National Institute of Technology Rourkela

Departmental Seminar

Seminar Title	: Formulation and characterization of a novel Quercetin conjugated MgO nanoparticle for cancellous alveolar bone tissue regeneration
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Venue	: BM Department Seminar Room
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Abstract	: Teeth loss is mostly linked with the loss of alveolar bone, which is the supportive structure of teeth. The complex structure of cancellous alveolar bone causes a great challenge for the researchers to develop an effective alveolar bone regeneration therapy. The use of nanoparticles in dental implants to reduce implant infection, free radical formation and time of healing is a promising option for speedy recovery of defect alveolar bone tissue. The formulation of a potential nanoparticle is, therefore, highly demanding for dental implants. Quercetin, a flavonoid, is popularly known for its strong antimicrobial, anti-oxidant and osteogenic properties. As reported, modification of quercetin (Qr) functional groups in blood plasma hinders the bioavailability of this phytocompound at the defect site. Therefore, there is a need for conjugation of Qr with a molecule which can avoid functional modification in Qr. In this context, the metallic magnesium oxide (MgO) nanoparticle which is well-known for its osteogenic activity can be conjugated with quercetin to improve its bioavailability. In the present research, green synthesis of quercetin conjugated MgO, referred as Qr-MgO as a novel nanoparticle was successfully developed, wherein Qr was used as a reducing agent for MgO. FESEM micrographs revealed speherical structures of of MgO and Qr-MgO nanoparticles with particle size of 44.42±0.008 nm and 90.01±0.001 nm respectively. Elemental analysis validated the presence of Mg in Qr-MgO nanoparticle. FTIR analysis confirmed the Mg-O bond vibration with a slight shifting in the peaks and specific Qr peaks in Qr-MgO nanosphere. From X-ray diffractogram the crystalline structure of nanoparticle with presence of distinguished MgO and Qr peaks were observed. The UV-VIS spectrum scanning of nanoparticle showed peaks at 264 and 388 wavelengths which are between the spectrum of MgO nanoparticle and quercetin molecule, confirming the conjugation of MgO particle with Qr. The anti-oxidant property of the MgO nanoparticle was tremendously enhanced measuring 84.52±1.33% when conjugated with Qr. The antimicrobial activity of the Qr-MgO nanoparticle was significantly higher compared to MgO nanoparticle against Escherichia coli (gram-negative) and Staphylococcus aureus (gram-positive) bacteria. Herein, the impact of MgO and Qr-MgO nanoparticles on Human Osteoblast like Saos-2 cell was examined via MTT assay and cell viability rate. The Saos-2 cells exhibited remarkably higher viability and proliferation rate when cultured in Qr-MgO nanoparticle treated samples than the MgO treated sample. Overall, it was demonstrated that Qr-MgO nanoparticle can be acted as an ideal nanoparticle for reconstruction of cancellous alveolar bone tissue Keywords:, Anti-microbial, Anti-oxidant, Cancellous alveolar bone, Magnesium oxide, Nanoparticle, Quercetin