



Project Proposal for Ph.D.

Project Details	
Project Title	Virus-nanoparticle based targeted delivery of therapeutics in osteoarthritis
Project Summary (Minimum 500 and maximum 2000 characters)	The purpose of this project is to design virus particle-based nanocarriers with the potential to deliver hydrophobic therapeutic drugs to osteoarthritis tissue. Osteoarthritis (OA) is a painful condition characterized by degeneration of joints, severe pain and inflammation, which causes severe debilitation and morbidity. While the treatment of OA is by the usage of nonsteroidal anti-inflammatory drugs (NSAIDs), however, the challenge lies in delivery of the drugs to chondrocytes in the joints through a vast mesh of cartilage and extracellular matrix proteins (ECM), and to ensure slow and sustained release of the drugs at the target site. We will design virus-like particles with targeting peptides to deliver OA-drugs to chondrocytes and synoviocytes. The efficacy of the VLPs as opposed to free drug will be tested in a unique 3D <i>in vitro</i> model of OA which has a similar local microenvironment as in patient tissues. The expected outcome will be targeted drug delivery by these particles in 3D bioprinted OA model with improved bioavailability compared to neat drugs.

Ph.D. Supervisors			
Role	Name of Faculty	Academic Unit in IITD/Institute/University	Email ID (Official)
Supervisor 1	Manidipa Banerjee	Kusuma School of Biological Sciences, IIT-Delhi	mbanerjee@bioschool.iitd.ac.in
Supervisor 2	Sourabh Ghosh	Department of Textile and Fiber Engineering, IIT-Delhi	sourabh.ghosh@textile.iitd.ac.in

Project requirements (Student qualifications, experience required, etc) *The candidate will be shortlisted based on common shortlisting criteria decided by ScRC (SIRe)
- The student must have a M.Sc./M. Tech. degree in Biotechnology/Biology with more than 80% marks in aggregate, and excellent academic records throughout. - The student must have CSIR-NET/GATE qualification - Experience in culturing of mammalian and insect cells, and molecular virology techniques are desirable.

Source of fellowship/funding (CSIR/UGC/DBT/ICMR/ICAR/NEET-PG/DST-INSPIRE/IRD/FITT Project details, if any)
Institute Fellowship/ Project Fellowship

Role of Faculty Members involved:	
Supervisor-1	Prof Banerjee’s laboratory at IIT-Delhi generates virus-like particles based on enveloped and non-enveloped virus capsids for biomedical applications. Her laboratory will train the student on surface engineering of virus capsids as well as a variety of biochemical and biophysical methods for understanding the mechanism of drug loading and release in chondrocytes and synoviocytes.
Supervisor-2	Prof Sourabh Ghosh’s laboratory is working on bioprinting and tissue engineering to develop <i>in vitro</i> diseased tissue models. His laboratory will generate 3D <i>in vitro</i> models of osteoarthritis from patient cells and will test the effect of VLPs on the OA models, as well as study variation in gene expression in the models.

