) nanomaterials (nanosilver) are widely used today for their antibacterial activity. It can be expected that, with prices of medical applications of nanosilver decreasing, their use will increase. Recent review papers suggest that nanosilver may not be hazardous to humans and may result in low internal exposure. In addition, indirect adverse effects on human health may occur via an increasing resistance of micro-organisms against silver based compounds. In this research, behavior of a plant pathogen, Erwinia carotovora subspecies betavasculorum, the causal agent of the soft rots disease, was studied in exposure to nanosilver. Size and shape of the silver nanoparticles was studied by AC-AFM microscope. 100 micro liters of 24 h bacterial culture was added to each dish containing NB or NBA media. Different concentrations of silver nanoparticles (0, 50, 75, 100 and 125 ppm) were added to bacterial cultures on bout NB and NBA media. Same concentrations were used to sugar beet contaminated in vitro plantlets. Deterrence rate of growth of isolates, and the number of new recovered seedlings from contaminated ones were assessed in a Factorial Complete Block Design. Growing proliferation of bacteria was prevented in LB medium with 50 ppm of the silver nanoparticles but in spite of their slowing proliferation in NBY medium at concentrations above 100 ppm, re-growth of bacterial proliferation occurred when incubated on a fresh medium. Bacterial survival in high concentrations of nanosilver may be due to bacterial resistance to nanosilver and therefore it's recommended that research be done to clarify this issue.

Effects of Ag Nanoparticles on the Activity of CPK and LDH Enzymes in Male Wistar Rats

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Nano materials and nanoparticles have received considerable attention recently because of their unique properties. The nano size results in specific physicochemical characteristics that may differ from those of the bulk substance or particles of largre size. Silver nanoparticles are important in many applications used in human body. In this study, 40 adult male Wistar rats with average weight of 220 ± 20 gr were injected with 50, 100, 200, and 400 PPm of silver nanoparticle in five consecutive days. Then three, eight and twelve days after the last injection, blood sampling was performed. To investigate the effect of silver nanoparticle on Phospho creatin kinase and Lactate dehydrogenase ANOVA was used in different days. The results indicate an increase in the concentration of lactate dehydrogenase 50PPm on the eighth day, but given the lack of significant LDH levels in this group and others groups (P=0/192) so more time is needed to study these enzymes. Creatine Phospho kinase levels in all groups except the eighth day 50PPm concentration was increased, although none of these values were not significant (P=0/841) and this can be a valuable indication of the safety of these nanoparticles.

Effect of the Nanoselenium on the Enzymatic Activity of Liver and Histometric Properties in Rat

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The present study investigated the effect of nano-selenium on antioxidative activities of the liver and its histopathological changes. Thirty adult Wistar rats were separated into three groups. Groups 1 and 2 received orally the nano-selenium and sodium selenite (1mg/kg for 20 days); group 3 offered as the control. To measure oxidative damages and lipid peroxidation, on days 10 and 20 after administration, TBARS level and catalase (CAT) and superoxide desmutase (SOD) activities in serum specimens and hepatic histopathological structure was evaluated. The result showed that CAT and SOD activities were significantly increased on day 20 in nano-selenium group than controls, but was reverse for TBARS. It was found that TBARS level on day 10 were significantly lower as compared with controls ($p<0.05$). Sodium selenite treatment resulted in an increase significantly in CAT activity on day 20 than the control group ($p<0.05$). Also an increase no significant was seen in SOD activity and vice versa a decrease TBARS levels observed on days 10 and 20 than the control group. There was significant difference in CAT activity in groups 2 and SOD in group 1 at 20th day than day 10. Histopathological results showed that in comparison with control rats, treatment with nano-selenium and sodium

selenite produce alterations in the hepatocytes, the sinusoids and portal. The changes in the hepatocytes included summarily as giant cells (binucleated) and cloudy swelling, hyperemia sinusoids and portal and lobular penetrate by inflammatory cells. Keywords: Anti oxidative enzymes, Liver, Nano selenium, Sodium selenite.

Interaction between Lactate Dehydrogenase and Nanoparticle Silver of Three Different Sizes

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Nanosilver products which have well-known antimicrobial properties have been used extensively in a range of medical settings. Interactions of known biologically active silver nanoparticles (Three different sizes) were studied by various kinds of spectroscopic methods. In order to study the activity of LDH mechanisms underlying the effects of silver nanoparticles on lactate dehydrogenase (LDH, EC1.1.1.27) injected with nanoparticles silver of various doses. The results showed that nanosilver could significantly decrease activity of LDH ; By fluorescence spectral assays, the nanoparticle silver was determined to be directly bound to LDH, and nanoparticle silver induced the protein unfolding. The fluorescence data showed that the binding of nanosilver to proteins caused strong static fluorescence quenching. It was concluded that the binding of nanoparticle silver altered LDH structure and function. The titration results indicated that nanosilver quenched the fluorescence intensity of LDH through static mechanism, and there are three different kinds of interaction behavior with three different sizes. In addition, according to decrease activity of LDH, the results showed that the fluorescence quenching of LDH originated from the Trp and Tyr residues, and induced a conformational change of LDH with the addition of the nanosilver. This study showed that the size and concentration of nano particles are important in their effect on biomolecules, so it is useful to study on toxicity of silver nano particles in vivo.

Hypersensitivity Assay (Allergenicity Test) on Two Antiseptic Colloidal Nanosilver Products

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In this study, two antiseptic colloidal Nanosilver solutions (as 15ppm and 20ppm nanosilver concentrations) individual in pharmaceutical marketing of Iran were evaluated by mouse ear swelling test (MEST) for quantitatively measuring the sensitization. In this assay, a "positive" sensitization response was considered to have occurred if the test ear of an animal was at least 20% thicker than the control ear. Our investigation showed no significant sensitization and irritation responses to dermal exposure to both of nanosilver products. Based on the hypersensitivity test is proposed to predict some possible immunologic impacts of substances, it should be considered in complementary risk assessments and safety evaluations in dermal delivery of nanomaterials.

Novel Smart Cell-Imprinted Substrate to Safe Control of Stem Cell Fate

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Stem cell features, such as accurate differentiation to desire lineage and maintenance of pluripotency, are regulated and controlled not only by the stem cells themselves but also through the 3D microenvironment. Mimicking this environments or niches utilizing biocompatible materials, could facilitate the production of large amount of specifically differentiated stem cells. Notably investigation revealed the potential importance of physical/mechanical cues influencing stem cells, such as stiffness and cell shape, alongside the biochemical factor roles. In this paper, we have presented the smart and safe substrate, based on cell-imprinted templates and mechanotransduction to accurate control the fates of stem cells. For the fabrication of the cell-imprinted substrates, PDMS was utilized. This substrate was characterized by SEM, AFM, Flouresent and Confocal microscopy. The toxicity of PDMS to stem cells was evaluated using an MTT-assay. The gene expression analysis of differentiated cells, were detected by Real Time PCR. The optical microscopy, AFM and SEM results, demonstrated that the stem cells mimicked the mature cells morphology. After 3-4

weeks, the Real Time-PCR results and protein expression patterns confirmed the mentioned microscopy data by expression of the chondrocyte and Tenocyte specific markers in the imprinted stem cells on nano-featured substrate. This methodology might pave the way for a safe, reliable, efficient, and cheap way of controlling stem cell differentiation. Additionally, imprinting cells patterns with bioprinting techniques on substrates which alter the stem cells morphology can induce the stem cell differentiation to specific lineages without any biochemical agents such as growth factor.

Study of Intensification Effects of Existence of Nanomaterials in Live Cells Exposure to Environmental Mutagenic Rays by Monte Carlo Methods using Geant4 Simulation Toolkit

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Rays (Electromagnetic waves, Ions, etc) deposit energy in the position of impact to live tissue which have destroying effects. Bodily effects are in a wide range: temporal disorder in some physical acts to serious aftermath like decreasing lifetime, resistance against diseases and breeding power and etc. The amount of suffered injury is a function of ray's dose and of the exposure medium. These effects of rays could be direct (DNA breaking) or indirect (breaking up water's molecule to ions and active radicals). Materials and elements have potential of converting a ray to a wide range of other rays which in turn can take effects on weakness or intension of reactions between live tissue and primary rays. Geant4 (for GEometry and Tracking) is a platform for "the simulation of the passage of particles through matter" using Monte Carlo methods and is developed by CERN. In this research the effects of existence of nanomaterials in live tissue impacted by rays, is studied by Geant4 simulation toolkit. Environment and cell structures are obtained and the code has a considerable capability to add more options for detailed analysis in future. Exported data from the simulation include "site of the impact", "energy deposition in each pixel of exposured cell" ... and how the living cell to be affected by this conditions will be presented.

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Safety Analysis of Gd2O3 Nanoparticls with Different Core-Shells in Cell-Tracking as New Contrast Agents for Molecular MRI

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Despite the wide application of gadolinium and gadolinium oxide (Gd-oxide) as contrast agents for magnetic resonance imaging (MRI), there is a serious lack of information on its toxicity. There are methods for reducing toxicity of Gd-oxide based contrast agents in MRI, such as core nanoparticles coating or conjugating. Therefore, for toxicity evaluations, we compared viability of commercial contrast agents in MRI (Gd-DTPA) to the synthesized nanoparticles with the same core Gd-oxide and small particulate gadolinium oxide (SPGO<40nm) but different coating diethyleneglycol (DEG) as Gd2O3-DEG, methoxy polyethylene glycol-silane (mPEG-silane550, mPEG-silane 2000) as SPGO-mPEG-silane550, SPGO-mPEG-silane 2000, and Gd2O3-DEG loaded in Liposomes. These are analyzed in the SK-MEL3 , U-87 MG, THP-1 and MC/9 cell lines, by light microscopy, MTT assay using 3-[4, 5-dimethylthiazol-2-yl]-2, 5-diphenyl tetrazolium bromide, and the LDH assay detecting lactate dehydrogenase activity. The viability values were not statistically different between the nanoparticles and covencial contrast agent Gd-DTPA. The MTT and LDH assay results showed Gd2O3-DEG nanoparticles are more toxic than Gd-DTPA and other nanoparticles. The SPGO-mPEG-silane 2000 and Gd2O3-DEG loaded in Liposomes are more biocompatible than other nanoparticles. Overall, based on the above results it is apparent that there is not an increase in the observed cytotoxicity not only dose-dependently but also time-dependently for synthesized nanoparticles and Gd-DTPA. Therefore, among different groups coating materials due to their considerable properties and not having fixed sizes (different molecular weights), selected as useful surface covering of nanomagnetic particles that could reveal noticeable relaxivity and biocompatibility.

Optimum Concentration of Contrast Agent for Different RF Pulses in CEST MRI

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Chemical exchange saturation transfer (CEST) imaging is a relatively new MRI technique. In this approach exogenous or endogenous compounds containing are selectively saturated (by RF pulse) and after transfer of this saturation, detected indirectly through the water signal. CEST agents provide a powerful source for potential applications including pH imaging and nanoparticle/polymer labeling. CEST is suitable for molecular and cellular imaging that employ both paramagnetic and diamagnetic contrast agents (CAs) which has led to the nomenclature of paraCEST and diaCEST respectively. However there are some limitations for using CAs due to perturbing the physiological environment and their toxicity. We try to find maximum CEST contrast by optimum CA concentration that can minimize toxicity, therefore we compare the effects of Gaussian, Fermi and Rectangular RF pulses by using numerical solution of Bloch-McConnell equations (BME). Efficiency of RF pulses is investigated by CEST ratio, specific absorption rate (SAR) and CA concentration assuming a constant flip angle (FA). Our results show Rectangular RF pulse has the better performance than other RF pulses that are soft RF pulses based on aforementioned indices. Among soft RF pulses, Fermi is better than Gaussian. Our results show that adding excessive CA concentration will not necessarily lead to increased CEST contrast. Despite Rectangular RF pulse, soft RF pulses, achieve maximum contrast by lower concentration. Although maximum contrast in the soft RF pulses is smaller than Rectangular RF pulse. All results are consistent with empirical formulations previously reported for CEST.

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Optimization in Production, Bio-Safety and Enhancement of Biosynthesis of Gold Nano-Particles by Streptomyces Bacteria in Sarcheshmeh Copper Complex

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Gold nano-particles (GNPs) produced by several soil Streptomyces bacteria isolated from soils of Sarcheshmeh Copper Complex. Biological, ecological and environmental safety had high priority in our goal in biotechnological approaches. Unfortunately the traditional methods of extracting gold have high environmental risks particularly contamination of groundwater aquifers. Microbial production of gold nano-particles performed through fermentation procedures of Streptomyces bacteria isolated from soils of Sarcheshmeh Copper Complex. The procedure managed under well-monitored environmental security and safety. Gold nano-particles produced by various strains of Streptomyces bacteria. To determine the characteristics of produced nano-particles, techniques of using flame photometry, spectroscopy and electron microscopy were employed. Metal-winning processes based on the activity of microorganisms offer a possibility to obtain metals from mineral resources not accessible by conventional mining. The criteria established in our procedure, were indicative of no adverse environmental consequences but indicative of an eco-friendly manner; however, further optimization is under investigation. Ongoing objectives of the project include development of a bio-mining procedure for applications of microbial operations for an economical heavy metals recovery by use of the tested microorganisms to recover nano-gold particles from disposals and sewages of different processing units of the Sarcheshmeh Copper Complex as refinery, concentration and bioleaching plants.

Effects of Size and Concentration of Nanosilver on Liver Tissue of Common Carp (Cyprinus Carpio)

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Silver nanoparticles are used in various industries, which can easily enter the aquatic environment and exert toxic effects on different organs such as the liver of aquatic animals. According to literatures, the liver is the main organ of accumulation of nanomaterials including nanosilver. The present study was carried out to determine effects of size and concentration of nanosilver on liver tissue of common carp (Cyprinus carpio). In this study, fish were placed in water containing nanosilver of approximately 10-50 nm in size and 10, 25, 50 and 100 microgram per liter (PPM) concentration. Following anesthetizing fish, the liver was removed and fixed in formalin. Histopathological changes of the liver tissue were studied using microscope equipped with a camera and computer. The results were compared with a control group and recorded. Liver tissues after 24, 48 and 96 hours exposure to 10 PPM concentration of nanosilver, showed a relatively mild toxic effects, while increased in concentration of nanosilver from 10 PPM to 25, 50 and 100 PPM, resulted in increased liver tissue damage, so that the histopathological effects to the parenchyma as well as the port area were evident. This finding suggest that, severity of toxic effects of nanosilver on the liver tissue are directly related to increased nanosilver concentration and duration of exposure, which denote that liver of common carp are at the greater risk of environmental pollution by nanosilver.

MUC 1 Aptamer Conjugated to Chitosan Nanoparticles, an Efficient Targeted Carrier Designed for SN38 Delivery toward Colon Cancer

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SN38 (7-ethyl-10 hydroxycamptothecin) is a potent metabolite of Irinotecan (7-ethyl-10-[4-(1-piperidino)-1-piperidino]-carbonyloxycamptothecine) which cannot be used clinically due to its poor solubility. Developing Nanoparticles (NPs) of the conjugated drug-polymer overcoming such problem can be a good candidate for delivering therapeutics to the target tissue. In this study, chitosan was used as a promise carrier for delivery of SN38 to colon cancer. N-carboxethyl chitosan ester (CS-EA) synthesized as an intermediate for conjugation of SN38 to chitosan. Conjugation of CS-SN38 was confirmed by Fourier transform infrared (FTIR) spectroscopy, and 1Hnuclear magnetic resonance (H NMR) spectroscopy. Drug content of 7.09%± 0.12 was achieved for prepared conjugates. To target colon cancer cells, Anti MUC1 aptamer (Apt) was conjugated to the NPs. Results showed prepared NPs have a spherical morphology. Conjugation of aptamer was confirmed by agarose gel electrophoresis. In vitro cytotoxicity of the prepared NPs experiments were assessed in cell culture using HT-29 as MUC 1+ cell line through MTT test. Results showed that aptamer conjugated nanoparticles were more toxic for MUC 1+ cell line than non-targeted NPs than and as toxic as free drug. Therefore, our prepared CS-SN38-Apt conjugated nanoparticles can increase efficacy of SN38 in cancer treatment

Antibacterial Activity of Polyvinyl Alcohol/ Multi-Walled Carbon Nanotube Nanocomposite films

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Polyvinyl alcohol (PVA) thin films were reinforced by glutaraldehyde and multi-walled carbon nanotubes (MWCNT) and then mechanical, water solubility, water swelling, water uptake, water vapor permeability and antibacterial properties of the films were examined. Cross-linking by glutaraldehyde or incorporation of MWCNT caused a significant increase in tensile strength, decrease in elongation at break and increase in young modulus of the PVA films while; MWCNTs were more effective rather than that of glutaraldehyde. Cross-linking by glutaraldehyde or incorporation of MWCNT caused a significant decrease in water solubility, water swelling and water uptake, with a similar manner. Cross-linking by glutaraldehyde or incorporation of MWCNT caused a significant increase in the light absorbance, while maximum absorbance was at 400 nm. Only PVA/MWCNT films but no PVA/glutaraldehyde showed significant antibacterial activities in a dose-dependent manner against both Gram-positive and Gram-negative bacteria. Thus, non-covalent improvement by MWCNT was more effective on the PVA thin films rather than covalent cross-linking by glutaraldehyde.

Antibacterial Properties of Ag+TiO2, ZnO Nanoparticles

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The environmental behaviors of nano particles and technical applications have been in the focus of extensive research in recent years due to their antibacterial, light, electrical, properties. Previous study shows that Ag, TiO2, ZnO, Cu, Nano particles have antibacterial properties, which are dependent on the size and density of them. In this work we have fabricated Ag nano particles in TiO2 matrix and ZnO nano particles by plasma enhanced chemical vapor deposition (PECVD) and investigated the bacterial activity of Ag and TiO2 and ZnO nano particles against Escherichia coli (E.coli) under VI radiation and dark condition, at room temperature, due to their applications as a covering surface on clinical devices.The nano particles have better antibacterial efficiency in visible light conditions.The number of bacteria is reduced in vicinity of ZnO to 1/3 of its original in 24 hours, in vicinity of TiO2 to 1/2 of its original in 8 hours and in vicinity of Ag+TiO2 to 0 in 8 hours. Our results show that the Ag+TiO2 nano particles have strong antibacterial property.

Bio-Finishing of Cotton Fabrics to Enhance Antibacterial Performance of Nio-nanoparticles Sonochemically Coated on Fabrics

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The high incidence of hospital-acquired infections places a huge financial burden on our health care systems. These infections are also responsible for many millions of deaths each year. Antibacterial fabrics for use in medical textiles, such as hospital uniforms, bedding and wound dressings, can provide a useful weapon in the on-going fight against these infections. There are a few reported uses of nickel oxide and there is no report on NiO/cotton composite as antibacterial agent. This paper describes a method for enhancing the stability and the antibacterial activity of NiOnanparticles synthesized and embedded sonochemically on cotton bandage, by bio-finishing the fabric surface with cellulase enzyme. X-ray diffraction(XRD) pattern of the coated bandage showed single-phase NiO with a cubic structure and scanning electron microscope(SEM) micrograph of deposited nickel oxide nanoparticles demonstrated homogeneously fiber coated with nanoparticles.The antibacterial activities of the NiO/cotton composite were tested against Pseudomonas aeruginosa(1399,Gram negative) culture using Diffusion Disk Method (DDM). The antibacterial effect was detected due to the nickel oxide nanoparticles.Enzymatic treatment had a positiveimpact on the deposition of smaller sized and improved adhesion of NiOnanparticles and consequently on the antibacterial activity in compared with untreated-cotton. The coated fabrics can have potential applications in wound dressing, bed lining and as active bandages. They can be also recommended for the purification of medical and food equipment, for domestic cleaning, etc.

Immunogenicity Study of Vibrio Cholerae Ctx B based on Oral Trimethyl Chitosan Nano-Capsules in Guinea Pig.

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Vibrio cholerae toxin consists of two components A, B, that Part B (CtxB) non-toxic and its role to create channels in the cytoplasm of the host cell for the transfer of toxic part (A). The CtxB can be used to develop immunity against bacteria. The oral method is the primary way of cholerae bacteria antigens, but they are unstable and virtually no chance of attracting. In this method, CtxB was added to TMC for the nano-encapsulation. After measuring nano-encapsulation and confirmed by SEM was administered to the guinea pig. Headline Group encapsulated measurement results, compared to non-encapsulated and control group showed a large increase, As a result, If the antigen is placed inside the nanocapsules, the antigen can be easily absorbed through the M Cell and the immune response is provided and to escape from destruction and lack of absorption in the gastrointestinal tract. Also, considering the length of the polymer destruction more help stimulate the immune system makes antigen against. Thus, this nano-encapsulation method can be considered candidates for vaccination.

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Evaluation of Lipid Profile and Oxidative Stress Indexes after Iron Oxide Nanoparticle Administration in Serum and Liver of Rat

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Regarding to importance of iron and role of oxidative stress in its toxicity, at present study effect of nano iron oxide on oxidative stress indexes and lipid profile in serum and liver of rats was compared with conventional iron oxide. One group of rats was kept as control and nano or conventional iron oxide was interaperitoneally injected daily for 15 days at dose 8mg/kg. The amount of malondialdehyde (MDA), antioxidant activity (AOA), triglyceride (TG) and cholesterol in serum and liver, carbonyl protein and total lipid in liver and LDL, VLDL and HDL in serum of rats were determined. Liver AOA was significantly increased by nano and conventional iron oxide. MDA in serum was significantly decreased and in liver was significantly increased by nano iron oxide. Carbonyl protein was significantly increased by nano and conventional iron oxide. TG and VLDL were significantly decreased by nano and conventional iron oxide and LDL was significantly increased by nano iron oxide. Thus, nano iron oxide can increase oxidative stress in liver and induce arthrosclerosis; although this needs evaluation in more times.

Effect of Nano-Polyethylene Absorbent and Antimicrobial Cover on the Antioxidant Activity of Mango Fruit

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An experiment was carried out to investigate the effect of three concentrations of a nano-zeolite (nano-polyethylene absorbent containing potassium permanganate), and an antimicrobial cover on shelf-life of mango fruit at 15±1°C and 93±2% relative humidity. After bleaching processes, the fruit were treated with nano-zeolite (0, 1, and 2 of five-gram Sachet). Then they were covered with and without an antimicrobial cover and stored for two week in a warehouse. At 5, 10, and 15 days after storage, some biochemical characteristics of fruit were evaluated. The results showed that the greatest reduction of total phenols (1.87 mg gallic acid per 100 g fresh weight) and the highest concentration of Polyphenol oxidase (1.74 Mml-1) were observed in the treatment of antimicrobial cover without the application of nano-zeolite at 15 days after storage. The lowest reduction in total phenolics with an average of 0.87, 1.38, and 1.17 and the lowest concentration of polyphenol oxidase with an average of 0.96, 1.20, and 1.42 were obtained at 5, 10, and 15 days after storage when 2 Sachet of nano-zeolite was used with antimicrobial cover, respectively. However, a high concentration of peroxidase and catalase were observed at 10 and 15 days after storage than at 5 days after storage in all treatments. It was concluded that the use of nano-zeolite with antimicrobial cover led to a preventive in enzyme activity. As a result, the shelf-life of mango fruit will be increased via retaining a high antioxidant capacity.

Effect of nano-polyethylene absorbent and antimicrobial cover on the antioxidant activity of banana fruit

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Abstract an experiment was carried out to investigate the effect of three concentrations of a nano-zeolite (nano-polyethylene absorbent containing potassium permanganate), and an antimicrobial cover on shelf-life of banana fruit at 15±1°C and 93±2% relative humidity. After bleaching processes, the fruit were treated with nano-zeolite (0, 1, and 2 of five-gram Sachet). Then they were covered with and without an antimicrobial cover and stored for one week in a warehouse. At 2, 4, and 6 days after storage, some biochemical characteristics of fruit were evaluated. The results showed that the greatest reduction of total phenols (6.41 mg gallic acid per 100 g fresh weight) and the highest concentration of Polyphenol oxidase (1.98 Mml-1) were observed in the treatment of antimicrobial cover without the application of nano-zeolite at 6 days after storage. The lowest reduction in total phenolics with an average of 6.67, 6.63, and 6.57 and the lowest concentration of polyphenol oxidase with an average of 1.06, 1.45, and 1.78 were obtained at 2, 4, and 6 days after storage when 2 Sachet of nano-zeolite was used with antimicrobial cover, respectively. However, a high concentration of peroxidase and catalase were observed at 4 and 6 days after storage than at 2 days after storage in all treatments. It was concluded that the use of nano-zeolite with antimicrobial cover led to a preventive in enzyme activity. As a result, the shelf-life of banana fruit will be increased via retaining a high antioxidant capacity. Keywords: banana, nano-zeolite, antimicrobial cover, antioxidant compounds

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Dermal Safety of Virgin and Used Engine Oil Enriched with Copper Nano Particles in Rabbits

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Acute dermal toxicity of virgin and used conventional engine oil (vCEO and uCEO) and nano-enriched engine oil (vNEO and uNEO) was evaluated in rabbits according to the OECD 404-2004 guideline. Rabbits were exposed dermally to 0.5 mL of either of the products using dermal patches on the dorsal area for 3 min - 4 h. The area was monitored up to 14 days after termination of the application. The results determined that none of the products led to a harmful effect during 3 min - 4 h of application or 1 h - 14 days after ceasing the application

Study of Defensive Effects of the C60/Liposome Complex against UVA

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Fullerenes are the artificial forms of the element carbon. Fullerenes words, the whole set of hollow carbon molecules that have structures with pentagons and hexagons, are included. Application of lipid-based nanocarriers in drug formulation is one approach to improve drug safety. We previously reported biological safety of fullerene-C60 (C60) incorporated in liposome consisting of hydrogenated lecithin and glycine soja sterol, as Liposome-Fullerene (0.5% aqueous phase; a particle size, 76 nm; Lpsm-Flln), and its cytoprotective activity against UVA. In the present study, Lpsm-Flln was administered on the surface of three-dimensional human skin tissue model, rinsed out before each UVA-irradiation at 4 J/cm2, and thereafter added again, followed by 19-cycle-repetition for 4 days (sum: 76 J/cm2). UVA-caused corneum scaling and disruption of epidermis layer were detected by scanning electron microscopy. Breakdown of collagen type I/IV, DNA strand cleavage and pycnosis/karyorrhexis were observed in vertical cross-sections of UVA-irradiated skin models visualized with fluorescent immunostain or Hoechst 33342 stain. Upon administration with Lpsm-Flln [16.7 μM (12 ppm): C60-equivalent] on human abdomen skin biopsies mounted in Franz diffusion cells, C60 permeated after 24 h into the epidermis at 1.86 nmol/g tissue (1.34 ppm), corresponding to 0.3% of the applied amount and a 9.0-fold dilution rate, but C60 was not detected in the dermis by HPLC, suggesting no necessity for considering a toxicity of C60 due to systemic circulation via dermal veins. Thus Lpsm-Flln has a potential to be safely utilized as a cosmetic anti-oxidative ingredient for UVA-protection.

Improving the Properties of Alumina Nanoparticles in The Presence of Safety Additive Materials

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Alumina nanoparticles are one of the safety nanoparticles which have many applications in pharmaceutical industry and health care products. However, fragility and instability of the nanoparticles make some defects but use of surface coatings reduces or eliminates these defects improves its properties. In this study various alumina nanoparticles were synthesized in presence of oleic acid and polyvinylpyrrolidone (PVP) as two safety coating by chemical precipitation method. The chemical interaction of the surfactant with the nanoparticles in each level was studied by infrared spectroscopy (IR). Also the samples were characterized by X-Ray Diffraction (XRD), electron microscopy (SEM) and Transmission Electron Microscopy (TEM). The average size of nanoparticles is obtained 58 nm in the presence of oleic acid and 46 nm in the presence of PVP. But average size of alumina nanoparticles without additives is estimated about 61 nm. Electron microscopy results revealed that the coating are separated adjacent grains and creates an orderly distribution of grains in nanoparticles, so that nanoparticles will be more stable

Toxicity Evaluation of Extract of Banana Peel at Nano Scale in Two Spot Gourami fish

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Natural extracts of fruit and peels obtained from the plant Musa sp (musaceae) consist of various chemical compounds such as Melatonin, Serotonin, Catecholamine which can be effective for treatment of diseases such as depression, and Parkinson syndrome. In present study the acute toxicity of extract of banana peel as nano scale which might potentially cross the blood brain barrier and in this regard being more effective for clinical use is evaluated using a bioassay technique. Nano extracts of banana peels (NEBP) which were prepared by the previous studies and also confirmed by Scanning Electron Microscopy (SEM), were studied in this study in order to be determined its general toxicological profile. Different concentrations of NEBP which ranged from 2 to 20ng/μl were applied to gourami fish fry two spotted (Trichogaster trichopterus) for one week assay. LC50 values for each assay were obtained by probit analysis after taking average for three distinct experiments. The mean LC50 value obtained from lethality of gourami fish fry to NEBP was as 102.84 ± 15.65 ng/μl. The bioassay results showed that the extract of banana peels has dose dependent toxicity to gourami fish and can be considered as significantly active.

The influences of zinc oxide nano particles on the population of rumen protozoa in Markhoz goat kids

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In this study, the effects of nano zinc oxid (nZnO) as a dietary zinc supplement on the population of rumen protozoa in Markhoz goat kids were investigated. A total of 12 male Markhoz goat kids aged 7-8 months were randomly allotted to 3 treatments including; 1) basal diet containing 22.12 mg Zn/kg DM; 2) basal diet+20 mg Zn/kg DM as nZnO and 3) basal diet+40 mg Zn/kg DM as nZnO in a completely randomized design. The diets were offered daily at 08:00 and 17:00 in 2 equal portions for 14 days. On the end day of the experiment, 3.5 h after morning feeding, rumen fluid was obtained from each kid via esophageal tube. The samples were tested for total count and the kind of protozoan. In the rumen fluid of the kids were found 5 kinds of protozoa (Isotricha, Dasytricha, Entodinium, Diplodinium and Epidinium spp.). No significant difference was observed between treatments for a total count of protozoan. Highest and lowest counts were found for Entodinium spp. and Isotricha spp. respectively. Overall results showed that the levels of 20 and 40 mg Zn/kg DM as nZnO had no effect on the population of rumen protozoa in Markhoz goat kids.

Synthesis of CNT/Tio2 Nanocomposite Improved by Choosen Corrective Ratio between Cnts and Tio2 and Doped Mo, Applicated as a Nano Photocatalyst for Degradation of Dyes in Textile Industry

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Dyes are one of main sources of water pollutants existing in our environment. One of the water purification technologies is using from the various compounds of TiO2 nanoparticles and nanocomposites and its compounds as nano-photocatalysts.TiO2 is a very active photocatalyst, physical and chemical stable,exuberately and availability and of low biological toxicity,etc. In recent year, very experimentals and studies have done for improved photocatalytic activity of TiO2 nanoparticle. Many techniques have been examined to shift the absorption wavelength range of TiO2 higher towards visible region, such as, we do doping by Mo as transition metal ion and the coupling of carbon nanotubes (CNTs) and TiO2 nanoparticle that it has attracted much attention in the literature. Hence, by using from core–shell coatings of TiO2 on the CNTs surface should improve the transfer of photo-induced free electrons from the TiO2 matrix to the CNTs and inhibit the recombination of photo-induced carriers through the formation of heterojunctions.This nanocomposites prepared by improved sol-gel method and CNT/TiO2 doping with Mo prepared by photochemical method.We found best ratio between CNT and TiO2 and best percent of Mo in this nanocomposite. Recently, C, N, S, F, Br anion-doped TiO2 photocatalysts that show a relatively high level of activity under visible-light irradiation have been reported to reduce the band gap energy of TiO2. The doping of various transitional metal ions into TiO2 could shift its optical absorption edge from UV into Visible light range.

Synthesis of Cobalt Oxide Nanoflakes by Sol-Gel Method for Efficient Removal of Cd(II) from Aqueous Solution

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Cobalt oxide (CO3O4) nanoflakes were prepared by citric acid in low temperature based sol-gel method. The physiochemical properties of nanoflakes were investigated using Fourier transform infrared spectrometry (FT-IR), scanning electron microscopy (SEM) and transmission electron microscopy (TEM). The average crystalline size of CO3O4was estimated from the X-ray diffraction peaks of powders using scherrer's formula. The adsorption of Cd (II) from aqueous solution on CO3O4 nanoflakes was studied in a batch system. The effects of PH and dosage of the adsorbent on the adsorption process were examined. The maximum Cd (II) adsorption capacity was achived at PH>8 and dosage of the adsorbent optimum at 20mg. the experimental data were analyzed using the Langmuir and Freundlich isotherms.

Monitoring of ZnO Nanoparticle Release from Nanocomposite Packaging during Caviar Storage

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Nanotechnology recently introduced in the food packaging industry can potentially provide solutions to shelf life of foods. Antimicrobially active packaging is a new generation of nano food packaging based on metal nanocomposites which are made by incorporating metal nanoparticles into polymer films. Nanoparticles (NP) of Ag and ZnO are being used industrially for different purposes. Aim of this study was to evaluate the capabilities of ZnO nanoparticles filled LDPE nanocomposite packaging as a new approach to preservation and prolonging shelf life of caviar. Nanocomposite LDPE films containing ZnO nanoparticles were prepared by melt mixing in a twin-screw extruder. Packages prepared from nanocomposite films were then filled with non-pasteurized caviar and then stored at 4□C. ZnO nanoparticles migration from package to caviar and microbial stability of caviar was evaluated after 60, 90, 120, and 150 days of storage. The results showed the increase of ZnO migration and decrease of microbial growth rate as a result of using this nanocomposite packaging material.

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Core-Shell Structured Nano-Hydrogels of Poly Ethyleneimine Ionomer Containing Redox-Sensitive Cross-Links: Effect of the Morphology on Biocompatibility of the Macromolecule

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Despite widespread biological applications of polycations such as poly ethyleneimine (PEI), they demonstrate some safety problems to different extents depending on their molecular weight, charge density, structure and conformational flexibility. Herein, a novel nano-hydrogel structure was developed for delivery of water soluble chemotherapeutic agents. The core comprises a network of the cross-linked poly cations while the shell of poly ethylene oxide chains are expected to provide an improved physicochemical and biological stability. The nano-hydrogels were synthesized by template assisted method. Donor-acceptor complexes of a metal ion and polyamine segment of the PEI ionomer (mPEG grafted branched PEI) were served as micellar template for biodegradable cross-linking with dithiodipropionic acid, followed by acidic pH dialysis. The nano-hydrogels were characterized by dynamic light electrophoretic spectrometry and TEM. The biocompatibility of the nano-hydrogels was compared to the PEI ionomer and PEI (control) by different experiments such as albumin induced aggregation, erythrocyte aggregation, hemolysis and MTT cytotoxicity assay. Furthermore, Ellman's assay was performed to study biodegradability in a simulating medium containing NaBH4. The nano-hydrogels represented uniform, discrete and neutral hydrophilic nanoparticles as confirmed by TEM. They demonstrated an excellent biocompatibility. Surprisingly, unlike PEI or the PEI ionomer, the nano-hydrogels showed no detectable hemolytic effect up to 3 mg / ml. Similarly, a strong erythrocyte aggregation was observed for PEI; however, the aggregation disappeared following the cross-linking reaction. Shielding effect of mPEG chains and noticeable reduction of the zeta-potential might play a critical role for the observations.

Effect of Carbon nano tubes on alcohol dehydrogenase

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We studied the effect of carbon nano tube (CNT) and functionalised carbon nanotube (FCNT) on Alcohol dehydroganse (ADH) that exist in liver and kidney by electrochemical methods. The carbon nanotubes have destructive of this enzyme. The cyclic voltammetry (CV) of ADH shows that any current is exist bcz of enzyme but if the methylene green is used as mediator, the electron transferring is seen vis mediator. Reduced current in CV shows that ADH is exposed to carbon nanotube and derivatives denature the ADH and cause that it can't work properly. The exposure of FCNT and CNT with ADH was recorded for 7 days and 1 month

Reported Nanosafety Practices in Research Laboratories of Isfahan Iran

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The possibility of nanomaterials having an adverse impact on human health and the environment has been a cause for concern for a number of yearsand various guidelines on handling nanomaterials have been published. It also binds other hazardous pollutants in water or air, or react with, and thus easier to make their entry into the body. However, nanoparticles have many beneficial to humans but also can be very harmful. Procedure, a questionnaire consisting of 6 parts which are visiting the research centers in Isfahan has been completed and the data were collected. Then analyze the data using the software SPSS. In this study, the results showed that more than 73 percent of the researchers personal protective equipment when they do not use gloves or gloves with 98% of the researchers without regular work. This is despite the fact that over 63% of dangerous particles known researchers and scholars from more than 80 percent in favor of entering the synthesis and application of nano particles are in the air. We find that only about 10% of researchers who are working with nanomaterials reported using nanoenabled hoods, and one in four did not use any type of general laboratory protection.

Comparative Study of the Effects of Bulk and Nanoparticles Titanium Oxide on Germination Characters of Corn (Zea Mays L)

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Nano-sized TiO2 is widely used in cosmetic and skin care products, in antibacterial and cleaning air products, and for decomposing organic matter in wastewater. Due to the increased demand and production volume, the environmental exposure to nanoscale TiO2 has been predicted and measured to be higher than the exposure to other frequently used NMs such as ZnO, nano-Ag, fullerenes and carbon nanotubes. In this research, Titanium dioxide nanoparticles (nano- TiO2) were prepared from commercial TiO2 nanopowder (Sigma-Aldrich, USA) by dispersing nanoparticles in ethanol through ultrasonication (300 W, 40 kHz) for 30 minutes. Particle size distribution of the nanoparticles was determined through measurements carried out on Scanning Tunneling Microscopy (STM) (NANA – SS-5, Japan) images. Corn seeds were separately treated with different concentrations of nanoscale titanium dioxide and bulk titanium dioxide (0, 5, 10, 50, 100 and 200 mg L-1) and the effect of these treatments was studied on seed germination characters. The results showed that lower concentrations of nanoscale and bulk TiO2 promoted seed germination factors but higher concentrations (more than 100 mg L-1) had inhibitory effects on germination percentage and rate of corn seeds. In order to understand the possible benefits of applying nanomaterials in agriculture, it is important to analyze penetration and transport of nanoparticles in the plants. The inhibitory effect with higher nanoparticle concentration reveals the need for judicious usage of these particles in such applications.

Study of MIC and MBC of Graphene Oxide Nanoparticles on E.Coli

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The antibacterial applications of graphene-based materials, including toxicology, have grown rapidly in the past few years. Graphene and graphene oxide (GO) have been extensively explored as some of the most promising biomaterials for antibacterial applications due to their unique properties: two-dimensional planar structure, large surface area, chemical and mechanical stability, superb conductivity and appropriate biocompatibility. These properties result in promising bio-applications for the design of advanced drug delivery systems by focusing on infectious and antibacterial disease of a broad range of therapeutics. In this study, we have reported the antibacterial activity of GO nanoparticles (nps) against general and more pathogenic bacteria which is named Escherichia coli (E.coli). Experiments were done with different concentrations of GO nps dispersion and then placed in culture plates with presence of E.coli. The results were reported as the minimum inhibitory concentration (MIC) and minimum bactericidal concentration (MBC). The MIC and MBC examination of GO nps on E.coli were 25 and 100 mg/ml respectively.

Synthesis and Evaluation of Physicochemical Properties of Super Paramagnetic Iron Oxide Nanoparticles (Spions) and its in Vitro Cytotoxicity

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Among the different nanoparticle carriers which have been used SPIONs have attracted great attention because of their unique physical properties (Superparamagnetism) and their biocompatibility and biodegradability. This class of NPs has a potential to be used as diagnostic and therapeutic purposes, and because of this property they have been called theragnostic agent. SPIONs can serve as a great contrast agent and utmost feature of them are their capability to produce heat when exposed to alternative magnetic field (Hyperthermia) which candidate them as an excellent therapeutic and diagnostic agent. In order to obtain monodisperse nanoparticles, a microemulsion method was employed to synthesis the SPIONs. At the next step, SPIONs were coated by gold to reduce its cytotoxicity and then its cytotoxicity as bare NPs and protein corona covered NPs were assessed by MTT assay at HT-29 and L929 cell line. Furthermore, physicochemical properties of NPs (size distribution, zeta potential, X-ray Photoelectron Spectroscopy, Transmission Electron Microscopy, and UV) were evaluated. TEM images and DLS data confirmed that prepared NPs were monodispersed and gold coating was confirmed by UV and XPS. MTT assay results showed that gold coated SPIONs have no cytotoxicity at 1-100 μg/ml concentration ($P< 0.05$) and NPs covered with 10% protein corona have low cytotoxicity than bare NPs while 100% protein corona covered NPs are more cytotoxic than bare NPs. SPIONs are a class of NPs with lowest cytotoxicity and their monodispersity and superparamagnetic properties candidate them as an excellent drug carrier and diagnostic agent.

The Effect Absorbtion of Nano Silver in Dermal Toxicity on Kidneys

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Silver nanoparticles have been widely used as new potent antimicrobial agents in cosmetic and hygienic products. Present study compares the serum and tissue level of silver nanoparticles in kidneys of Guiana pigs quantitatively after dermal application and analysis the morphological changes and pathological abnormalities on the basis of the Silver nanoparticles tissue level. Before toxicological assessments, the size of colloidal nanosilver was recorded by X-Ray Diffraction and Transmission Electron Microscope tests and the sizes of samples were recorded in sizes less than 100 nm. For toxicological evaluation, male guinea pigs were exposed to three concentrations of Silver nanoparticles (100, 1000 and 10000 ppm) according to acute pretests for further assessments in sub-chronic model in a period of 90 days. A close correlation between dermal exposure and serum & tissue level of Silver nanoparticles was found ($p < 0.05$) and tissue uptakes happened in dose dependent manner. In histopathological studies, severe proximal convoluted tubule degeneration and distal convoluted tubule were seen in the kidneys of the middle and high-dose animals. Separated lines and marrow space narrow were determined as two major signs of bone toxicities which observed in three different dose levels of silver nanoparticles. It seems that Ag ions could be detected in kidneys after dermal exposure, which has the potential to provide target organ toxicities in a time and dose dependent manner.

The Impact of Zinc Oxide Nanoparticles on the Antioxidant State and Hematological Parameters of Broiler Chickens during Starter Stage

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This research was carried out to investigate the effect of dietary zinc oxide nanoparticles (ZONPs) on the antioxidant enzymes activity and some hematological parameter of broiler chickens during starter stage (1-21d). Experiential diets were including: T1 (control; basal diet), T2, T3, T4 and T5, were supplementation basal diet with 30, 60, 90 or 120 mg of ZONPs/kg diet respectively. Three hundred one-day-male broilers (Ross-308) distributed in a completely randomized design (CRD) consists of five experimental groups, four replicate and 15 chicks in each pen. Results revealed that dietary ZONPs had decreased significantly ($P>0.05$) serum alkaline phosphatase (ALP), Aspartate transferase (AST), alanine transferase (ALT) and lactate dehydrogenase (LDH) enzymes activity compared with control treatment. Total antioxidant capacity (TAC) had significantly ($P<0.05$) increased and malonyldialdehyde (MDA) decreased ($P>0.05$) in birds fed diet supplemented with 60 (T3) and/or 90 (T4) mg of ZONPs in comparison to control and other treatments. As well, dietary ZONPs had increased white blood cells (WBC), red blood cell, hematocrite and hemoglobin ($P>0.05$) compared with control group, although no statistically significance. In conclusion, current study indicated that ZONPs had improved oxidant state and positive effect on the several serum enzymes activity. As well, optimum changes observed in the levels 60 (T3) or 90 (T4) mg of ZONPs/kg.

The Protective Effect of Zinc Oxide Nanoparticles on Kidney and Impairment Induced By Paclitaxel Treatment in Female Wistar Rats

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Paclitaxel, an important anticancer drug is a novel antimicrotubule agent that promotes the assembly of microtubules from tubulin dimers and stabilizes microtubules by preventing depolymerization and inhibits cell growth at the end of G2 and M stages. Considering the medical applications of zinc oxide nanoparticles, evaluating their protective effects on the organisms is important. The aim of this study was to evaluate the efficacy of two doses, 5mg/kg and 10 mg/kg ZnO nanoparticles during 4 consecutive days of intraperitoneal injection of the kidneys were treated with paclitaxel. For this purpose, female wistar rats were divided into 6 groups as follows: 1 control group. 2 The experimental group (dose of 5 mg/kg ZnO). 3 The experimental group (dose of 10 mg/kg ZnO). 4 The experimental group (dose of 3 mg/kg paclitaxel). 5 The experimental group (doses of 5 mg/kg ZnO and 3 mg/kg paclitaxel). 6 The experimental group (doses of 10 mg/kg ZnO and 3 mg/kg paclitaxel). Renal function after 28 days of injection was examined microscopically and macroscopically. On macroscopic examination, group 3 had large and swollen kidneys and there were fat around them. On microscopic examination, groups 1 and 2 in comparison with control group had the same shape. Group 3 in comparison with control had compact nucleus and the shape of cells had changed. In groups 4 and 5 the shape of cells had a bit changed. Results of blood test showed that the urea and creatinine levels in group 3 were increased ($P<0.001$) in comparison with control but the amount of uric acid had not changed significantly. It seems that the ZnO reduced the side effects of paclitaxel on kidneys.

The Protective Effect of ZnO Nanoparticles on Liver and Impairment Induced by Paclitaxel Treatment in Female Wistar Rat

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Paclitaxel is a new chemotherapy drug that inhibits cell growth of microtubules, depolymerization and inhibit cell growth at the end of G2 and M stages. In some studies patients with normal liver function using paxlitaxel have an increase in bilirubin, SGOT, SGPT. The aim of this study was to evaluate the efficacy of two doses 5mg/kg and 10mg/kg ZnO nanoparticles during 4 consecutive days of intraperitoneal injection of liver is treated with paclitaxel. For this purpose, female rats were divided into 6 groups as follow: 1. Control group 2. The experimental group (dose of 5mg/kg ZnO). 3 The experimental group (dose of 10 mg/kg ZnO). 4 The experimental group (dose of 3 mg/kg paclitaxel). 5 The experimental group (doses of 5 mg/kg ZnO and 3 mg/kg paclitaxel). 6 The experimental group (doses of 10 mg/kg ZnO and 3 mg/kg paclitaxel) Liver function after 28 days of injection were examined microscopically and macroscopically.on macroscopic examination group3 had large and swollen liver. On microscopic examination groups 1 and 2 in comparison with control had the same shap. Group 3 in comparison with control had compact nucleus and the shape of cells had changed. In groups 4 and 5 the shape of cells had a bit changed. Results of blood test showed that the SGOT, SGPT and bilirubin levels in group 3 were increased ($p<0.001$) and ALK levels decreased in comparison with control group ($p<0.001$).

The Protective Effect of ZnO Nanoparticles on Ovary and Impairment Induced by Paclitaxel Treatment in Female Wistar Rat

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Paclitaxel is anti-cancer agent, which is used to treat a variety of cancers including ovarian cancer. Due to the side effects of paclitaxel on different organs, purpose of this study, The protective effect of ZnO nanoparticles as a potent antioxidant on paclitaxel-induced toxicity in the reproductive system of female adult Wistar rats. In this experimental study, adult female Wistar rats were randomly divided into six groups including one control group and five experimental groups. The control group received saline by intraperitoneal injection or (i.p). The experimental groups received, nano ZnO (5mg/kg), nano- ZnO (10mg/kg), paclitaxel (3mg/kg), nano- ZnO and paclitaxel (5mg/kg and 3), nano- ZnO and paclitaxel (10and3mg/kg) respectively an intraperitoneal.Treatment was performed for 3 days. After 28 days, measuring sex hormones levels and also histological and morphological changes in ovarian tissue were studied. Plasma LH levels in the experimental groups in comparison with control group was not obtained significantly different. The use of paclitaxel in experimental group 3, caused significant decreased in FSH and progesterone and decreased number of grafian follicles in comparison with control group. The use of Zno nanoparticles with paclitaxel in groups 4 and 5 caused significant increased in FSH and progesterone, also there were increased in the number of graffian follicles in comparison with experimental group 3. The use of nano-Zno significantly improved paclitaxel-induced changes.

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The Study of Antifungal and Antiadhesive Properties Nickel Oxide Thinfilms Polymer-Matrix Nanocomposite

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Nickel oxide thin films of various preferred orientations were deposited by sol-gel methods using different solvents including methanol, ethanol and isopropanol. The resulting films were analyzed by X-ray different (XRD), scanning electron microscopy (SEM), content angle measurement, UV-vis spectroscopy, atomic force microscopy (AFM). Nickel-oxide-based films antifungal activities against Pathogenic both Candida and Standard Candida have been evaluated by drop test method under UV light irradiation and dark condition. The relationship among solvent polarity, preferred orientation, optical, and structural properties of the NiO films and dependent antifungal activity were investigated. Surface properties play a vital role in the functioning of a biomaterial. Cellular adherence and growth onto biomaterials can be enhanced in biomaterial modification of their surface. Polymeric coating may present some disadvantages. As a result, embedding of bioactive compounds and biomoleculs within inorganic coatings is attracting significant attention. In this work, to improve antifungal and anti-adhesive properties of NiO thin films, organic polymer-matrix nanocomposite coating were prepared by layer by layer self-assembly. Here we used chitosan as an antifungal and heparin as anti-adhesive agent as alliteratively deposited on NiO films. As another polymer-based nanocomposite coating, polythyleneimine was self-assembled on NiO films. NiO surface NiO surfaces were successfully modified toward higher inactivation efficiency in comparison with bare NiO films especially against Candida. The most likely reason for the higher polymeric coating's activities was its sufficient hydrophobicity and/ or positive charge. Keyword: Nickel oxide, sol-gel, Thin films, Polymer-matrix, nanocomposite, Antifungal.

The Toxicology of Nanofiberouse PCL on Muscle Skeletal Tissue

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The biocompatibility of polymeric nanofibers is most important for cell culture approaches. Namely, for skeletal muscle tissue engineering, we need the appropriate nanofiberouse mats not only with the mechanical parameter, but also the biocompatibility property is more important. That is because a proper biocompatibility supports cellular attachment and even their differentiation. In our study, the electrospun poly caprolactone with nanofiberouse architecture was studied for in vitro assessments by molecular and cellular assays. Our analysis have showed not only nanofiberouse PCL has not produced the toxicological effects, but also cross linking of nanofibers with a protein such as collagen makes our scaffolds more applicable for skeletal muscle stem cells. Otherwise, our results have demonstrated more capabilities for PCL with a layer of collagen which provides the ligands for cellular attachment. Finally, this study confirms the safety and biocompatibility of PCL for cellular proliferation and maturation.

Toxicity of Silver Nanoparticles on Spermatozoa Characteristics

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Manipulation of the size of metals into nanoscale sizes of <100 nm increases the functional surface area and proportion of atoms exposed on the surface of nanoparticles, making them much more reactive than larger particles and enabling them to bind, adsorbs, cross biological barriers and move through the body. Because of their distinctive properties; nanomaterials have attracted considerable attention in the fields of biotechnology and biosciences. Among these nanomaterials, nanosize preparations of silver have been shown to retain antibacterial properties, a feature that has made nanosilver a promising candidate for biomedical applications. Studies have revealed that the same properties that make nanoparticles so unique could also be responsible for their potential toxicity. Therefore, the present work aimed to investigate the effect of silver nanoparticle on the viability, membrane and acrosomal integrity of Japanese quail spermatozoa. Silver nanoparticles were coincubated (0.01, 0.1, 1 and 10 μg/ml final concentration) with spermatozoa for 40 min. in parallel a negative control was run. Immediately after treatment, spermatozoa were used for investigation of sperm viability, membrane and acrosomal integrity. Viability and membrane integrity were significantly decreased in treatments of silver nanoparticles. There were seen more morphological abnormalities of acrosome in treatments that compared with control. The results of this study clearly showed that silver nanoparticle may have a potential reproductive toxicity.

Toxicity Study of Synthesized Nanoparticles, Pesticides and Heavy Metals on Bioluminescent Bacteria

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Acute toxicity of silver nanoparticles, synthesized by biological and chemical methods, silver ions, pesticides and heavy metals on bioluminescent bacteria, Vibrio fischeri, was investigated. The bacterial light inhibition test as a toxicological endpoint was used by applying of a homemade luminometer. This method is sensitive, low-cost, and reproducible and takes 5 to 30 minutes to predict toxicity. Luminometer was designed with Photomultiplier (PMT) detector. Chemiluminescence reaction of luminol was carried to depict the calibration graph. Optimized conditions of growth of Vibrio fischeri were stirring at 120 rpm at incubation temperature within the range of 15 to 18°C after 24 to 48 h, when solid cultures were reserved at 18°C. To compare the toxicity effects as a quantitative parameter, a nominal effective concentrations (EC) of chemicals and a susceptibility constant (Z-value) of bacteria, after 5 min and 30 min exposure times, were calculated. Limit of Detection for pesticides, Malathion and Diazinon, and heavy metals, Mercury and Selenium is about 1ppb. After 5 and 30 min contact times, the EC50 values of two silver nanoparticles and the EC20¬ values were about similar. The EC values of nanoparticles were larger than those of the silver ions, means silver ions showed more acute toxicity than silver anoparticles. On the other hand, the susceptibilities of V.fischeri to the silver ions were greater than those of the nano silvers.

Transglutaminase-Induced Cross-Linking of Whey Proteins to Generate Non-Toxic Nanoparticles

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One of the most commonly used approaches to control the release of encapsulated substance from protein nanoparticles and improve their thermal stability is cross-linking. There are many reports in literature on the influence of cross-linking nanoparticles by glutaraldehyde after desolvation. It is worthy to note that glutaraldehyde is toxic, making the efficient removal of aldehyde molecules from the protein solution necessary in order to warranty the consumer's safety. Compared to aldehyde containing cross-linkers such as glutaraldehyde, the enzyme transglutaminase is preferred for proteins because provides a totally non-toxic approach for reinforcement of protein assemblies and particles. The enzyme transglutaminase-induced cross-linking was employed to inter-connect the whey proteins after which ethanol were added to protein solution in order to desolvate the medium and generate whey protein nanoparticles. Light scattering measurement of the hydrodynamic size of particles showed a bimodal pattern for all samples comprised from two populations with different median sizes. Enzyme-induced cross-linking of proteins yielded more monodisperse particles and decreased the mean size of the major fraction of particles to 81 nm. Scanning electron microscopy images revealed a spherical morphology for all samples and atomic force microscopy indicated a lower height for the particles from enzymatically cross-linked proteins. Results obtained from differential scanning calorimetry indicated that pre-heating of protein solution before cross-linking and desolvation denatured the proteins entirely. In-vitro degradation of whey protein nanoparticles in a simulated gastric fluid demonstrated that cross-linking of whey proteins before desolvation stage enhanced significantly the digestion stability of particles. Keywords: Non-toxic cross-linking; nanoparticles; Transglutaminase

Zinc Nanoparticles Protect Human Lymphocytes in Vitro from the Cytotoxic Activity of the Organophosphates

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Chlorpyrifos (CP) is used throughout the world as an insecticide in agriculture and an eradicating agent for termites around homes. It has been reported that CP induces oxidative stress in human cell via producing the reactive oxygen stress species and causes immunological abnormalities. In this present study, CP is considered as an oxidative agent which we examine the anti-oxidative activating role of Zinc nanoparticles in CP-treated lymphocytes of human. Lymphocytes isolated by Ficoll and exposed to 75 μg/ml CP either alone or in combination with logarithmic doses of ZnO nanoparticles (0/1, 1, 10, 100 μg/ml). After 3-day incubation period, the viability and oxidative stress markers including cellular Lipid Peroxidation (LPO), Myeloperoxidase (MPO), Total Thiol Molecules (TTM) and Total Antioxidant Power (TAP) were evaluated. Our results showed that incubation with CP significantly increase percent of mortality and levels of biomarkers which play a role in oxidative stress like LPO, MPO and also decrease the levels of TAP ad TTM. Moreover, lymphocytes treated with different concentrations of ZnO nanoparticles, as antioxidant agents, in incubation with CP resulted in a significant decreased the percent of mortality as well as the levels of MPO and LPO, as compared with CP-treated lymphocytes. Also, ZnO nanoparticles increased the levels of TAP and TTM in 0/1, 1, 10, and 100μg/ml, among them the significant change was observed in 1 μg/ml. In conclusion, results support protective and positive effects of ZnO nanoparticles in prevention of cytotoxic activity of the organophosphates CP in the lymphocytes.

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Phytotoxicity of Silver Nanoparticles and Ions on Model Plant Medicago Truncatula

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Nanotechnology's breadth of vision not only is not at the nanoscale, but so widespread that it has penetrated in all fields. Desirability of the emerging technology exploitation factor, needed to fundamental toxicological studies which are most important aspect of the sustainable nanotechnology. The anthropogenic release of nanoparticles to the environment poses a potential hazard to plants, as the first step of the food chain.

This study accomplished for the purpose of investigating the effects of silver nanoparticles and silver ions; and equivalent comparisons between equal concentrations of treatments or organized comparisons in reply to particular questions. Model plant medicago truncatula seeds were incubated with various concentrations of silver nanoparticles or silver nitrate and assessed the factors influencing the germination behavior and root elongation.

The observations indicated that treatment by nanoparticles led to the elimination of plant rootlets, and deteriorated germination criteria more than ions. On the other hand, it negatively affected the germination criteria such as velocity, relative rate, energy and cumulative germination and seedling length. Besides, higher concentrations of silver nanoparticles demonstrated breaking of the seed testa, endosperm rupture and damaged embryos. Furthermore, consecutive scan-photography and orthogonal comparing time-related contrasts, distinguished the important role of exposure time. More importantly, SEM images revealed the presence of nanoparticles in the aerial parts of the plants.

Therefore, the application of such nanoparticles not only endangers the plant growth but also could pose a serious threat to human and animal health if the plant material is consumed.

In Vitro Safety Evaluation of Zinc Oxide Nanoparticles

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Metallic oxides such as zinc oxide (ZnO) in nano-scaled diameter have been introduced to pharmaceutical industry, in recent years. The present study was aimed to assess the toxicity of ZnO nanoparticles (NPs), one of the widely used ingredients of cosmetics and other dermatological preparations, in vitro. ZnO NPS was produced by adding ZnO powder to HCl following treating with NaOH. The mixture was centrifuged. The settle was mixed with isopropanol and sonicated. Isopropanol was thrown away by further centrifuging followed by drying the excess vehicle by heat. The NP cytotoxicity was assessed using MTT assay against L929 cell line at 200μg/mL concentration. Size of the NPs was around 100nm.The NPs had no toxicity effect on L929 cell line (LC50 ≥200 μg/mL). Whilst the debate on general nanoparticle safety continues, the case for safe ZnO NPs formulations appears to be feasible for cosmetic purposes.

Nano Iron Chelate: New Generation of Fertilizer and Its Safety Aspects

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The use of nanotechnology in various fields of science and industry is raising continously, so their safety aspects should be mentioned. In the current study, the safety of the world's first nano iron chelate fertilizer (khazra), which was synthesized based on the new nanochelating technology (USPTO Number US20120100372A1), was evaluated. The cytotoxicity and antioxidant properties of nano iron chelate fertilizer were evaluated in fibroblast cells by assessment of cell viability, intracellular ROS levels, glutathione and SOD activity. In addition, this nano-complex's effects on the karyotype of human monocyte cells were compared to control samples. The selected concentrations were 0.001-2 mg/cc that are applied concentrations in agriculture or much higher. Oral and intraperitoneal LD50 of nano iron chelate fertilizer were assessed in rats, and histopathological studies were conducted on heart, liver and lungs via hematoxylin and eosin staining. The effects of various doses of the nano-complex were investigated on the germination of basil and pea plants. The results show normal cell karyotype, non-toxicity and antioxidant properties of nano iron chelate fertilizer in the mentioned concentrations even in its highest concentrations, 1 mg/cc.The oral and intraperitoneal of nano-complex LD50 were 1000 and 570 mg/kg respectively and histopathological studies show its non-toxicity in both acute and chronic phases. Various concentrations had no negative effect on the germination, but they rather promoted the relevant factors such as germination criteria and seed priming. In conclusion, the nano iron chelate fertilizer possesses the required nano safety.

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Synthesis and Characterization of PLGA-Mpeg Block Copolymers and Preparation of Copolymeric Nano Micelles for Encapsulation of Anticancer Drug Docetaxel and Its Antitumor Effect on Cancerous Cell Line

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Low solubility in water is an intrinsic property of many anticancer agents because many of them are bulky polycyclic compounds. Polymeric nanomicelles are a class of drug delivery systems helps increasing solubility of drugs. Polylactic glycolic acid block polyethylene glycol copolymer (PLGA-PEG) is a famous copolymer that can produce nanomicelle for antitumor drugs. PLGA and PEG as lipophillic and hydrophilic parts respectively enable the micelle to load the drugs. PLGA- PEG copolymer was synthesized by chemical conjugation. Then copolymer nanomicelles prepared by precipitation method and Docetaxel loaded into micelles by passive method. Polymeric micelles characterized by NMR, FTIR, DSC, HPLC and size analyzer to evaluate conjugation, micelle characteristics and drug loading. Nanoparticles then studied in cancerous MCF-7 cells to evaluate the antitumor effects of nanomicelles on this cell lines. PLGA-PEG can produce nanomicelles that have less than 100 nm sizes, which is suitable for carrying drug in the body. These particles can load about 10% Docetaxel without the need of using any excipient such as Tween 20 and 80 (used in commercial Docetaxel product) which can cause hypersensitivity in patients. These nanoparticles had cytotoxic effect against MCF-7 cells and therefore, these nanoparticles could become a potent chemotherapeutic system. Amphiphilic copolymers are nanocarrier drug delivery systems. PLGA-PEG copolymers have a special position among others. PLGA-PEG was synthesized via chemical conjugation with acceptable yield. The results showed PLGA-mPEG can produce nanosized self- aggregates. Additionally, PLGA-PEG nanoparticles could load suitable amount of Docetaxel (about 10%) that shows cytotoxic effect on cancerous MCF-7 cells.

Controlling the Release of Harmful Ions from 316L SS Implants by Applying Nanostructured Mg-Doped Fluorapatite Coating

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Austenitic stainless steels are one the most popular materials used as surgical implants. However, austenitic stainless steels are subjected to localized corrosion in chloride media such as body fluids. The corrosion products have shown deleterious effects in several organs and tissues. The aim of this work is preparation and characterization of nanostructured magnesium substituted fluorapatite (Mg-FA) coating on 316L stainless steel (SS) for bioactivation and protection of these implants and decreasing the release of metallic ions. Characterization methods such as X-ray diffraction analysis (XRD), Fourier transformed infrared spectroscopy (FTIR), scanning electron microscopy (SEM) and transmission electron microscopy (TEM) were utilize to investigate the structural properties of obtained coating. In order to evaluate the corrosion behavior of uncoated and Mg-doped fluorapatite coated 316L SS, electrochemical potentiodynamic polarization tests and immersion tests were performed in Ringer's solution at 37±1˚C. The released metallic ions were measured by inductively coupled plasma-optical emission spectrometry (ICP-OES) as an indication of biocompatibility. Uniform and crack-free magnesium substituted fluorapatite coating with particle size of about 40 nm was successfully applied on 316L SS. Mg-FA coatings improved the corrosion resistance of 316L SS and coated samples released less Fe, Cr and Ni ions in comparison to bare samples.

Aptamer Coupled Hyaluronic Acid-Chitosan Nanoparticles for Targeted Drug Delivery of 5-Fluorouracil to Colon Cancer

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The MUC1 aptamer and non-specific MUC1 protein is an attractive target for tumor-specific drug delivery owing to its overexpression in most adenocarcinomas. We have developed a delivery system constructed with hyaluronic acid and chitosan. MUC1 DNA aptamer (Apt) was conjugated to the surface of prepared nanoparticles via an EDC/NHS technique (HACSAptNPs). Hyaluronic acid chitosan nanoparticles (HACSNPs) loaded with 5-fluorouracil (5-fu) were prepared by ionic gelation method. The effect of total polymer concentration and polymer mixing ratio on the size, polydispersity index, zeta potential and drug loading was examined. The characteristics of the optimum formulation were determined by using differential scanning calorimetric (DSC), FTIR spectroscopy and scanning electron microscopy (SEM). Nanoparticles were spherical in shape with mean diameter of 180±10 nm and low polydispersity index. Drug release studied in two different media demonstrated initial burst release following by a constant and continuous release. Conjugation of the aptamer confirmed by agarose gel electrophoresis. The cytotoxicity of 5-fu towards HT-29 cancer cells in HACSAptNPs was higher than both uncoupled and conventional 5-fu solution in MTT assays. Cellular uptake of the HACSAptNPs was assayed by confocal microscopy using FITC as fluorescent marker. HACSAptNP showed significant higher uptake as compared to HACSNPs and free drug. As a conclusion prepared nanoparticles immobilizing MUC1 aptamer which is an attractive target for tumor-specific drug delivery owing to its overexpression in most adenocarcinomas could be a promising delivery of therapeutics to the target tissue.

Synthesis of Biodegradable and Thermosensitive Pnipaam Magnetic Nanohydrogels as Anti Cancer Drug Delivery System

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Biocompatible stimuli-responsive nanohydrogels based on N-isopropylacrylamide (NIPAAm) is gaining attention for numerous potential applications in various biomedical and biotechnological fields, including controlled drug delivery systems. Combining thermoresponsive polymers such as PNIPAAm with magnetic nanoparticles (MNPs) while minimize the toxicity, makes hybrid materials which can be manipulated by two different stimuli; temperature and magnetic fields. Such dual responsive materials are of interest for magnetic drug targeting followed by simultaneous hyperthermia and drug release. The objective of this study is to develop temperature-responsive PNIPAAm magnetic nanohydrogels, which should be biocompatible and biodegradable, with using modified maleate-starch as cross-linkers. The NIPAAm polymerization is carried out on the surface of starch stabilized MNPs. The obtained nanohydrogels are characterized by transmission electron microscopy (TEM), dynamic light scattering (DLS), X-ray diffraction (XRD) and vibrating sample magnetometer (VSM). The application of resulted nanohaydrogels in controlled drug delivery of mitoxantrone as anticancer drug model is further investigated and it is found that resulting magnetic nanohydrogels exhibited good cytocompatibility and have a potential as tumor targeting drug carrier.

Nanomicelles Based on Waterborne Polyurethane Polymer: Suitable Carrier for Drug Delivery to Cancer Cells

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To improve treatment a variety of tumors, creation an efficient drug delivery carrier seems to be necessary for anticancer chemotherapies such as paclitaxel. The biocompatibility and biodegradability of carrier are considered main concerns about nano-based formulations. This study attempts to report the synthesis of novel waterborne polyurethane polymer to create nanomicelles physically loading the paclitaxel for efficient delivery of paclitaxel into the human breast cancer MCF-7 cells. The amphiphilic polyurethane was synthesized from poly (tetramethylene ether) glycol and dimethylol propionic acid with isocyanate groups in toluene diisocyanate. To attain ionic centers in the polymer backbone, the free carboxyl groups of dimethylol propionic acid were reacted with triethylamine. The paclitaxel loaded nanomicelles showed suitable physical stability, negative zeta potential charge and high loading efficiency (80%), low level of critical micelle concentration and pH-sensitive mechanism for drug release. These nanomicelles showed the significant cytotoxicity compared to neat paclitaxel at in vitro condition leading MCF-7 cells to apoptosis. Occurring apoptosis was proved by the real time RT-PCR analysis of apoptosis related genes also by the DNA frag-

mentation in the treated cells.

Evaluation of Antioxidant Capacity Polyanilin/Graphene Nanocomposites to Scavenging Free Radical ABTS Activity in Phosphoric Acid Medium

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To evaluate the electrochemical modification of composite 2B pencil graphite surface with polyaniline/graphene (PANI/Gr) Nano composite of radical scavenging assays using 2,2′-azino-bis-3-ethylbenzthiazoline-6-sulphonic acid (ABTS) in phosphoric acid medium, to investigation of antioxidant capacity and study the effect of pH on the electron transfer process by cyclic voltammetry. The response of ABTS was independent of pH for (PANI/Gr) Nano composite but the absorption intensity of ABTS radical experiences a progressive decrease with increasing amounts of PAni in solution. The Antioxidant capacity showed a strong positive relationship by ABTS was stronger positively associated with the oxygen radical absorbance capacity (ORAC), (for ABTS: $\rho = 0.593$, $p < 0.001$ respectively).

Investigation of Hydroquinone As a Safety Compound on Electrochemical Sensor Based on Graphene–Polyaniline (GR–PANI) Nanocomposite Modified in Presence of P-Toluenesulfonic Acid

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An electrochemical sensor based on graphene–polyaniline (GR–PANI) nanocomposite modified electrode for voltammetric determination of hydroquinone (HQ) is presented which was prepared in presence of p-Toluenesulfonic acid as electrolyte support. The electrochemical behavior of HQ at the GR–PANI nanocomposite film modified glassy carbon electrode (GCE) was investigated by cyclic voltammetry. Morphological, structural and the optical properties of the PANI/Gr nanocomposite modified electrode were extensively characterized by SEM, FTIR and UV spectroscopy. HQ is one of the most effective molecules for the treatment; with over 40 years of efficacy and safety data. However, much attention is now focused on its safety. This electrochemical sensor shows a favorable analytical performance for HQ detection with a detection limit of 6.9 × 10−7 M and high sensitivity of 634.4 μA mM−1. In this research the sensitivity effects of this sensor on HQ was investigated. HQ can be detected simultaneously without interference of each other in a large dynamic range by using this sensor.

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Conjugating Recombinant Protein EPC1 by Nanogold Particles for Serodiagnosis of Echinococcosis by Dot Immunogold Filtration Assay (DIGFA)

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Nanomaterials have superior properties particularly in treatment and diagnosis while may be dangerous if not properly handled, so nanosafety is an important part of nanotechnology. We proposed labeling recombinant protein EPC1 with nanogold particles and using it in dot immunogold filtration assay (DIGFA) could optimize serodiagnosis of dog echoinococcosis. Having positive echinococcosis serum, eight dogs were challenged with protoscoleces and 2 puppies were used as uninfected controls. Colloidal gold particles were prepared with considering exposure controls during high exposure activities. Particles size and absorbance density were characterized using UV spectrophotometer. DIGFA has been developed by coating rEPC1 labeled with colloidal gold on nitrocellulose membrane. The canine sera, taken three times including, 15, 28 and 35 days post infection were comparatively tested with both DIGFA and ELISA. Nanoparticles of 20-22 nanometers showed maximum optical density in wavelength of 520 nm. Gold-labeled antigen, showed a dark purple dot with agglutination particles in positive sera and light purple dot without agglutination in negative sera. Among 30 serum samples, 23 were positive and 7 were negative with DIGFA and 24 were positive, 6 were negative with ELISA. Since DIGFA was done using colloidal form of nanoparticles on the membrane, accidental hazardous effects of nanomaterials through inhalation or dermal exposure were minimized. We anticipated nanogold labeled rEPC1 could be a promising candidate as an alternate source of antigen and DIGFA as a rapid and simple procedure could be utilized in quickly diagnosis of echinococcosis.

Chitosan Nanoparticles Modified with Cross Linkers for Detecting Purposes

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Chitosan nanoparticles have a high density of amine groups, permitting strong electrostatic interactions with proteins. Due to the possibility of protein loading these NP can be used for detecting pathogenic and toxic antigens in human body once the related antibodies have been used. The purpose of this study is preparation and characterization of stable chitosan/Nanoparticles modified with crosslinker for loading protein for biosensing purposes. Medium molecular weight CS (chitosan) was dissolved in acetic acid (0.01 gr chitosan in 400μl acetic acid). 3.3mg TPP (Tri Poly Phosphate) was added to the reaction system with. CT NP was centrifuged, washed and redispersed to remove the non-adsorbed TPP. 0.03gr BSA (Bovine Serum Albumin) was added and stirring for 45min. the TPP was added again to crosslink CS and BSA. CT Nanoparticles were analyzed by means of FTIR, Bradford indicator and zeta potential analyzer. The result show that spherical particle of CT-TPP with average size of 6 nm (confirmed by zetasizer and SEM), were formed. After protein absorption the size of particles increased which is due to size of protein. FTIR results indicated the peak of NH2 indicating the presence of protein. Moreover Bradford indicator also showed the presence of BSA on CT-TPP NP. This study demonstrated that this compound may be offered as a promising protein carrier due to its size and biological properties. Since these NP provide stable particles for protein loading they can be used for biosensing purposes in detecting pathogenic antigens in human body.

Clove Essential Oil Encapsulation in Chitosan by Dual Capillary Electrospray

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Researchers have been interested in studying about natural antioxidants for several years. Among these, clove oil has represented significant radical scavenging activity. Direct usage of clove oil in food formulation might have short durability and lead to sensitivities and harmful effects on human health as well as its bad taste. Encapsulation has become a technique with increasing interests due to numerous benefits such as increasing stability, protection against oxidation, and controlled releasing. Furthermore, nanocapsules can provide prolonged shelf-life by protecting oils with encapsulating. The electrospray as a novel technique for preparation of nanoparticles and nanocapsules were used by researchers, recently. Essential oil of clove (Eugenia caryophyllata L) was obtained by hydrodistillation. The chemical composition of clove oil was analyzed by GC/MS. Radical scavenging activity of the oil was evaluated by DPPH method. The oil was encapsulated into chitosan nanoparticles via dual capillary electrospray method. Obtained nanocapsules were characterized by SEM and FT-IR techniques. Eugenol was the major component of clove oil. The oil showed significant radical scavenging activity with IC50 value < 50 μg/ml. After encapsulation stage, SEM results showed the presence of nanocapsules with spherical and smooth morphology. FT-IR results showed no new chemical bonds between clove oil and chitosan in nanocapsules. Results suggest that this method is suitable for preparation of clove essential oil nanocapsule as a natural antioxidant in food industry.

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Hydrophobically Modified Pegylated Chitosan for Encapsulating Of Paclitaxel

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Paclitaxel is a practically insoluble anticancer drug which its formulation in Cremophore EL and ethanol causes serious adverse effects. In this regard, we successfully synthesized and characterized a series of amphiphilic chitosan derivatives as a biodegradable and biocompatible nano-carrier for paclitaxel. After conversion of mPEG5000 to its aldehyde form and palmitic acid to its activated NHS form, medium (MCS) and previously prepared low molecular weight (LCS) chitosans were pegylated and palmitoylated by substitution reactions at their primary amines. The synthesized graft copolymers were characterized using FTIR, 1H-NMR, elemental analysis and DSC. The CMC values of the copolymers were determined by fluorescence method and AFM was employed to observe the morphology of micelles. Micelle's particle size was measured by laser diffraction particle size analyzer. The encapsulation and loading efficiencies of paclitaxel were determined using HPLC method. FTIR, NMR and DSC analysis showed successful synthesis of copolymers. Elemental analysis determined the substitution degrees of pegylation and palmitoylation successfully. The AFM images of the MCS-PEG-PA 1.50.600 micelles showed compact and spherical particles approving formation of micelles (200*100 nm in diameter). The micelles' CMC was in the range of 31.25-62.5 (μg/ml) and the mean particle size was in the range of 104-133 nm. Mean encapsulation and loading efficiency of paclitaxel were 80% and 12%, respectively. Optimum nanostructures containing drug were freeze-dried without significant change in PS and drug loading. MCS-PEG-PA copolymers in special modification extents are excellent candidates for delivery of PTX and should be investigated more.

Removal of Reactive Blue 29 Dyes with Modified Nanochitosan from Aqueous Solution

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Industrial effluents that carry dyestuff into natural water systems are serious environmental concern. The complex aromatic structures of dyes make them more stable and more difficult to remove from the effluents discharged into water bodies. In the present study, removal of reactive blue 29 dye with nanochitosan from aqueous solution was investigated in a batch adsorption system with respect to the changes in the contact time, pH of solution and nanochitosan dosage. Adsorption isotherms of this dye on to nanochitosan were also studied. The results revealed that the adsorption capacity of reactive blue 29 dyes on nanochitosan was higher in lower pHs and higher initial dye concentration. And finally the Langmuir isotherm showed the best conformity to the equilibrium data.

Enhancing Nitrate Removal by Using Chitosan Supported - Iron Nanoparticles

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Organic and inorganic pollutants in the surface- and ground-water are the actual risks for human and the environmental health. Many methods have been proposed to reduce and/or remove these compounds. During last two decades, experimental evidences have shown that zero valent iron nanoparticles (Fe0Nps) can effectively be used to remove/immobilize various types of environmentally relevant compounds, including heavy metals, organic pollutants, and inorganic anions like arsenate and nitrate. A disadvantage of using particles in nano-scale is agglomeration process that reduces the effective surface area and thus the chemical reactivity. To enhance chemical reactivity of Fe0Nps, chitosan was used to support nanoparticles and control their agglomeration process. Supported nanoparticles (Ch-Fe0Nps) were tested for their ability to remove nitrate ion in a range of initial nitrate concentration, Fe0Nps concentration, and initial pH. Experimental data indicated that there is an adverse relation between the initial nitrate concentration and the removed nitrate. An increase in pH also led to a decrease in nitrate removal strongly. The effect of pH was attributed to the proton ion consumption in nitrate reaction with Fe0Nps. Ch-Fe0Nps could remove many times nitrate ion than non-supported nanoparticles (Fe0Nps). In addition, supporting Fe0Nps by chitosan led to less proton concentration for a particular amount of nitrate. This dual effect makes Ch-Fe0Nps much more effective than Fe0Nps for remediation of polluted water resources.

Removal of Silver Nanoparticles from Aqueous Solution by using of Montmorillonite Nanoclay

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Silver nanoparticles (SNPs) are extensively used in consumer products industrial applications due to its antimicrobial property. Nowadays, use of SNPs is increasing in a large number of consumer products. There are more than 1000 nano-based consumer products in market of which silver nanoparticles incorporated consumer products, including clothing and cosmetics are about 200. Worldwide, the present production of SNP is estimated to be 500 tons per year thus; the possible buildup of the nanoparticles in the environment is becoming a major concern. It was shown that the SNPs can easily leak into waste water during washing from SNPs impregnated clothes and the washing systems, thus potentially disrupting beneficial bacteria used in waste-water treatment facilities, and the endangering aquatic organisms in lakes, streams and other fresh water systems. The nanoparticles have adverse effects on human health due to its smaller size and large surface area. In this work, removal of silver nanoparticles from aqueous solution was evaluated by montmorillonite nanoclay as an effective adsorbent. Effective parameters in removal of silver nanoparticles including pH, Temperature, contact time were optimized. In an aqueous solution of SNPs at 25 oC and pH 8.0, the adsorption capacity was evaluated using both the Langmuir and Freundlich adsorption isotherm models. The results indicated that the montmorillonite nanoclay could be employed in the removal of silver nanoparticles from water samples.

Preparation and Characterization of Modified Multi-Wall Carbon Nanotubes Doped With Alumina Safety and Non-Toxic Nanoparticles by In-Situ Method

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In this study, alumina nanoparticles doped with amino functionalized multiwall carbon nanotubes (MWCNTs) by co-precipitation method successfully. Nowadays, Al2O3 nanoparticles because of their high thermal conductivity, stability in fluids and being safe for humans and nature have the most widely range of applications in aerospace and medical industries. These nanoparticles have some difficulty that can be eliminated by attaching them with CNTs. Recently, although most range of methods was applied for doping need plenty equipment and high temperature. Therefore, we established a facility method and used amino functionalized carbon nanotubes instead of carboxylic because amino groups adsorb alumina nanoparticles more than carboxylic. The obtained product was analyzed by X-ray diffractometer (XRD), infrared spectroscopy (IR), scanning electron microscopy (SEM) and transition electron microscopy (TEM). The results confirmed the coating of carbon nanotubes by alumina and the average size of nanoparticles are 43.3%. Loading amount of alumina nanoparticles was estimated by SEM, TEM and titration method about 87%. The results show amino functionalized CNTs increase the amount of doping and decrease the average size of alumina in comparing with carboxylic groups.

Prospective Detoxification of Nano Gold Particles from Treated Cancer Patients

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Use of Nano Gold Particles (NGPs) is getting to a new era of noninvasive detection and treatment of cancer. Administering NGPs to blood stream, directing them to the cancer cells and then heating them with infrared light proved promising in fighting cancer, but there remains excess or idle NGPs surplus in blood stream. Similar to pharmaceutical drugs, NGPs should be designed to be eliminated in the body. Indeed, NGPs elimination should be considered seriously, since they are more resistant to elimination routes such as metabolism and renal excretion. "Nanogold detoxifying machine" (NDM) eliminates idle NGPs from blood stream of treated cancer patients to reduce undesirable deposition and accumulation in non-target tissues and organs in post therapy. It also makes some experimental recommendations for future research at the interface of nanotechnology and biological systems. NDM is equipped with impermeable membrane containing nanotubes to which cancer specific-antigens (CSAs) are attached. While blood circulates in NDM, CSAs attract and immobilize the idle nanogold-antibodies. Implementation of NDM clears patient's blood from idle nanogold-antibodies which were not attached to their targets, the cancer cells. Elimination of idle NGPs from blood would minimize side effects resulting from their deposition or accumulation on non-target cells or tissues. NDM would enhance efficacy of NGPs targeted toward specific cancers. NDM method holds great promise to reduce the time, effort, and expense in cancer research, screening, detection, and therapy. Key words: Nanogold particles, Nanoparticle toxicity, Antibody-nanogold, Nanotoxicology, Cancer therapy, Nanogold detoxification.

Effects of coating carbon nanotube with gum arabic on the growth of green algae Dunaliella salina

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Increasing production and use of nanomaterials with novel properties have given rise to concerns about their impact on the environment, especially aquatic environment and human health. Assessing the environmental and human health implications of nanomaterials requires an understanding of the toxicological effects due to acute and chronic exposures. In the present study, the effects of multiwall carbon nanotube (MWNTs) coated with gum arabic (GA) on the unicellular green algae Dunaliella salina as a biological model was investigated. Results showed that 10 mg L-1 uncoated MWNTs caused 40% reduction in growth compared to the control, while coated MWNTs had no effect on growth of the algae. GA as coating polysaccharide by itself had no effect on the growth of the algae. Chlorophyll content, expressed as pg cell -1, increased in the presence of uncoated MWNTs. MWNTs had no effect on total phenolics and antioxidant activity of the algae. Analysis of data suggests that GA can decrease the toxicity of MWNTs under controlled laboratory condition. The transformation of the MWNTs under natural environment and their toxicity change await further research. Keywords: Carbon nanotube, Gum Arabic, Green Algae Dunaliella salina

Complement assays In vitro and in vivo as safety predictors for NANOmedicines and biologicals

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Non-IgE-mediated hypersensitivity reactions are frequent adverse consequences of intravenous administration of drug carrier nanosystems (liposomes, micelles, polymers) and monoclonal antibodies. Earlier studies provided evidence that activation of the complement (C) system plays a causal role in these infusion reactions. The clinical significance of C activation-related pseudoallergy (CARPA) lies not only in the severe, occasionally lethal cardiopulmonary distress associated with these reactions, but also in a heightened risk that the nanomedicine or antibody become immunogenic, preventing their multiple applications. For these reasons, in vitro and in vivo C tests may be useful to diagnose and predict the C activating and CARPA-inducing activities of nanomedicines and monoclonals. Here we report on studies on cancer patients treated with taxans (Taxol and Taxotere) and the monoclonal antibody rituximab (Rituxan), whose infusion reactions correlated with massive C activation (e.g., 5-10-fold increase of SC5b-9 over baseline) in their blood incubated with the drug in vitro. In another established method, the in vivo CARPA assay (in pigs and other animals), C activation-related hemodynamic, hematological, blood chemistry and skin changes are monitored as endpoints of CARPA. These assays can be used in screening tests to identify highly reactogenic drug candidates, to study the mechanism of CARPA and to develop safe administration, prevention and treatment protocols, such as desensitization or stepwise infusion. An unmet need in the field, to measure C activation directly in animals, may be alleviated by a recently developed pan-specific C3 ELISA, which measures plasma C3 in many animal species.

Effect of nano-TiO2 on anti-oxidation property of traditional in tumescent flame retardant coating

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The protection of materials against fire and improvement their fire safety characteristics have become an important issue in the construction industry. In this study, nano-titania as a UV resistance filler in different loading was added to the traditional ammonium polyphosphate (APP), pentaerythritol (PER) and melamine (MEL) coating. The effects of this synergistic effect were investigated in detail by using themogravimetric analysis (TGA), X-ray diffraction (XRD) and Bunsen burner test. The TGA result approved that adding nano-TiO2 could increase the residue weight at final stage of burning. The XRF result indicated that anti-oxidation property of the coating was improved by increasing carbon content and decreasing oxygen content due to existence of nano-TiO2. The bunsen burner test revealed that the best fire protection performance with the highest thermal stability was achieved with incorporation of 20 wt.% nano-TiO2.

A New Model for Nanotechnology Project Risk Management

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Nanotechnology project managers are encountered by the frequent uncertainties about the risks and benefits of the nanomaterial applications. Due to these uncertainties, customary project risk management principles such as feasibility study, cost-benefit analysis, and acceptable risk are not practical more than the most recent risk management principle, the precautionary approach. It seems a more flexible, executive, and accommodating risk management vision is required, which not only will help the manager to control risks from nanomaterial manipulations, but will also create a new risk management algorithm for overcoming the future risks from similar nonothechology projects. The workplace safety and environmental risks of nanomaterials rather than project economic aspects were at the core of our focus. This paper proposes a 10- step qualitative risk management model for nanotechnology project managers. In an algorithmic approach by dividing the work into sections, subsections and tasks or process-units according to Work Breakdown Structure (WBS), the significant risks will be identified; suitable decisions and executive comments will be offered to the managers in every step. The steps of the presenting model could enable project managers to detect significant risks in the workplace, making decisions, performing the most suitable actions and recording the results. The authors believe that the majority of hazardous impacts of nanoparticles on human health, and the environment could be prevented by recognition significant risks and limiting exposure to the free nanoparticles.

Efficacy of Collagen-grafted Polyether Sulfone Nanofibrous Scaffold on Human Endometrial Stem Cells Viability and Hepatic Differentiation

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Considering the substantial supportive role of extracellular matrix (ECM) on cell survival, proliferation, and differentiation, numerous combinations have been used for substitution. Present study aimed to determine stem cells viability and differentiation by recruitment of biocompatible polymeric materials besides some chemical surface modifications as well as natural polymer. Polyether sulfone (PES) was randomly electrospun and functionalized by plasma treatment. Following the mechanical properties and wettability examination, collagen was grafted by chemical linkers. Human Endometrial Stem Cells (hEnSCs) were seeded and the survival and proliferation of hEnSCs were assessed on functionalized nanosurface scaffold using cytotoxicity assay up to 12 days. The maturation of hEnSCs derived hepatocyte-like cells was examined by biological tests. Fourier transform infrared spectroscopy (FTIR-ATR) confirmed all typical absorption characteristics of PES and collagen polymers. MTT test and scanning electron microscopy illustrated cell attachment, proliferation and integration along with shape like hepatocyte on collagenized PES nanofibrous scaffold. The chemical and molecular assay revealed that cells differentiated toward hepatocyte at 30 days. These cells also had functionality as glycogen storage through chemical staining test. The chemically modified tissue's substrate improves cell-cell and cell- nanofibres interaction. Functionalized scaffold improves hepatic specialty recreation.

Evaluation of Toxicity Characteristics of Cellular Uptake of a Paramagnetic Liposomal Nanoparticles as a Molecular MRI Contrast Agent

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Nanoparticles are unique in that their physical, chemical, and electronic properties enable many promising medicinal and technological applications. It is widely accepted that nanoparticles should be thoroughly tested for health hazards or nanotoxicity, but a moderate risk analysis is currently prevented by a revealing absence of mechanistic knowledge of nanoparticle toxicity. The purpose of this study was to assess in vitro cytotoxicity of Gadolinium oxide with diethylene glycol polymer (Gd2O3-DEG) and magnetoliposomse nanoparticles (MLNs) in Hepa 1-6 cell lines as models to assess nanotoxicity in vitro. The effects of magnetic nanoparticles on these cell lines were evaluated by light microscopy and by standard cytotoxicity assays. Furthermore, the underlying interactions of these nanoparticles with physiological fluids is a key characteristic for perception of their biological effectives, and these interactions can perhaps be performed to relieve unpleasant toxic effects. Our results demonstrated that the Gd2O3-DEG and MLNs had significantly different noncytotoxicity effect. Our results suggest that these cell lines provide valuable models to assess the cytotoxicity of nanoparticles in vitro. Finally, the results of the present study demonstrated that MLNs and Gd2O3-DEG with lower T1 than Gd-DTPA in Hepa 1-6 cell lines, is a sensitive positive MRI contrast agent that could be an attractive candidates for cellular and molecular lipid content targets such as liver diagnostic applications. These data reveal that MLNs is a useful positive contrast agent for targeting and cell tracking. This will help imaging of cells and special organs like liver that uptakes liposomal formulation very well.

Tungsten Oxide Nanostructure Synthesized for Visible Light Photoinactivation of E.coli

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Among metal oxide semiconductors, WO3 is one of the interesting photocatalytic materials, due to its high photosensitivity, chemical stability and low-cost preparation. Bactericidal activity of K2W6O19 nanowires was investigated against Escherichia coli bacteria in visible light. Tungsten oxide nanowires was synthesized with potassium hydroxide as catalyst on a tungsten foil via a unique two-step heating process, first step raised up to 390°C and keeping for half an hour then the second step up to 400, 600 or 800°C and maintained for two hour. The synthesized samples were characterized by scanning electron microscopy (SEM), X-ray photoelectron spectroscopy (XPS) and X-ray diffraction (XRD). SEM images show the best temperature for growth of nanowires with 50 to 90 nm widths and several ten micrometers length is 600°C. The XRD shows by increasing the second step temperature, the majority of nanowire's structure was changed from WO3 with (100) orientation to (002) orientation with K2W6O19. According to deconvolution of W4f and O1s in XPS results, by the increasing annealing temperature, W6+ and O2- state was increased, and also the percent of O-H bound was decreased on the surface. The photoinactivation properties against E coli bacteria were seen in visible light. The sample was grown in 400°C exhibits the best antibacterial activity because of the growth pour WO3 structure of nonorads and the more percentage of O-H bound. Finally, the results show that the photoinactivation of E.coli was 5 times stronger than activity in dark in WO3 structure which was growth at 400°C.

Investigations on the Effect of Particle Size and Surface Charge on Interaction of Silver Nanoparticles with Cancerous and Normal Cells and Biomolecules

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Silver nanoparticles (AgNPs) are widely used as antibacterial agent. This study focuses on the effect of size, zeta potential and ROS production of bare and citrate-coated AgNPs on cellular and bimolecular behavior. AgNP with high and low concentration and no citrate coating were synthesized by using a simple wet chemical method and were named as AgNP/HC, AgNP/LC and AgNP, respectively. Citrate coated particles showed larger Zeta potential of -22 meV and AgNp/HC showed smallest size of 13.2 nm. ROS production of all AgNPs was similar at 28 ppm although it was significantly higher as compared to control group. We further investigated cell viability by using MTT assay (on BE (2) M17, STO and HUVEC) and bacterostatic activity by using microdilution method (on E.Coli and S.Aeurogenosa) to determine IC50 and MIC. Cell membrane damage by AgNP was studied by means of LDH measurement. Further, effect of AgNPs on structure of chromosome after 48 h and glutathione peptide after 0 and 24 h post incubation were analyzed using DAPI staining and circular dichroism techniques. Results showed that cancerous cell was about twice more sensitive than normal cells to toxic effect of AgNPs and AgNP/LC is less toxic to cells owing to higher value of IC50, MIC and lower release of LDH. AgNP/HC induced less harmful effects on chromatin and glutathione while bare AgNP stabilized glutathione structure at all concentrations. DAPI staining and circular dichroism results showed that Ag/NP and AgNP/HC induced highest and lowest breaking of chromosome and structural stability on glutathione, respectively.

Metals Health Risk Evaluation by Solid Phase Extraction of Trace Concentration Using Nano-Zeolite–Y

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Metal exposure as a health risk occurs in environmental contamination and various usages in different industries. Determination of elements in different matrix is a way to control metal exposure while trace amounts of metal is hurdle for analysis. Sample preparation is used to simplify analytical procedures. In this work Solid phase extraction based on the functionalized nano-Zeolite–Y was suggested for preconcentration of trace amounts of Cd2+ and Pb2+ in solutions. Solid phase was evaluated with encapsulation of ligand in the micelles of Triton X-100 where these setting were loaded on the pore of nano-Zeolite Y. To confirm the formation of functionalized nZY was investigated. Suggested solid phase was optimized regarding to PH, ligand concentration, eluting condition, amount of coated nano-Zeolite Y and sample volume. Metal extraction at the trace concentration from optimized solid phase was measured by flameless-atomic absorption spectroscopy. The particles size of nano-zeolite Y was shown about 139 nm by the scanning electron microscopy image. Cd2+ and Pb2+was retained on solid phase by recoveries of 96% and 95% respectively. Linear standard curves over the concentration range between 10 to 80 ppb were obtained with a correlation coefficient of >0.99.The optimized solid phase extraction was validated with four within- and between-day experiments when it was showed acceptable reproducibility. It is concluded that, functionalized nano-zeolite Y was applied successfully for the risk assessment of metal.

Bio-safety and hemocompatibility of a poss nanocomposite for cardiovascular application

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Haemocompatibility and biosafety of cardiovascular implants depends mainly on the induced thrombogenic response. Platelet activation, inflammatory response and leukocyte activation induced by biomaterials play central role in haemocompatibility of cardiovascular implants. An advanced nanocomposite has been developed based on polyhedral oligomeric silsesquioxane (POSS) nanoparticle and poly(carbonate-urea)urethane (PCU), with improved properties for cardiovascular applications. In this study, haemocompatibility and inflammatory response of POSS-PCU was investigated.

Thromboelastograph (TEG) coagulation analyzer was used to analyze whole blood coagulation on the nanocomposite. TEG cups were coated with a thin layer of POSS-PCU and PCU as a control via dip-coating method. Platelet rich plasma and peripheral blood leukocytes were extracted from healthy volunteers and exposed to the thin films of POSS-PCU and PCU. Direct ELISA and FACS analysis were used to determine platelet and leukocyte activation and inflammatory cytokines release.

The results showed that incorporation of

POSS nanoparticles confers anti-thrombogenic properties to the polymer by a prolonged clotting time and reduced clot propagation and strength. Platelet also adhered less to the POSS-PCU and showed lower activation rate and metabolism. Inflammatory response and leukocyte activation was also significantly less on POSS-PCU samples. The results of flowcytometry showed lower expression of leukocyte activation markers on POSS-PCU and were confirmed by quantitative ELISA results of cytokine release.

These results confirmed that POSS-PCU nanocomposite posses improved haemocompatibility and anti-inflammation efficacy. This makes POSS-PCU a material of choice for development of blood-contacting devices such as heart valves and bypass graft prostheses.

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