National Institute of Technology Rourkela

Defence Seminar

Seminar Title	: Deciphering the Role of Quercetin in Modulating Apoptosis and EMT with Therapeutic Enhancement via Chondroitin Sulfate-Conjugated Chitosan Nanoparticles for Targeted Drug Delivery in Oral Cancer
Speaker	: Puja Das (Rollno : 519ls1013)
Supervisor	: Bismita Nayak
Venue	: Seminar Hall, Department of Life Science
Date and Time	: 18 Jul 2025 (11.00AM)

Abstract : Oral squamous cell carcinoma (OSCC), a highly aggressive and recurrent malignancy, constitutes over 90% of oral cancers and a significant proportion of global head and neck cancers. Conventional therapies such as surgery, chemotherapy, and radiation are often limited by poor long-term survival rates and severe functional and cosmetic complications. To address this, phytochemicals like quercetin (QCT), a bioactive flavonoid, are emerging as promising anticancer agents due to their pro-apoptotic and anti-metastatic properties, including the inhibition of epithelial-to-mesenchymal transition (EMT). However, quercetin's clinical utility is hindered by poor solubility, low bioavailability, and rapid metabolism. This research focuses on overcoming these limitations by developing a nanotechnology-based delivery platform. Chitosan nanoparticles (QCT-CSNPs) were employed to improve quercetin's stability, bioavailability, and tumor-specific delivery. *In vitro* cell culture evaluation in CAL33 cells showed enhanced cytotoxicity, migration inhibition, and apoptosis. Additionally, chondroitin sulfate (ChS) was conjugated onto the nanoparticles (ChS-QCT-CSNPs) to target CD44 receptors, which are overexpressed in OSCC, enabling receptor-mediated endocytosis and site-specific delivery. The resulting formulation, ChS-QCT-CSNPs with superior target specific internalization, represents an innovative approach to maximize quercetin's anticancer potential. This innovative targeted delivery system offers a promising therapeutic strategy for OSCC, addressing the challenges of conventional treatments by enhancing drug specificity, reducing systemic toxicity, and improving anticancer efficacy, paving the way for potential clinical applications.

Keywords: Chitosan nanoparticles, Chondroitin sulfate, Oral cancer, Quercetin, Targeted delivery.