25th World Nanotechnology Congress

July 11-12, 2022 Singapore City, Singapore

Journal of Information Technology & Software Engineering

Volume 12 Issue 5 | ISSN: 2165-7866

Biopharmaceutics and Therapeutic Potential of Engineered Nanomaterials

Osman Yavuz
Firat University, Turkey

Abstract (600 word limit

Engineered nanomaterials are at the leading edge of the rapidly developing nanosciences and are founding an important class of new materials with specific physicochemical properties different from bulk materials with the same compositions. The potential for nanomaterials is rapidly expanding with novel applications constantly being explored in different areas. The unique size-dependent properties of nanomaterials make them very attractive for pharmaceutical applications. Investigations of physical, chemical and biological properties of engineered nanomaterials have yielded valuable information. Cytotoxic effects of certain engineered nanomaterials towards malignant cells form the basis for one aspect of nanomedicine. It is inferred that size, three dimensional shape, hydrophobicity and electronic configurations make them an appealing subject in medicinal chemistry. Their unique structure coupled with immense scope for derivatization forms a base for exciting developments in therapeutics. This review article addresses the fate of absorption, distribution, metabolism and excretion (ADME) of engineered nanoparticles in vitro and in vivo. It updates the distinctive methodology used for studying the biopharmaceutics of nanoparticles. This review addresses the future potential and safety concerns and genotoxicity of nanoparticle formulations in general. It particularly emphasizes the effects of nanoparticles on metabolic enzymes as well as the parenteral or inhalation administration routes of nanoparticle formulations. This paper illustrates the potential of nanomedicine by discussing biopharmaceutics of fullerene derivatives and their suitability for diagnostic and therapeutic purposes. Future direction is discussed as well. The accumulating investments and efforts in nanotechnology are expected to lead to new technological breakthroughs and increase in the applications of nanomaterials in medicine in the near future . Engineered nanomaterials are being exploited in many different biological and medical fields due to their unequaled photo/electro-chemical and physical properties. Multifunctional nanoparticles play important roles in cancer diagnostics and therapeutics. Particles and their aggregates can be broken down to even smaller particles via milling and/or dispersion—a distinct process to generate nanoscale particles rather than solvated materials. The translocation and distribution of nanoparticles in the body is size-dependent. Hence, the adverse effects of nanoparticles may not be easily predicted or derived from the known toxicity of the same chemical constituent at micro-size. There is a need for the information on the biopharmaceutics (ADME) of these man-made nanoparticles. Dissolution, translocation, deposition or excretion is critical for nanoparticles to exert their biological effects within the body. This increase in surface area would cause chemical modifications at the surface and generate additional physico-chemical and /or biological activities that the corresponding large particles may not possess. Furthermore the increase in particle surface would allow insoluble, labile particles or even particle core to carry more reactive molecule species, and ultimately produce either beneficial or adverse biological effects. Metabolism of many nanomaterials has not been studied in detail. Most metabolic studies on nanomaterials employed the traditional analytical methods to compare the results from the nanoscale with the non-nanoscale materials. Although the requirements for studying the biodistribution /toxicokinetics and mutagenicity/genotoxicity of nanoparticles are similar to those used for studying conventional micro or macro sized materials, the specific characteristics of nanoparticles may require additional considerations of methodologies to measure the unique features of distribution and metabolism of nanoparticles. For example, the present genotoxicity tests for novel chemotherapeutic agents in vivo do not cover the expected target organs or tissues where nanoparticles deposit.

Importance of Research(200 words)

Full-scale research and development initiatives for nanotechnology in many countries were spawned by the National Nanotechnology Initiative, announced in January 2000 under Clinton's administration [1]. The NNI stresses long-term research looking 20 to 30 years ahead, on the conviction that prioritizing basic and challenging research will lead to breakthrough technological developments. Chinese government is also investing and committing to nanotechnology. In the past years the number of publications on nanotechnology originating from China rose to several hundreds per year, which is exceeded only by the United States. The high number of papers at recent nanotechnology conferences in China provides evidence of vigorous research and development that is being carried out by Chinese researchers, and shows the extensive commercialization efforts being made around Shanghai and Beijing. The establishment of the National Center for Nanoscience and Technology of China at Beijing and the National Engineering Research Center for Nanotechnology at Shanghai are good indicators of the high level of interest. There is special interest in combining nanotechnology with traditional Chinese medicine, because nanoformulations may greatly increase therapeutic efficacy of traditional Chinese medicine, and improve its standardization, modernization, and internationalization. Multifunctional nanoparticles play important roles in cancer diagnostics and therapeutics

Journal of Information Technology & Software Engineering

Volume 12 Issue 5 | ISSN: 2165-7866

.

Biography: (200 words)

Dr. Osman Yavuz graduated from Department of Physics, Ankara University, Turkey in 1974 and received PhD- degree from Dicle University, Diyarbakir-Turkey. He studied at Surrey University, Guildford, UK, as a post doctoral research scientist in 1986-1987, and his studies focused on shape memory alloys. He worked as research assistant, 1975-80, at Dicle University and shifted to Firat University in 1980. He became professor in 1996, and he has already been working as professor. He published over 50 papers in international and national journals; He joined over 100 conferences and symposia in international and national level as participant, invited speaker or keynote speaker with contributions. He served the program chair or conference chair/co-chair in some of these activities. In particular, he joined in last four years (2014 - 2018) over 50 conferences as Speaker, Keynote Speaker and Conference Co-Chair organized by South Asian Institute of Science and Engineering. He served his directorate of Graduate School of Natural and Applied Sciences, Firat University in 1999-2004. He supervised 5 PhD- theses and 3 M.Sc theses. He is also Technical committee member of many conferences. He received a certificate which is being awarded to him and his experimental group in recognition of significant contribution of 2 patterns to the Powder Diffraction File – Release 2000.

Information of institute & lab

Fırat University is a state university based in Elazığ, Turkey. The university was founded in 1975 and named after the Turkish name of the Euphrates River which originates near Elazığ. Fırat University, which has a deep-rooted history, started its educational services in Elazığ, a city with cultural richness. Then, it has become a higher education institution that contributes significantly to the progress of higher education in the Eastern and Southeastern Anatolia Region by establishing higher education institutions and training personnels with its postgraduate activities particularly in Elazığ's towns and in Bingöl, Muş, Tunceli and in Kemaliye – a town of Erzincan .Initially, a High Technical School was opened in Elazığ in 1967, and in the same year, the decision of Ankara University that sets forth being established of the Faculty of Veterinary Science in Elazığ was approved by the Ministry of National Education.The High Technical School was transformed into the Elazığ State Engineering and Architectural Academy (ESEAA) with the law no. 1184 in 1969, and the Faculty of Veterinary Science started education in 1970 being dependent on Ankara University.

Recent Publications

1. Jia L. Global governmental investment in nanotechnologies. Curr. Nanosci. 2005;3:263–266.
2. Whitesides GM. The 'right' size in nanobiotechnology. Nat. Biotechnol. 2003;21:1161–1165.
3. Seaton A, Donaldson K. Nanoscience, nanotoxicology, and the need to think small. Lancet. 2005;365:923–924.
4. Mazzola L. Commercializing nanotechnology. Nat. Biotechnol. 2003;21:1137–1143.
5. Paull R, Wolfe J, Hebert P, Sinkula M. Investing in nanotechnology. Nat. Biotechnol. 2003;21:1144–1147.
6. Roszek B, de Jong WH, Geertsma RE. Nanotechnology in medical applications: state-of-the-art in materials and devices. 2005 RIVM report 265001001/2005.
7. Jia L. Nanoparticle formulation Increases oral bioavailability of poorly soluble drugs: experimental evidences, theory, and approaches. Curr. Nanosci. 2005;3(1):237–243.
8. Oberdorster G OE, Oberdorster J. Nanotoxicology: An Emerging Discipline Evolving from Studies of Ultrafine Particles. Environ. Health Perspect. 2005b;113:823–839.
9. de Jong WH, Roszek B, Geertsma RE. Nanotechnology in medical applications: possible risks for human health. 2005 RIVM report 265001002/2005.
10. Zhao Y, Nalwa HS. Nanotoxicology. California: American Scientific Publishers; 2007. 2007.
11. Nel A, Xia T, Madler L, Li N. Toxic potential of materials at the nanolevel. Science. 2006;311:622–627.
12. Hoet PH, Bruske-Hohlfeld I, Salata OV. Nanoparticles - known and unknown health risks. J. Nanobiotechnol. 2004;2:12.
13. Liu Y, Wang HF. Nanotechnology tackles tumours. Nat. Nanotechnol. 2007;2(1):20–21.
14. Jia LW, Cerna C, Weitman S. Effect of nanonization on absorption of 301029: Ex vivo and in vivo pharmacokinetic correlations determined by LC/MS. Pharm. Res. 2002;14:1091–1096.
15. Bittner B, Mountfield RJ. Intravenous administration of poorly soluble new drug entities in early drug discovery: the potential impact of formulation on pharmacokinetic parameters. Curr. Opin. Drug Discov. Dev. 2002.