In The Name of God

Islamic Azad University
Pharmaceutical Sciences Branch

JPHS

# Journal of Pharmaceutical & Health Sciences

Volume 3, Issue 1. Winter 2015

Official Journal of Pharmaceutical Sciences Branch

Islamic Azad University (IAUPS)

**Indexed by:**
Scientific Information Database
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|---|---|
| Full Journal Title | Journal of Pharmaceutical & Health Sciences |
| ICR abbreviation Title | J Pharm Health Sci |
| ISO abbreviation Title | J. Pham. Health. Sci |
| Category | Biomedical/Health |
| p-ISSN | 2228-6780 |
| Language | English/Persian |
| Journal Country/Territory | Iran |
| Frequency | Quarterly |
| Print Circulation | 1000 Copies |
| Online Submission | www.jphs.ir |
| Distribution | Distribution for each issue is 1000 copies |
| Publisher | Islamic Azad University (IAU) |

*Postal Address: No 99, Yakhchal, Dr. Shariati, Tehran, Iran.*
*Postal Code:194193311 P.O. Box:193956466 Tel: +98-21-22600037 Fax: +98-21-22600099*
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# Journal of Pharmaceutical & Health Sciences

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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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# Special issuue of Asian Nano Forum Conference 2015

## Part I Nanomedicine sessions

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# Optimization of Electrospinning Parameters for PAN and PAN-MgO Nanofibers in Air Filtration Applications

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## Abstract:

The present study aimed to optimize the some electrospinning parameters for PAN nanofibers and PAN nanofibers containing MgO nanoparticle for achieving adequate fiber diameter and mat porosity for application in air filtration. Optimization of electrospinning parameters (applied voltage, solution concentration, and spinning distance) was conducted through the Response Surface Methodology . In total 30 trials were done according to the prepared study design. The fiber diameter and porosity measurement was done using SEM image analysis. For air filtration testing, the nanofiber mat was produced based on the suggested optimum conditions for the variables of electrospinning to produce nanofiber of desirable fiber diameter and porosity range. According to results, lower solution concentration favors thinner fiber and MgO nanoparticle -embedded PAN solutions gave smaller diameter fibers. Regression analysis emphasized that solution concentration is the major significant factor that affects the average nanofiber diameters and porosity. Porosity of PAN media is inversely related to fiber diameter, although the larger diameter of PAN-MgO gives the higher porosity. At a given spinning distance, there was a positive curvilinear relationship PAN-fiber diameter and applied voltage; and also a negative correlation between PAN-MgO fiber diameter and applied voltage. The porosity of PAN electrospun mat increases with decreasing the solution concentration and at any given concentration, porosity was increased with increase in applied voltage and spinning distance. The lower concentration of PAN-MgO gave lower porosity and there were curvilinear relationships between porosity and both spinning distance and applied voltage at any concentration. According our optimization results, we could develop filter media which can be comparable to HEPA filter regarding collection efficiency and pressure drop. Through these empirical models, we hope to provide an orientation to the subsequent experiments to form uniform and continuous nanofibers for future applications in air purification.

**Keywords:** Electrospinning, Filtration, Polyacrylonitrile Nanofiber, Magnesium oxide nanoparticle, Response Surface Methodology.

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# Mass transport of inhaled nanoparticles from human lung to whole body

**MojdehMonjezi[1], Mohammad Said Saidi[1*], MahmoodRahmati[1]**

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## Abstract:

Inhaled nanoparticles can have both toxic and therapeutic effects for human. CNTs, asbestos fibers and other industrial nanomaterials could cause pulmonary diseases. On the other hand inhaled nanomedicines have been developed for treating pulmonary or systemic diseases. Thus, many researches in the area of inhaled nanoparticle retention and clearance has been developed. In this research a multi compartmental model has been developed that can predict the bio-kinetics of insoluble nanoparticles translocation from lungs to systematic circulation, lymphatic systems, gastrointestinal tract and organs. In order to calculate the amount of nanoparticles in each compartment, a system of differential equations quantifying the transport of particles from one compartment to another were solved. Experimental retention of nanoparticles in rat lung was used to find transport rates in the model equations. The model transport rates were found by minimizing the mean square error existed between the model and experimental retention data. Calculated transport rate for the rat has been converted to the human onesusing a valid allometric scaling method. This model provides a complete specification of the residence time in lungs, blood circulation and other key organs of the body and can be used in diverse fields such as toxicology for exposure-risk analysis and respiratory nano-drug development and targeting.

Nanoparticle deposition in mouth, trachea, bronchia and alveoli during inhalation was obtained by the program multiple-path particle dosimetry (MPPD) and was used as initial condition of the corresponding equation. Kolanjiyil and Kliensteruer (2013) showed that only 0.2% of the nanoparticles weretranslocated to the olfactory region within 800 days. So, we don't have to consider the olfactory compartment in the model. Our results showed that significant amount of nanoparticles could reach heart and liver, which has nonreversible side effects.

**Keywords:** Multi compartment modeling, nanoparticle deposition

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# Novel paint design based on nanopowder to protection against X and Gamma rays.

**Abdi A[1*], Dehghan N[2], Movahedi M[3], Mehdizadeh A[3], Abdi F[4]**

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## Abstract:

Lead-based shields are the standard method of intraoperative radiation protection in the radiology and nuclear medicine department. Human lead toxicity is well documented. The lead used is heavy, lacks durability, is difficult to launder, and its disposal is associated with environmental hazards. The aim of this study was to design a lead free paint for protection against X and Gamma rays. In this pilot st we evaluated several types of nano metal powder that seemed to have good absorption. The Monte Carlo code, MCNP4C, was used to model the attenuation of X-ray photons in paints with different designs. Experimental measurements were carried out to assess the attenuation properties of each paint design. Among the different nano metal powder, nano tungsten trioxide and nano tin dioxide were the two most appropriate candidates for making paint in diagnostic photon energy range. Nano tungsten trioxide (15%) and nano tin dioxide (85%) provided the best protection in both simulation and experiments. After this step, attempts were made to produce appropriate nano tungsten trioxide-nano tin dioxide paints. The density of this nano tungsten trioxide-nano tin dioxide paint was 4.2 g/cm(3). The MCNP simulation and experimental measurements for HVL (Half-Value Layer) values of this shield at 100 kVp were 0.25 and 0.23 mm, respectively. The results showed the cost-effective lead-free paint can be a great power in absorbing the X-rays and Gamma rays and it can be used instead of lead.

**Keywords:** Lead-free shields, Nano metal powder, Radiation protection

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# Cell cytotoxicity of active targeted mAb coupled loaded nanocarrier

**DerakhshandehK[1*], HematiAzandaryani A[2]**

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[2]Nano Drug Delivery Research Center, Kermanshah, IR Iran
*Email:kderakhshandeh@kums.ac.ir

## Abstract:

Methotrexate (MTX) is a folate antimetabolite that competitively binds to dihydrofolatereductase (DHFR). MTX widely used in the treatments of various types of malignancies, but high toxicity and short plasma half-life have limited its use. Targeted drug delivery is a method of delivering medication to a patient in a manner that increases the concentration of the drug in infective organs or cells, relative to others. Monoclonal antibodies (mAb) conjugation to drug carriers is a potent method in targeted drug delivery. In this work the mAb-decorated biodegradable poly (lactide-co-glycolide) (PLGA) nanoparticles were developed for tumor targeting.
Drug loaded PLGA nanoparticles (NPs) were prepared by solvent dispersion/evaporation method, with the PVA as a surfactant. Then mAb attached to particles with the aim of carbidiimides as a linker. The amount of antibody coupled investigated by the bradford method. The size and feature of obtained nanoparticles confirmed by photon correlation spectroscopy, transmission electron microscopy and fourier transform infrared spectroscopy. In vitro cytotoxicity of particles investigated on cancerous cell lines.
The encapsulation efficiency of the prepared PLGA-mAb nanoparticles was found to be 65%. PCS investigation showed that the average size of approximately 160±10 nm and 200 nm for PLGA and PLGA-mAb NPs respectively, and the PDI of particles lower than 0.3 that proved with TEM micrographs. Characterization of the products by FT-IR and Bradford method proved that PLGA-mAb nanoparticles were obtained. In vitro release profile indicated that nearly of 90% of the drug was released in the first 24 hrs for both PLGA and PLGA-mAb NPs. The in vitro cytotoxicity of the nanoparticles on cancerous cell lines showed that the PLGA-mAb nanoparticles are more cytotoxicity compared to non-mAb-mediated carriers.

**Keywords:** Targeted drug delivery, Monoclonal antibodies, In vitro cytotoxicity

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# Fluorescence spectroscopic investigation of the interaction between lactate dehydrogenase and nanoparticle silver

**Halimi F[1*], Iranfar H[2], Chmani J[2], Rajabi O[3]**

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[3]Mashad University of Medical,Mashhad,IR Iran
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## Abstract:

Nanosilver products which have well-known antimicrobial properties have been used extensively in a range of medical settings.Despite the widespread use of nanosilverproducts,relatively few studies have been undertaken to determine the biological effects of nanosilverexposure. The present study was designed to evaluate size -dependent protein interaction of known biologically active silver nanoparticles (Three different size)was studied by various kind of spectroscopic.In order to study the mechanisms underlying the effects of silver nanoparticules on lactate dehydrogenase(LDH,EC1.1.1.27)we were injected with nanosilver of various doses into solutionLDH.We then examined LDH activity and direct evident for interaction between nanosilver and LDH using spectral methods.
LDH;By fluorescence spectral assays,thenanoparticulate silver was determined to be directly bound to LDH ,and nanoparticulate silver induced the protein unfolding. It was concluded that the binding of nanoparticulate silver altered LDH structure and fuction.The fluorescence data showed that the binding of nanosilver to proteins caused strong static fluorescence quenching. The binding constants of nanosilver to LDH were determined in presence of three different sizes of nanosilver particles under the physiological condition.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 size,the results showed that the fluorescence quenching of LDH originated from the Trp and Tyr residues,and indicated a conformational change of LDH with the addition of the nanosilver.The three-dimentional fluorescence spectroscopy and resonance light scattering method data confirm these results.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 invivo.

**Keywords:** Lactatedehydrogenase, Nanosilverparticles, fluorescence spectroscopy

JPHS

# Mesoporoussilicahollow sphere enhance the cytotoxicity of anticancer palladium complexes

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## Abstract:

In this study, mesoporous silica hollow spheres (MSHS) were synthesized and characterized by XRD, N2 adsorption-desorption, scanning electron microscopy (SEM), and FT-IR. Next, two new palladium(II) complexes containing 2-(Furan-2-yl)-1H-Imidazo[4,5-f][1,10]Phenanthroline (FIP) and 2-(thiophen-2-yl)-1H-imidazo[4,5-f][1,10]phenanthroline (TIP) ligands have been synthesized and the structures of the compounds, [Pd(Phen)(TIP)](NO3)2 and [Pd(Phen)(FIP)](NO3)2 were determined by applying 1H-NMR, UV-visible and FT-IR spectroscopic methods and elemental analysis. Also, the interaction of human serum albumin (HSA) with two synthesized palladium(II) complexes were investigated using isothermal titration UV-visible spectrophotometry in 10 mmol/L Tris buffer, pH 7.4. Then, palladium drugs loaded into MSHS by wet impregnation method and release profile of palladium drugs from the MSHS in acetate buffer solution (pH 4.5) and phosphate buffer solution (pH 7.4) were evaluated by dialysis method. This cytotoxicity of the drug-loaded MSHS was even higher than of the pure drugs in solutions, suggesting that MSHS loaded with palladium drugs enabled a localized intracellular release of the palladium compounds and possibly also facilitated the drug's hydrolysis, enhancing the desired cytotoxic effect.

**Keywords:** Mesoporoussilicahollow sphere, Palladiumcomplexes, Cytotoxic

JPHS

# Antibacterial effects of Ag/ZnOnanoparticle on renal damage in rat model of pyelonephritis

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## Abstract:

Objective: Urinary tract infection has change a basic challenge in human population. Antibacterial nanoparticles have turned over the new leaf in scientist's research. Materials and Methods: Ag/ZnO nanoparticle is synthesis in high temperature (5000C). FT-IR, XRD, SEM and TEM were used for determination of spectroscopic, structural and morphology of samples, respectively. Also the nanoparticle was digested and analyzed by ICP-AES for determining the presence of residual chemical element in the nanoparticle. Bacterial sensitivity to nanoparticle was commonly tested using by MIC and MBC tests. For achievement of in vivo tests, the renal of rats were injected and then were infected with E.coli. After that, animals were divided to 9 treatment group and the effect of three concentrations of MIC and MBC; also intermediate concentrations of MIC and MBC and each as a separate group, were studied. Results: The particles size was less of 12 nm, approximately. The MIC and MBC observed for Ag/ZnO were 32$\mu$gml-1 and 512$\mu$gml-1 for E.coli, respectively. Treatment with a concentration 512 $\mu$gml-1 of Ag/ZnO nanoparticle in combination with Ciprofloxacin reduced severity of renal cortical thickness of pyelonephritis rats. The microscopic pathological examination indicated that there was no any severe Inflammation of renal tubules in the groups that had been treated with 512 $\mu$gml-1 concentration of Ag/ZnO nanoparticle in combination with ciprofloxacin. In compared with the control groups. Conclusions: This study showed that the Ag/ZnO nanoparticle in cooperation with ciprofloxacin has great antimicrobial effect against E.coli on renal damage of Pyelonephritis.

**Keywords:** Antibacterial, Ag/ZnONanoparticle, Pyelonephritis

JPHS

# Enhancement of new ZnOnanofluid formulations against various bacteria and fungi

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## Abstract:

ZnO NPs and their water- based nanofluids containing new formulations have used in this study. Because they are most significant metal oxide nanoparticles, in industrial scale and available in many countries with various applications such as pharmaceutical. ZnO NPs are nontoxic, permeable and new formulations including modified high surface energy with (PEG, amine, polymer, solvent, and surfactant) are able to dissolve in water. Due to these observations, 12 different and novel zinc oxide nanofluids were fabricated by sol-gel method, and used as new formulation with functionalized surface and were applied against some gram positive and negative bacteria and fungi. The characterization was determined by XRD, FTIR, DLS, zeta-potential, SEM technique and UV-Vis absorbance spectroscopy. Also antimicrobial activity based on minimum inhibitory concentration and agar well method with standard strains of bacteria and fungi were performed. Among the13 different bacteria strains, new ZnOnanofluids, nanocomposites and ZnO/ polymer products were showed the best effect on gram positive bacteria like: Enterococcus faecalis, Strep A pyogenes and Staphylococcus aureus and listeria monocytogenes and gram negative (Escherichia coli) had un growth zones 60mm, 60 mm, 35 mm, 40 mm and 25 mm in comparing with gentamycin 20mm, 25mm, 30 mm, 25mm and 10 mm. So the MIC of ZnOnanoformulations on bacteria were determined as 0.75, 0.75, 6.25, 3.12, and 12.5mg/ml respectively. Additionally our examination showed noticeable results for dermatophyte fungi like T .mentagrophytes and M .canis which had un growth zones 70 and 35 in comparing with Clotrimazole 30mm and 25 mm and MIC ZnO NPs on fungi were determined to be equal to 0.35 and 6.25 mg/ml. These findings represented that ZnOnano fluids can generate the most influence on some gram positive bacteria and fungi in nano medicine science which cause dermal and mucosal infections, fetal abortion ,water pollution, anthrax, bed sore and burn infection

**Keywords:** ZnOnanofluids, Antimicrobialactivity, Medicine

JPHS

# Preparation and investigation of antibacterial activity of Fe3O4LDH EDTA-Ag

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## Abstract:

Magnetic nanoparticle Fe3O4 was covered in aluminum _ nickel Layered Double Hydroxide (LDH) by sol-gel process. Subsequently, the EDTA-dianhydride attached to the hydroxide surface of magnetic nanoparticles (MNP) during the nucleophilic attack. Then, the Ag nanoparticles embedded in this polycarboxylic layer by chelating mechanism. The Fe3O4 LDH EDTA-Ag were characterized by scanning electron microscopy, atomic force microscopy and Fourier–transform infrared spectroscopy. The antibacterial effect of the synthesized silver nanocomposite was studied by disk diffusion, minimum inhibition (MIC) and minimum bactericidal concentrations (MBC) methods against some bacterial strains. Finally, the new nanocomposite displayed potent antimicrobial activity against Gram–negative and Gram–positive bacteria. These properties indicated that the films could be potentially useful as antimicrobial materials in a wide variety of waste water treatment, biomedical and general use applications.

**Keywords:** Magnetic nanoparticles, Antibacterial activity, Silver

JPHS

# Nanotechnology safety-its importance in engineering education

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## Abstract:

Nanotechnology has gained a great deal of public interest due to need and applications of nanomaterials in many area of human endeavors including industry, agriculture, business, medicine and public health. However, the safety of nanomaterials has raised serious concerns since current research indicates that the nanomaterials can interact with human and animal cells or organs and damage or kill those cells or organs, block blood flow and cause serious health harms, due to their physicochemical characteristics such as shape, size, surface area, charge, etc. At such, worker protection should be paramount within any nanomaterial over sight regime. There are a number of protection methods to manufacture non-toxic nanomaterials and nanodevices. The aim of this paper is to present the recent development on those nanomaterials and protection methods. This is necessary to protect university students involved in production and the use of these materials. We consider that our study will improve the quality of students and engineers life by safety using nanomaterials which can benefit society in general.

**Keywords:** Nanoeducation, Nanomaterials, Protection

JPHS

# The study of antibacterial activities of synthesized Ag nanoparticles using waste extract

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## Abstract:

Ag nanoparticle as one of the most used nanoparticles in dealing with infectious diseases has been considered by researchers. Therefore many reports for synthesis of Ag nanoparticles has been presented like chemical reduction using poisonous and dangerous materials like: N2H4, NaBH4 and N,N-Dimethyl Formaldehyde. Metallic nanoparticles are widely used so developing biocompatible methods like synthesis process by biomimetic method is considered. In this project according to the green chemistry's principles, biological reduction by waste extract has been used. The extract of some of Cellulosic wastes was used as reducer and stabilizer. Cellulosic wastes had an important role in reducing metals and synthesis of Nanostructured metals because of cellulose, hemicellulose, pectin and lignin. The easiness, availability of waste, low Cost and non-toxic wastes are the benefits of this method. Scanning Electron Microscopy confirmed the nanoparticles and the EDX spectrum of the Ag nanoparticle solution in the presence of an Ag signal, confirmed an element without Impurity. Absorption spectrum shows the maximum absorption in about 420-430 nanometers. With the comparison between maximum absorption wave lengths of synthesized Ag nanoparticles and other researcher's reports based on maximum absorption wave length and nanoparticle's measure relation can estimate synthesized nanoparticle's measure about 35-50 nanometers. Although UV-vis spectrum shows that with increasing concentration of AgNO3, the maximum absorption has been increased. In other words the concentration of nanoparticles has been increased. In addition the comparison between reducer's effects (pomegranate waste, watermelon peel and Olvera) shows that pomegranate waste is better for reducing. The Scanning Electron Microscopy and UV-vis spectra can estimate the nanoparticle measures less than 40 nanometers. The anti-bacterial activities of Ag nanoparticles investigated against gram-positive Pseudomonas.areuginosa, Staphylococcus and gram-negative E.coli. The results showed that Ag nanoparticles synthesized by this method has a high antibacterial property.

**Keywords:** Ag nanoparticles, Green chemistry, Cellulosic wastes

JPHS

# Prenatal exposure to silver nano-particles induced depressive and not anxiety-like behaviors in adult male offspring

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## Abstract:

Nanosilver has become one of the most widely used nanomaterials in consumer products and its production has been estimated 250–312 tons worldwide. Despite the wide application of nanosilver, there is a serious lack of information concerning their impact on human health. Due to the unique antimicrobial and many other broad spectrum biotechnological advantages, silver nanoparticles (Ag-NPs) are widely used in biomedical and general applications. Very little is known about the toxicity of nano-sized silver particles, however, the size and surface area are recognized as important determinants for toxicity. It is believed that reactive oxygen species (ROS) and oxidative stress results from an increased generation of ROS or from poor antioxidant defense systems may be responsible for the neurotoxicity of Ag-NPs. In this regard, we examined whether maternal exposure to (Ag-NPs) is able to induce depressive-like behaviors in the adult male offspring. Results revealed that daily administration of 15 mg/kg Ag-NPs (average size of 10nm and 30nm, orally) to pregnant female NMRI mice during gestational period produced depressive-like behaviors in adult male offspring when assessed by forced swimming test and splash test. Using open-field and hole-board tests, similar treatments induced no alteration in anxiety-like behaviors of experimental animals. Also, we showed that pretreatment with ascorbic acid (as free radical scavenger) did not reverse the detrimental impact of prenatal exposure to Ag-NPs on animal behavior except for 30 nm Ag-NPs. Furthermore, severity of depressive-like behaviors in animals was dependent on the size of Ag-NPs. The smaller size of Ag-NPs in prenatal state exerted more potent depressant effects in comparison with 30 nm Ag-NPs. Overall, the results of this study suggested that prenatal exposure to Ag-NPs may lead to development of psychiatric disorders such as depression later in life.

**Keywords:** Silver nanoparticles, Male offspring, Depression

JPHS

# Extraction and determination of brilliant blue food dye in cake and jelly by modified nanosorbent

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## Abstract:

A new method has been developed for the separation/preconcentration of trace level brilliant blue food dye using surfactant immobilized on nanosorbent SBA-15 as a new sorbent SPE and their determination by spectrophotometry. Synthesized nanoparticle was characterized by X-ray diffraction (XRD) and transmission electron microscope (TEM). Various influencing parameters on the separation and preconcentration of trace level brilliant blue food dye such as, pH value, amount of nanosorbent, amount of diphenylcarbazone, condition of eluting solution, the effects of matrix ions were examined. The brilliant blue food dye can be eluted from the nanosorbent using CCl4 as a desorption reagent. The detection limit of this method for brilliant blue was 4.9 ngml-1and the R.S.D. was 0.92 % (n=6). The advantages of this new method are including rapidity, easy preparation of sorbents and high concentration factor. The proposed method has been applied to the determination of brilliant blue at trace levels in real samples such as, cake and jelly with satisfactory results.

**Keywords:** Nanosorbent, Brilliant blue, Cake and Jelly

JPHS

# Antibacterial coatings containing silver nanoparticles generated in situ in a thermal radical initiated system

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## Abstract:

Different methods have been followed for the ion reduction, such as photochemical, Electrochemical, chemical reduction. In the present study, thiol-ene that induced by a thermal radical system, has been used to reduce silver ions and prepare a silver/polymer composites based on an in situ bottom-up approach. Thiol-ene radical initiated polymerization proceed by a radical step growth mechanism, which involves two main reactions, the addition of a thiyl radical to the ene double bond followed by a chain-transfer reaction. The use of this radical polymerization system guarantees the preparation of polymers in which the metal nanoparticles synthesized are highly and homogeneously dispersed in the thiol-ene network, showing improved antibacterial properties. Thiol-ene systems, in fact, assure a fast formation of a uniform crosslinked network with high polymerization rates, low shrinkage, and reduced oxygen inhibition. The silver atoms distribution map was investigated by an energy dispersive X-ray analyzer system (EDX). EDX pattern showed a uniform distribution of silver metal in membrane surface owing to cooperation of thiol-ene reaction in the polymerization. This combination presents thiol groups to interact with silver particles and prevent their aggregation lead to proper antiseptic activity of silver. The EDX analysis together with the X-ray fluorescence spectrometer results make possible to confirm the reduction of silver ions to elemental silver particles inside the composite membranes. In addition, morphological analyses were investigated by transmission electron microscope (TEM), in order to conﬁrm the presence of silver nanoparticles and investigate their size. TEM micrographs showed the presence of well dispersed and distributed silver nanoparticles in the polymer network with an average size of the particles being around 30–50 nm. Finally, the antimicrobial activity of was evaluated. A clear antimicrobial action was caused by the silver nanoparticles embedded in the thiol-ene membranes.

**Keywords:** Silver nanoparticle, Antibacterial, In situ generation

JPHS

# The antioxidant properties of Rosemarinusofficinalis as medical plant by electro-oxidation using single-walled carbon nanotubes

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## Abstract:

Antioxidants attract great attention because of their importance for radical scavenging in living organisms. They also have an important role in preventing a variety of diseases and aging because they inhibit or delay the oxidation process by blocking the initiation or propagation of oxidizing chain reactions. Plant tissues contain a network of compounds that control the level of reactive oxygen species, including phenolic compounds, vitamins C and E and several enzymes. Phenolic compounds widely distributed in the natural plants tissues include flavonoids, tannins, hydroxycinnamate esters and lignin. Rosemary (Rosmarinusofficinalis L.) is a spice and medicinal herb widely used around the world. Rosemary has been widely accepted as one of the spices with the highest antioxidant activity. Rosemary essential oil is also used as an antibacterial, antifungal and anticancer agent.

Electrochemical techniques are being developed and improved for determination of antioxidant compounds. These techniques are low-cost and enable rapid analysis of sample. Cyclic voltammetry on carbon nanotube modified electrode appears to be a suitable tool in antioxidant assays.

In this work, leaves of Rosmarinus were dried at shadow and at room temperature. The powdered leaves of the plant were sonicated in methanol for 12 min. It have been compared the voltammograms of methanolic extract of Rosmarinus at a bare glassy carbon and single-walled carbon nanotube (SWCNT) electrodes. The cyclic voltammetric responses for electrochemical oxidation of methanolic extract on the bare and SWCNTs modified electrodes in a 0.25 M buffer solution with a pH of 7.2 recorded. The peak was sharper and the peak current increased significantly on the SWNTs modified electrode as compared with the bare electrode. The electrode surface modification with SWCNTs augmented its effective surface area and the oxidation currents of antioxidants.

**Keywords:** Medical Plant, Carbon nanotube, Antioxidant

JPHS

# Fe3O4aminopropyltriethoxysilanepolycarboxylic acid polymer Ag: anew generation of antimicrobial agent

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## Abstract:

Novel Fe3O4aminopropyltriethoxysilanepolycarboxylic acid polymer Ag nanocomposite were fabricated for the removal of bacteria from waste water by the sol–gel polymerization of aminopropyltriethoxysilane on the Fe3O4 nanoparticles, followed by EDTA-dianhydride attached to the hydroxide surface of magnetic nanoparticles during the nucleophilic attack. Subsequently, Ag nanoparticles embedded in this polycarboxylic layer. Silver nanocomposites were examined by Fourier-transform infrared, scanning electron microscopic images (SEM), X-ray diffraction, and vibrating sample magnetometer (VSM). SEM images showed a layer of silver nanoparticles, polycarboxylic acid polymer and aminopropyltriethoxysilane on Fe3O4. The antibacterial effect was studied by disk diffusion method against some bacterial pathogenic strains. Silver nanoparticles showed promising activity against Staphylococcus aureus and slightly active against Escherichia coli.

**Keywords:** Fe3O4 nanoparticles, Self-assembled monolayer, Sol-gel

JPHS

# The effect of molar ratio of polyaniline in polyaniline/graphenenano-composite to investigated the ABTS radical scavenging activity

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## Abstract:

Antioxidant activity of polyaniline/graphenenanocomposite (PANI/GR) on graphite pencil in [1]M phosphoric acid solution (H3PO4) containing 1 M calcium chloride (CaCl2) is performed. The antioxidant activity is investigated through reaction with 2, 2-azino-bis (3-ethylbenzothiazoline-6-sulfonate) (ABTS) radical in methanol. FT-IR and UV-Visible spectrums demonstrate that there are positive correlations between the molar fraction of polyaniline/graphenenano-composite and antioxidant activity, the increase in molar ratio of PANI in nanocomposite has increased the antioxidant activity of composite. Furthermore, the electrochemical impedance spectroscopy (EIS) reports that the increase of molar fraction of PANI in nanocomposite has also increased the charge and mass transfer.

**Keywords:** Electrochemical impedance spectroscopy, ABTS free radicals, Antioxidant activity

JPHS

# Organic supporting electrolyte influence on antioxidant activity of polyaniline/graphenenanocomposite modified electrode synthesized to scavenging DPPH free radical activity

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## Abstract:

Polyaniline/graphenenanocomposite modified electrode synthesized on graphite pencil as working electrode in acidic solution and 0.2M PTSA as supporting electrolyte. Polyaniline/graphenenanocomposite antioxidant activity is accomplished through reaction with 1, 1-diphenyl-2-picrylhydrazyl (DPPH) radical cation. The electrochemical impedance spectroscopy (EIS) and UV-Visible spectrums indicate that scavenging of DPPH radicals by Polyaniline/graphenenanocomposite prepared in presence of Para toluene sulfonic acid is efficient to decrease the absorbance of DPPH free radicals thus the antioxidant activity of Polyaniline/graphenenanocomposite is increase in presence of Para toluene sulfonic acid.

**Keywords:** Polyaniline/graphenenanocomposite, DPPH radicals, Antioxidant activity

JPHS

# Antifungal activity of synthesized silver nanoparticle using cotton seed extract

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## Abstract:

Now biological methods used for synthesized silver nanoparticle. The use of plant extracts as biological material, proves it to be suitable for the synthesis of nanoparticles. Plants or their extracts provide a route biological synthesis for the synthesis of metallic nanoparticles environmentally friendly and are possible Synthesis at specified size and shape. Extracellular synthesis of silver nanoparticles using extracts of medicinal plants is done for induction of silver ions in a short time. In this study, flower Stachyslavandulifoli extract was prepared and treated with aqueous solution of silver nitrate.Change color from light yellow to brown in treated extract indicated green synthesis of silver nanoparticles. By absorption UV-visible spectroscopy, Fourier transform infrared spectrometer (FTIR), X-ray diffraction (XRD) and transmission electron microscopy (TEM) Analysis biological synthesis of silver nanoparticles were confirmed. Also the antifungal activity of soluble silver nanoparticles was tested on the most pathogenic fungi.

**Keywords:** Biosynthesis, Silver nanoparticles, TEM

JPHS

# Physiological and biochemical responses of potato under silver nanoparticle and silver nitrate exposure in invitro conditions

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## Abstract:

The aim of this work was to elucidate advantage and disadvantage of supplementation silver nanoparticle (AgNP) and silver nitrate (AgNO3) in invitro culture of potato plant. Our results indicated that 2 mgL-1 of silver (AgNP and AgNO3) treatment resulted in improvement in growth parameters such as fresh and dry weight of shoot. On the other hand, Silver treatments were elevated root length, leaf area and leaf area/shoot length ratio at the 2 mgL-1 concentration. However, shoot length significantly reduced. Total chlorophyll and carotenoids at 2 mgL-1and higher levels increased and reduced, respectively. Anthocyanin content was elevated in AgNO3 treatments in a dose-dependent manner, while in 2mgL-1 and higher levels of AgNP treatments; it was increased and diminished, respectively. Proline content was reduced at 2mgL-1. However, an increase in proline accumulation was observed at higher levels of silver. Flavonoids were increased in treated plantlets in 2mg.L-1, while a reduction was monitored at higher levels. Total Phenolics were significantly increased in all treatments and no difference in H2O2 content was observed at 2mg.L-1 AgNO3 treatment in respect to the control, whereas it was increased in plantlets treated with AgNP at this level. MDA content was elevated in treated plants in 2 mgL-1. At higher concentration of silver, MDA content was remarkably increased. Based on our results we concluded that AgNP enhanced growth profile and roots and reduced abnormalities of plantlets arising in the culture vessel in potato plants grown invitro at low levels which probably referred to inhibitory effects on ethylene action. Furthermore, AgNP was more toxic than AgNO3 at higher than 2 mgL-1. This toxicity is probably attributed to induction of oxidative stress.

**Keywords:** Silver nanoparticle, Invitro, Oxidative stress

JPHS

# Effect of synthesis parameters on toxicity of chitosan/streptokinase nanoparticles

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## Abstract:

Streptokinase is one of thrombolytic agents which mediates dissolution of fibrin in blood clot. Recently, delivery of Spa via nanoparticles has also gained a lot of popularity due to ability to control particles' size and loading capacity in nano-based systems. Size of Nanoparticles is close to that of cellular components (i.e. proteins), thus, they may pass through cell membrane and harm living cells. Therefore, toxicity assessment of nanoparticles is a necessity before using them in vitro /in vivo. In this study, chitosan and Streptokinase nanoparticles were prepared by selfassembly. Then, artificial neural networks were used for identifying main factors influencing the cytotoxicity of particles. Three variables, namely Chitosan concentration, pH of solution and stirring time were used as input parameters. Experimental data were modeled and validated against unseen data. The response surfaces generated from the software demonstrated that Chitosan concentration is the dominant factor which affects toxicity of nanoparticles. Increasing chitosan concentration leads to decreasing toxicity. Also increasing pH of solution has a direct effect on toxicity of particles. Increasing chitosan concentration and pH leads to increase nanoparticles size. Whereas probability and potential of interaction between cells membrane depend on nanoparticles sizes, small sized nanoparticles, passing through the membrane of cells more easily than the larger ones. It can be concluded that factors which affected size of particles could have an influence on toxicity of particles. Decreasing size of particles usually cause increasing of toxicity of nanoparticles. In conclusion for obtaining particles with minimum toxicity, concentration of Chitosan and pH of solutions must be adjusted carefully.

**Keywords:** Toxicity, Chitosan, Artificial neural networks

JPHS

# Zno nanoparticles effect on expression of P53 and RB genes

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## Abstract:

Nanomaterials have been the center of attention of many researchers due to wonderful physico-chemical properties observed of them. However, their toxicity potential necessitates performing an extensive amount of biocompatibility and toxicity studies before being clinically employed. ZnO nanoparticles (NPs) as metal oxide NPs, with wide industrial and biomedical application, have exhibited a range of cytotoxical effects on different cell types and negative effects on the survival and growth in In vivo studies. In this study ZnO NPs with 23 ± 11 nm sizes and concentration of 1600 ppm espoused to MCR5 cells for 72 hour. To evaluate expression of p53 gene in MRC5 cells culture, primers that detect prominent variants of p53 transcripts in lung fibroblast cells were used. The relative mRNA expression assay was performed in controlling and exposed cells with ZnO NPs. Results shows approximately 5-fold increase in expression of p53 in comparison to HPRT gene expression as internal control. Also 1.5 fold increase in expression of Rb is observed compared with HPRT gene expression. Expression of both genes increases in exposed cells, of which expression of p53 gene was more considerable. P53 gene expresses in stressful physiological situation and has been called guardian of the genome. The p53 tumor suppressor gene plays an important role in genomic response to DNA damage by cell cycle or apoptosis control and possibly plays an important role in toxicity of ZnO NPs. These findings may indicate a cellular response to toxic effect of ZnO NPs by different pathways including gene expression.

**Keywords:** ZnO nanoparticles, P 53 gene, RB gene

JPHS

# Facile green synthesis of silver nanoparticles using seed aqueous extract of Nasturtium officinale R.Br and its antibacterial activity

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## Abstract:

In the present work, we describe the synthesis of silver nanoparticles (Ag-NPs) using seed aqueous extract ofand its antibacterial act Nasturtium officinale R.Br ivity. UV–visible spectroscopy, X-ray diffraction (XRD), Fourier transform infrared spectroscopy (FTIR), transmission electron microscopy (TEM), scanning electron microscopy (SEM), and X-ray energy dispersive spectrophotometer (EDAX) were performed to ascertain the formation of Ag-NPs. It was observed that the growths of Ag-NPs are stopped within 35 min of reaction time. The synthesized Ag-NPs were characterized by a peak at 460 nm in the UV–visible spectrum. XRD confirmed the crystalline nature of the nanoparticles of 5-40 nm size. The XRD peaks at 38◦, 44◦, 64◦ and 77◦ can be indexed to the (1 1 1), (2 0 0), (2 2 0) and (3 1 1) Bragg's reflections of cubic structure of metallic silver, respectively. The FTIR result clearly showed that the extracts containing OH as a functional group act in capping the nanoparticles synthesis. Antibacterial activities of Ag-NPs were tested against the growth of Gram-positive (S. aureus) using SEM. The inhibition was observed in the Ag-NPs against S. aureus. The results suggest that the synthesized Ag-NPs act as an effective antibacterial agent. It is confirmed that Ag-NPs are capable of rendering high antibacterial efficacy and hence has a great potential in the preparation of used drugs against bacterial diseases. The scanning electron microscopy (SEM) , indicated that, the most strains of S.aureus was damaged and extensively disappeared by addition of Ag-NPs. The results confirmed that the Nasturtium officinale R.Br is a very good eco friendly and nontoxic source for the synthesis of Ag-NPs as compared to the conventional chemical/physical methods.

**Keywords:** Silver nanoparticles, Nasturtium officinale R.Br, Scanning electron microscopy (SEM)

JPHS

# Comparing antibacterial properties in mono polypropylene and bicomponent polypropylene polyethylene fibers containing silver nanoparticles

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## Abstract:

As antibacterial attribute is the main property in the fiber which are used in hygienic products such as baby diapers, sanitary napkins and all that and on the other hand silver particles are the best materials with the minimum allergic reaction according to medical literature and also nano particles have much better properties with lower amount, in this study, using silver nano particles in mono polypropylene and bicomponent polypropylene polyethylene fiber has been investigated. To have permanent antibacterial property, particles have been used during fiber melt spinning production. As bicomponent fibers are used in thermo bonding process for producing different nonwovens, it was gained to use polypropylene with higher melting temperature in core and polyethylene in sheath layers to produce the fiber with better bonding and mechanical properties. Also nano silver masterbatch has been added in the sheath to optimize the amount of particles.
The results indicate that in bicomponent fiber with using the silver nano particles in the sheath layer, the same antibacterial properties comparing to mono fiber can be achieved with much lower amount of particles and this can have the most important affect in end-product finish cost.

**Keywords:** Antibacterial property, Silver nanoparticle, Mono and bicomponent fiber

JPHS

# Effect of nanocopper oxide on liver tissue in ross broilers

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## Abstract:

Liver toxicity is the leading cause of drug or food supplements failure, so the advance could help streamline the drug and food industry development resulting in fewer toxic materials and a greater success rate for clinical and industrial trials. Therefore, the present study tries to investigate the effect of Nano Copper Oxide on the pathological changes of liver tissue in broilers. In this experimental study, 60 one-day female broiler chickens of Ross 308, with an approximate weight of 40 g were examined. The chickens were randomly divided into three groups of 20, control, experimental groups 1 and 2. The control group received water and food, and no special experimental material were feed orally or by injection. The experimental group 1 was feed one dose of 16 mg / kg/bw Nano Copper Oxide and experimental group 2 received two dose of 32 mg /kg/bw Nano Copper Oxide for 30 days. At the end of the period, the tissue sections were prepared from liver tissue. Our results showed the changes including congestion of central vein, congestion of sinusoids, and lymphocytic infiltration around the central vein, liver necrosis and vacuolization of the cytoplasm in the experimental group 2 in comparison to control.

**Keywords:** Nano copper oxide, Liver tissue, Broiler

JPHS

# Antimicrobial hydrogel as a nanoreactor and immobilizing matrix for silver nanoparticles

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## Abstract:

Hydrogels are polymeric cross linked networks which are water-insoluble and hydrophilic and also able to retain a lot of water. Hydro gels offer large free space in swollen stage within the cross linked network and may act as a nano-reactor that not only provides a sufficient space for nucleation and growth of particles but also provides long term stability. Characterization studies established that hydrogel provides a controlled and uniform distribution of nanoparticles within the polymeric network without addition of any further stabilizer. The aim of this work is to develop chitosan–PEG-based hydrogel which act both as a nano-reactor and an immobilizing matrix for silver nanoparticles (AgNPs). With these, higher degree of biocompatibility and long-term antibacterial activity can be achieved. First of all we develop chitosan-PEG hydrogels with different ratio of polymers to find the best ratio for our work by characterizing the synthesized hydrogels. The hydrogels were characterized by measuring swelling ratio and water vapor transmission rate which are important according to our aim. Then at the appropriate ratio, hydrogels with different crosslinking densities were developed. The hydrogel containing AgNPs with different crosslinking densities were prepared by repeated freeze–thaw treatment.Silver nanoparticles inside hydrogel were prepared via in situ reduction of silver nitrate (AgNO3) using sodium borohydride (NaBH4) as reducing agent.In hydrogel network uniformly dispersed silver nanoparticles stabilized by the polymer network were obtained.The variation in cross-link density in the hydrogel network is a simple and facile synthetic strategy to control the size of the nanoparticles and regulate shape of nanostructures such as nanorods, nanocubes. The hydrogel containing AgNPs were well characterized by swelling behavior, antibacterial studies, XRD, UV-Vis spectrometry, scanning electronmicroscopy and transmission electron microscopy.

**Keywords:** Hydrogel, Nanoreactor, Anti-microbial

JPHS

# Antimicrobial effect of Curcumin-loaded starch nanoparticles on Streptococcus mutansbiofilms: using in dental caries

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## Abstract:

Introduction: The purpose of modern dentistry is the early prevention of tooth decay rather than invasive restorative therapy. However, despite tremendous efforts in promoting oral hygiene and fluoridation, the prevention of caries lesions are still challenges for dental research and public health. Dental caries is caused by bacterial biofilms on the tooth surface, and the process of caries formation is modulated by complex interactions between acid-producing bacteria and host factors including teeth and saliva. Streptococcus mutans is a gram-positive endogenous bacterium to the oral cavity, which is deemed as the main cariogenic agent. The main virulence factors of S. mutans associated with cariogenicity include adhesion, acidogenicity, and acid tolerance. Therefore, novel approaches for developing oral care products, such as dentifrices and mouthwashes, rely on targeting these highly adaptable oral organisms and blocking their key mechanisms of phenotypic variation, are increasing. One major step forward in achieving this goal has been the development of antimicrobial systems that could effortlessly diffuse across all biofilm structures. For this purpose, there has been increasing interest in developing nanoscale systems to be used as biological carriers within biofilms. Of special interest are those nanoscale systems developed from natural polymers, e.g., starch. Also in associated with poorly water-soluble compounds, nanotechnology-based drug delivery systems have been proved to be prom¬ising platforms to enhance bioavailability and biological activities and targeting to cancer tissue or cells, which can open up a new avenue for poor in vivo action drugs like curcumin. Curcumin is a highly potent, nontoxic, bioactive agent found in turmeric that has inhibitory effect against sortase A, an enzyme which plays a role in influencing the cariogenicity in S. mutans.Methods: Techniques required for the production of polysaccharide nanoparticles containing curcumin in this investigation are precipitation and ionic gelation methods. To evaluate the effect of nanoparticle surface charge and its density on binding rate with enamel model material (hydroxyapatite), starch polysaccharide was used for nanoparticle production. Size and distribution of nanoparticles were performed by SEM and DLS analysis.Results: The aim of this research was to develop antibacterial compounds for preventing dental biofilm development. So, starch nanosystem was used to investigate S. mutans function on hydroxyapatite. Curcumin was utilized as a biological agent for loading into nanoparticles. Results showed that nanosystem containing curcumin has an appropriate efficiency in biofilm reduction.

**Keywords:** Streptococcus mutans, Polysaccharide nanosystem, Curcumin

JPHS

# H2S detection by carbon nanotube field effect transistor-based gas sensor

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## Abstract:

The unique electrical properties of single-wall carbon nano-tubes (SWNTs) have generated a huge amount of research on nano-electronic devices and nano-sensors. Immobilization of H2S onto the sidewall of a semi-conducting SWNT is found to change the gate and drain control parameters of the Carbon Nanotube Field Effect Transistor (CNTFET). In this paper, we propose the effect of reaction between H2S molecules and the surface of the Single Wall Carbon nanotube (SWCNT) channel in a CNTFET device as a sensor. The theoretical basis of CNTFETToy is a model developed by Natori for ballistic FETs which was expanded upon by Rahman.

Ignoring mobile charge in the channel, the Laplace potential at the top of the barrier is then:The three α's in equation (1) describe the gate, drain and source's control over the Laplace solution and depend on the two-dimensional structure of the device.

Reaction between H2S molecules and SWCNT changes the surface charge and potential of the CNT channel, which in its turn, causes the corresponded variations in device characteristics. This reaction is simulated in Virtual Nanolab (VNL) software which leads to the changes in i-v curve of CNTFET through the affecting in gate control parameter and drain control parameter. We insert this parameters in FETToy area (a code developed under MATLAB) to extract the i-v curves. The curves comparison clearly shows that the H2S molecule will affect the performance of CNTFET as its sensor.

**Keywords:** CarbonNanotube, CNTFETSensor, Hydrogen Sulfide

JPHS

# Carbon paste electrode based on chemically modified carbon nanotube for determination of iodide and Cu2+ ion

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## Abstract:

Novel carbon paste electrode (CPE) based on chemical modification of MWCNTs and its subsequently metalized with on-line pathway to obtain the 3- methoxy 2-((3-silylpropylimino) methyl) phenol chemically bonded to MWCNTs (MSPIMP–MWCNT and MSPIMP–MWCNT-Cu). These novel materials were fully identified and characterized by SEM, TEM and FT-IR. These ionophores as electro -active agent in the matrix of carbon paste applied with other ingredients such as (NaTPB), graphite powder and Nujol oil were mixed thoroughly and then packed into the hole of the electrode body. The influence of variables including sodium tetraphenylborate (NaTPB), ionophore, and amount of multiwalled carbon nanotubes (MWCNT), CuO nanoparticles, graphite powder and Nujol on the electrodes response were optimized by central composite design and surface response technology. At optimum composition of carbon pastes Cu2+ ions successfully was determined over a wide concentration range of 4.09×10-8-1.0×10-2 mol L-1 with detection limit of 1.6×10-8 mol L-1 and a Nernstian slope of 29.56 ± 0.56 mV per decadeof Cu2+ concentration. The electrode response is independent of pH in the range of 3.5;5.5 with response time lower than 20 s. The subsequent on-line complexation with metal ions candidate a novel material for construction of iodide selective electrode over 8.8×10-7-1.0×10-2 mol L-1 with detection limit of 4.1×10-7 mol L-1 and a Nernstian slope of -59.41 ± 0.78 mV per decadeof iodide concentration. On the basis of the results discussed in this paper, MSPIMP-MWCNT and MSPIMP-MWCNT-Cu are good and suitable neutral carriers for the construction of a carbon paste electrode for Cu2+ ion and iodide determination. The proposed electrodes have good operation characteristics performance such as high sensitivity, stability, response time, detection limit and wide linear range.

**Keywords:** Carbon paste electrode,Multiwalled carbon nanotubes, Chemically modified electrode

JPHS

# Size-dependent cytotoxic effects of ultra smallZnOnanoparticles under UV irradiation

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## Abstract:

With the development of nanoscience, various types of nano-biomaterials have widely been used in the medicine and clinical setting (e.g., diagnosis and cancer therapy). In this context, one of the interesting nanoparticles is quantum dots (QDs) with unique and tunable optical and targeting properties. ZnO as a quantum dot, which belongs to the group II-VI semiconductors, has a wide energy gap and large exciton binding energy. Additionally, Nano-scaled ZnO is able to play a role as a photocatalyst, which could generate the ROS (Reactive oxygen species) under irradiation procedure. Consequently, this agent can induce a double-strand breakage (DSB) of the DNA together with the cellular toxic effects. In our research, we have investigated the ROS generation of ZnO nanoparticles with different sizes, under UV irradiation and studied cytotoxic effects of these nanoparticles on Hela cells. The ZnO nanoparticles were prepared by using different conditions to synthesis different size ultra smallZnO nanoparticles with a narrow size distribution (from 2 up to 5.5 nm). UV-VIS spectroscopies and the Tauc plot application have been used to size determination. ROS generation and cytotoxic effect 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 and 0.1 mW/cm2) irradiation times. Apoptosis and necrosis in HeLa cells were detected by MTT assay. A Significant increase in ROS generation was observed due to the size elevation and increased irradiation times. Meanwhile, it was observed that UV irradiation could enhance the suppression ability of ZnO nanoparticles on cancer cells proliferation, and these effects were in the size-dependent manner. The apoptotic effect and ROS generation of ZnO NPs was marked up to a concentration of 0.05 mgr/ml and size of 5.5 nm. Based on our results, the different size ZnO nanoparticles with the smaller-scale (up to 10nm) have a reverse size-dependence ROS generation activity in comparison with the large scales (>10). It is hypothesized that, in some cases with the increased surface area to volume ratio, the number of surface atoms have been decreased that could be causing of an activity reduction.

**Keywords:** ROS, Size-Dependent, ZnO NPs

JPHS

# Synthesis, characterization, and antibacterial activities studies of silver nanocomposite

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## Abstract:

In this study, a group of nano alkaline earth metal fluorides, which have very wide applications in various fields-have been synthesized and studied. The general formula for these compounds is MF2, where M = Mg, Ca, Sr. strontium fluoride Nanoparticles was used ,for synthesis of strontium fluoride- Magnesium oxide inorganic nano-composite by ultrasonic method. These compounds were characterization by infrared spectroscopy (IR), ultraviolet spectroscopy (UV) and some other physical properties as well as the size and structure of nanoparticles synthesized were identified by X-ray diffraction (XRD) and surface morphology and the structural model developed by scanning electron microscopy (SEM) were studied. Fluoride compounds have antibacterial properties. Antibacterial properties of these materials on Cocos staphylococcal bacteria aureus, Escherichia coli and Bacillus subtilis, was studied.

**Keywords:** Nano Fluorides, Scanning Electron Microscope, X-ray diffraction

JPHS

# The toxicity of copperoxidenanoparticles in ross broilers

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## Abstract:

Nanoparticlesare used in a variety of medical and consumer products because of their antibacterial activity.However, there is limited information about their toxicity potential. The present study has investigated the level of lipid peroxidation in the presence of CuONanoparticles (by measuring malondialdehyde) and ceruloplasmin as an antioxidant enzyme. In this studyRoss broilers were divided into 2groups. The control group received only food. Experimental groups1 and 2 received respectively 16and 32 mg/kg/bwCuO Nanoparticles since5 days old for 30days.SerumMDA and Cp levels were measured in the venousblood samples taken at the end of treatment. Base on the results ceruloplasminlevels, at two different doses, showed no significant change. However, Malondialdehyde level in the group receiving the higher dose of CuO Nanoparticlesshowed significant increase. In conclusion CuO Nanoparticles in the higher doseshowedtoxicity due to inducing oxidative stress in the broilers

**Keywords:** CuO Nanoparticle, Ceruloplasmin, Malondialdehyde

JPHS

# Study on antibacterial activity of polyester fabric finished by allicin-conjugated nanocellulose

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## Abstract:

An extensive effort has been done in the textile industry to stop the rapid growth of microorganisms. Therefore, the development of textiles has been converted to special demand. The main antimicrobial agents used in textiles include organo-metallic compounds, phenols, quaternary ammonium salts and organo-silicons. To be successful in the marketplace, these finishing agents should be durable and have selective activity towards undesirable organisms. In this study, the antimicrobial properties of polyester fabric finished by allicin-conjugated nanocellulose were evaluated against Staphylococcus aureus (Gram positive bacteria) by AATCC 100-1993 test method. Moreover, chemical changes, morphology and washing fastness of finished fabrics were investigated. Analysis was performed using XRD to investigate the crystalline structure of samples. The crystal size of polyester sample was measured as 84.64 A0 by XRD analysis. From FTIR, it was found that the specific absorption peak of conjugated polyester fabric due to –NH amide stretching. This can be related to the linkage between the amine group of allicin and carboxy-nanocellulose. The SEM image of finished fabrics with allicin-conjugated nanocellulose shows the accumulation of material on the sample surface, although it was absent on the raw fabrics surface. The results of antimicrobial properties on finished fabrics with allicin-conjugated nanocellulose showed that the polyester fabric has the very good antimicrobial activity against the selected bacteria.

**Keyword:** Nanocellulose, Allicin, Antibacterial properties

JPHS

# Biosynthesis and characterization of selenium nanoparticles by Acinetobacterjuniiand its antibacterial activity

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## Abstract:

Selenium and its nanoparticles have an extensive range of applications. Therefore, the development of clean, nontoxic and eco-friendly biological methods for the production of Se NPs deserves merit. The aim of this study was biosynthesized of selenium nanoparticles (SeNPs) by Acinetobacterjunii and its structural characterization and investigate its antibacterial activity. Acinetobacterjunii was isolated and purified from glass factory sewage and identified by 16SrRNA gene analysis.
Selenium nanoparticles were extracted from culture of bacterium using centrifugation and disrupting cells by liquid nitrogen. Disrupted cells were resuspended in Tris-HCl buffer and washed in chloroform and ethanol. Purified Se nanoparticles were characterized by Transmission Electron Microscope (TEM), Dynamic Light Scattering (DLS), Energy Dispersive Spectroscopy (EDS) and Scanning Electron Microscopy (SEM) and the growth of Staphylococcus aureus in the presence of Se nanoparticles was examined.
The appearance of red color in the culture plate suggested the formation of selenium nanoparticles. Isolated bacterium identified as Acinetobacterjunii by biochemical and morphological characterization and also 16S rRNA gene sequencing. The biosynthesized Se nanoparticles were with the size range of 13nm to 54nm with an average size of 95nm. The TEM and SEM analysis revealed that the SeNPs were spherical in shape.The EDS spectrum of SeNPs was indicated the presence of strong peak at1.5keV means that SeNPs entirely composed of Se. Results of this study also provided the evidence of strongly inhibited growth of Staphylococcus aureus in the presence of SeNPs at concentration of 30g/mL.
In conclusion, the results of our study showed that the Acinetobacterjunii has the potential for production of selenium nanoparticles and can be suggested as a promising alternative for the large-scale commercial synthesis of SeNPs. Furthermore, these nanoparticles may be used to effectively prevent and treat Staphylococcus aureus infections but should be further studied for such applications.

**Keyword:** Acinetobacterjunii, Selenium nanoparticles, Biosynthesis

JPHS

# Medical faculty researchers' attitudes on the ethical issues related to biological DNA materials usage

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## Abstract:

DNA nanotechnology, uses the nucleic acids and components of natural biological systems to engineer innovative nanodevices. DNA not only is a key biological information storage molecule but also become a preferred material for nanotechnologists because of its unique properties of structural stability, programmability of sequences, and predictable self-assembly. DNA has been the subject of many medical researches such as biobanking, gene therapy, genetic engineered products and cloning. From the early stages of growing the nanotechnology, social and ethical challenges have been raised in parallel and begun to emerge. Research endeavors with the subject of DNA, have been in center of attention particularly. Issues like hazardous effects of genetic manipulated products or recombinant DNA on the environment, confidentiality and safety in biobanking, informed consent forms, the domain of interference of DNA as an advanced nanomaterial in the environment and nature have been the most challenging areas. The basic knowledge and attitude of researchers of medical faculty in Mashhad University of Medical Sciences con some ethical issues of DNA usage as a nanosized biomaterial has been studied in a cross-sectional study. Data gathering tool was a self-administered questionnaire. The results of our study showed that approximately over 50% of M.Sc. students and 70% of Doctoral researchers had a good knowledge about biobanking, gene therapy, genetic engineered products and cloning issues. Also, on average almost75% of the researchers tend to preserve their DNA samples for possible future usage. They believed that patients should be aware about how their biological samples (including DNA) preserveor dispose.
In conclusion, the study showed that researchers feel responsible against human and environmental dilemmas (issues) related to DNA. Also they believe that policy makers and governmental authorities should have a regulatory approaches with the aim of generate a safe practice and use of biological DNA materials.

**Keyword:** DNA, Nanoethics, Medical faculty

JPHS

# An evaluation of quantum dots to detect blood fingermarks

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## Abstract:

In the frame of an investigation on crime scene or related evidence, one of the major goals for investigators is the detection of fingermarks that were left on objects or surfaces by individuals.During the last decade, several studies have focused on the development of new detection methods based on the use of nanoparticles (NPs) to detect fingermarks. More recently, researchers stabilized QDs in petroleum ether by grafting aliphatic chains on their surface and tried to detect sebaceous fingermarks on silicon wafers and paper substrates.A new and original reagent based on the use of highly fluorescent cadmium telluride (CdTe) quantum dots (QDs) in aqueous solution is proposed to detect weak fingermarks in blood on non-porous surfaces.To assess the efficiency of this approach, comparisons were performed with one of the most efficient blood reagents on non-porous surfaces, Acid Yellow 7 (AY7). Four non-porous surfaces were studied, i.e. glass, transparent polypropylene, black polyethylene, and aluminum foil. The results showed that QDs were equally efficient to AY7 on glass, polyethylene and polypropylene surfaces, and were superior to AY7 on aluminum. The use of QDs in new, sensitive and highly efficient latent and blood mark detection techniques appears highly promising.Health and safety issues related to the use of cadmium are also discussed. It is suggested that applying QDs in aqueous solution (and not as a dry dusting powder) considerably lowers the toxicity risks.

**Keywords:** Nanoparticles, Quantum dots, Latent fingermarks

JPHS

# Nanosilver induced abnormalities in kidney and spleen: a sub-chronic dermal toxicity

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## Abstract:

Silver nanoparticles have been widely used as antimicrobial agents in various products.Present study compares the tissue levels of silver nanoparticles in different organs of Guiana Pigs. Before the colloidal silver nanoparticle toxicity evaluation, their size was subjected in sizes < 100 nm by Transmission Electron Microscope and revealed that the nanoparticles contained nanosilver by X-Ray Diffraction. For toxicological evaluation, male guinea pigs were exposed to three concentrations of nanosilver (100, 1000 and 10000 $\mu$g/ml) in subchronicmodel in a period of 13 weeks.Tissue levels of nanosilver and tissue uptakes happened in dose-dependent in kidney and spleen. In histopathological studies, severe proximal convoluted tubule degeneration and distal convoluted tubule were seen in the kidneys of the middle and high-dose animals. In spleen, the highest levels of red pulp inflammation, white pulp atrophy, and thinnest capsules were seen in the high-dose group. The three different nanosilverconcentration gave comparable results for histopatological changes in tissues. It seems that Ag ions could be detected in organs after dermal exposure,which has the potential to provide target organ toxicities in dose dependent manner.

**Keywords:** Nanosilver, Nephrotoxicity, Dermal toxicity

JPHS

# Nanosafety practices: A reported study in research laboratories of Isfahan Iran

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## Abstract:

Background: Nanoparticles have potentially the possibility of an adverse impact on human health and the environment. It is a reason for concerning about their toxic effects and therefore various guidelines on handling nanoparticles have been published. Moreover, they can bind or react with other hazardous pollutants in water or air and therefore entry into the body so much easier. Although nanoparticles have many benefits for human's life but they potentially could be serious risk.
Materials and Methods: In this study, the procedure was that a questionnaire consisting of 6 parts were completed by staffs which work at the research centers (work with nanomaterials) in Isfahan and the data were collected. The collected data were analyzed using the SPSS software.Results: The results showed that more than 73% of the researchers do not use personal protective equipment during the work and 98% do not use gloves or use normal gloves. 93% of researchers do not use special was to waste disposal. This is despite the fact that more than 63% of researchers believe that nanoparticles are dangerous particles. Moreover, 80% of researchers agree with entering the nanoparticles to air during the synthesis and their application.
Conclusion: The results show that the protective rules observance by the research staffs is very poor and it is essential to have a vast occupation health control program in order to moderate and improve the nanomaterials protection.

**Keywords:** Nano, Nano safety compliance, Nanotechnology

JPHS

# Antimicrobial effect of iron oxide nanoparticles in treatment of cutaneous infection due Pseudomonas aeruginosa in mouse model

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## Abstract:

Pseudomonas aeruginosa is an important life-threatening nosocomial pathogen and plays a prominent role in serious infections in burned patients. Pseudomonas aeruginosa has become an important cause of infection, and it is a frequent cause of nosocomial infections. Pseudomonas infections are complicated and can be life-threatening. Although many methods for diagnosing and treating of infectious diseases currently exist, there is an urgent need for new and improved approaches for bacterial destruction. The aim of this study was to investigate the usage of Iron oxide nanoparticles for treatment of Pseudomonas Cutaneous infection. The Antimicrobial effect of Iron oxide nanoparticles was investigated by using 15 mice with bacterial Skin burn infection that was induced by Pseudomonas aeruginosa. Anti microbial effect of Iron oxide nanoparticles against skin infections due to P.aeruginosa was approved in mouse model. The results showed iron oxide nanoparticles declined the number of bacteria in local burn wounds of BALB/c mice. our findings indicated that iron oxide nanoparticle is more efficient and might have significant therapeutic implications.

**Keywords:** Iron oxide nanoparticles, Pseudomonas aeruginosa, Cutaneous infection

JPHS

# Antimicrobial effect of chitosan hydrogel composite of coral nanoparticles for dental plaque treatments

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## Abstract:

Nanotechnology is a promising approach to be applied in to the microbial dental biofilms. Although many substances have been presented throughout the years as antimicrobial agent, many compounds have failed in clinical examinations due to their weak ability to reduce the existing dental biofilm. The natural substance that presents throughout the years the best antimicrobial effect is chitosan and has led several groups to use in different techniques in biomedical applications. Chitosan (1-4, 2-amino-2-deoxi-b-D-glucana) is a deacetylated derivative from the biopolysaccharide chitin with an excellent biocompatibility, high bioactivity, biodegradability, polyelectrolyte action, antimicrobial activity, chelation ability and absorptive capacity. In this study, By the aid of abrasive property of nano sized particles the penetration of antimicrobial effect of chitosan into the biofilm facilitated. Chitosan hydrogel prepared in acetic acid-water (AA-water) solution (2 wt%) and before gel preparation coral nanoparticles added to the solution. Coral nanoparticles were evaluated with scanning electron microscopy (SEM), and chitosan hydrogel synthesis process followed by pH measurement during the phase nanoparticle fixed in hydrogel. Fourier transform infrared spectroscopy (FTIR) of the sample was performed. According to the result, the final pH of the prepared hydrogel is around 4.5 and by applying the chitosan hydrogel content into the biofilm the formation of biofilm decreased and nanoparticle abrasive ability broke up the biofilm attachment on the dental surface while the microbial biofilm weakened by the presence of chitosan hydrogel.

**Keywords:** Nanoparticle, Chitosan, Microbial biofilm

JPHS

# Electrochemical investigation of catechol at gold–sodium dodecylbenzenesulfonatenanoparticles modified glassy carbon electrode

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## Abstract:

A large variety of phenolic compounds are widely used in the chemical industry, oil refinery and pharmaceutical preparation. The identification and quantification of these compounds are important for environmental monitoring because many of them are toxic contaminants in medical, food and environmental matrices and have harmful effects on plants, animals and human health. Many analytical methods are available for their determination, such as capillary electrophoresis and high performance liquid chromatography. These methods are very expensive and time-consuming. Therefore, researchers prompted to develop different types of sensors for detection of phenolic compounds. Gold nanoparticles (AuNPs) have good conductivity and strong adsorption ability. Furthermore, AuNPs can promote the electron transfer. AuNPs are usually used in many sensors. A method was designed to construct an electrochemical sensor for detection of phenolic compounds based on electrodeposition of gold–sodium dodecylbenzenesulfonate nanoparticles onto a glassy carbon electrode (GCE). GCE modified with gold nanoparticles was prepared using electrodeposition at constant potential of -0.40V during 300 seconds, and characterized with Atomic force microscopy (AFM) and electrochemical techniques. Cyclic voltammetry (CV) was employed to study the electrochemical behaviors of catechol at the modified electrode in the presence of sodium dodecylbenzenesulfonate. The oxidation and reduction peak potentials showed negative and positive shifts respectively in the presence of sodium dodecylbenzenesulfonate indicating that the electron transfer between the electrode and bulk solution of catechol was facilitated. In comparing CV peaks of catechol at modified and bare GCE, modified electrode shown higher current peaks. In pHs from 2 to 9, pH 3 was the optimum pH to study electrochemical behavior of catechol. AFM shown that gold–sodium dodecylbenzenesulfonate nanoparticles are deposited onto GCE.

**Keywords:** Phenolic compound, Gold nanoparticles, Electrochemical behavior

JPHS

# Alumina nanoparticles interaction with hairy roots of Linumpersicum

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## Abstract:

Over the recent decades, there have been rapid increases in use of nanotechnology. Undoubtedly, by this expansion of nanoparticles applications and production, their environmental impacts on our environment are becoming increasingly significant. Several researches have been done to comprehend their effects on the environment especially with the focus on toxicity. These studies toward plants as the fundamental component of an ecosystem are of special importance. Moreover, the entry of nanoparticles into food webs raises a great concern.
To the best of our knowledge, general consequences of nanoparticles exposure for plants still remain unclear; even though considerable experiments dealing with the way by which nanoparticles affect some plant growth indicator like root elongation and seed germination rate have been carried out. Therefore, we have investigated alumina (Al2O3) nanoparticles interaction with hairy roots of Linumpersicum as a root model. Alumina nanoparticles have been announced as the priority for toxicological studies.
Hairy roots were developed by seedling of L.persicum that were infected by Agrobacterium rhizogenes. After reaching adequate amounts of hairy roots in the McCown culture media, they were categorized into three groups based on culture media component: controls, nanoparticles, bulk alumina. Characterization was performed in 30 days with intervals. Changes in dry and fresh biomass, genotoxicity and metabolite production yield in three groups were measured in triplicate. Uptake and accumulation of nanoparticles in roots and morphological changes were observed via light and electron microscopy.
Finally, this research results in the implication of either alumina nanoparticles in this specific research circumstances would be toxic or advantageous.

**Keywords:** Alumina, Hairy roots, Interaction

## اعضای هیئت تحریریه ( به ترتیب الفبا )

# فصلنامه
# علوم دارویی و سلامت

**فصلنامه واحد علوم دارویی دانشگاه آزاد اسلامی**

**سال سوم، شماره اول، زمستان ۱۳۹۳**

**شماره مجوز وزارت ارشاد: ۹۰/۴۴۱۵**

**شماره مجوز انتشارات از معاونت پژوهشی دانشگاه آزاد اسلامی: ۳۳۶۹۰۴/۸۷**

**نمایه شده در:**

**پایگاه اطلاعات علمی جهاد دانشگاهی**

**بانک اطلاعات نشریات کشور**

**ایندکس کوپرنیکوس**





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معاونت پژوهشی دانشگاه آزاد اسلامی واحد علوم دارویی

| | |
|---|---|
| **ناشر:** | **واحد علوم و تحقیقات دانشگاه آزاد اسلامی** |
| دوره انتشار: | فصل نامه |
| شماره شاپا: | ۶۷۸۰-۲۲۲۸ |
| زبان: | انگلیسی - فارسی |
| نشانی: | تهران، خیابان دکتر شریعتی، ابتدای خیابان یخچال، واحد علوم دارویی دانشگاه آزاد اسلامی |
| کدپستی: | ۱۹۴۱۹۳۳۱۱ |
| صندوق پستی: | ۱۹۳۹۵۶۴۶۶ |
| تلفن: | ۲۲۶۰۰۰۳۷ |
| دورنگار: | ۲۲۶۰۰۰۹۹ |
| تلفن بخش اشتراک: | ۲۲۲۳۳۴۶۴ |
| شماره پیامک: | ۲۰۰۰۱۲۰۶ |
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| شماره حساب نشریه: | حساب جام شماره ۱۲۷۵۲۴۶۱۳۹ نزد بانک ملت به نام دانشگاه آزاد اسلامی واحد علوم دارویی |