National Institute of Technology Rourkela

Departmental Seminar

Seminar Title	: Unveiling the bioactive components of corona responsible for the enhanced Antimicrobial and cytotoxic propensity of zinc oxide nanoparticle synthesised using extracts of eucalyptus globulus, mangifera indica, and tagetes erecta
Speaker	: Kumari Subham (Roll No: 519ls1006)
Supervisor	: Santosh Kumar #2787
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Abstract	: INTRODUCTION: Medicinal plants have their own biological activity and act as a better reducing and capping agent for metal ions to turn into respective metal nanoparticles. Metal NPs synthesized by biological means show better antimicrobial propensity and anti-cancerous activity than their chemical counterparts. However, the exact reason behind this is still obscure, and the need of the time. AIM AND OBJECTIVE: To unveil the bioactive components of corona responsible for the enhanced antimicrobial and cytotoxic propensity of zinc oxide nanoparticle synthesised using extracts of Eucalyptus globulus, Mangifera indica, and Tagetes erecta. METHODS: Zinc oxide nanoparticles were biofabricated using different plant extracts and characterised using a combination UV-Vis spectroscopy, DLS-ZETA, FTIR, XRD, and TEM followed by phyto-corona characterization using GC-MS. Antibacterial efficacy was investigated against Bacillus subtilis and Escherichia coli through broth microdilution assay, with MIC determination. Anticancer activity was evaluated against adenocarcinoma human alveolar basal epithelial cells (A549) using Alamar blue dye reduction assay and cell viability was measured. To trace the mechanism behind antimicrobial and anti-cancerous activity internalization and ROS studies were conducted. RESULTS: The characterization of biofabricated ZnONP showed spherical, crystalline NP of 20-40 nm size with well-defined corona of 2-4 nm with negative surface potential. GC-MS analysis gave the exact constituent of bioactive compounds comprising the phyto-corona. ZnONPs were found to have antimicrobial activity against Bacillus subtilis and Escherichia coli via predominantly enhanced intracellular ROS generation with increasing concentration. Interestingly, the nanoparticles showed higher cytotoxicity towards A549 cells than human keratinocyte cells (HaCaT) and was also found to co-localize with the nucleic acid. CONCLUSION: The horizon for the forthcoming progress in nanomedicine is very promising. The biological corona characterization unveils the presence of bioactive compounds responsible for enhanced antimicrobial and anti-cancer potential, along with providing stability to nanoparticles.