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Review Article

A Review: Nanotechnology as a Noble Drug Delivery System

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ABSTRACT

Nobel drug delivery system refers to approaches formulation technology and system for transporting a pharmaceutical compound in the body as a needed to safety achieve desired therapeutic effect.is a system for drug other than conventional drug delivery system. It is a combination of advance that are technique and new dosage form which are better than conventional drug delivery system it Improves therapy by increasing the duration of action and reducing side effects increase patients compliances through decreases doing frequency and convenient route of administration. Achieve targeting of that drug to specific site to reduce unwanted side effects and obtain maximum efficiency this reduced its the dose and thud reduction in side effects of drugs .There are various challenges related the novels drug delivery system which are the location of drug targeting changes drug by activity and kinetics is Every patient has different metabolism, patient or the drug may respond differently efficiency times hard to clinical trials are expensive and difficult to conduct are of vaccine of drug delivery systems. This presentation explores the transformative potential of the microscopic carrier can precisely these targeted disease cells, minimize side effects and improves therapeutic efficacy compared to used are conventional drug administration discover the cutting-edge innovation poised to redefine system are particles as patient care and medical treatments. Novel drug delivery System refers to approaches Its formulation technology and system for transporting a pharmaceutical compound of the safety drugs. Precision medicine integrates nanotechnology to Diagnostic treatment symptoms disease disorder individual patient nanoscale materials for targeted delivery. Approaches also enable the combining diagnostics and therapeutic functions with a single nanoparticles System. The improves therapy by increasing the duration of action and reducing side effects therapeutic in the drug delivery system. Targeted Drug delivery: Nanocarrier like lipid nanoparticles can be engineered to deliver drugs directly to specified cells or tissue. The Patient has different metabolism patient of the drug delivery System. They Passes through of nanoparticles nanocarriers nanomaterials.

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INTRODUCTION

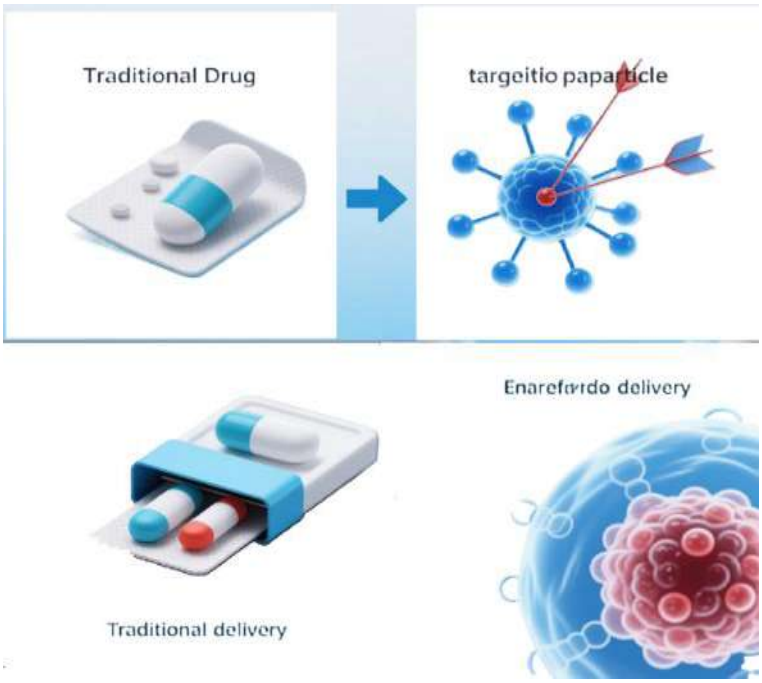
The Promise of Nanomedicine

Traditional drug delivery systems often involve systemic distributions meaning the drugs travels the entire body affecting both diseased and healthy cells. This can lead to the significant side effects and lowers drugs concentrations at the largest sites Nanoparticles typically 1 to 100 nm in size offers is a medicines revolutionary solution. Their scale allows them to the navigate biological barriers and the partials cells. The method by which a drug is delivered can have a significant effect on its Efficacy as Some drugs have an optimum concentration range with in which maximum benefits Its derived and concentration.

1.Precision at the Nanoscale: Nanoscale utilize material and devices at the nanoscale. It targeted delivery can be used usually are they such nanocarrier nanomaterial nanoscience of the pharmaceutical therapy agents of these are premise of nanotechnology with helps of these f the pharmaceutical sciences of the industries.

2.Diagnostics and Imaging: Nanomaterial can improve the sensitivity and specificity of diagnostics tools and imaging techniques it is usually such as therapeutic effects the diagnosis treatment symptom disease disorder of these they help us then of diagnostics in therapy the nanoparticles of used in the sensitivity of the nano technology in the laboratory in the diagnostic centre. The pharmaceutical & nanomedicine of drugs.

3.Medicine & technology: Nanotechnology contributes to personalized approaches in regenerative medicine in the laboratory fields in the sciences of the prevalent of the technique in the used in the diagnostic centre medicine they used in the laboratory field in the technology in the - pharmaceutical's fields in the sciences.



Figure(1):-The promise of nanotechnology & nanomedidine

History of Nanotechnology:

Even through nanotechnology seems like as aspects of science its utilization by humanity is not

novel at all. The history of nanomaterials usages in construction dates back to 4500 years ago when natural asbestos used utilizes for ceramic matrices one of the oldest richest and progressive cultures globally Egyptians realized the capabilities of nanomaterial 4500 years ago. The journey of the nanomaterials and nanotechnology made throughout history before millennial. Nanoparticles are objects ranging in size from 1 to 100 nm The NPs are produced at the nanoscale and quantified and manipulated Currently, many nano-substances are made with the help of this emanating nanotechnology with occupies important scientific research. The helps used they in the structure.

Controlled drug delivery System:

Controlled drug delivery system maintains suitable and desired drug release over and extended time period and oral administration of drugs has been the most common and preferred route for delivery of the most therapeutic agents. The role of drug delivery system today to take a therapeutically the effective molecule with sub optimal physiochemical or physiochemical properties and development that will still be therapeutically effective added benefits of the controlled drug delivery system drugs.

Diffusion control drug delivery system:

In this drug delivery system, the rate controlling step is the diffusion of dissolved drug molecule the through the rate-controlling element (insoluble non-erodible and non- degradable and not the drug dissolution rate.

Erosion control drug delivery system:

Erosion is the physical disintegration of a polymer/wax matrix or coating a result of pharmaceutical sciences and technology of the therapeutically control drug delivery system.

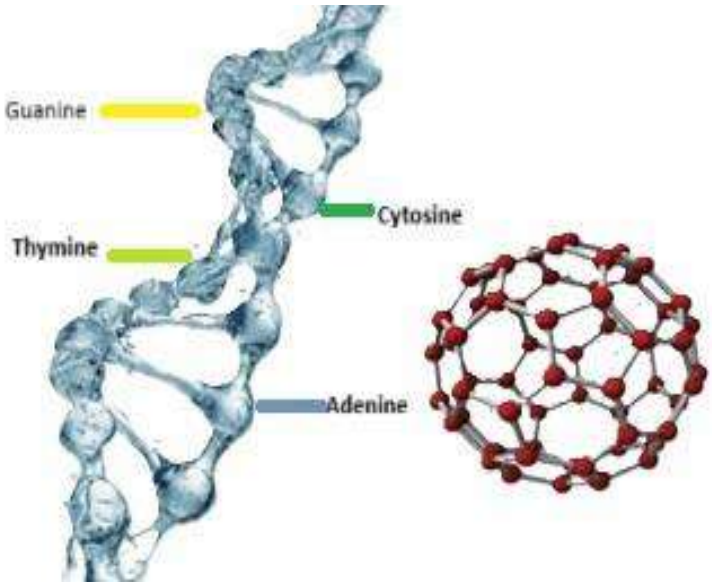


Figure (2): -Nanotechnology is DNA technology

METHODOLOGY

Enhancing Therapeutic Outcomes and Targeted Delivery System

To understand the nanoparticles can deliver drugs directly to specific disease sites reducing system toxicity. Target drug delivery system to be a major innovation in the pharmaceuticals fields. Therapy

typically involves delivering drugs to a specific target drug. These drugs are the medicines and therapeutic agents of the noble drug delivery system of healthcare of nanomedicine and nanomaterial & nanocarrier. Which provide an enhanced way to address atherosclerotic lesions by delivering therapeutic agents of These methods are often used interchangeably or in combination to combat diseases and system.

Improved Bioavailability To explore nanotechnology enhance drug absorption and stability leading to better therapeutic It is usually the microphase it is the therapeutic agents in the biological source of drugs these the goal therapy Nanotechnologies are making a compelling contribution in this area through the development of novel modes for drug delivery and some of these method proven these effective in clinical setting and are clinically used drugs of the bioavailability of nanoparticles drugs.

Reduced Side effects: To highlights the potential of nanoparticles to minimize adverse this reaction protecting healthy tissues from drug exposure A perfect drug delivery system two elements control over drug release and the targeting Ability Side effect the specifically targeting and killings harmful rancorous cell. The agents which are used in the therapeutic agents and drugs delivery system the Additionally controlled drug release can also reduce the side effects of Drugs benefits of the drugs nanoparticles novel drug delivery system includes minimized irritant reactions and improved these penetrations within the body due to their small size of these side effects of the nanoparticles drugs

Future Applications: The present emerging trends and potential break in nano nanoparticles drugs delivery across various medical fields. The cancer worldwide highlighting the need for an accurate detection method and novel drug delivery system that is more specific efficient and exhibits sides effects. Anticancer treatments are often regarded as superior therapeutic effects.

Macrophase disorder and Improved bioavailability:

The disease development disorder:

Strategies to regulate macrophase by nanomedicines for disease treatment:

They relevance between various disease and macrophases, have become an impoirtant therapeutic target in different diseases macrophages play different roles so they need to be regulated from the differents aspects such as macrophages depletion macrophages re-polarization and inhibitions of macrophase infiltration. In response to these strategies there have been a variety of corresponding nano formulations these treported. The uses of nanostructures to encapsulates drugs has shown Strategies for macrophases-targeting delivery. Nanomedicine a promising drug delivery candidate which gives elegant solutions address both pharmaceutics and biopyharmaceutics issues of various drugs, such as poor of these solubility limited bioavailability.They drug agents caused in the sources of the drugs is used for the pharmacokinetic and pharmacodynamics is the nanoparticles novel drug delivery system.

Activated modulated drug delivery system:

In this drug delivery system these the drug release is controlled or activated gby some physical and bilogical process or by any applied process reduction. This activatiuon process can be classified into the following categories:

1.Activation by physical process 2.Activation by chemical process 3.Activation by biological process

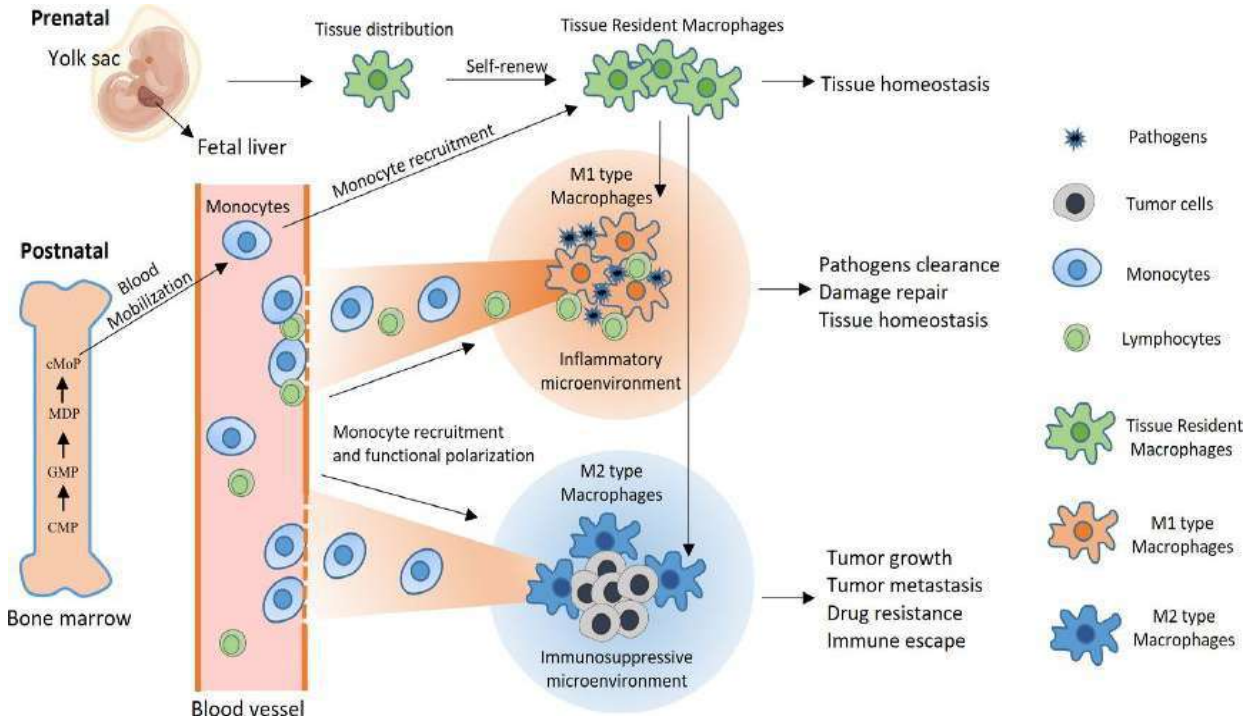


Figure (3) :- Macrophase disorder or Improved bioavailability

Nanoscience drug dose specifications & Reduce side effects

Nanoscience has revolutionized the pharmaceutical industry by enabling the production of improved therapeutics drugs with enhanced efficacy and lower toxicity various Nanoparticles can improve the pharmacokinetics of the drugs by increasing their solubility stability and bioavailability. They can also targeted specific tissues and cells side effects and enhancing their efficacy. The nanoparticles size and unique physiochemical properties of nanoparticles demand precise specifications in terms of drugs dose and administration and the pharmaceutical and the nanotechnology in the production of agent. The nanoscale size and unique physio chemicals properties of nanoparticles demand precise of these specifications in term of drugs doses and administration furthermore nanoparticles careful reduced consideration of their dose researchers need to determine the optical dose range frequency duration of nanoparticles. There is the microencapsulation this process in which solid liquid or gaseous phase.

Microsphere:

Microsphere are small spherical free flowing particles having diameter of 1000 microns. They consist of biodegradable proteins or synthetic polymer the Microsphere are two types i.e. microcapsule and micrometrics.

Microcapsules:

Microcapsules are small sphere having uniforms wall surrounding medicine. These used diameter of microcapsules usually ranges between a few micrometres to a few meters.it should be the abilities of drug solution.

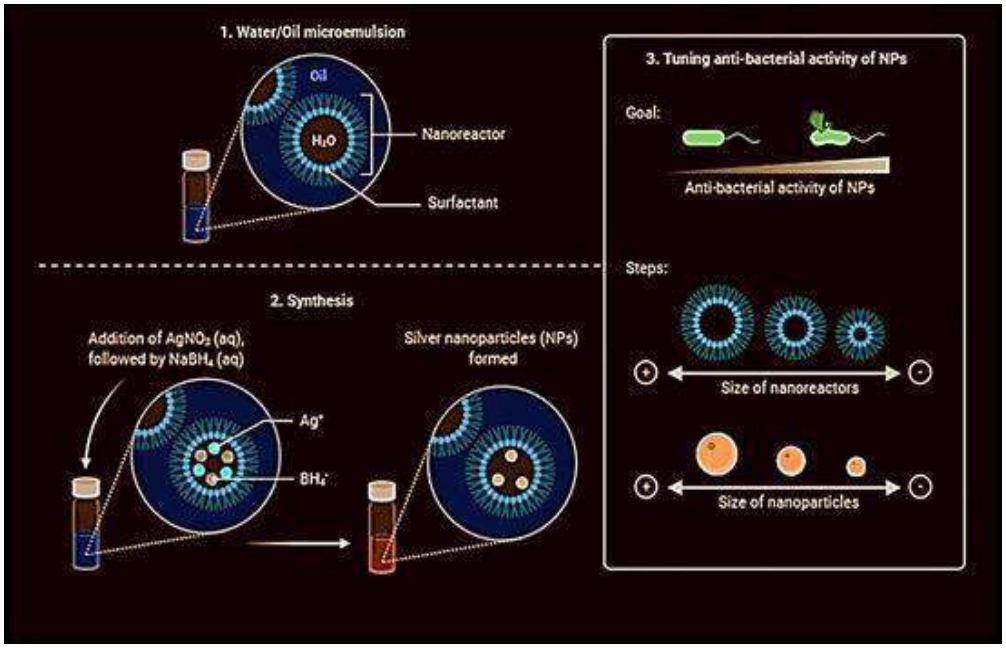


Figure (4)-: Nanoscience and drug dose specifications and reduce side effects

Future of nanomedicine & drug delivery system and future applications

Nanomedicine are particles measured in nanometre a scale so small that a single human hair is roughly 80,000 to 100,000 nanometres wide. At this scale, materials behave differently gaining properties that can be harnessed for medical purpose. They can slip through biological barriers interact with tissue. The future medicines of the therapeutic agents of the pharmaceutical agents It is usually the healthiest are very humorous sector in the fields such as patients and consultation of the doctor office in the health sector in pharmacy. Liposomes can encapsules both water-soluble and fat-soluble drugs protecting from degradations until they are reaching their destination such as:

Polymeric nanoparticles: Polymeric nanoparticles can be engineered to release their payload slowly over time. Metallic nanoparticles can be heated withy infrared lights to destroy tumours directly the versatility is staggering of the nanomedicine in the outcomes in the laboratories drugs the nanoparticles.

Therapeutic agents: The surface of nanoparticles can be functionalized with molecules that act as like homing devices guiding specific cells or tissues. They can recognize receptors overs expressed on cancers cells or inflamed tissues, ensuring that therapeutic agents.

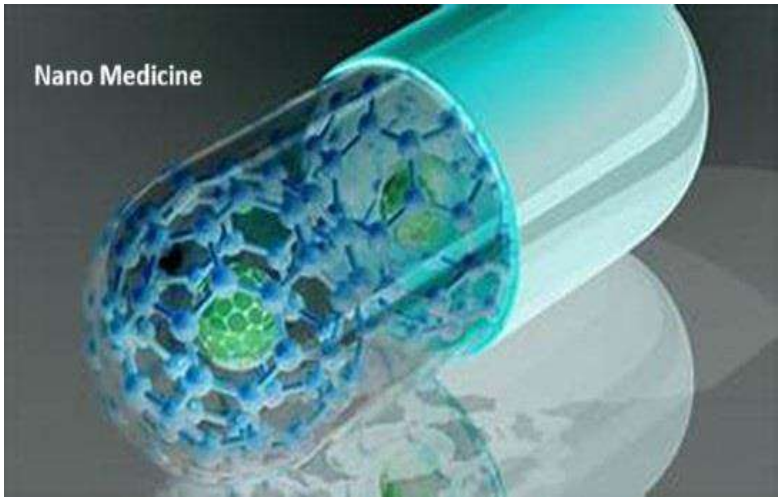


Figure (5):- Future of nanomedicine & drug delivery system

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An acknowledgement for a noble drug delivery system (NDDS) research paper typically recognized visit academic platforms like research gate and Slide share where paper often have acknowledgement section included within their specific papers on novel drug delivery systems such as those focusing on herbal drugs using search like noble drug delivery system acknowledgement on the platforms such as; -

1.Go to research gate: these platforms host numerous academic articles reviews and presentation on various topics including novel drug delivery system.

2.Use to search functions: On either site type in keywords like noble drug delivery system acknowledgement or a more specific title you might be looking for.

3.Locate the acknowledgement section: The acknowledgement section is typically found at the end of the document after the references and before the main body of the paper.

CONCLUSION

Nanotchnology offers the ability to build large number of products that are incredibly they powerful by todays standards.This possibility creates both opportunity and risk.It would be diffficult the deny the potential benefits of nanotechnology and stop development of research related to it since it has already begun to penetrate many different fields of research related to since it has already begun to penetrate is many different fields of research.However nanotechnology can be developed they using guidelines to that the technology does not become to potentially harmful.Humans have the potential to live healthier lives in the near future of the nanomedicines innovations of nanotechnology like this diagnosis,prevention and treatment of diseases,better drug delivery system with minimal side effects and tissues reconstructions. The developments of nanoparticles helps the nanoparticles it is used for basically of nanoparticles as a nobel drug delivery system.

REFERENCE

1. Therapeutic nanoparticles: Principles by Vinod Tiwari & Robert J. Lee. (ISBN: 978-0-470-49651-7).

2. Nanomedicine: Nanotechnology & Medicine (Elsevier Journal)- A leading journal for cutting-edge research.
3. Nanoparticles novel drug delivery system: Principles by J. W. Burgess & S.L.W. Lickert (ISBN:978-0-470-49651-7). Shailesh & Prajapati, Dr. R. Manivannan
4. Nanomaterial Noval Drug Delivery system Thakur Publication PVT.LTD Lucknow.
5. Aijaz Sheikh, Dr. Subhash V. Deshmukh, Dr MD. Rajeev & Md. Usman Novel drug Delivery System, S. Vikas company.
6. Luta & Maria, Gheorghe. (2012). Semi-empirical vs mechanistical kinetic models used to design drug delivery System UPB Scientific Bulletin, Series Chemistry & Materials Science. 74.99-112.
7. J P GRIFFIN b.sc, Ph.D., MB BS, FRCP, FRCP., FFPM, PF DARCY OBE b pharms, Ph.D., d.sc, (Hon), pharms, Chem, FRSC, FPSNI In A Manual of Adverse Drug Interactions (Fifth Edition), 1997.
8. Huynh, Cong Truc & Lee, Dong-Sheng. (2014). Controlled Release. Encyclopedia of Polymeric Nanomaterials, 2014 1-12.
9. 10.1007/978-3-642-29648-2_314.Keshari Roshan*, Rathore KS. Meenakshi, Mishra AMU Bhupal Nobels Institute of Pharmaceutical Science, Udaipur, Rajasthan, India.
10. A Comprehensive Study on Design Trends & Future Scope of Implantable Drugs Delivery System Kritika Ramesh and Shagun Gupta and Suhaib Ahmed & Kakkar. Vijayakumar & Subramanian, K. (2016). Drug Carriers, Polymers as: Synthesis Characterization & in Vitro Evaluation.10.1081/E-EBPP-120050597.
11. Mandal, Uttam & Chatterjee, Vapidity & seniti, Faria (2016). Gastro-retentive drug delivery Systems and Their in Vivo Success. A recent update. Asian Journal Pharmaceutical sciences. 11.575-584.10.1016/j.ajps.2016.04.007.
12. Emerich DF, Thanos CG. Nanotechnology and medicine. Expert Opine Boil Ther 2003; 3:655-663.
13. Sahoo SK, Alabaster V. Nanotech approaches to drug delivery and imaging. Drug Discover Today 2003; 8:1112- 1120.
14. Williams Nanotechnology: a new look. Med Device Techno 2004; 15:9 - 10.
15. Cheng MM, Cuda G, Brnovich YL, Gaspari M, Heath JR, Hill HD. Nanotechnologies for biomolecular detection and medical Diagnostics. Opine Chem Boil 2006; 10:11 - 19.
16. Matsuda M, Hunt Nanotechnology and public health. Nippon Keshu Eisei Zachs 2005; 52:923-927.
17. Chan WC. Bio nanotechnology progress and advances' Blood Marrow Transplant 2006; 12: 87 - 91.
18. Matsumura Y, Maeda H. A new concept for macromolecular therapeutics in cancer chemotherapy: mechanism of tumour accumulation of proteins and the antitumor.
19. Agent smacks. Cancer Res 1986; 46: 6387-6392. The mediated drug delivery to the brain. Adv Drug Deliv Rev 1999; 36: 299-321. Anderson A, Allan S, Petersen A, Wilkinson framing of nanotechnologies.
20. Ajayan PM, Ebbesen TW. tubes of carbon. 2003; 60: 1025-1065.
21. Hughes GA. Nanostructure-mediated drug delivery Nanomedicine. Drug Discovery Today 2005; 10:1435-1442.
22. Mu L, Feng SS. A novel controlled release formulation for the anticancer drug paclitaxel (Taxol): PLGA nanoparticles containing vitamin E TPGS. J Control Release 2003; 86:33
23. Lin Y, Rao AM. Bon nanotubes with J Phys Chem B 2002;106: 1294 -1298. Wu W,

Wieckowski S, Pastorin G, Benincasa M, Klumpp C, Briand JP.

24. Amphotericin B to cells by using functionalized carbon nanotubes. Chemical Intstitutes2005; 44: 6358-6362. Liu Z, Tabakman S, Welsher K, Dai H. Carbon Nanotubes in
25. Biology and Medicine: In vitro and in vivo detection, imaging and drug delivery. Nano Res 2009; 2: 85-120.
26. Desai TA, Chu WH, Tu JK, Beattie GM, Hayek A, Ferrari M. Microfabricated immune Biotechnology 1998; 57:118-120.
27. Leoni L, Desai TA. Nanoporous for the encapsulation of insulinoma cells: and biocompatibility considerations. IEEE Trans Biomed Eng 2001; 48:1335-1341.
28. Freitas RA. Current status of nanomedicine and medical nanorobotics. Theor Nanotechnology science 2005; 2:1-25.

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