

NCNN-2014



NATIONAL CONFERENCE ON NANOSCIENCE AND NANOTECHNOLOGY (NCNN-2014)

Theme

Nanotechnology: Past, Present and future trends

Held on 8th November, 2014

Sponsored by: Indian National Science

Academy (INSA), New Delhi

Organized by:

Faculty of Pharmaceutical Sciences, Shri Shankaracharya Group of Institutions
Shri Shankaracharya Technical campus, Bilai, Chhattisgarh, India



Special Issue: NCNN-2014

(National Conference on Nanoscience and Nanotechnology - 2014)

Carbon Nnano Tubes: Past, Present and Future Trends

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Nanotechnology is a group of emerging technologies in which the structure of matter is controlled at the nanometre scale, to produce new, interesting materials and devices with unique properties. Nanotubes belong to the promising group of nanostructured materials. Though there are many other tubes based on boron nitride and molybdenum but carbon nanotubes (CNTs) are most important group. Carbon nanotubes are among the most anisotropic materials ever produced. These molecular-scale tubes of graphitic carbon are one of the stiffest and strongest fibers known. Besides, they have remarkable electronic, optical, thermal and chemical properties. For these reasons their interest in both academic and industrial areas is unique. The CNTs find applications in the field of conductive polymers, advanced composites, fibers, displays, etc. They are characterized as single wall carbon nanotubes (SWCNTs) and multiwalled carbon nanotubes (MWCNTs). Development of efficient processes and chemical treatments that is able to control the quality of the CNT samples and to induce both their dispersion and partial or complete debundling remains highly challenging. As far as the role of CNTs in the fields of pharmacy and medicine is concerned, they can be used as vehicle for drug delivery, in cancer and infection treatments, in gene therapy etc. CNTs can attach covalently to amphotericin B and transport it into mammalian cells. This conjugate has reduced the antifungal toxicity about 40% as compared to the free drug.

Special Issue: NCNN-2014

(National Conference on Nanoscience and Nanotechnology - 2014)

Engineered Fullerene Nanomaterials as Advanced Personalized Nanotheranostic System for Chemotherapeutics

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Administration and therapeutic effectiveness of drugs is limited by several tribulations such as solubility, instability, targeting and side-effects which hoist health concerns for a long time. Nanomaterials have revolutionized this era and have all solutions of emerging troubles. Engineered Carbon Nanotubes are elongated fullerenes wrapped into cylindrical dimensions with a very high length to width ratio known potentially potential for drug delivery, discovery and theranostics. They have a high adsorptive surface and can be employed exhaustively for absorbing drugs on the surface. Cancer nanotheranostics is a rapidly developing field which aims at combining both imaging and therapy of tumor involving nanomaterial engineering that potentially interacts with malignant cells at the molecular level, thereby significantly improves the efficacy and specificity of pharmacotherapeutics at advanced stage. Personalized approaches provide customization of treatment based on biomarkers which influences cancer progression. The therapeutic and diagnostic agents are formulated in carbon nanotubes system as theranostic platform by conjugating varieties of biological ligand, nanoparticles, stem cells and T cells in immunotherapy and to promote siRNA co-delivery, stimuli- responsive release, multimodality therapies. Some major neoplasms like metastatic cancers, drug-resistant cancers impose the greatest challenge, which exclusively overcome by different types of nanotube carriers that execute synergetic cum combinatory therapy bypass the biological membranes to reach the target cancer cells including the blood, liver, kidneys, spleen and blood-brain barrier. This article describes current personalized theranostics approaches and technologies of conjugated fullerene carriers for improved imaging, identifying, targeting, delivery and chemotherapeutics of progressive malignancy at the earliest stage.

Special Issue: NCNN-2014

(National Conference on Nanoscience and Nanotechnology - 2014)

Novel Piperazine Coupled Benzimidazoles: Antimicrobial Evaluation

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Over the past few decades, gradually increasing drug resistance in the treatment of infectious disease indicate a crucial problem in antimicrobial therapy and necessitates continuing research into novel classes of antimicrobials. A number of researchers have reported antimicrobial properties in benzimidazoles. Keeping these facts in view, we considered it of interest to synthesize some novel benzimidazole analogues for their antimicrobial activity. The structures of the compounds were elucidated using elemental analysis, IR, ¹H-NMR and mass spectral data. The synthesized compounds were tested for their *in-vitro* antimicrobial activity against the Gram-positive bacteria *Staphylococcus aureus* and *Bacillus subtilis*, the Gram negative bacteria *Proteus mirabilis* and *Pseudomonas aeruginosa*, the fungal strain *Aspergillus niger* and the yeast like pathogenic fungus *Candida albicans*, by disk diffusion method. Most of compounds displayed significant activities against all the pathogenic microorganisms tested including *Pseudomonas aeruginosa* and *Candida albicans* responsible for nosocomial infection. Out of all the twenty compounds evaluated for antimicrobial studies, most active compound showed appreciable antibacterial activity against all six microbial strains used (zone of inhibition in disk diffusion method- 17 mm against *Staphylococcus aureus*, 14 mm against *Bacillus subtilis*, 16 mm against *Proteus mirabilis*, 17 mm against *Pseudomonas aeruginosa*, 15 mm against *Aspergillus niger* and 17 mm against *Candida albicans*). The considerable antimicrobial activity of active compounds may be attributed to the presence of phenyl and benzyl substitutions which might be responsible for penetration of the compound inside the microbial strains used due to their increased lipophilic character. Structure activity relationship among the synthesized compounds was also studied.

Special Issue: NCNN-2014

(National Conference on Nanoscience and Nanotechnology - 2014)

Nano Sunscreen – The Wave of Future?

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Who doesnot like a beautiful skin!

UV radiation causes not only skin tanning, solar elastosis, lentigo, UV induced immunosuppression, skin aging but also skin cancers. Since umpteen years sunscreen have become the most popular means of protection against UV radiation. Most of the sunscreen block only one type of UV radiation i.e UVB but nano sunscreen blocks both UVA and UV B. Traditional inorganic sunscreens appear white on our skin. Many people don't like how this looks. Nano sunscreen due to its small particle size does not scatter the light and hence after application it does not appear white. This presentation will explain how sun exposure leads to skin damage, the various types of sunscreen and why nano sunscreens are the future of cosmetic industries.

Special Issue: NCNN-2014

(National Conference on Nanoscience and Nanotechnology - 2014)

A Density Functional Approach: Cationic Interaction in Polymer Systems

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First principle calculations based on density functional theory is performed to analyze the cationic interaction with the polyethylene oxide (PEO) based systems. The relaxed polymer structures are simulated, the analysis of partial density of states; density of states; bond lengths and the charge density distribution around interacting atoms is made. The structural and electronic properties of polymer systems are discussed; it takes into account of the cationic and anionic nature of the atoms of dispersed molecules.

Special Issue: NCNN-2014

(National Conference on Nanoscience and Nanotechnology - 2014)

Hydrotropic Solubilizing Approach for Quantitative Estimation of Hydrochlorothiazide and Nebivolol Hydrochloride

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Two simple, accurate, novel, safe and precise methods developed for the simultaneous estimation of poorly water-soluble drugs Hydrochlorothiazide and Nebivolol Hydrochloride in tablet dosage form using 2 M Citric acid as hydrotropic solution. It was found that solubility enhanced of HCZ and NEB was more than 46 and 49 fold respectively in hydrotropic solution as compare with distilled water. HCZ and NEB show maximum absorbances at 271.5 and 280 nm respectively. Citric acid solution did not show any absorbance above 240 nm. HCZ and NEB follows the Beer's law in the concentration range of 5-25 µg/ml and 30-150 µg/ml ($r^2= 0.9999$ and 0.9987). Method-A simultaneous equation method employs 271.5 and 280 nm as two analytical wavelengths, method-B is absorption ratio method, which uses 275.4 and 280 nm as two analytical wavelengths were used for estimation of HCZ and NEB. The optimized methods showed good reproducibility and mean recovery with 98.71 ± 0.877 and 99.29 ± 0.99 in method A and 98.83 ± 0.82 and 99.27 ± 0.99 in method B for HCZ and NEB respectively. The mean percent label claims of tablet dosage were found to be 97.84 ± 0.721 and 99.60 ± 0.32 in method A, 99.28 ± 0.982 and 100.20 ± 0.645 in method B for HCZ and NEB respectively. The standard deviation, coefficient of variance and standard error were obtained for HCZ and NEB was satisfactorily low. and therefore the both methods be able to used for routine monitoring of HCZ and TEL in industry in the assay of bulk drug and as well as tablets dosage form.

Special Issue: NCNN-2014

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An Overview on Bilayered Tablet Technology: A Review

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Bi-layer tablets have been developed to achieve controlled delivery of different drugs with pre-defined release profiles. The introduction of bilayer tablet in the last decade had developed an interest in developing a combination of two or more active ingredients in a single dosage form in the pharmaceutical industry, promoting patient compliance and acceptance. Bi-layer tablet is suitable for release of two drugs in combination or inseparate layer for the delivery of two incompatible substances and also for sustained release tablet in which one Layer is immediate release as initial dose and second layer is loading dose. Bi-layer tablets is an effective drug delivery system for the treatment of hypertension, diabetes, inflammation and analgesic because in these diseases combination therapies are often used. Bilayer tablet is improved beneficial technology to overcome the shortcoming of the single layered tablet. This review explains the therapeutic advantages of bilayer tablet by releasing the medicaments for the immediate relief and then maintaining the level of medicament for the certain time in order to get the sustain release of drug.

Special Issue: NCNN-2014

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Fullerene: A Wonder Carbon Nanoparticle

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The primary advantages of using carbon nanoparticle are their bioactivities which are not found in any other existing compounds. Fullerene is a carbon allotrope like diamond and graphite. All the electrons in fullerene are delocalized and spread over the whole molecule periphery as clouds. These electrons demonstrate antioxidative potency when they react with free radicals and active oxygen. Its use is not restricted to any one industry but can be extended to many other industries including cosmetics industry, non-linear optics, surface coatings, artificial photosynthesis and various biological applications including drug delivery and cosmetics. Henceforth, research institutions worldwide are continuously investigating more potential applications of fullerene. Major limitations in its use include insolubility in water and nonbiodegradability. Various approaches have been made for increasing its solubility and processibility.

Special Issue: NCNN-2014

(National Conference on Nanoscience and Nanotechnology - 2014)

Chemistry of Dyes

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The worldwide demand for natural dyes is nowadays of great interest due to the increased awareness on therapeutic properties of natural dyes in public. Natural dyes are derived from naturally occurring sources such as plants, insects, animals and minerals. Several synthetic colorants have been banned because they cause allergy like symptoms or are carcinogens. Among all natural dyes, plant based pigments have wide range of medicinal values. Although known for a long time for dyeing as well as medicinal properties, the structures and protective properties of natural dyes have been recognized only in the recent past. Many of plants used for dye extraction are classified as medicinal and some of these have recently been shown to possess remarkable antimicrobial activity. The present review, describes the detail information about basic chemistry of the major pigments and their medicinal importance found in naturally occurring dye yielding plants, which are helpful to further development of pharmaceutical formulations.

Special Issue: NCNN-2014

(National Conference on Nanoscience and Nanotechnology - 2014)

Upsurge of Nanotechnology in Dental Medicine

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The word nano is a Greek derived word meaning dwarf. It is a prefix that literally means one billionth of a physical size. Nanotechnology will give us the ability to arrange atoms as we desire and subsequently to achieve effective and complete control of the structure of matter. This upcoming field has the potential to drastically improve and replace the conventional dental materials used like impression material, implant material, bonding agents, composites with better esthetic properties. The development of nanodentistry will allow nearly perfect oral health by the use of nanomaterials and biotechnologies, including tissue engineering and nanorobots. The presentation will deal with classification, method of synthesis, advantage, disadvantage and its application in field of dentistry: from a dentist point of view.

Special Issue: NCNN-2014

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Nanooncology: A Radical Approach for the Treatment of Ovarian and Metastatic Breast Cancer

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Breast cancer is one of the most common cancers in women in the developed countries of the world and it is the cause of death in approximately 20% of all females who die from cancer in these countries. Although relatively little is known about the molecular mechanisms leading to breast cancer development, breast cancers have probably been studied more than any other tumor type with regard to oncogene expression. *MYC*, *ERBB2* or one of the *RAS* families has been found to be expressed in over 60% of cases. Clinical and experimental data have indicated that exposure to estrogens is one of the leading causes of sporadic female breast cancer and in December 2002 estrogen was declared to be a known human carcinogen by the National Toxicology Program of the National Cancer Institute in the USA. It is becoming apparent that estrogen has separate hormonal and DNA-damaging cancer-promoting effects. Nanooncology, the application of nanobiotechnology to the management of cancer, is currently the most important chapter of nanomedicine. Nanobiotechnology has refined and extended the limits of molecular diagnosis of cancer. Nanooncology can serve as targeted drug-delivery vehicles carrying chemotherapeutic agents or therapeutic genes directly into malignant cells. Examples of such drug delivery devices for breast cancer include albumin-bound 130nm particle formulation of paclitaxel for injectable suspension approved by the FDA for metastatic breast cancer, and doxorubicin-loaded, long-circulating, polyethylene glycol-coated liposomes. The future of Nanooncology for the treatment of breast cancer inarguably could be considered as a better option than the conventional methods used for the treatment of breast cancer.

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(National Conference on Nanoscience and Nanotechnology - 2014)

Transcutaneous Immunization with Hepatitis B Surface Antigen (HBsAg) Nanoparticle Adjuvanted with Aluminium Phosphate for Treatment of Hepatitis B

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Transcutaneous immunization one of the most promising and well known immunization method now-a-days. Vaccine administration through the skin painlessly via a larger surface area than that used by a needle, referred to as transcutaneous immunization (TCI). The Nanoparticles are sub-nanosized colloidal structure composed of synthetic or semi synthetic polymers and having size range between 1-1000 nm. Hepatitis is an inflammation of liver, most commonly caused by a viral infection. Mainly five types Hepatitis are A, B, C, D and E. In particular type B leads to chronic disease in hundreds of thousands people. In present study, we prepared nanoparticles by using aluminium phosphate and HBsAg. Characterization of prepared nanoparticles done by FTIR, TEM, particle size & zeta potential measurement and by SDS-PAGE. TEM image of nanoparticles are spherical and FTIR shown characteristic peaks of Hepatitis B and aluminium phosphate. Zeta potential and particle size found to be -24.5 and 29-40 nm. The result of histopathological studies shown nanoparticles containing aluminium phosphate as adjuvant show more degree of inflammation and result of ELISA suggested that antibody titer produced by adjuvanted nanoparticle are more than other formulation such as nanoparticles alone and with hepatitis B alone. From all the study we concluded that preparation containing HBsAg adjuvanted with aluminium phosphate nanoparticles have long term immunogenicity cellular as well as humoral immunity.

Special Issue: NCNN-2014

(National Conference on Nanoscience and Nanotechnology - 2014)

Mutation in Active Site: Major Problem for Designing New Inhibitors for Swine Flu

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Swine flu is a contagious and acute respiratory which cause morbidity and mortality worldwide. This is due to classical influenza virus H1N1 strains which have known for its ability to mutate. Currently there are two classes of antiviral medicine for swine flu, amantadine and neuraminidase inhibitors. Due to highly mutation till now there is no any appropriate drug and vaccine also. The swine flu virus, however, typically affects the younger population, i.e. from 5 to 65 years.

Present study deals the drug against mutant protein in H1N1 flu. We can target these surface protein Neuraminidase (NA), Hemagglutinin (HA) and M2-protein channel which present on virus cell and are responsible for the penetration in host cells. Among this Neuraminidase (NA) is good target for inhibitor. Oseltamivir is the main target for Neuraminidase (NA), but due to mutation in NA at position H274Y, N294S, E11V etc. it change the binding site in neuraminidase protein so that no any inhibitors bind to the active site and it result fully resistance towards any drug including oseltamivir. We make virtual library of FDA approved drug, derivative of oseltamivir, paper reviewed potent neuraminidase inhibitors compound.

By help of various computational studies like virtual screening, docking study and verification score we developed the potent inhibitors as lead compound against resistant protein neuraminidase which could be future drug for swine flu. In this research we develop the virtual library, screen the all ligands of virtual library and analysis the structure of potent inhibitors by the help of Structure Activity Relationship (SAR). In this research I developed the lead compounds which are analogous of oseltamivir for the binding to resistant neuraminidase structure which may be action as the potent neuraminidase inhibitors.

Special Issue: NCNN-2014

(National Conference on Nanoscience and Nanotechnology - 2014)

Development of Quality Control Parameter of A Unani Formulation “Saffof Bars”

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The Unani System of Medicine pioneered in Greece and was developed by Arabs into an elaborate medical science based on the frame work of the teaching of Buqrat (Hippocrates) and Jalinoos (Galen). This system is based on Hippocratic theory of four humours viz. blood, phlegm, yellow bile and black bile, and the four qualities of states of living human body like hot, cold, moist and dry.

Saffof Bars is a blood purifier. Saffofbars made of a mixture of herbs and edible salts, including Geru (Red ochre). Saffof Bars help against bacterial and fungal infections in humans and used for Therapeutic relief from Vitiligo/Leucoderma, Pruritis/Itching. Saffof Bars (SBL) was prepared by grinding and mixing the different type of salts as a major components, with three main herbs (ajmood, surpukha, fulfilsiyah) with geru in proportion accordance with Unani Formulary of India. This was evaluated by comparative analysis with the marketed formulations SBR & SBH for their extractive values (ethanol and distilled water), Micromeretic parameters (bulk density, true density, angle of repose and Carr's Index) and Phytochemical evaluation (TLC, Fluorescence analysis). The prepare formulation & marketed formulation (SBL & SBR, SBH) had water soluble extractive value (55.99 & 56.55, 58.27), Ethanol soluble extractive, value (56.06 & 55.41, 58.41), also found micromeretic Parameter, bulk density (0.40g/ml & .38, 0.43g/ml), true density (0.5g/ml & .45, .55g/ml, angle, of, carr's index (20% & 20.60, 21.81%). The TLC of various samples of saffof Bars were carried out containing one of the active ingredients as piperine with Rf value as 0.6 in close relation with that of standards.

Special Issue: NCNN-2014

(National Conference on Nanoscience and Nanotechnology - 2014)

AB-Intitio Study of OLED Electrodes for the Fundamental Application and Properties by Using Density Functional Theory Approach

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Organic Light Emitting Devices (OLEDs) have long used indium tin oxide (ITO) as a highly-transparent, conducting anode for the case of polymer light-emitting devices, a metal cathode with a low work function has also been necessary for the attainment of facile electron injection and efficient device operation. Due to the fact that the power efficiency of OLEDs can exceed that of incandescent lamps, discharge lamps, lighting purposes is very promising with organic layers prepared in vacuum from low molecular weight organic semiconducting materials. In contrast to that, the established liquid crystal displays only changes the polarization state of the illuminating light, an effect which is strongly viewing angle dependent and the lowering of the operating voltages of OLEDs. The field of organic semiconductors comprises also an additional field, namely polymeric semiconductors. It will explode with the availability of high resolution large and flat organic displays, capable of displaying information at video rates, operating at low voltages and consuming very little energy, which makes them suitable for battery powered purpose. In order to develop a novel and efficient OLEDs, in our work emphasis will be given to internal properties especially electronic properties of electrodes (Graphene, Alq3 Super yellow, PEDOT:PSS etc.) and active medium. For which, a density functional based SIESTA (Spanish Initiative for Electronic Simulations with Thousands of Atoms) and TRANSIESTA for the measurement of different properties.

Special Issue: NCNN-2014

(National Conference on Nanoscience and Nanotechnology - 2014)

Nanocarriers Role in Reversing Multi Drug Resistance

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A major hurdle to chemotherapy is development of multi drug resistance due to microenvironmental selection pressures. In this review we discuss the application of nanotechnology-based delivery systems to overcome MDR in solid tumors. Evidence from the literature illustrates the development of various types of engineered nanocarriers specifically designed to enhance tumor-targeted delivery through passive and active targeting. Moreover, multi-functional nanocarriers are developed to enhance drug delivery and overcome MDR by combination therapy with MDR modulators (e.g., with P-glycoprotein substrates), agents that regulate intracellular pH, agents that lower the apoptotic threshold (e.g., with ceramide). The combination approaches which involve the design of novel drug delivery systems with these MDR modulators look promising in overcoming various forms of multi-drug resistance and opens new horizons for cancer treatment.

Special Issue: NCNN-2014

(National Conference on Nanoscience and Nanotechnology - 2014)

Nanotechnological Products: Evaluation Facilities in India

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Nanoproducts are getting huge popularity among present researchers. Diverse range of drugs is being loaded in various Nanotechnological carriers. Some of those are already in market and some are under pipe line. Major obstacle in the way of nanotech research is the characterization of final formulations prepared. The equipments used for characterization of these products are very costly and are generally not available in all institutions of our country. There are some institutions in India which do have the facilities and they also offer the same for external users too. In present review we attempted to enlist those institutions which provide the facilities for characterization of Nanoproducts. This collection will be very beneficial for all those who are working in this field.

Special Issue: NCNN-2014

(National Conference on Nanoscience and Nanotechnology - 2014)

Omparative *In-vitro* Cytotoxic Evaluation and Antioxidant Potential of Naringin and Qurcetin-3-O-Rhamnoside

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In-vitro cytotoxic and cell viability assays of two pharmacologically active polyphenolic compounds were performed on breast cancer cell lines. Further, antioxidant potential of these molecules was studied on oxidative damage of DNA *in-vitro*. Two naturally occurring flavonoids naringin (NA) and Quercetin-3-O-rhamnoside (Qr) were evaluated for their cytotoxic activity against MCF-7 cell lines using SRB assay protocols at various concentrations of 25, 50, 100 and 200 µg. Also, MTT and trypan blue cell viability assays were done on these concentrations. Oxidative defence of DNA cleavage (H₂O₂ and UV) was checked using pBR322 DNA at concentrations of 25, 50 and 100µg. Both NA and Qr showed >65% of cell death (inhibitory) activity in a concentration dependant manner (n=3, p<0.001) as compared to control. Moreover, <45% of cell viability was recorded at highest concentrations of NA and Qr. Further, at 50 and 100 µg conc. Of NA and Qr both showed complete (100%) protection of DNA from UV and H₂O₂ induced oxidative damage. Both molecules consist of cytotoxic potential towards breast cancer cell lines and have low cell viability at higher concentrations and also have an antioxidant activity against oxidative DNA cleavage. These two properties lead these molecules for future *in-vivo* studies and a prospective of having anticancer potential. The metabolism of these flavonoids is a vast field of study which further leads them toward their delivery through Novel drug delivery systems to enhance their efficacy.

Special Issue: NCNN-2014

(National Conference on Nanoscience and Nanotechnology - 2014)

Advancement in Novel Drug Delivery System: Self-Emulsifying Drug Delivery Systems

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Self-emulsifying formulations are isotropic mixtures of drugs, lipids (natural or synthetic oils) and emulsifiers (solid or liquid), usually with one or more of hydrophilic cosolvents / co-emulsifiers. The size and charge of oil –droplet in the emulsion formed other important factors that effects gastrointestinal absorption efficiency. According to biopharmaceutical classification (BCS) the 40% of active substances are poorly water soluble, high intra and inter subject variability. To overcome this problem, various technologies are developed like solid dispersion or cyclodextrin complex formulation. More attention has been given to lipid –based formulation with particular emphasis on self -emulsifying drug delivery system to improve the oral bioavailability of lipophilic drugs. Following their oral administration, these systems rapidly disperse in gastrointestinal fluids, to yielding micro or nanoemulsion. This microemulsified drug can easily be absorbed through various pathways by passing first pass effect. In this article gives an overview of self emulsifying drug delivery system with emphasis on different types of self emulsifying formulation, advantages, characterization and recent development.

Special Issue: NCNN-2014

(National Conference on Nanoscience and Nanotechnology - 2014)

The Diagnosis and Management of Severe Life-Threatening Hyperthyroidism During Pregnancy

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Changes in thyroid hormone concentrations that are characteristic of hyperthyroidism must be distinguished from physiological changes in thyroid hormone economy that occur in pregnancy, especially in the first trimester. Approximately one to two cases of gestational hyperthyroidism occur per 1000 pregnancies. Identification of hyperthyroidism in a pregnant woman is important because adverse outcomes can occur in both the mother and the offspring. Graves disease, which is autoimmune in nature, is the usual cause; but hyperthyroidism in pregnancy can be caused by any type of hyperthyroidism--eg, toxic multinodular goitre or solitary autonomously functioning nodule. Gestational transient thyrotoxicosis is typically reported in women with hyperemesis gravidarum, and is mediated by high circulating concentrations of human chorionic gonadotropin. Post-partum thyroiditis occurs in 5-10% of women, and many of those affected ultimately develop permanent hypothyroidism. Antithyroid drug treatment of hyperthyroidism in pregnant women is controversial because the usual drugs--methimazole or carbimazole--are occasionally teratogenic; and the alternative--propylthiouracil--can be hepatotoxic. Fetal hyperthyroidism can be life threatening, and needs to be recognized as soon as possible so that treatment of the fetus with antithyroid drugs via the mother can be initiated. In this Review, we discuss physiological and pathophysiological changes in thyroid hormone economy in pregnancy, the diagnosis and management of hyperthyroidism during pregnancy, severe life-threatening thyrotoxicosis in pregnancy, neonatal thyrotoxicosis, and post-partum hyperthyroidism.

Special Issue: NCNN-2014

(National Conference on Nanoscience and Nanotechnology - 2014)

Asthma and Chronic Obstructive Pulmonary Diseases: Importance of Continuity in Inhaler Devices

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Inhaled therapies are central to the treatment of asthma and chronic obstructive pulmonary disease. Physicians consider many factors when selecting the most appropriate inhaler device, including device efficacy and the cost to the health care system. This review aims to discuss the factors that are important when considering inhaler devices and the importance of continuity in the choice of inhaler device. A large number of factors can contribute to therapeutic outcomes with inhalation devices. The inhalation technique is critical to treatment success and differs substantially between inhaler devices. Misuse of an inhaler is common, and thorough training of patients and physicians is important to ensure correct utilization. Patient satisfaction is an important consideration because it is significantly correlated with compliance and better outcomes. Financial pressures contribute to decision making: although selecting the less expensive inhaler device might reduce direct treatment costs, it can have a large impact on disease control and the patient's well-being. Switching may be associated with a poor inhalation technique, reduced disease control and quality of life, increased use of other treatments and health care resources, and a greater chance of unsuccessful treatment. Nonconsensual switches can result in patient discontent, reduced confidence in the medication, and uncertainty regarding the degree of disease control. It is recommended that patients with stable disease remain on their current device. If a switch is considered, the patient should be consulted and the physician should take into account the patient's preference, their ability to correctly use the device, and the availability of the preferred drug in the preferred device.

Special Issue: NCNN-2014

(National Conference on Nanoscience and Nanotechnology - 2014)

Canagliflozin: A Potential Glucose Co-Transporter 2 Inhibitor for the Treatment of Type 2 Diabetes

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Type 2 diabetes mellitus (T2DM) is a prevalent metabolic disorder, which affects more than 300 million people globally. As hyperglycemia defines diabetes, glycemic control is fundamental to the management of diabetes. Sodium glucose co-transporter 2 inhibitors (SGLT2) are a new group of oral antidiabetic medications that act by blocking the reabsorption of glucose, causing it to be excreted in the urine. Canagliflozin was the first SGLT2 inhibitor to be approved in the US by the Food and Drug Administration for the treatment and control of T2DM and on September 19, 2013, the Committee for Medicinal Products for Human Use of the European Medicines Agency adopted a positive opinion, recommending the granting of a marketing authorization for the medicinal product Invokana®. Canagliflozin is a SGLT2 inhibitor, which acts upon the proximal tubules of the kidneys and reduces the renal threshold for glucose. It is highly selective, binding 250 times more potently to SGLT2 than sodium glucose co-transporter 1 inhibitor. Among the most common adverse events are hypoglycemia, headache, nausea, female genital and urinary tract infections, nasopharyngitis, and transient postural dizziness. Given its high efficacy in reducing hyperglycemia and good safety profile as either monotherapy or an add-on treatment to metformin, sulfonylureas, or insulin, canagliflozin seems to be a promising antihyperglycemic drug. Nevertheless, further large-scale and long-term studies should be conducted to evaluate the impact of canagliflozin on cardiovascular risk in T2DM patients.

Special Issue: NCNN-2014

(National Conference on Nanoscience and Nanotechnology - 2014)

Advancement in Ophthalmic Delivery of Drugs Through In-Situ Smart Polymers

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Conventional ophthalmic solutions owing to pre-corneal elimination of the drug, drainage by gravity, nasolacrimal drainage, conjunctival absorption, and the absence of controlled release and of bioadhesive properties exhibit low therapeutic efficacy. These problems can be overcome by various strategies. One of such strategies is to use in-situ gelling systems prepared from polymers that exhibit reversible phase transitions (sol-gel) and pseudo plastic behavior to minimize interference with blinking. The in-situ gelling systems undergo phase transition due to various causes including- temperature, and pH in the pre-corneal region or the electrolyte composition of the tear film. Thus, researchers have developed different kinds of in-situ gelling polymers (eg. thermo, pH, and electrolyte responsive polymers), viscosity- increasing agents and isotonic agents. The in-situ gel forming polymeric formulations have several advantages such as sustained and prolonged action as compared to conventional drug delivery systems. In recent past, various polymers like poly(N-isopropylacrylamide)-chitosan(PNIAAm-CS), pluronic F127, N-isopropylacrylamide(NIPAM), butylacrylate(BA), poloxamer has been extensively studied for the efficient ophthalmic delivery of bioactives like timolol maleate (anti ocular hypertensive), methotrexate (antimetabolite and antifolate), fluconazole (antifungal), diclofenac sodium (NSAID) etc. This shows that smart polymers are doing well in the delivery of ophthalmic formulations. In this paper, we are compiling recent development in the field which will definitely help the scientists working in the same field.

Special Issue: NCNN-2014

(National Conference on Nanoscience and Nanotechnology - 2014)

Drug Delivery Device in Ophthalmic Therapeutic: Ocular Implant

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Eye is a sensitive, vital organ of our body and if any complication is there than it can lead to serious effect on the visual activity of the individual. Development of novel drug delivery technologies is effective for treatment of ocular diseases. Effective drug delivery from ocular route remains a biggest challenge due to its complex anatomy & physiological structure. Controlled release formulation of various carrier system like nanoparticle, nanoemulsion, micro emulsion, dendrimers and microparticles has been emerged as novel strategies in ophthalmic. Various biodegradable as well as non-biodegradable polymers used in ocular implantable devices & the technological development of implants as a therapeutic device in the treatment of various ocular disorders has been discussed in this paper. Non-biodegradable intraocular implants present the advantages of controlling drug release with predicted kinetics over a long period of time. However, in contrast to biodegradable implants, these devices must be removed after complete drug release, representing a risk for patients. Biodegradable implants do not have to be removed as they are degraded or absorbed. Finally, there are many challenges to consider & overcome in order to develop biodegradable implants able to provide prolonged drug release within the therapeutic range for effective treatment of ocular diseases. The main characteristics of the implants and their potential clinical application is also highlighted in this paper.

Special Issue: NCNN-2014

(National Conference on Nanoscience and Nanotechnology - 2014)

Treatment of Rheumatoid Arthritis: Modulation of Therapy by Psychological Factors

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Rheumatoid arthritis is an autoimmune disease that can cause chronic inflammation of the joints and other areas of the body. There is no known cure for rheumatoid arthritis. To date, the goal of treatment in rheumatoid arthritis is to reduce joint inflammation and pain, maximize joint function, and prevent joint destruction and deformity. This abstract presents a comprehensive review of research relating psychological domains with response to therapy in patients with rheumatoid arthritis. A holistic approach to the disease was adopted by incorporating not only disease activity but also dimensions of the impact of disease on patients' lives. Psychological distress, including depression and anxiety, is common among patients with rheumatoid arthritis and has a significant negative impact on response to therapy and on patients' abilities to cope with chronic illness. Evidence regarding the influence of positive psychological dimensions such as acceptance, optimism, and adaptive coping strategies is scarce. The mechanisms involved in these interactions are incompletely understood, although changes in neuro-endocrine-immune pathways, which are common to depression and rheumatoid arthritis, seem to play a central role. Indirect psychological influences on therapeutic efficacy and long-term effectiveness include a myriad of factors such as adherence, placebo effects, cognition, coping strategies, and family and social support. Data suggest that recognition and appropriate management of psychological distress may improve response to treatment and significantly reduce disease burden.

Special Issue: NCNN-2014

(National Conference on Nanoscience and Nanotechnology - 2014)

The Treatment of Skin Disorders by Formulating Liposomal Gel for Topical Administration

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Acne vulgaris is a common human skin disease, characterized by areas of skin with seborrhea, comedones, papules, pustules, nodules, and possibly scarring. Clindamycin Hydrochloride, a lincosamide antibiotic is used for treatment acne vulgaris. But clindamycin hydrochloride has a major drawback of having low topical bioavailability of only 4-5 %. Liposomal carriers are well known for their potential in topical drug delivery have been chosen to help Clindamycin Hydrochloride molecules in the skin layers. So, the purpose of study was to increase the absorption of drug through the skin using liposomal approach. The liposomes were prepared using different concentrations of phospholipids and cholesterol by thin film hydration method. The prepared liposomes were characterized for particle size and particle size distribution, and entrapment efficiency. Liposomal gel was prepared using optimized gelling agent i.e., carbopol 934. The prepared liposomal gel was further evaluated for drug content, pH, homogeneity, spreadability, consistency, *in-vitro* drug diffusion studies and stability studies. The mean particle size of different formulations was found to be 678-680 nm with the drug entrapment of 54.87% to 61.54%. The drug was found to be uniformly distributed. Data obtained from evaluation of gel was found to be satisfactorily for topical delivery of drug. *In-vitro* studies suggested that the % release of drug from liposomes was more than the available marketed preparation. Stability studies revealed that the formulations are stable for 90 days.

Special Issue: NCNN-2014

(National Conference on Nanoscience and Nanotechnology - 2014)

Effect of Omega-3 Fatty Acid on Memory

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Omega -3 fatty acids are long chain, polyunsaturated fatty acid of plants and marine origin because these essential fatty acid can not be synthesized in the human body, they must be derived from dietary source. Omega -3 fatty acid are vital for normal metabolism but some of potential health benefits of supplementation are controversial. There is tentative evidence that marine omega polyunsaturated fatty acids reduce the risk of breast cancer but this is not conclusive on human. Omega 3 fatty acids on rats inhibit the development of premalignant and malignant lesions which may be due to anti-inflammatory, antioxidant, anti-proliferative and anti-angiogenic properties. Omega-3 fatty acids are components of fats in foods we eat. Alpha-linolenic acid, eicosapentaenoic acid and decosathexaenoic acid are three types of omega -3 fatty acid. Omega -3 polyunsaturated fatty acids have essential role in brain development function and beneficial effects of omega -3 PUFA. Treatment have consistently been demonstrated in a variety of hippocampal-dependent tasks. Omega -3 fatty acids prevent against heart diseases, diabetes and also against dementia and Alzheimer's disease and slows ageing and reduces depression levels, risk of cancer and improves blood cholesterol level and bone strength. Omega fatty acids are seem to be "panacea" for good health, found in fishes such as salmon , herring, soybean, pumpkin seeds, spinach, walnuts and salad greens omega fatty acids can be easily included in your diet. Many clinical studies shows about omega that it has good anti inflammatory property.

Special Issue: NCNN-2014

(National Conference on Nanoscience and Nanotechnology - 2014)

Recent Advancements in Phytosomes: An Emerging Technology in the Field of Pharmacognostical Research

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Phytosomes are novel drug delivery system containing hydrophilic bioactive phytoconstituents of herbs surround and bound by phospholipids. Development of phytosomes is at the budding stages in India and abroad. It has a lot of potential in the field of medicine, pharmaceuticals and cosmetics. The technology has improved pharmacokinetics and pharmacological parameters. It is found to be safe and efficacious, which in result can advantageously be used in the treatment of various diseases of human beings and animals. During the last century chemical and pharmacological studies have been performed on a lot of plant extracts in order to know their chemical composition and confirm the indications of traditional medicine. The phytoconstituents produce a lipid compatible molecular complex with phospholipids, also called as phyto-phospholipid complex. The result is a little micro sphere or cell is produced. It enhances the absorption of lipid insoluble polar phytoconstituents through oral as well as topical route showing better bioavailability, hence significantly greater therapeutic benefit these drug-phospholipid complexes can be formulated in the form of solution, suspension, emulsion, syrup, lotion, gel, cream, aqueous micro dispersion, pill, capsule, powder, granules and chewable tablet.

Special Issue: NCNN-2014

(National Conference on Nanoscience and Nanotechnology - 2014)

***In situ* Floating Gel Formulation: A Novel Approach in Gastrosustaining Drug Delivery System**

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Oral route is one of the most popular route for delivery of drug. This route is often limited by poor bioavailability with conventional dosage forms due to incomplete drug release and short residence time at the site of absorption. To overcome this drawback and to maximize the oral absorption of these drugs, novel drug delivery systems have been developed. Gastroretentive systems such as floating systems, mucoadhesive etc. have been developed. Over the past few decades, many novel *in situ* gel-based delivery matrices have been designed and fabricated to fulfil the ever-increasing needs of the pharmaceutical and medical fields. *In situ* gelling dosage form is liquid at room temperature before administration but undergo gelation when in contact with body fluids or change in pH. *In situ* gel forming drug delivery is a type of mucoadhesive drug delivery system from which the drug gets released in a sustained and controlled manner. This approach is useful for systemic as well as local delivery of drug administered. This review gives a brief overview about various approaches viz. *in situ* gel formulation based on chemical stimulation and physiological changes. This comprehensive article contains approaches, polymers, marketed preparations, patents, herbal approaches and recent advances of *in situ* gel.

Special Issue: NCNN-2014

(National Conference on Nanoscience and Nanotechnology - 2014)

Advancement in the Drug Delivery by using Polymers of Natural Origin

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A polymer is a large molecule which consist of repeating structure units or chain connected by covalent chemical bond. The formulation of solid, liquid, and semi solid dosage form by polymer. The natural polymer are very important for pharmaceutical industry because they are economical, readily available, non toxic and capable of chemical modification and having the property of biodegradability. Polymers consist of long chain branched or unbranched monomer or may be crosslinked networks of monomer in two or three dimation. The useful features of a polymer are its swelling ability which manifests itself. When swelling can be triggered by a change environment around the delivery system. The polymer is depend upon the pH, temperature, ionic strength. The important nature material are organicpolymer such as cellulose, lignine, ruber, protein, nucleic acid. Synthetic organic polymer many plastic, polythene nylons, polyester.natural polymer ispagula, acacia, agar, gelatin. The drug release can be controlled by polymer through the process of formulation .natural polymers are readily available potential and degradable multitude of chemical modification and compatible due to there origin. That's why theyremains attractive primarily.

Special Issue: NCNN-2014

(National Conference on Nanoscience and Nanotechnology - 2014)

A Technique to Improve the Bioavailability of Poorly Water Soluble Drugs: Solid Dispersion

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Oral bioavailability of a drug depends on its solubility and/or dissolution rate, therefore efforts to increase dissolution of drugs with limited water solubility is often needed. Improving oral bioavailability of drugs those given as solid dosage forms remains a challenge for the formulation scientists due to solubility problems. The dissolution rate could be the rate-limiting process in the absorption of a drug from a solid dosage form of relatively insoluble drugs. By improvement of drug release profiles of these drugs, it is possible to improve its bioavailability and reduce side effects. When delivering an active agent orally, it must first dissolve in gastric fluids and/or intestinal fluids before it can then permeate the membranes of (GI) gastro intestinal tract to reach systemic circulation. Many methods are available to improve these characteristics including salt formation, micronization and addition of solvent or surface-active agents. Solid dispersions are the most successful strategies to improve drug release of poorly soluble drugs. These can be defined as molecular mixtures of poorly water soluble drugs in hydrophilic carriers, which present a drug release profile that is driven by polymer properties. It consists of two different components i.e. hydrophilic matrix and hydrophobic drug. The matrix can be either crystalline or amorphous. The drugs can be dispersed molecularly, in amorphous particles or in crystalline particles.

Special Issue: NCNN-2014

(National Conference on Nanoscience and Nanotechnology - 2014)

Development Prospects of Polymer Conjugation for the Inhibition of Cancer Cells

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For most molecule-targeted anticancer systems, intracellular protein targets are very difficult to be accessed by antibodies, and also most efforts are made to inhibit protein activity temporarily rather than inactivate them permanently. In this work we firstly designed and synthesized multifunctional polymer-drugconjugates for intracellular molecule-targeted binding and inactivation of protein for growth inhibition of cancer cells. Small molecule drug was conjugated to polymer side chain for intracellular signal protein targeting, and simultaneously the fluorescent characteristic of polymer for tracing the cellular uptake and localization of polythiophene-drug conjugates by cell imaging. The conjugates showed selective growth inhibition of cancer cells, which exhibits low side effect for our intracellular molecule-targeted therapy system.

Special Issue: NCNN-2014

(National Conference on Nanoscience and Nanotechnology - 2014)

Advancement in the Viral Vaccine for HRSV by Reverse Vaccinology

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The world is facing a burden of infectious diseases like measles, swine flu, acute respiratory infections, typhoid and tuberculosis. Among them most common problem is bronchiolitis and pneumonia which is caused by human respiratory syncytial virus (HRSV). Despite of intensive research over the decades, medical therapy has remained unchanged and controversial. Human respiratory syncytial virus (HRSV) belongs to the family paramyxoviridae. In the present review, earlier attempts for HRSV vaccine discovery and modern treatment option for HRSV infection by reverse vaccinology (RV) approach is discussed, which helps in systematic analysis of sequences, structure and interaction of the proteins involved in virus life cycle and stimulating protective immunity. This review provides evidence that RV is an evident approach to design vaccine for HRSV. We expect that RV will provide a number of candidate antigens for new vaccine to control and eradicate HRSV infections. It is to be hoped that will make RSV vaccines accessible and affordable worldwide.

Special Issue: NCNN-2014

(National Conference on Nanoscience and Nanotechnology - 2014)

Buccal Patches: Advancement in Oral Drug Delivery System

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Buccal administration of drug provides a convenient route of administration for both systemic and local drug actions. The preferred site for retentive oral transmucosal delivery systems and for sustained and controlled release delivery device is the buccal mucosa. Rapid developments in the field of molecular biology and gene technology resulted in generation of many macromolecular drugs including peptides, proteins, polysaccharides and nucleic acids in great number possessing superior pharmacological efficacy with site specificity and devoid of untoward and toxic effects. However, the main impediment for the oral delivery of such drugs as potential therapeutic agents is their extensive presystemic metabolism, instability in acidic environment resulting into inadequate and erratic oral absorption. Direct access to the systemic circulation through the internal jugular vein bypasses drug from the hepatic first pass metabolism leading to high bioavailability. The extensive efforts have recently been focused on targeting a drug or drug delivery system in a particular region of the body for extended period of time to get the desired benefit, not only for local targeting of drugs but also for the better control of systemic drug delivery. The objective of this article is to review the developments in buccal adhesive drug delivery system as patches.

Special Issue: NCNN-2014

(National Conference on Nanoscience and Nanotechnology - 2014)

Double Emulsion Technique for Preparation of Microparticle as Controlled Drug Delivery System

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Several methods and techniques are potentially useful for the preparation of Microparticles in the field of controlled drug delivery. The type and the size of the microparticles, the entrapment, release characteristics and stability of drug in microparticles in the formulations are dependent on the method used. One of the most common methods of preparing microparticles is the single emulsion technique. Poorly soluble, lipophilic drugs are successfully retained within the microparticles prepared by this method. However, the encapsulation of highly water soluble compounds including protein and peptides presents formidable challenges to the researchers. The successful encapsulation of such compounds requires high drug loading in the microparticles, prevention of protein and peptide degradation by the encapsulation method involved and predictable release, both rate and extent, of the drug compound from the microparticles. The above mentioned problems can be overcome by using the double emulsion technique, alternatively called as multiple emulsion technique. Aiming to achieve this various techniques have been examined to prepare stable formulations utilizing w/o/w, s/o/w, w/o/o, and s/o/o type double emulsion methods. This article reviews the current state of the art in double emulsion based technologies for the preparation of microparticles including the investigation of various classes of substances that are pharmaceutically and biopharmaceutically active.

Special Issue: NCNN-2014

(National Conference on Nanoscience and Nanotechnology - 2014)

Evaluation of Self – Sealing Capacity & Fragmentation Test for Rubber Closure of Pharmaceutical Importance

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The different types rubber are used in pharmaceutical packaging e.g. butyl rubber, nitrile rubber, chloroprene rubber, silicon rubber. The variation should be minimized to apply fragmentations and self-sealing test in pharmaceutical rubber closure. The fragmentation test is used to compare with another rubber closure to number of fragment found in water with the help of piercing with the hypodermic syringe. After the fragmentation test it was seen that number of fragment in water where found to be higher in case of natural rubber as compare to latex rubber which indicates that latex rubber is best as closure for aqueous preparation. The self – sealing test was performed on few sample of natural rubber closure. One of the rubber was plugged on a first vial containing purified water in nominal volume than it was pierce 10 times with the help of 21 SWG hypodermic needle and immerse in to dye solution and left for 30 min. second vial plugged with fresh rubber plug and heated in water bath for 1 hour and pierce in 10 times immerse in dye solution. Similarly third vial plugged with another fresh rubber plug was heated in water bath for two hour and pierced with the needle and immersed in dye solution for 30 min. In first and the second container no color was found so rubber plug passes the self- sealing test but color was found in the third vial which was heated for a longer period, this shows that self-sealing capacity of rubber decreases with increasing temp and time.

Special Issue: NCNN-2014

(National Conference on Nanoscience and Nanotechnology - 2014)

Carrier System for Self-Assembling Supramolecular & Nanoparticulate System

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Aquasome are colloidal range biodegradable novel drug delivery carrier based on the principle of self assembly. Administration of bioactive molecules in their active state has been an enormous task to the pharmaceutical additionally as biotechnological industries. The pharmaceutical & biotechnological industry have challenges to make an appropriate route of drug delivery system. Recent advancement within the space of biotechnology & genetics science has resulted in promotion of protein & peptides as therapeutic agent. The main goal of drug delivery system to optimized drug loading & release properties for long self life & low toxicity. NDDS are considered as promising carrier for broad range of drug delivery system. Supramolecule & nanoparticulate assemblies are defined self assembled structure are successful application in drug delivery system. Aquasome water like properties preserve the conformational integrity & bio chemical stability of bio active. In the present work, we have under line the importance of supramolecule & nanoparticulates for the delivery of bio actives.

Special Issue: NCNN-2014

(National Conference on Nanoscience and Nanotechnology - 2014)

Synthesis and Characterization of Trisubstituted Sulfonylurea Derivatives Containing Thiazine

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A new series of 3-(4-substitutedphenyl)-1-(4-(4,6-dimethyl-6H-1,3-thiazin-2-yl)phenylsulfonyl)-1-substitutedurea (5a-o) was prepared and established by spectroscopic and analytical methods. This route of synthesis is proved to be easy and effectual which makes it possible to explore the novel site for substitution in sulfonylurea as well as the way of thiazine can be prepared. Rational of trisubstitution in sulfonylurea derivatives was achieved by protecting the ionizable amine by various aromatic and heterocyclic molecules.

Special Issue: NCNN-2014

(National Conference on Nanoscience and Nanotechnology - 2014)

Melphalan Loaded *In situ* Thermoreversible Injectable Hydrogel of Tri Block Copolymer System

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In the present study, we have investigated the role of thermoreversible injectable hydrogel for the successful administration of a PEGylated anticancer drug. To achieve the objective, a modified PEGylated melphalan (MLPEG) synthesized from a linear methoxy poly (ethylene glycol) (M-PEG) 2000 and 5000, Da with improved solubility was loaded to the thermosensitive Poloxamer 407 (P407) gel to produce an injectable hydrogel (MPX). As far as the safety issues are concern, conjugates at a concentration of 32 µg/ml after 1 h, showed low hemolysis ($48.8 \pm 1.5\%$) compared to high hemolysis (81.3 ± 0.5) for MLPEG 5000 and MLPEG 2000, respectively. Therefore, a significant decrease in hemolytic activity was found in case of MLPEG 5000 conjugate compared to MLPEG 2000. The tightening of the PEO chains due to the presence of NaCl salt reduced the initial burst release of the drug from the hydrogel and only 43 % of drug released during 2 hours from MPX-CG hydrogel. Moreover, a lower diffusion coefficient (D) for MPX-CG gel as compared to MPX-7.4 gel (4.8×10^{-6} vs $19.7 \times 10^{-6} \text{ cm}^2 \text{ min}^{-1}$, respectively) showed prolonged release of melphalan from the MPX-CG hydrogel. Administration of the prepared hydrogel via subcutaneous and intramuscular routes, confirms the depot formation, good syringeability and biocompatibility.

Special Issue: NCNN-2014

(National Conference on Nanoscience and Nanotechnology - 2014)

Futuristic Applications of Gold Nanoparticles

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Nanoparticles have several biomedical and industrial applications in diagnosis of disease, targeted chemotherapy and in drug delivery. Multifunctionality and sub-micronic size is the main characteristics of nanoparticles. Nanoparticles can be integrated with ligands, imaging labels, therapeutic agents and other functionalities for site specific drug delivery and cellular uptake. In the present review we are discussing the application and synthesis of gold nanoparticles which is the most studied among all metallo-nanoparticles. Various anticancer drugs are available but these are cause the necrosis of cancerous cell as well as normal cells. But gold nanoparticles cause the necrosis of only cancer cells. These are targeted drug delivery systems which are smaller than human cells so can easily penetrate the tumour and destroy the cancerous cell. Various anticancer drugs conjugated with gold nanoparticles result in increased efficiency of anticancer drug. Gold nanoparticles are beneficial for chemotherapy and also for diagnosis of cancer due to their photo physical property and optical property. Gold nanoparticles can be functionalized with peptides and nucleic acid. So these have a great application not only in bio sensing drugs but also in drug, gene and protein delivery.

Special Issue: NCNN-2014

(National Conference on Nanoscience and Nanotechnology - 2014)

Novel Drug Delivery Systems for Herbal Phytoconstituents

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Drugs of plant origin are widely being used all over the world these days and have been recognized by researchers for their better therapeutic value as they are having very low adverse effects as compared with allopathic medicines. These natural drugs of plant origin may be better utilized by delivering it by a suitable delivery system. Novel drug delivery systems are now a days getting huge popularity. Present study is focused on various Novel drug delivery systems for the delivery of various herbal medicines.

Special Issue: NCNN-2014

(National Conference on Nanoscience and Nanotechnology - 2014)

Nanocosmeceuticals: A New ERA in Cosmetics

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Nanotechnology is the engineering of functional systems at the molecular scale, deals with particles sizes between 1 and 100 nanometre. Nanoparticles and other nanostructure materials have unique properties which cannot be achieved when working with the bulk form of the material. As today's consumers are much concerned about appearance, the use of nanotechnology in cosmetics has increased significantly. The applications of nanotechnology and nanomaterials can be found in many cosmetic products including moisturisers, hair care products, make up and sunscreen. The two main uses for nanoparticles in cosmetic products are UV filtering and delivery of active ingredients. Titanium dioxide and zinc oxide are both used extensively in sunscreens to prevent UV damage to the skin. The second use is nanotechnology for delivery. Liposomes and niosomes are used in the cosmetic industry as delivery vehicles. The primary advantage of using nanoparticle formulations in cosmetic ingredients are to improve the stability of various cosmetics ingredients like unsaturated fatty acids and antioxidants encapsulated with nanoparticles, enhance penetration of ingredients like vitamins, increase the efficacy and tolerance of UV filters on the skin surface. It is critical for dermatologists involved with the health of the skin to be aware of this new technology, and to play an active role in evaluating this technology. The efficacy and safety of new nanomaterials has to be deeply studied by laboratory techniques. In this review, emphasis is made on the types of nanomaterials available in market for use in cosmetics by the various cosmetic brands.

Special Issue: NCNN-2014

(National Conference on Nanoscience and Nanotechnology - 2014)

PLGA Based Novel Drug Delivery System for Treatment of Cancer

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Cancer is disorder of uncontrolled growth of cell. Nanotechnology is getting huge popularity day by day. Because of numerous advantages associated with this delivery system it is very popular among researchers. Various drugs for the treatment of cancer are also being loaded in nano carriers. Various polymers are used for the preparation of nanoparticles. PLGA is one of those. In present study PLGA based drug delivery systems are covered.

Special Issue: NCNN-2014

(National Conference on Nanoscience and Nanotechnology - 2014)

Pharmaceutical Significance and Biomedical Application of Cellulose

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The amalgamation of polymer and pharmaceutical sciences led to the introduction of polymer in the design and development of drug delivery systems. Polymeric delivery systems are mainly intended to achieve controlled or sustained drug delivery. Polysaccharides fabricated into hydrophilic matrices remain popular biomaterials for controlled-release dosage forms and the most abundant naturally occurring biopolymer is cellulose; so hydroxypropylmethyl cellulose, hydroxypropylcellulose, microcrystalline cellulose and hydroxyethyl cellulose can be used for production of time controlled delivery systems. Additionally microcrystalline cellulose, sodium carboxymethyl cellulose, hydroxypropylmethyl cellulose, hydroxyethyl cellulose as well as hydroxypropyl cellulose are used to coat tablets. Cellulose acetate phthalate and hydroxymethyl cellulose phthalate are also used for enteric coating of tablets. Targeting of drugs to the colon following oral administration has also been accomplished by using polysaccharides such as hydroxypropylmethyl cellulose and hydroxypropylcellulose in hydrated form; also they act as binders that swell when hydrated by gastric media and delay absorption. This review paper assembles the current knowledge on the structure and chemistry of cellulose, and in the development of innovative cellulose esters and ethers for pharmaceuticals.

Special Issue: NCNN-2014

(National Conference on Nanoscience and Nanotechnology - 2014)

Evaluation of Antibacterial Effect of Ethanol Extract of *Clerodendrum Indicum* Against *E. coli* and *Staphylococcus Aureus*

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In the present study ethanolic extract of aerial part of *Clerodendrum indicum* (Verbenaceae) was explored for possible antibacterial activity against bacteria that attacks on wound e.g. *E.coli* (Gram negative) and *Staphylococcus aureus* (gram positive). Ethanolic extract of varying concentration 0.5, 1.0, 1.5, & 2% was prepared and tested against test organism using well diffusion method. Among all these extracts of *Clerodendrum indicum*, 2% showed optimum activity which was analysed by comparing with standard (Gentamicin). Moreover it was also found that the ethanolic extract of *Clerodendrum indicum* was equally efficacious as the choosen standard one. So this study suggested that this organic extract holds the potency of antibacterial activity. The another significant consequences of this study was that the value zone of inhibition of *Staphylococcus aureus* was more than that of *E.coli*.

Special Issue: NCNN-2014

(National Conference on Nanoscience and Nanotechnology - 2014)

Efficacy of Polymeric Nanoparticles in Management of Neurodegenerative Disorders via Encapsulation with PLGA Particles

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Nanoparticles could potentially transfigure management for neurodegenerative diseases which implies the application of neurotrophic factors to amend neuronal survival and synaptic connectivity and thus promising therapeutic approach for many diseases, however, due to limitations posed by the restrictive blood brain barrier (BBB), it is very difficult to ensure long-term administration in the brain. Here in this study L-DOPA-loaded PLGA- NPs were fabricated by an emulsification/solvent diffusion method. The 6-OHDA-induced rat model (400 mg/kg) was utilized to investigate the efficacy of nano-DOPA in a set of behavioral tests like placing task, footfault asymmetry test etc. Statistical analysis by ANOVA was done for about five weeks which concludes that nano-DOPA preparation administered intranasally in the dose of 0.35 mg/kg (by L-DOPA) significantly improved the motor function in rats with 6-OHDA PD model when compared with control group, non-treated group, L-DOPA group as well as L-DOPA+inh group throughout the whole treatment period and holds potentiality for chronic administration in the clinical practice of the PD therapy.

Special Issue: NCNN-2014

(National Conference on Nanoscience and Nanotechnology - 2014)

Nanotechnology in Pharmaceutical Product Development

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A number of new molecular entities (NMEs) selected for full-scale development based on their safety and pharmacological data suffer from undesirable physicochemical and biopharmaceutical properties, which lead to poor pharmacokinetics and distribution after in vivo administration. An optimization of the preformulation studies to develop a dosage form with proper drug delivery system to achieve desirable pharmacokinetic and toxicological properties can aid in the accelerated development of these NMEs into therapies. Nanoparticulate drug delivery systems show a promising approach to obtain desirable druglike properties by altering the biopharmaceutics and pharmacokinetics properties of the molecule. Apart from the advantages of enhancing potential for systemic administration, nanoparticulate drug delivery systems can also be used for site-specific delivery, thus alleviating unwanted toxicity due to nonspecific distribution, improve patient compliance, and provide favorable clinical outcomes. This review summarizes some of the parameters and approaches that can be used to evaluate nanoparticulate drug delivery systems in early stages of formulation development.

Special Issue: NCNN-2014

(National Conference on Nanoscience and Nanotechnology - 2014)

Evolving Concept of Nano Drug Delivery System

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Nanotechnology is the art of characterizing, manipulating and organizing matter systemically, at the nanometer scale, which has created a revolution in science, engineering, technology, drug delivery and therapeutics. Nano-sized systems could be designed into a more sophisticated system associated with its physical dimension of less than 100 nm. Nanotechnology, as a novel technology, offers opportunities for the production of new generation of sophisticated drug delivery systems. There are now a wide range of nano-systems, not only nanoparticles and nanocapsules but lipid complexes, polymeric micelles. Herein, we discuss two important aspects of nanomedicine—drug delivery and tissue engineering. Tissue engineering is the use of a combination of cells, engineering and materials methods, and suitable biochemical and physico-chemical factors to improve or replace biological functions. Tissue engineering cover a broad range of applications, in practice the term is closely associated with applications that repair or replace portions of or whole tissues (i.e., bone, cartilage, blood vessels, bladder, skin, muscle etc.). Often, the tissues involved require certain mechanical and structural properties for proper functioning. Nanotechnology and tissue engineering are used for better designs to improve biochemical properties.

Special Issue: NCNN-2014

(National Conference on Nanoscience and Nanotechnology - 2014)

Development and Evaluation of Solid Fat Nanoemulsions of Anti-Tuberculosis Drug

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Formulations were prepared by modified lipid hydration method and evaluate the potential of solid fat nanoemulsion SFN for selective delivery of an anti-tuberculosis drug, rifabutin, to pulmonary tissues particularly alveolar macrophages as this is the densest site of tuberculosis infection. The formulations were characterized for zeta potential, polydispersity index, particle size, percent drug entrapment and in vitro drug release. Pharmacokinetics and biodistribution of formulations and plain drug upon nebulization of nanoparticles or intravenous administration to Balb/c mice were also investigated. The toxicity and targeting potential of the prepared formulation were assessed with alveolar macrophage viability, haematological, hepatotoxicity and lung histopathology studies. The nanoparticles were found to be spherical shape. The size of SFNs was found to be 250 ± 12.4 nm with polydispersity index of 0.25 ± 0.03 suggesting the moderate particle size distribution. Percent Drug entrapment and drug loading was found to be $\sim 77\%$ of initial drug added. The drug release showed the biphasic pattern of release i.e. initial burst followed by a sustained release pattern. The cytotoxicity studies revealed that SFNs are safe, non toxic as compared to free drug. In contrast to free drug, the nanoparticles not only sustained the plasma level but also enhanced the AUC and mean residence time (MRT) of the drug, suggesting improved pharmacokinetics of drug. Ex vivo cellular uptake studies of SFN formulations in alveolar macrophages depicted almost six times enhanced uptake as compared to free drug. Further, the serum level and organ distribution studies demonstrated efficiency of the system for prolonged circulation and spatial delivery of rifabutin to alveolar tissues. Finally, it is concluded that SFNs can be exploited for effective and targeted delivery of rifabutin compared to plain formulation and ultimately increasing the therapeutic margin of safety while reducing the side effects.

Special Issue: NCNN-2014

(National Conference on Nanoscience and Nanotechnology - 2014)

Newer Pharmacophoric Approach: 6-Substituted-6H-Pyrrolo [3,4-D] Pyridazine Derivatives for Gaba Mediated Anticonvulsant Activity

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A newer series of 6-aryl-6H-pyrrolo [3,4-d]pyridazine pharmacophores has been synthesized for anticonvulsant activity. There are numerous changes performed at the six position in the pyrrolopyridazine ring to evaluate the anticonvulsant potency. This position of the ring provides a great scope for SAR study to improve the activity. Some simple aryl substituted compounds like 4a, 4b, 4f, 4i and 4k have shown a remarkable activity, but the 4-methoxyphenyl containing compound (4k) has found to be most active. The formation of benzylidene (schiff base) of 6-aryl ring as in 6b and 6d were also carried considerable anticonvulsant activity but lesser than the initial lead. The anticonvulsant activity has shown efficacious in the Maximal Electroshock model.

Special Issue: NCNN-2014

(National Conference on Nanoscience and Nanotechnology - 2014)

Eudragit Based Nanoparticulate Drug Delivery System for Treatment of Glaucoma

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Glaucoma is an ocular disorder characterized by increased intra ocular pressure. Acetazolamide is used for its treatment. But its oral administration results in low bioavailability. This is due to its low solubility and low permeability profile. In present study this drug is loaded in Eudragit Nanoparticles by nanoprecipitation method. The *in vivo* studies in rabbits showed that the ocular hypotensive activity was higher as compared to topical acetazolamide solution.

Special Issue: NCNN-2014

(National Conference on Nanoscience and Nanotechnology - 2014)

Breaking the Barrier of Hepatic Metabolism by the Application of a Novel Concept of Buccal Patches

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Buccal drug delivery systems are design to deliver drugs systemically or locally via buccal mucosa. In which the drugs release can occur when a dosage form is placed in the outer vestibule between mucosa and gingival. among the various route of drug delivery, oral route is perhaps the most preferred to the patient and the clinical alike. Some advantages of peroral administration are hepatic first pass metabolism and enzymatic degradation within GIT. Buccal drug absorption occurs by passive diffusion of the nonionized species. There are two type of buccal dosage form, they are matrix type and reservoir type. The component which are mainly used in the formulation of buccal dosage form that are drug substance, bio adhesive polymer, backing membrane permeation enhancer. Mainly two methods which are used in the preparation of buccal patches including solvent casting method and direct milling method. The evaluation test methods are surface PH, thickness measurement, swelling study, thermal analysis study, morphological characterization, water absorption capacity test, ex-vivo bioadhesion test, in vitro drug release, permeation study, ex-vvo mucoadhesion time and stability study in human saliva. Due to various advantages of buccal patches, these are using extensively in now-a-days.

Special Issue: NCNN-2014

(National Conference on Nanoscience and Nanotechnology - 2014)

Development and Optimization of Nanostructured Lipid Carrier-Enriched Cream for Topical Delivery of Betamethasone Valerate

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Nanostructured lipid carriers (NLC) for topical delivery of betamethasone valerate (BMV) were designed by solvent diffusion technique using response surface methodology (with 3 level factorial design and quadratic model). In the present study, the selected independent variables were the lipid composition (ratio of glycerylmonostearate:oleic acid) and surfactant concentration as formulation variable and sonication time as a process variable. The dependent variables were the drug entrapment efficiency and drug loading within NLCs. The physicochemical attributes of NLCs were assessed using transmission electron microscopy, scanning electron microscopy and differential scanning calorimetry. The resultant NLCs were also characterized for size, zeta potential, encapsulation efficiency and drug release profile. The optimized BMV NLCs were nearly spherical and smooth and a mean particle size of 390.8nm, zeta potential of 26.7 mV and entrapment efficacy of 86.84% were obtained for BMV-loaded NLC. The NLCs were incorporated in 0.1% w/w stearic acid cream base and in vitro skin deposition studies in goat ear skin were conducted. Significantly higher deposition of drug rate was found in goat ear skin from BMV NLC cream (32 µg) as compared to betamethasone valerate plain cream (20 µg). These findings provide supplementary evidences that nanolipid carriers have a targeting and prolonged release profile that can find potential applications in designing future BMV therapy strategies for skin diseases.

Special Issue: NCNN-2014

(National Conference on Nanoscience and Nanotechnology - 2014)

Resealed Erythrocyte as a Novel Drug Delivery System for Cancer Therapy

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Drug delivery is now entering quite an exciting and challenging era. Significant high costs involved in the development of new drug molecule has compelled scientists all over the world to search for alternative ways of administering the existing drug molecules with enhanced effectiveness. Improper drug administration inside the biological system not only causes distress to other body tissues but also demands more therapeutic molecules to elicit the appropriate response. Among the various carriers used for targeting drugs to various body tissues, the cellular carriers meet several criteria desirable in clinical applications, among the most important being biocompatibility of carrier and its degradation products. Leucocytes, platelets, erythrocytes, nanoerythrocytes, hepatocytes, and fibroblasts etc. have been proposed as cellular carrier systems. Among these, the erythrocytes have been the most investigated and have found to possess greater potential in drug delivery. Therapeutic uses of a variety of drug carrier systems have significant impact on the treatment and potential cure of many chronic diseases, including cancer, diabetes mellitus, rheumatoid arthritis, HIV infection, and drug addiction. Biopharmaceuticals, therapeutically significant peptides and proteins, nucleic acid based biological, antigens, anticancer drug and vaccines, are among the recently focused pharmaceuticals for being delivered using carrier erythrocytes.

Special Issue: NCNN-2014

(National Conference on Nanoscience and Nanotechnology - 2014)

Formulation & Characterisation of Microemulsion with Nonionic Surfactants

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Pseudoternary phase diagram was investigated which reveals the influence of hydrophobic chain lengths of surfactant, cosurfactant, oil & their(S/Co) different ratios on the phase behaviour of surfactant/cosurfactant/ oil/ H₂O. The total area of microemulsion (ME) regions were determined 2:1(w/w) ratio of S/Co was found to show largest ME region. Formulation of MEs increased with an increase of hydrophobic chain length of non ionic surfactant, which was antagonistic to the trend for oil. Among the alcohol cosurfactant chosen, n-butanol formed largest ME region. Various physical parameters give idea about ME region formed. Sub ME regions were identified by conductivity measurements. o/w MEs were observed when water content was higher than 62-68 %. The o/w sub phase region had significantly shown lower viscosities than w/o or bicontinuous sub phases.

Special Issue: NCNN-2014

(National Conference on Nanoscience and Nanotechnology - 2014)

Various Approaches for the Formulation of Nanocapsules

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A review of the state of knowledge on nanocapsules prepared from preformed polymers as active substances carriers is presented. Other advantages of nanoencapsulated systems as active substance carriers include high drug encapsulation efficiency due to optimized drug solubility in the core, low polymer content compared to other nanoparticulated systems such as nanospheres, drug polymeric shell protection. This entails a general review of the different preparation methods: nanoprecipitation, emulsion-diffusion, double emulsification, emulsion-coacervation, polymer-coating and layer-by-layer, from the point of view of the methodological and mechanistic aspects involved, encapsulation of the active substance and the raw materials used. Similarly, a comparative analysis is given of the size, zeta-potential, dispersion pH, shell thickness, encapsulation efficiency, active substance release, stability and in vivo and in vitro pharmacological performances, using as basis the data reported in the different research works published. Nanoencapsulation is an attractive strategy for the vectorization of a variety of active substances. Consequently, the information obtained allows establishing criteria for selecting a method for preparation of nanocapsules according to its advantages, limitations and behaviours as a drug carrier. On the other hand, the nanoencapsulation strategies such as polymer-coating and the layer-by-layer technique have shown interesting results, particularly in relation to in vivo nanocapsule behaviours since the final nanocapsule positive charge reduces their enzymatic degradation.

Special Issue: NCNN-2014

(National Conference on Nanoscience and Nanotechnology - 2014)

Polymeric Lipid Hybrid Nanoparticles (PLN): Versatile Carrier System for Antigen

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Polymer Lipid Hybrid Nanoparticles (PLN) having the liposomes as well as polymeric nanoparticles features. Polymeric core (hydrophobic) and a polymeric shell (hydrophilic) separated by a single layer of lipid. In addition to potential applications in drug delivery and PLN can also be used as novel adjuvants in the field of vaccination. Biodegradable poly (lactic-co-glycolic acid) and phosphatidylcholine are used as the polymer and lipid models, respectively. PLN has been formulated by the DESE (Double Emulsion Solvent Evaporation) method. Antigen Bovine Serum Albumin (BSA) which is aqueous solubility has been used. The three-factored factorial design with three levels was used in this study. The drug encapsulation efficiency (EE), drug loading (DL) percentage and particle size of BSA-PLN were investigated with respect to three independent variables including BSA concentration (F1), polymer concentration (F2) and lipid concentration (F3). The optimal formulation for BSA-PLN was composed of BSA concentration (F1) of 35 mg/ml, lipid concentration (F2) of 50mg and lipid concentration (F3) of 15mg. BSA-PLN under the optimized conditions shows Entrapment Efficiency - (91.95±1.4) %, Drug Loading - (66.62±1.3) %, mean diameter (199±2.5) nm, polydispersity index - 0.134 and zeta potential value - (-22.5±1.2) mV. TEM of the optimized PLN showed spherical particles.

Special Issue: NCNN-2014

(National Conference on Nanoscience and Nanotechnology - 2014)

Formulation Development and Characterization of Chitosan Multiparticulate System for Treatment of Colorectal Cancer

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In the present work, chitosan microspheres with a mean diameter between 42.32 μ m and 49.44 μ m, were produced by ionically cross linking method of chitosan, and tested for treatment of colorectal cancer. Aiming at developing a suitable colon specific strategy, Fluorouracil (Fu) was encapsulated in the microspheres, following Eudragit S-100 coating by solvent evaporation technique, exploiting the advantages of microbiological properties of chitosan and pH dependent solubility of Eudragit S-100. Different microsphere formulations were prepared varying the ratio FU:chitosan (1:2 to 1:10), stirring speed (1000–2000 rpm), and the concentration of emulsifier Sodium lauryl sulfate (0.5–1.5% (w/v)). The effect of these variables on the particle size and encapsulation parameters (production yield (PY), loading capacity (LC), encapsulation efficiency (EE)) was evaluated to develop an optimized formulation. In vitro release study of non-coated chitosan microspheres in simulated gastrointestinal (GI) fluid exhibited a burst release pattern in the first hour, whereas Eudragit S-100 coating allowed producing systems of controlled release diffusion fitting to the Higuchi model, and thus suitable for colon-specific drug delivery. DSC analysis indicated that FU was dispersed within the microspheres matrix. Scanning electron microscopy revealed that the microspheres were spherical and had a smooth surface. Chitosan biodegradability was proven by the enhanced release rate of FU in presence of rat caecal contents.

Special Issue: NCNN-2014

(National Conference on Nanoscience and Nanotechnology - 2014)

QSAR and Pharmacophore Studies on Arylbenzofuran Derivatives as Histamine H₃ Receptor Antagonists

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Quantitative structure activity relationship (QSAR) studies using Molecular Design Suite (VLife MDS) software and pharmacophore studies using a web based pharmacophore identification server Pharmagist were performed on 29 compounds belonging to arylbenzofuran chemical class for their histamine H₃ receptor antagonistic activity. 2D QSAR analysis was performed using partial least square regression (PLSR) while k-nearest neighbour molecular field analysis (kNN-MFA) methodology was applied to derive 3D QSAR models. The variable selection method applied for both strategies was stepwise forward backward. The best 2D QSAR model had squared correlation coefficient (r^2) = 0.8662, cross validated correlation coefficient (q^2) = 0.6029 and predictive correlation coefficient (pred_r^2) = 0.3940. The QSAR model indicated that the T_3_N_5 (count of number of triple bonded atoms separated from nitrogen atom by five bonds in a molecule), T_C_C_7 [count of number of carbon atoms (single or double bonded) separated from any carbon atom (single or double bonded) by 7 bonds in a molecule] and T_2_3_5 [count of number of double bonded atoms (i.e. any double bonded atom, T_2) separated from any other triple bonded atom by 5 bonds in a molecule] were the important determinants for H₃-receptor antagonistic activity. The generated predictive model using kNN-MFA had internal predictivity of 70.55% (q^2 = 0.7055) and external predictivity 60.00% (pred_r^2 = 0.60). The contribution 3D plot for this model showed that steric (S_579), electrostatic (E_453) and hydrophobic (H_779) interactions play important role in determining H₃-receptor antagonistic activity. The identified pharmacophoric features are aromatic (2), hydrophobic (2) and hydrogen bond acceptor (2). The findings of this work can be utilized for the development of novel H₃-receptor antagonists.

Special Issue: NCNN-2014

(National Conference on Nanoscience and Nanotechnology - 2014)

QSAR and Pharmacophore Studies on Thiazolidinone Derivatives as Potential Epidermal Growth Factor Receptor Inhibitors

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The epidermal growth factor receptor (EGFR) inhibitory activity of some thiazolidinone analogues was subjected to 2D and 3D quantitative structure activity relationship analysis and pharmacophore studies using Molecular Design Suite (VLife MDS) software and web server Pharmagist respectively. 2D QSAR analysis was performed using partial least squares regression (PLSR) while 3D QSAR models were generated using k-nearest neighbour (kNN) methodology. The variable selection method applied for both strategies was stepwise forward backward. The QSAR models generated by both the methods were subjected to internal and external validation. The best 2D QSAR model had r^2 , q^2 and pred_r^2 values of 0.8758, 0.8002 and 0.9141 respectively. This model indicates that the descriptors $T_N_O_4$ and RadiusOfGyration contribute (positively) 43% and 34.11% respectively and descriptor $T_T_C_4$ contributes (inversely) 22.46% to the biological activity. The best 3D QSAR model exhibited q^2 and pred_r^2 values of 0.8032 and 0.7843 respectively. In this 3D QSAR model, the steric field points S_374 and S_209 with their negative values indicate the need of less bulky group in these positions. The identified pharmacophoric features are aromatic, hydrogen bond donors (2) and hydrogen bond acceptor (3). The present work may be of help in providing guidance for further lead optimization and designing of potent anticancer agents.

Special Issue: NCNN-2014

(National Conference on Nanoscience and Nanotechnology - 2014)

LC/MS: A Hyphenated Chromatographic Technique

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Pharmaceutical chemistry is the core branch of pharmacy education and research. It can be categorized as synthesis of new drug molecule, its analysis and pharmacological studies. High performance liquid chromatography is the highly advantageous technique to analyze the sample. Mass spectrometry is method used to quantify the sample. High performance liquid chromatography coupled with mass spectrometry (LC/MS) is a key enabling technology for the detection and characterization of organic molecules, providing the analytical chemist with one of the most powerful analytical tools of modern times. With advancements in ionization methods and instrumentation, liquid chromatography/mass spectrometry (LC/MS) has become a powerful technology for the characterization of macromolecule. This article will illustrate the role of LC/MS analysis in drug discovery process. The LC/MS technique extend its applications to newer areas of pharmaceutical research, including metabolomics, proteomics and biomarker discovery. It is expected that LC/MS technique will continue to play important roles in every aspect of drug discovery and development. LC/MS is typically applied to analysis of multiple component mixtures.

Special Issue: NCNN-2014

(National Conference on Nanoscience and Nanotechnology - 2014)

Docking Studies: A Tool for Computer Aided Drug Design

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Molecular modeling has become a valuable and essential tool to medicinal chemists in the drug design process. Molecular modeling describes the generation, manipulation or representation of three-dimensional structures, all theoretical method and computational techniques used to model or mimic behaviour of molecule. It involves a range of computerized techniques based on theoretical chemistry methods and experimental data to predict molecular and biological properties. Docking studies are used to find best matching between two molecules. The major aspects of the docking studies are protein flexibility, ligand sampling, and scoring functions. The aim of this study is to explain the aspects of docking studies that has helped in the discovery process of new drugs. The emphasis will be on lead generation and optimization.

Special Issue: NCNN-2014

(National Conference on Nanoscience and Nanotechnology - 2014)

Nano-Emulsion: An Emerging Carrier for Drug Delivery

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Nano-emulsions, as non-equilibrium systems, present characteristics and properties which depend not only on composition but also on the preparation method. Nano-emulsion droplet sizes fall typically in the range of less than 1000 nm and show narrow size distributions. Nano-emulsions report their formation by dispersion or high-energy emulsification methods, an increased interest is observed in the study of nano-emulsion formation by condensation or low-energy emulsification methods (based on the phase transitions that take place during the emulsification process). Nano-emulsions are proposed for numerous applications in pharmacy as drug delivery systems because of their capacity of solubilizing non polar active compounds. Fundamental difference between microemulsions and nano-emulsions: microemulsions are equilibrium systems (i.e. thermodynamically stable), while nano-emulsions are non-equilibrium systems with a spontaneous tendency to separate into the constituent phases. Although there have not been reported too many applications in other fields, there is a great potential for nano-emulsion applications if Oswald-ripening destabilization mechanism is limited by using very insoluble oils. Currently, research on nano-emulsion system is aiming towards the specificity of drugs action and target, to facilitate the bioavailability of drugs through biological membranes, or to protect a drug against enzyme inactivation. It is an effort to summarize the recent development in the area of nano-emulsion, which are examined in relation to their use in different route of administrations.

Special Issue: NCNN-2014

(National Conference on Nanoscience and Nanotechnology - 2014)

Nanostructured Lipid Carriers: A Novel Generation of Solid Lipid Nanoparticles

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Nanostructured Lipid Carriers (NLC) are the new generation of lipid nanoparticles, attracting major attention as novel colloidal drug carriers. NLC were developed to overcome the limitations associated with the SLN. SLN consist of solid lipids, while NLC consist of a mixture of specially blended solid lipid (long chain) with liquid lipid (short chain), preferably in a ratio of 70:30 up to a ratio of 99.9:0.1. Commonly observed disadvantages of SLN include limited drug-loading capacity, drug expulsion during storage, and relatively high water content in the dispersions (70–99.9%). As compared to SLN, NLC have a higher drug-loading capacity for a number of active compounds, and avoid or minimize potential expulsion of active compounds during storage. For a number of drugs, the solubility of liquid lipid is higher than that of solid lipid, which enhances drug-loading. These carriers are composed of physiological and biodegradable lipid, exhibiting low systemic toxicity and low cytotoxicity. SLN and NLC revealed several advantages compared to the other colloidal carrier systems. They provide a controlled drug release and an increase in chemical stability of the incorporated drugs. Moreover, they are safe carriers which can be produced easily on large scale. NLC have also a lower water content of the particle suspension and a less tendency of unpredictable gelation.

Special Issue: NCNN-2014

(National Conference on Nanoscience and Nanotechnology - 2014)

Nanotheranostics and Pharmacogenomics for the Development of Personalized Medicine

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Nanotheranostics, the integration of diagnostic and therapeutic function in one system using the versatile strategy of nanotechnology, is extremely attractive for personalized medicine. The discovery of genetic, genomic and clinical biomarkers have revolutionized the treatment option in the form of personalized medicine (PM) which allows us to accurately predict a person's susceptibility/progression of disease, the patient's response to therapy, and maximize the therapeutic outcome for a particular patient. It aims to provide right treatment, to the right patient, at the right time, at right cost. "One size does not fit all" is the prime reason for the evolution of PM, which emphasizes on genetic makeup of individuals that can be correlated with difference in drug therapy. Genetic variations in humans are recognized as an important determinant of drug response variability. Different patients respond differently to the same drug, with genetics accounting for 20–95% of the variability. Pharmacogenomics is the study of how human genetic variations affect an individual's response to drugs, considering the drug's pharmacokinetic properties like absorption, distribution and metabolism. It plays an important role in reducing/avoiding the adverse drug reactions (ADRs) and optimizing drug dose by identifying drug responders and non-responders. Recently, the U.S. Food and Drug Administration (FDA) has realized the contribution of pharmacogenomics in better healthcare and advocated the consideration of pharmacogenomic principles in making safer and more effective drug. By predominantly utilizing the unique properties of nanoparticles to achieve biomarker identification and selective/targeted drug delivery, nanotheranostics can be useful for personalized cancer treatment.

Special Issue: NCNN-2014

(National Conference on Nanoscience and Nanotechnology - 2014)

The Potential of Polymers on Intestinal Permeability and pH Sensitivity of Nanoparticles of a Camptothecin Derivative: An *Ex vivo* Study

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SN-38 (7-ethyl-10-hydroxycamptothecin) is a camptothecin derivative is currently being investigated for use in the treatment of metastatic colon cancer. It is potentially cytotoxic but it is insoluble in pharmaceutically acceptable solvents and has low bioavailability. Polymeric nanoparticles can be explored for delivery of SN-38 to colon area for effective treatment of colon cancer. The aim of the present study is to see the effect of biodegradable and non biodegradable polymers on intestinal permeability of drug across colon region and pH sensitivity of nanoparticles. In the present approach chitosan coated PLGA (Poly-lactic-co-glycolic acid) nanoparticles (PCNP) and chitosan coated ES-100 (Eudragit S-100) nanoparticles (ECNP) were prepared by emulsion-solvent evaporation method with modifications. FTIR and DSC depicted the structure, morphology and drug-polymer-exipients interaction. TEM images indicate the formation of polymer coated spherical nanoparticles. The *in vitro* release studies of SN-38 was conducted in simulated gastric fluid (pH 1.2), simulated intestinal fluid (pH 6.8) and simulated intestinal fluid with 4% rat cecal contents (pH ≥ 7.4) at 37°C. Permeability of ECNP's and PCNP's across female Wistar rat colon was observed by confocal laser scanning microscopy and fluorescent microscopy. SN-38 an anticancer drug was successfully entrapped inside PCNP's and ECNP's as depicted by TEM images with no incompatible reactions seen by DSC and FTIR. *In vitro* release studies under different simulated conditions showed faster release in colonic contents which demonstrated the pH sensitivity of nanoparticles. PCNP showed better permeability than ECNP proving it to be a better and effective candidate for colon cancer.

Special Issue: NCNN-2014

(National Conference on Nanoscience and Nanotechnology - 2014)

First Principles Study of Thermal and Vibrational frequencies and Bonding Analysis in Oxides (M₂O) Superoxides (MO₂) and Ozonides (MO₃); (M=Li, Na, K)

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First-principles calculations in order to study the stability of oxides, superoxide and ozonide of alkali metals (Li, Na, K) has been performed by HF cluster procedure implemented by Gaussian 09 sets of programs with the choice of basis set 6-31G*. The correlation effects in the calculations have been accounted by applying Moller-Plesset second order perturbation approximations (MP2). Our calculation shows that when increasing the bond length between atoms of molecules, the binding energy of the corresponding system decreases, i.e. the stability of the studied system is inversely proportional to the bond length between the atoms of the corresponding system. Quantum Theory of Atoms In Molecule (QTAIM) approach has been adopted for bonding analysis for studied systems and this study shows that the bonding in all studied systems are of closed shell type at all. Our study for the variation of the real space function with bond length finds that with increase in bond length the real space function values at BCP (ρ and 2ρ) found to be decrease, which are in close agreement with the previously reported calculations. The electrostatic potential within the molecular surface of the studied systems has been systematically analysed. The study of the HOMO-LUMO gap on the alkali metal oxide, superoxide and ozonide shows that the calculated value is higher for ozonide and lower for oxides. Calculations have been also performed to estimate the frequency of vibration and force constant of the studied systems and then we study the variation of the frequency of vibration with the corresponding masses. Further calculation is extended to study some thermal behaviour of studied systems with and without isotropic substitution of oxygen as well as non-bonded Lennard-Jones parameters for lithium oxide.

Special Issue: NCNN-2014

(National Conference on Nanoscience and Nanotechnology - 2014)

Isolation and Staining of Endophytic Fungus with Special Reference to their Antibacterial Activity

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Now days a large number of medicine are also prepared from fungi, plants, bacteria etc. But from all of these, fungi play an important role for formation of useful drugs which is used for curing a number of diseases. Fungi are eukaryotic protists that differ from bacteria and other prokaryotes in many ways. Fungi generally show both type of reproduction. They can reproduce sexually or asexually. The simplest type of fungi is unicellular yeast. Fungi consist of thread like structure called hyphae and the mass of hyphae are called mycelium. Depending upon the morphology, the fungi generally divide into three groups like yeast, yeast like fungi, mould and dimorphic fungi. In all of these fungi, a huge work carried out on endophytic fungi for preparation of useful product for mankind. The term 'endophyte' ('endo-'means inside; 'phyte' is derived from the Greek word phyto, which means plant). These microorganisms may produce a large number of novel natural product for medical, agricultural, and industrial uses such as antibiotics, anticancer reagents, biological control agents and other useful bioactive compounds. Natural product search and discovery from endophytes of medicinal plants represents a challenge to the biotechnologist. The diverse range of biosynthetic pathways in plants, fungi and bacteria has provided an array of lead structures that have been used in drug development. The present study was designed to search the novel antimicrobial compounds from the metabolites of Endophytic fungi.

Special Issue: NCNN-2014

(National Conference on Nanoscience and Nanotechnology - 2014)

Pharmacophore Modeling, Atom Based 3D-QSAR and Docking Studies of Azetidin-2- Ones Derivatives as Tubulin Inhibitors

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Azetidin-2-ones have been recognized as effective tubulin polymerization inhibitors that bind to the colchicine site on β -tubulin. Energetic based pharmacophore mapping (hybrid structure and ligand based method) explain how the energy parameter from the Glide XP scoring function are plotted onto pharmacophore sites from the docked fragments so as to rank their implication for binding. Pharmacophore and atom based 3D QSAR modeling (ligand based method) were performed on 71 compounds of azetidin-2-ones derivatives as tubulin-binding agents for antitumor activity. Five-point common pharmacophore hypothesis were selected for alignment of all compounds. The 3D-QSAR models developed using training set of 51 compounds and test set of 20 compounds. The generated common pharmacophore hypothesis (CPHs) and 3D-QSAR models were confirmed further externally by estimating the activity of database of compounds and comparing it with actual activity. Molecular docking (structure based method) were performed on a series of azetidin-2-ones using colchicines binding site of β tubulin. The docking studies indicate important interactions of trimethoxy benzene with Cys241 and Val318 for anticancer activity. We have established structure activity correlation by using Pharmacophore Modeling, Atom based 3D-QSAR and Docking Studies. The results of these studies would be beneficial to refine the pharmacophore for design of novel potential compounds for antitumor activity.

Special Issue: NCNN-2014

(National Conference on Nanoscience and Nanotechnology - 2014)

Effects of Nanoparticles & Nanotechnology on Health

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Pharmaceutical nanotechnology has provided diagnosis and focused treatment of disease at a molecular level and pharmaceutical nanotechnology is most innovative and highly specialized field, which will revolutionize the pharmaceutical industry in near future. Pharmaceutical nanotechnology presents revolutionary opportunities to fight against many diseases. It helps in detecting the antigen associated with diseases such as cancer, diabetes mellitus, neurodegenerative diseases, as well as detecting the microorganisms and viruses associated with infections. We do not, in fact, understand the interaction of small particles with cells and tissues, but there are diseases associated with a few We do not, in fact, understand the interaction of cell particles with cells and tissues, but there are diseases associated with a few of them: silicosis, asbestosis, "black lung" of them: silicosis, asbestosis, "black lung". If nano particles are likely to be more reactive than the same material in bulk, and that nanoparticles may be able to penetrate human cells. However, there is no evidence that the limited number of nanoparticles used in cosmetics can cause any damage.

Special Issue: NCNN-2014

(National Conference on Nanoscience and Nanotechnology - 2014)

Lipid Nanoparticles for Improved Topical Application

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Due to lower risk of systemic side effects topical treatment of disease appears favourable, yet the stratum corneum counteracts the penetration of xenobiotics into viable skin. Particulate carrier systems may mean an option to improve dermal penetration. Lipid nanoparticles (LN) were developed at the beginning of the 1990s as an alternative carrier system to emulsions, liposomes and polymeric nanoparticles. LN for the use in topical cosmetic and pharmaceutical formulations epidermal lipids are found in high amounts within the penetration barrier, lipid carriers attaching themselves to the skin surface and allowing lipid exchange between the outermost layers of the stratum corneum and the carrier appear promising. Besides liposomes, solid lipid nanoparticles (SLN) and nanostructured lipid carriers (NLC) have been studied intensively. Here we describe the potential of these carrier systems and compare the dermal uptake from SLN and NLC to the one of alternative vehicle systems. A special focus is upon the interactions of active ingredients and the lipid matrix as well as the quantification of dermal penetration.

Special Issue: NCNN-2014

(National Conference on Nanoscience and Nanotechnology - 2014)

Chitosan Based Nanoparticles for Ocular Delivery

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Ocular drug delivery efficiency depends on the barriers and the clearance from the choroidal, conjunctival vessels and lymphatic. Nanoparticles (NPs) have been designed to overcome the barriers, increase the drug penetration at the target site. Mucoadhesive chitosan (CS)-sodium alginate (ALG) nanoparticles were investigated as a new vehicle for the prolonged topical ophthalmic delivery of antibiotics. Chitosan is very suitable for nanoparticle technology due to its better stability, low toxicity, simple and mild preparation methods providing versatile routes of administration. Chitosan-based systems for improve the retention and biodistribution of drugs applied topically onto the eye. Besides its low toxicity and good ocular tolerance, chitosan exhibits favourable biological behaviour, such as bioadhesiveness and permeability-enhancing properties, and also interesting physico-chemical characteristics, which make it a unique material for the design of ocular drug delivery vehicles. Chitosan has been shown to form colloidal particles and entrap macromolecules through a number of mechanisms, including ionic crosslinking, desolvation, or ionic complexation. Moreover being a natural polymer it is considered as a safe material that has good biocompatibility and bioavailability which accounts for its wide use.

Special Issue: NCNN-2014

(National Conference on Nanoscience and Nanotechnology - 2014)

A Novel Approaches in Pharmaceutical Formulations: Hydrogels

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The availability of large molecular weight protein- and peptide-based drugs due to the recent advances in the field of molecular biology has given us new ways to treat a number of diseases. Synthetic hydrogels offer a possibly effective and convenient way to administer these compounds. Hydrogels are hydrophilic, three-dimensional networks, which are able to imbibe large amounts of water or biological fluids, and thus resemble, to a large extent, a biological tissue. They are insoluble due to the presence of chemical (tiepoints, junctions) and/or physical crosslinks such as entanglements and crystallites. These materials can be synthesized to respond to a number of physiological stimuli present in the body, such as pH, ionic strength and temperature. The aim of this article is to present a concise review on the applications of hydrogels in the pharmaceutical field, hydrogel characterization and analysis of drug release from such devices. These recent developments are the subject of this review, which addresses the use of water-swollen, crosslinked biomedical materials as carriers for the development of novel pharmaceutical formulations and for the delivery of drugs, peptides and proteins, as targeting agents for site specific delivery, or as components for the preparation of protein or enzyme conjugates.

Special Issue: NCNN-2014

(National Conference on Nanoscience and Nanotechnology - 2014)

A New ERA of Nanotechnology

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Nanoparticles have been used as carriers of anticancer drugs to increase antitumor potency of the old drugs and reduce toxic side effects. A Nanotechnology based on human protein albumin exploited natural pathways to selectively deliver larger amounts of drug to tumors while avoiding some of the toxicities of solvent-based formulations. Nanotechnology has been extensively studied for melanoma treatment and diagnosis, to decrease drug resistance, increase therapeutic efficacy, and reduce side effects. One of the most active research areas of the nanotechnology is nanomedicine, which applies nanotechnology to highly specific medical interventions for prevention, diagnosis, and treatment of diseases, including cancer disease. Advantages as drug carrier systems since they can improve the solubility of poorly water-soluble drugs, modify pharmacokinetics, increase drug half-life by reducing immunogenicity, improve bioavailability, and diminish drug metabolism. Cancer and many other non-oncological diseases has been used nanotechnology associate with the development of drug delivery system and photoprocess to improve the treatment of clinical protocol to treat skin cancer and other cancers.

Special Issue: NCNN-2014

(National Conference on Nanoscience and Nanotechnology - 2014)

Nanodevices

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Nanodevices are the critical enablers that will allow mankind to exploit the ultimate technological capabilities of electronic, magnetic, mechanical, and biological systems. The introduction of nanotechnology in biomedical applications has facilitated the exact control and regulation of biological environments. There are many interesting nanodevices and nanomaterials being developed that have a potential to improve cancer detection, diagnosis, and treatment. Nanodevices will ultimately have an enormous impact on our ability to enhance energy conversion, control pollution, produce food, and improve human health. The use of Nanodevices is to confirm the entry of the produced nanoparticles into cells opening new sights for the use of these particles as drug/gene delivery agents and/or as a new method for optimal imaging when methodologies like x-ray computed tomography or magnetic resonance cannot be used. Nanodevices has developed new and innovative concepts and methods for measuring and characterizing airborne ENP with novel portable and easy-to-use device for workplaces. This ability is derived from the small size of the devices and their multifunctional capabilities to operate at specific sites for selected durations of time.

Special Issue: NCNN-2014

(National Conference on Nanoscience and Nanotechnology - 2014)

Mechanism of Nanoparticulate Delivery System via Ocular Site

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Controlled and sustained delivery of ophthalmic drugs continues to remain a major focus area in the field of pharmaceutical drug delivery with the emergence of new, more potent drugs and biological response modifiers that may also have very short biological half-lives. The anatomy, physiology, and biochemistry of the eye render this organ highly impervious to foreign substances. A significant challenge to the formulator is to circumvent the protective barriers of the eye without causing any tissue damage. In ocular drug delivery, the physiological constraints imposed by the protective mechanisms of the eye lead to poor absorption of drugs with very small fractions of the instilled dose penetrating the cornea and reaching intraocular tissues. The benefits of having the drug in the form of a nanoparticulate suspension are reduction in the amount of dose, drug release for a prolonged period of time, higher drug concentrations in the infected tissue, longer residence time of nanoparticles on the cornea surface, reduction systemic toxicity of drug.

Special Issue: NCNN-2014

(National Conference on Nanoscience and Nanotechnology - 2014)

Holistic Approaches for the Cure of Ailments by the Application of Antibody Drug Conjugation

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Antibody drug conjugates is a class of biotherapeutics which represents treatment strategy in the field of oncology. Antibodies engineered to carry biologically active drugs and deposit in target cell. The monoclonal antibodies conjugation with cytotoxic drugs with labile bonds to make antigen specific delivery of highly potent cytotoxic drugs to tumor cell. Coupling antibodies to cytotoxic drug permit greater control of drug pharmacokinetics and improve delivery to target tissue. An anticancer drug is coupled with antibody that specifically targets a certain tumor marker. The biochemical reaction between the antibody and the target protein triggers a signal in the tumor cell, which then absorbs or internalizes. After ADC is internalized, the cytotoxic drug is released and kills the cancer. ADCs binds to antigen expressing cells following tumor localization and get internalized into endosomes/lysosomes. The rate and extend of internalization are important because it influences uptake of the drug as well as release of the drug in tumor and normal cells. Selective targeting by antibodies is feasible and cell death of the target is the therapeutic goal.

Special Issue: NCNN-2014

(National Conference on Nanoscience and Nanotechnology - 2014)

Novel Approches of Transdermal Route of Application: Nanoparticles

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Nanotechnology has evolved to be an integral part of the 21st century. Nanotechnology enabled products find applicability in almost everything, such as medicine, pharmaceuticals, chemicals, biologics and information technology. They can penetrate cell and tissues gaps to arrive at the target organs like lungs, liver, spleen, bone, brain, spinal cord and lymph etc. Transdermal delivery involves applications of a pharmacologically active compound on the skin to achieve therapeutic blood level in order to treat diseases remote from the site of application. Transdermal drug delivery system has been accepted as potential non-invasive route of drug administration with advantages of prolonged therapeutic effect, reduced side effects, improved bioavailability, better patient compliance and easy termination of drug therapy. Transdermal delivery is particularly advantageous for those drugs gastrointestinal tract. They are able to show controlled release properties due to their biodegradability, pH, ion and temperature sensibility. The major goals in designing nanoparticles have been widely used to delivery systems are to control particle size, surface properties and release of pharmacologically active agents in order to achieve the site specific action at the therapeutically optimal rate & dose regimen. Nanoparticles base drug delivery systems may offer plenty of advantages over conventional dosage forms, which include improved efficacy, reduced toxicity enhanced, biodistribution and improved patient compliance. This review describes enhancement such as physical & chemical penetration enhancers in trans drug delivery.

Special Issue: NCNN-2014

(National Conference on Nanoscience and Nanotechnology - 2014)

Development and Characterization of Solid Lipid Nanoparticle of Diclofenac Sodium in the Treatment of Ocular Pain after Photorefractive Keratectomy

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The aim of this study was to prepare and evaluate incorporating solid lipid nanoparticles (SLNs) of Diclofenac sodium for systemic delivery of the active after ocular application. Diclofenac sodium loaded solid lipid nanoparticles (SLNs) have been successfully developed using a microemulsion technique. Three different formulations were prepared. It was found that variation in the amount of ingredients had profound effects on the Diclofenac sodium loading capacity, the mean particle size, and size distribution of charge, morphology, and drug-lipid compatibility. At optimized process conditions, Diclofenac sodium loaded SLNs showed spherical particles with a mean particle size of 450 nm and 60% Diclofenac sodium incorporation efficacy was achieved. The SLNs were evaluated for *in vitro* drug release, *ex-vivo* permeation studies. The SLN sustained the drug release for 6 h *in vitro*. The results suggest enhancement in ocular delivery of Diclofenac sodium with incorporating SLNs.

Special Issue: NCNN-2014

(National Conference on Nanoscience and Nanotechnology - 2014)

New Treatment for Psoriasis - With Help of Nanotechnology

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The chronic hyperproliferative diseases (CHD) include cancer, precancerous lesions and diseases of unknown etiology such as psoriasis. The causes of psoriasis are not fully understood. It is not purely a skin disorder and can have a negative impact on many organ systems. Psoriasis has been associated with an increased risk of certain cancers, cardiovascular disease, and other immune-mediated disorders such as Crohn's disease and ulcerative colitis. The effectiveness and safety of a new generation of targeted immune therapies is being established with randomized controlled trials, and several have been approved or rejected for safety concerns by regulatory authorities. No cure is available. Psoriasis was considered as one of the deadly disease of skin in ayurvedic granth. Psoriasis is a skin disease that usually contains raised, red patches covered with a build-up of dead skin cells. There are different forms of psoriasis include plaque, guttat, inverse pustular and erythrodermis. It is generally considered a genetic disease, thought to be triggered or influenced by environmental factors. Psoriasis develops when the immune system mistakes a normal skin cell for a pathogen, and sends out faulty signal that cause overproduction of new skin cells. It is not contagious. The recent announcement from the 2013 American association of pharmaceutical scientists conference entitled "Tropical treatment for psoriasis target deeper layer of the skin, improves healing", fits this mold. Although psoriasis can happen at any age, it is more common in people between 15 and 30 years of age and then later in life between 50 and 60 years of age.

Special Issue: NCNN-2014

(National Conference on Nanoscience and Nanotechnology - 2014)

Methodology in QSAR

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Quantitative structure-activity relationships (QSARs) are mathematical models that attempt to relate the structure derived feature of a compound to its biological or physicochemical activity. QSAR works on assumption that structurally similar compounds have similar activities. Therefore these models have predictive and diagnostic abilities. They can be used to predict the biological activity (e.g., IC₅₀) or class (e.g., inhibitor versus non inhibitors) of compounds before the actual biological testing. Quantitative structure-activity relationships (QSARs) attempt to correlate chemical structure with activity using statistical approaches. The QSAR models are useful for various purposes including the prediction of activities of untested chemicals. Quantitative structure-activity relationships and other related approaches have attracted broad scientific interest, particularly in the pharmaceutical industry for drug discovery and in toxicology and environmental science for risk assessment. An assortment of new QSAR methods have been developed during the past decade, most of them focused on drug discovery.

Special Issue: NCNN-2014

(National Conference on Nanoscience and Nanotechnology - 2014)

Formulation and Characterization of Clobetasol Propionate Niosome

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The aim of this investigation was to prepare, and characterize Clobetasol propionate niosomes using different ratio of cholesterol and nonionic surfactant by modified hand shaking, lipid film hydration technique. Formulations were characterized with respect to surface morphology, particle size, entrapment efficiency, zeta potential and drug permeation study. The above prepared optimized niosome were incorporated into carbopol-934 gel and compared for permeability study. Vesicle size was found in nanometer ranges which are optimum for delivery of drug through the skin. The student-t test was performed to determine the significance of the study. The study concluded that entrapment of drug into niosomes leads to prolongation of drug release, and improved permeation across the skin.

Special Issue: NCNN-2014

(National Conference on Nanoscience and Nanotechnology - 2014)

Scope & Importance of Virginal Delivery System

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The purpose of study is to highlight the scope and importance of vaginal drug delivery system. Several studies proven that vagina is an effective route for drug administration intended for local action as well as systemic action. This route offers many advantages due to its large permeation area, permeability to large molecular weight drugs, rich vascularization, avoidance of first pass metabolism and relatively low enzymatic activity. Through this route steroidal compounds, spermicidal agents are already delivered to obtain suitable therapeutics action for prolong period of time with minimal side effects. Recently the vaginal route has been investigated for peptide and protein drug delivery. This study is mainly focused on different aspects related to vaginal drug delivery systems along with their anatomy physiology and factors affecting drug absorption from the vaginal route.

Special Issue: NCNN-2014

(National Conference on Nanoscience and Nanotechnology - 2014)

Pro-stimulatory Potentials of Methemoglobin in Inflammation during Cerebral Malaria through Heme Polymer Formation

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Cerebral malaria (CM), a severe form of malaria causes life threatening complication. Methemoglobin (MetHb), released from infected RBC causes inflammation due to its ability to produce free radicals. MetHb can catalyze heme to heme polymer formation in the presence of hydrogen peroxide utilizing its peroxidase activity ($R^2=0.9722$). More-Over, peroxidase inhibitors and the substrate inhibits heme polymer formation further confirm the role of peroxidase activity in polymerization process. Methemoglobin process both substrates (H_2O_2 and hemin) specifically with a K_m value of 6mM and 9.33 μ M respectively to form heme polymer. The heme polymer has chemical and structural properties similarities with known synthetic heme polymer (β -hematin). In the presence of H_2O_2 , methemoglobin exhibits a spectral shift from 406nm to 417nm to form compound II. The addition of hemin substrate brings compound II (417nm) back to native enzyme (406nm) indicating hemin oxidation is a single e-oxidation process. PBN (spin trap) inhibits heme polymer formation in dose dependent manner with an $IC_{50}=25$ nM further support the role of heme free radicals with heme polymerization. The inflammatory potential of heme polymer was tested for its ability to stimulate macrophage to releases ROS. J774A.1 stimulation by heme polymer causes robust ROS production within macrophage and the accumulation of large amounts of ROS in the supernatant. Surprisingly, the addition of methemoglobin along with heme polymer has pro-stimulator effects. It synergistically up-regulates several fold high ROS production and accumulation compare to their individual effects. In summary, our study highlights additional pathway of methemoglobin mediated inflammation utilizing its peroxidase activity to form heme polymer and enhance ROS production in the vicinity. Hence, our work highlights use of peroxidase inhibitors as an adjuvant therapy to reduce the patho-physiological effects during cerebral malaria.

Special Issue: NCNN-2014

(National Conference on Nanoscience and Nanotechnology - 2014)

Nanotoxicity: An Unmet Challenge

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Any substitute ranging from 1- 100 nm, known as nanomaterials, constitutes the bearer of most advancing technology, nanotechnology. The toxicity from nanomaterials is due to their exceptional properties which are attributable to their small size, chemical composition, small size, surface structure, aggregation, solubility and shape. Over the past number of years several studies have indicated that nanomaterials produce ultimate impact on health and the environment. An important mechanism of nanotoxicity is the generation of reactive oxygen species (ROS). There are four main human routes of exposure namely: dermal, inhalation, ingestion and injection. Environmental routes of exposure are manifold. Most important examples are wastewater system and disposal of nanomaterials or products of research laboratories, manufacturing companies and household. Despite the widespread development of nanotechnology and nanomaterials very limited numbers of studies have been performed on the effects of nanoparticles on environment and health. In view of the fact that there are many different nanomaterials and that the risk they pose differ substantially depending on their properties, fundamental research is necessary so as to do a risk assessment for each of the specific variation of nanomaterial before it enters the market.

Special Issue: NCNN-2014

(National Conference on Nanoscience and Nanotechnology - 2014)

Medicinal Plants used as Anticancer Drug

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India is the largest producer of medicinal plants and is precisely called the "Botanical garden of the world". Herbal medicine are the widely used for various diseases as the content various types of antioxidant and related active constituent which help in building the healthy cells which help for healthy person. There are many diseases found in the world, cancer is also one of them which largely effect human beings. Plants an important role in cancer prevention, as well as in therapy. In the proliferation stage the cancerious cells are in maturation stage so that if we used herbal medicines like vinca, neem, turmeric, tulsi, ginger etc. The medicinal plants are easily available, cheaper, and acquire no toxicity as compared to the allopathic drugs. Plants played a dominant role in the development of traditional medicinal systems. The alkaloidal constituent of vinca like vinblastine, vincristine largely used.

Special Issue: NCNN-2014

(National Conference on Nanoscience and Nanotechnology - 2014)

Polymer Grafting: Novel Approach in Drug Delivery

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The modification of polymers has received much attention recently. Among the methods of modification of polymers, grafting is one of the promising methods. In principle, graft co polymerization is an attractive method to impart a variety of functional groups to a polymer. Graft co-polymerization initiated by chemical treatment, photo-irradiation, high-energy radiation technique, etc. In the past several years, there has been increased emphasis on applications of grafted polymers. The modified polymers through grafting have a bright future and their development is practically boundless. The excellent physiochemical attributes such as providing stability to the formulations, improves solubility of hydrophobic drugs, excellent swelling capacity and its biodegradability, impart bioavailability, drug targeting in a specific tissue and very weak antigenicity, made grafted polymer the primary resource in both pharmaceutical and medical applications.

Special Issue: NCNN-2014

(National Conference on Nanoscience and Nanotechnology - 2014)

Synthesis and Biological Activity of some Thiazole Compounds Containing and Azetidinones and Thiazolidinones Derivatives

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Thiazole, azetidinone and Thiazolidinones are some heterocyclic ring which possess many biological activities one of them are anti-inflammatory and analgesic activity and the drug which are available are less potent or dose required are very high. In these study attempt is made to remove both of these problems. Various 3-chloro-4 (4-substitutedphenyl) -4-methyl-1-(4-(2 (naphthalene-1-yl) hydrazinyl) thiazole-2-yl)1,3thiazolidin-4-one have been prepared by treating Naphthalen-1amine with hydrazine in alkaline condition to get 1- (Naphthalen-1-yl) Hydrazine, methanolic solution of these was treated with chloroacetyl chloride to get 2-Chloro-N'-(Naphthalen-1-yl)Acetohydrazide, the methanolic solution of these was refluxed with thiourea for 2-3 hrs to get 5-(2-(Naphthalen-1-yl)Hydrazinyl) Thiazolidin-2-Amine, the ethanolic solution of these was treated with substituted benzaldehyde to get (E)-N-benzylidene-5-(2-(naphthalen-1-yl) hydrazinyl) thiazolidine-2-amine. To the above product merceptoacetic acid and chloroacetyl chloride to get newly targeted compound. The structural assignments of compounds have been made on the basis of elemental analysis, IR, ¹H-NMR and mass spectral data. The synthesized compounds were screened for their in vitro anti-inflammatory activity against carrageenan induced rat paw oedema. The compounds were also tested for their analgesic activity against phenyl butazone against induced pain syndrome in mice at dose of 50mg/kg. Compounds 3 and 7 were found to be most active compounds of this series, which shows 28.5% and 29.8% inflammation inhibitory and 27.9% and 28.4% analgesic activities respectively compared to the standard drug. The compounds are prepared and tested for the spectral and biological activities some of the compounds had shown better activity than the standard drug but still further studies are requested.

Special Issue: NCNN-2014

(National Conference on Nanoscience and Nanotechnology - 2014)

Formulation of Sustained Release Tablets of Glipizide using *Hibiscus Rosa Sinensis* Mucilage

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Glipizide is an oral hypoglycemic drug prescribed for type II diabetic patients. This work aims to use *Hibiscus rosa-sinensis* leaf mucilage mucilage for formulation of sustained release glipizide tablets. Mucilage was extracted from *Hibiscus rosa-sinensis* leaves using acetone. The extracted mucilage was dried and triturated to fine powder. Glipizide tablet were prepared by wet granulation using extracted mucilage in different proportion. The formulated tablets were subjected to various evaluations like weight variation, hardness, thickness, friability, appearance and *in vitro* drug release. Drug excipient compatibility study was conducted using FTIR. The physical evaluation tests of tablets were well within the accepted limit. Comparison of FTIR spectrum of pure drug and formulation confirmed that there was no chemical interaction. The *Hibiscus rosa-sinensis* leaf mucilage sustained the release of drug. However, further studies must be carried out to improve the potential of *Hibiscus rosa-sinensis* leaf mucilage as release retardant.

Special Issue: NCNN-2014

(National Conference on Nanoscience and Nanotechnology - 2014)

Dual Drug Loaded Liposomes

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Curcumin is a functional food, which provides a wide range of health benefits including anti-cancer activity and considered as a suitable alternative for chemotherapeutic agents. The major barriers to the clinical usefulness of curcumin in the treatment of cancer is poor oral bioavailability. However, poor oral bioavailability of curcumin is mainly due to its poor aqueous solubility, intestinal metabolism, hepatic metabolism and rapid systemic clearance. These limitations can be overcome by formulating dual drug loaded liposomal formulation.

Dual drug loaded liposome is expected to increase the aqueous solubility and thereby increase the bioavailability of both curcumin and bio-enhancer. Bio-enhancer is expected to minimize intestinal and hepatic metabolism by a competitive mechanism and thereby increase the bioavailability of curcumin.

Hence several batches of liposomes were prepared for optimization. The solubility of pure curcumin and the prepared dual drug loaded liposomes were compared which confirm enhancement of the water solubility of the prepared combination. For bioavailability study, pure curcumin, a mixture of pure curcumin with bio-enhancer and dual drug-loaded liposomes were administered orally at the same dose level to three different animal groups. Blood samples were collected at fixed intervals. Blood samples for the presence of curcumin and bio-enhancer using a validated HPLC method. Bioavailability was calculated and compared with pure curcumin and pure curcumin with bio-enhancer and liposomal formulation. This formulation appears to be promising to overcome oral bioavailability limitations of curcumin.

Special Issue: NCNN-2014

(National Conference on Nanoscience and Nanotechnology - 2014)

Emerging as Promising Tool of Nanotechnology: Gold Nanoparticles

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The use of nanotechnology in cancer treatment offers some exciting possibilities, including the possibility of destroying cancer tumors with minimal damage to healthy tissue and organs, as well as the detection and elimination of cancer cells before they form tumors. A method being developed to fight skin cancer uses gold nanoparticles to which RNA molecules are attached. The nanoparticles penetrate the skin and the RNA attaches to a cancer related gene, stopping the gene from generating proteins that are used in the growth of skin cancer tumors. The applications of nanotechnology in commercial products, although most applications are limited to the bulk use of passive nanomaterials. Examples include titanium dioxide and zinc oxide nanoparticles in sunscreen, cosmetics and some food products; silver nanoparticles in food packaging, clothing, disinfectants and household appliances such as Silver Nano; carbon nanotubes for stain-resistant textiles; and cerium oxide as a fuel catalyst. Nanotechnology is being used in developing countries to help treat disease and prevent health issues. The umbrella term for this kind of nanotechnology is Nanomedicine. Gold nanoparticles are emerging as promising agents for cancer therapy and are being investigated as drug carriers, photothermal agents, contrast agents and radiosensitisers. This review introduces the field of nanotechnology with a focus on recent gold nanoparticle research which has led to early-phase clinical trials. In particular, the pre-clinical evidence for gold nanoparticles as sensitisers with ionising radiation *in vitro* and *in vivo* at kilovoltage and megavoltage energies is discussed.

Special Issue: NCNN-2014

(National Conference on Nanoscience and Nanotechnology - 2014)

Role of Chemistry in Nanoscience and Nanotechnology

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Chemistry is dealing with atoms and molecules; therefore it seems to be the paradigm of the vision of nanotechnology with smallest dimensions ranging from a few nanometres to less than 100 nanometres to build up new structures atom by atom. Chemistry has contributed to the invention and development of materials whose properties depend on nano scale structure which are historically been associated with colloids, micelles, polymer molecules, phase-separated regions in block copolymers, and similar structures. Nanoscience is beginning to produce new methods of characterizing the structures of the phase separated regions (which are often of nanometer dimensions), and thus provide ways of engineering these regions.

Special Issue: NCNN-2014

(National Conference on Nanoscience and Nanotechnology - 2014)

Nanotechnology in Cancer Therapy

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The word "Nano" is derived from the greek word (nanos) means dwarf. Nanotechnology is the study and use of structures between 1 nanometer (nm) and 100 nanometers in size. Nanoparticles can be defined as particles less than 100nm in diameter nanometer-sized particles have novel optical, electronic, and structural properties that are not available either in individual molecules or bulk solids. Nanotechnology has tremendous potential to make an important contribution in cancer prevention, detection, diagnosis, imaging and treatment. Nanomedicine application areas includes drug delivery, cancer therapy, diagnostic & imaging technique and antimicrobial techniques.

Special Issue: NCNN-2014

(National Conference on Nanoscience and Nanotechnology - 2014)

Natural Excipients: A Review

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The use of natural excipients to deliver the bioactive agents has been hampered by the synthetic materials. However advantages offered by these natural excipients are their being non-toxic, less expensive and freely available. The performance of the excipients partly determines the quality of the medicines. The traditional concept of the excipients as any component other than the active substance has undergone a substantial evolution from an inert and cheap vehicle to an essential constituent of the formulation. Earlier used natural excipients are Carrageenan, Thaumatin, lard, Shilajit, Aerosil, Myrobalan, Storax, etc. Excipients are any component other than the active substance(s) intentionally added to formulation of a dosage form. This article gives an overview of natural excipients which are used in conventional dosage forms, because they are less expensive, non-toxic effect and freely available or improving the quality of medicines.

Special Issue: NCNN-2014

(National Conference on Nanoscience and Nanotechnology - 2014)

Emerging Trend in Gold Nanoparticle

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Nanoparticles have extremely small size and high surface area hence their surfaces has been available for further modification with hydrophobic, hydrophilic, cationic, anionic or any neutral moieties to the surrounding environment so they have many application in biological sciences. Metal Nanoparticles attract strong interest both because they open up a new field in fundamental science and because of their potential technological applications. Gold Nanoparticles have a great application not only functionalities for specific drug delivery and cellular in bio sensing drugs but also in drug, gene and protein uptake scattering. Gold nanoparticles (Au NPs) have been brought to the forefront of cancer research in recent years because of their facile synthesis and surface modification, strongly enhanced and tunable optical properties as well as excellent biocompatibility feasible for clinic settings. Gold nanoparticles exhibit novel optical and catalytic properties, are nontoxic and biocompatible, and attract considerable interest in a range of applications, e.g. photonics, diagnostics, and therapeutics. The morphology (size and shape) of the nanoparticles and their surface/colloidal properties are very important in the various application

Special Issue: NCNN-2014

(National Conference on Nanoscience and Nanotechnology - 2014)

Recent Approches of Drug Delivery System: Microemulsion

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Microemulsion is a system of water, oil and amphiphilic compounds (surfactant and cosurfactant) which is a transparent, single optically isotropic and thermodynamically stable liquid. The droplets in a microemulsion are in the range of 0.1-1.0 μ m. As pharmaceuticals drug delivery systems, microemulsion have unique properties, including clarity, high stability and ease of preparation. Microemulsions able to protect labile drug, control drug release, increase drug solubility, and reduce patient variability. It provides protection against oxidation, enzymatic hydrolysis and improves the solubilization of lipophilic drugs and hence enhances their bioavailability. Microemulsions are also attracting the interest of researchers due to their potential as drug delivery vehicles, in other food and pharmaceutical applications, and in the petrochemical industry. In addition to oral and intravenous delivery, they are amenable for sustained and targeted delivery through ophthalmic, dental, pulmonary, vaginal and topical routes. Microemulsions have great range of applications and uses such as in pharmaceuticals, agrochemicals, cutting oils, biotechnology, food, cosmetics, analytical applications, environmental detoxification etc. The main objective of this review paper is to discuss microemulsions as drug carrier system with other possible applications.

Special Issue: NCNN-2014

(National Conference on Nanoscience and Nanotechnology - 2014)

Isolation and Comparative Study of Mucilage from Fenugreek Seeds

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In recent years, plant derived polymers have evoked tremendous interest due to their diverse pharmaceutical applications such as diluent, binder, disintegrants in tablets, thickeners in oral liquids, protective colloids in suspensions, gelling agents in gels and bases in suppository, they are also used in cosmetics, textiles, paints and paper-making . These polymers such as natural gums and mucilage are biocompatible, cheap and easily available and are preferred to semi synthetic and synthetic excipients because of their lack of toxicity, low cost, availability, soothing action and non-irritant nature. The present study was concerned with the isolation and comparative study of mucilage from Fenugreek (*Trigonella foenum-graceum* L.) seeds. The Mucilage was isolated by using alcohol or acetone as a solvent and the mucilage was characterize for all the parameters viz. solubility, swelling index, loss on drying and pH as per official monographs. From the performed experiment, it was found that the percentage of alcoholic mucilage (1.83 g) is more than the acetonic mucilage (1.68 g), while the other parameters were found almost similar

Special Issue: NCNN-2014

(National Conference on Nanoscience and Nanotechnology - 2014)

Nanotechnology and Insulin: A Perfect Marriage

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Insulin is considered as the final therapeutic agent against IDDM (Type 1 Diabetes) and NIIDM (Type 2 Diabetes) but its delivery is currently possible only through subcutaneous injection. This painful delivery mode has been the major cause of resistance coming from the patients to follow the strict dosing regimen. Oral and pulmonary delivery using nanoparticles and microparticles, therefore, has been considered as the "Golden Way" to overcome the problem of daily injection. Oramed Pharmaceutical, Israel has come out with an oral preparation named ORMD 0801 currently in phase 3 clinical trials while NIDDK and NICHD, USA are also engaged in phase 3 trial of their oral insulin candidate. Oral delivery through insulin encapsulation in polymeric nanoparticle is the most experimented method currently looked at. Chitosan, Chitosan/Alginate and PEG have been the most used polymers. Exubera (Inhaled powder insulin; Pfizer) was the first non-injectable marketed insulin preparation launched in 2006. Another pulmonary insulin formulation Afrezza [Technosphere Insulin (TI); Mannkind Corporation] has been approved recently by US-FDA in 2014. Thus, oral and pulmonary delivery of recombinant human insulin is definitely possible and would remove the use of painful parenteral route.

Special Issue: NCNN-2014

(National Conference on Nanoscience and Nanotechnology - 2014)

Liposomes and Nanotechnology in Drug Development a Recent Approach on Ocular Drug Delivery System: An Overview

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Poor drug delivery to lesions in patients' eyes is a major obstacle to the treatment of ocular diseases. The accessibility of these areas to drugs is highly restricted by the presence of barriers, including the corneal barrier, aqueous barrier, and the inner and outer blood–retinal barriers. In particular, the posterior segment is difficult to reach for drugs because of its structural peculiarities. This review discusses various barriers to drug delivery and provides comprehensive information for designing nanoparticle-mediated drug delivery systems for the treatment of ocular diseases. Nanoparticles can be designed to improve penetration, controlled release, and drug targeting. As highlighted in this review, the therapeutic efficacy of drugs in ocular diseases has been reported to be enhanced by the use of nanoparticles such as liposomes, micro/nanospheres, microemulsions, and dendrimers. Our recent data show that intravitreal injection of targeted liposomes encapsulating an angiogenesis inhibitor caused significantly greater suppression of choroidal neovascularization than did the injection of free drug. Recent progress in ocular drug delivery systems research has provided new insights into drug development, and the use of nanoparticles for drug delivery is thus a promising approach for advanced therapy of ocular diseases.

Special Issue: NCNN-2014

(National Conference on Nanoscience and Nanotechnology - 2014)

Bilayer Delivery System Based on Polymeric Composition for Effective Management of Inflammatory Bowel Disease

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The use of multiparticulate drug delivery systems in preference to single unit dosage forms for colon targeting purposes dates back to 1985 when scientist showed that multiparticulate systems enabled the drug to reach the colon quickly and were retained in the ascending colon for a relatively long period of time. Site-specific colonic drug delivery systems of anti-inflammatory drug with natural polymer were reported with pH sensitive polymer. Chitosan nanoparticles consisting of a hydrophobic core enteric coated with pH-dependent polymer of Eudragit series are proposed, for the effective delivery of drug to the colon for treatment of ulcerative colitis. Nanoparticles were prepared by ionotropic gelation method showed number of hurdle during process. We have optimized stirring speed, polymer composition and tripolyphosphate concentration to get nano size carrier with uniform distribution. Chitosan nanoparticles (CTNP) and Eudragit chitosan nanoparticles (ECTNP) was characterized for shape and surface morphology by scanning electron microscopy (SEM) appeared to be spherical in shape. The in vitro drug release was investigated using USP dissolution test apparatus in different simulated GIT fluids showed promising release. In vivo experiments are in further proceeding for fruitful results.

Keywords: Colon targeting, Nanoparticles, 5-amino salicylic acid and Eudragit

Special Issue: NCNN-2014

(National Conference on Nanoscience and Nanotechnology - 2014)

Optimization of Lipid Concentration for the Development of Anticancer Agent Based Ethosomal Formulation

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Cancer is the major drastic disease in present scenario. Skin cancer generally treated by conventional cream that leads skin irritation and low therapeutic effect. Development of vesicular carrier for the enhancement of transdermal flux is the major concern towards non invasive approach. In this study we developed lipid based elastic carrier using soya phosphatidyl choline, ethanol and 5-fluoro uracil as model drug. Developed carrier was characterized for vesicle size, size distribution and zeta potential. Transmission electron microscopy was used to estimate surface morphology. Entrapment efficiency of the prepared carrier was evaluated by sephadex G50 column method. Results showed spherical, unilamellar structures with low polydispersity, nanometric size and improved entrapment efficiency over other delivery formulations. *In-vitro* drug release studies revealed that initial burst release and then controlled release of bioactive. *In vitro* studies of 5-fluoro uracil across dialysis bag resulted in enhanced flux from elastic liposomes that was significantly ($P < 0.05$) greater than that with ethanolic drug solution, conventional liposomes or plain drug solution. Optimized formulation for *in-vitro* cell line study is selected for further studies and is under process.

Keywords: Ethosome, 5-Fluoro uracil, Transdermal delivery, In vitro release

Special Issue: NCNN-2014

(National Conference on Nanoscience and Nanotechnology - 2014)

Lecithin/Chitosan Nanoparticles for Transcutaneous Immunization

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Transcutaneous immunization is an attractive mode of immunization due to improved safety, ease of use over needles, availability of large application areas and better patient compliance due to painless administration. In present study, Chitosan/lecithin nanoparticles (LCNs) incorporating model antigen Ovalbumin (OVA) was prepared and evaluated for their immune stimulating efficacy following topical application. OVA loaded LCNs were prepared and characterized for size, shape, antigen loading efficiency, zeta potential and antigen integrity. In vitro permeation study was performed in rat skin using Franz diffusion cell. Skin penetration efficiency of LCNs was assessed by fluorescence microscopy. NPs were characterised by prolonged release profiles with an initial burst (approximately 25%), followed by a slow release phase. Immune stimulating efficacy of nanoparticles was assessed by measuring the antigen specific serum IgG antibodies following transcutaneous immunization in Albino rats and results were compared with the alum adsorbed OVA given intramuscularly and topically administered plain aqueous OVA solution. Result shows that optimal LCN formulations could entrap 38.12 ± 0.33 of initial antigen with particle size range of 283 ± 29 nm and negative zeta potential -17.2 ± 3.2 mV. OVA permeability from an LCNs suspension was significantly improved compared to the permeability of OVA from the solution ($P < 0.001$). LCNs provided 2.3-fold higher flux compared to OVA solution. Fluorescent counterparts of these particles were confirmed to accumulate deep in the epidermal region of skin. It was found that serum IgG titers after three consecutive high dose of topical administrations followed by booster doses at 14 and 28 days of OVA loaded LCNs were comparable with OVA/alum formulations given by intramuscular route, suggesting an effective stimulation of serum immune response. Results suggest that the investigated CLNs systems could be effective as topical delivery of vaccines.

once administered intramuscularly to form the depot. The aqueous phase transition method was used for determining the microemulsion region and optimizing the SMEDDS formulation. The optimized formulation was characterized by optical isotropy, FTIR, polarizing optical microscopy, particle size analysis, gelling behaviour and spreadability in aqueous environment at 37°C, optical microscopy, in situ gelling in chicken muscles and in-vitro drug release studies. The polarizing optical microscopy reveals the gelling of the formulation due to the polymer at the body conditions. The in-vitro drug release showed a sustained release of the SMEDDS formulation for seven days with a zero order release kinetics model. The sol-gel conversion of the formulation was confirmed at 37°C by formation of a gel in aqueous environment maintained at 37°C. The particle size analysis confirm the formation of a microemulsion a condition wherein the SMEDDS would enter the blood stream leaving the gel matrix and self emulsify. After viewing the results it could be concluded that SMEDDS based thermally triggered in situ gelling implant for sustained release of rifampicin can be an alternative approach wherein the dosage administration is once in a week and further the myotoxicity studies need to be performed to check the toxicity of the formulation.

Special Issue: NCNN-2014

(National Conference on Nanoscience and Nanotechnology - 2014)

Phytochemical Screening of Plant *Apium* *Leptophyllum* Seeds

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Phytochemicals are non-nutritive plant chemicals that have protective or disease preventive properties. They are nonessential nutrients, meaning that they are not required by the human body for sustaining life. It is well-known that plant produces these chemicals to protect themselves but recent research demonstrate that they can also protect humans against diseases. *Apium leptophyllum* is also traditionally known as a Carminative, Antibacterial, Antifungal, Anthelmintic, Anti inflammatory (used in rheumatic disorders, inflammation of the urinary tract), Diuretic, Carminative, Nervine, Sedative, Antiemetic, Antispasmodic, Antiseptic (used in bronchitis, asthma, as well as liver and spleen diseases), Emmenagogue, Tranquilizer and Anticonvulsant. Seeds are used in the treatment of chronic skin disorders including psoriasis. The medicinal properties of the plant are due to presence of various phytoconstituents such as Terpenes, Phenolic compounds, volatile oil, Cardioglycosides, Saponine, Flavonoids, Alkaloids, Glycosides etc. Present studies deals with the identification of phytochemicals present in Ethanolic and Aqueous extract of plant *Apium leptophyllum* seeds. It is expected that the important phytochemical properties recognized by our study will be very useful for future research and is very important commercially and has great interest in pharmaceutical companies for the production of the new drugs for curing of various diseases.

Special Issue: NCNN-2014

(National Conference on Nanoscience and Nanotechnology - 2014)

Regulation of Nanomaterials: Issues and Facts

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While the applications of nanotechnology are increasing by leaps and bounds their regulatory issues are gaining importances proportionately. Nanotechnology is concerned with the production of materials which have at least one dimension below 100 nm. Nevertheless, the definition of nanomaterials has been a matter of discussion since its inception. As the regulatory frame work of different countries is slightly different from each other various organizations and regulatory systems worldwide are attempting to harmonize the definition of nanomaterials. The leading organizations which modulates the nanomaterials are Federal Food Drug Administration and European Directive with the main aim of safeguarding the public health from unknown hazards of nanomaterials. Three guidance documents related to applications, effects and safety of nanomaterials have been published by FDA. This paper proposes the areas where there is an urgent need of attention. These include standardized test materials, specific safety protocol, control over nanoparticle contamination, efficient characterization method etc.

Special Issue: NCNN-2014

(National Conference on Nanoscience and Nanotechnology - 2014)

First Principle Study on Interaction of ZnO Nanoribbon and Polyethylene Glycol

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A density functional theory based first principle study is performed to understand the mechanism of interaction of ZnO molecules with a capping agent PEG. It is divided into three steps; first step is the optimization of single PEG chain, ZnO nanoribbon (ZNR) and PEG chain with ZNR. The structural analysis is a second step, where noticeable structural change is observed in ZNR in presence of PEG chain. In final step, the electronic structure study is performed and corresponding DOS, PDOS and band-gap are compared. A computational program SIESTA is used under density functional environment. This novel approach provides wide opportunities in photovoltaic applications.