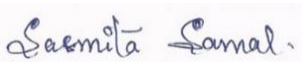
Mineralizing bone cell-derived exosomes integrated with polymeric scaffolds promote bone tissue regeneration by transferring their miRNA cargoes

Exosomes derived from bone progenitor cells have the advantage of being cell-free non-immunogenic cargo delivery vehicles. In the present study, exosomes are isolated from MC3T3-E1 cells both before (GM-Exo) and after 14 days of mineralization (DM-Exo) and it was observed that DM-Exo, accelerate the process of differentiation in the recipient cells more prominently. The exosome small RNA sequencing revealed that some miRNAs are highly upregulated after mineralization of cells that target the functionality of the host cells, thereby probably enhancing the activity of osteoblastic genes. To enhance the bioavailability of the exosomes, they are encapsulated in a chitosan-collagen composite hydrogel that serves as a bioresorbable extracellular matrix (ECM). The exosome-laden scaffold (DM-Exo+Scaffold) enhances bone regeneration in critical-sized calvarial bone defects within 8 weeks of implantation in rats. Integration of mineralized cell-derived exosomes on an ECM represents a bioresorbable matrix with a cell-free method for promoting new bone formation through the transfer of miRNA cargo, which can be further explored as personalized bone regeneration therapy.



Sasmita Samal
5th Year Ph.D. Student
Institute of Life Sciences,
Nalco Square,
Bhubaneswar- 751023