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ZnO nanoparticles a useful candidate to arrest the cancer cells of human hepatocellular carcinoma, human breast adenocarcinoma and their antibacterial activity

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Liver and breast cancer are the most shattering disease, which affects the major organs of the body. The nanoparticle of ZnO has a property to the entry into the body through any of the possible routes. Therefore, the aim of the present study was to investigate the activity against HepG2 and MCF-7 Cells, with zinc oxide nanoparticles (ZnO-NPs). The NPs (~13±2 nm) were prepared via non protonated chemical route and characterized with the standardtechniques such as X-ray diffraction spectroscopy used to know the crystalline property of NPs whereas, the morphology, functional and optical analysis were performed with FE-SEM, TEM, FTIR, UV visible spectroscopy respectively.The study shows that the treatments with NPs are very effective on HepG2 and MCF-7 cancer cells at dose dependant manner. The MTT assays revealed the concentration dependent cytotoxic effects of NPs in range of 2.5-100 µg/ml. HepG2 and MCF-7 cells were exposed to ZnO-NPs and it exhibited significant reduction (5% and 4%; $p<0.05$) at a very low concentration 25 µg/ml and justified with FACS data. Thus, the reduction in cell viability with NPs induces cytotoxicity in cultured cells. Quantitative RT-PCR demonstrates, exposure of HepG2 cells to ZnO-NPs and the level of mRNA expressions (Bax, P53, and Caspase-3) were significantly up-regulated, whereas the anti-apoptotic gene (Bcl-2) were down-regulated. The NPs were also tested against five pathogenic (*E.coli, S.aureus, P. aeruginosa,B. subtilis and S.acidaminiphila*) bacteria and compared with salt of ZnO via disk diffusion method and it's found that NPs achieved good inhibition of microbial strains.

Biography

Rizwan Wahab is working as an Assistant Professor in the department of Zoology, College of Science, King Saud University, Riyadh, Saudi Arabia. He worked for his doctorate degree in the department of Chemical Engineering, Chonbuk National University, Jeonju South Korea in 2008. He has published 40 international papers in reputed Journals on the topic of fabrication of nanostructures and their applications such as microbiology, cell biology, DNA damage, biosensing, photocatalysis etc. He worked on several projects such as novel bio-devices by Nano-bio fusion technology and their applications. His current research interest is applications of nanostructures for the anticancer and antimicrobial study.

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Rapidly growing potential of nanotechnology in healthcare, environmental monitoring and industrial settings

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Nanotechnology has paved the way to numerous prospective applications in healthcare, environmental monitoring and industrial settings during the last decade. It has led to significant improvements in biomedical diagnostics, assays, drug delivery, biomedical imaging, therapeutics, water purification, environmental monitoring, food packaging, textiles and (bio) analytical sciences. There have been tremendous advances in the production, modification, functionalization and characterization of nanomaterials apart from the formation of nanocomposites with polymers and/or nanomaterials. The rapidly growing potential of nanotechnology has generated tremendous technology push. It is expected that the nanotechnology-based products will have extensive commercial potential in the coming years. Presently, the formulation of international regulatory guidelines to evaluate the safety of nanomaterials is the most challenging task for the scientific community and the regulatory authorities. Moreover, there is a critical need for nanotechnology-based products to comply with the healthcare, industrial and bioanalytical guidelines and requirements. The rising awareness for all these issues has already intensified the international efforts to tackle these critical challenges. Therefore, the next decade will witness increased nanotechnology-based applications in healthcare, environmental monitoring and industrial settings, which will have a huge technology impact.

Biography

Sandeep Kumar Vashist completed his Ph.D. from Central Scientific Instruments Organisation, India in 2006. He was Scientist at Bristol-Myers Squibb Company, Ireland (2006-2009), Team Leader at NUS Nanoscience and Nanotechnology Initiative, Singapore (2009-2012) and presently, the Head of Immunodiagnostics at HSG-IMIT, Germany. His outputs include many technology transfers, patents and >100 publications in reputed journals and conferences. He has received prestigious fellowships and awards from renowned institutions for scientific excellence. He is Executive Editor of *J Basic Appl Sci* and *J Pharma Bioanal Sci;* Editorial Board member of *J Nanomed Nanotech,* and expert reviewer for many journals and funding agencies.

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