



Project Proposal for Ph.D.

Project Details

Project Title

Development of microbial derived biopolymers for tissue engineering applications

Project Summary

(Minimum 500 and maximum 2000 characters)

(Bio)polymers serve as important scaffolds in tissue engineering applications. They promote growth of cells and support tissue formation. Some of the properties of biopolymers that need to be tailored to tissue engineering applications include enhancing biocompatibility, tensile strength and water retention. Traditionally, chemically synthesized (bio)polymers have been employed in tissue engineering applications. Chemical synthesis require harsh chemical synthesis and treatment techniques for processing. More recently, efforts have focused on the use of naturally derived biopolymers with microbially synthesized biopolymers providing a promising avenue for their production.

This proposal aims to explore microbially derived biopolymers for use in tissue engineering applications including bacterially derived cellulose and polyhydroxybutyrate. Initially, microbial strains will be screened for their capacity for producing biopolymers. Growth conditions will be optimized for improving titers of the product along-side use of microbial metabolic engineering strategies. ^{13}C -MFA experiments will be conducted using ^{13}C labelled substrates to elucidate metabolic fluxes in the strains. Parallely, the biopolymers will be characterized for their properties such as tensile strength. Additionally, the effect of growth conditions on the self-assembly of these biopolymers leading to different morphologies will be investigated. They will further be embedded on supports and studied for their properties to promote cell growth under various conditions.

Ph.D. Supervisors

Role	Faculty	Academic Unit in IITD/Institute/University	Email ID (Official)
Supervisor 1	Prof. Neetu Singh	Biomedical Engineering	sneetu@cbme.iitd.ac.in
Supervisor 2	Prof. Ashish Misra	DBEB	ashishmisra@iitd.ac.in

Project requirements (Student qualifications, experience required, etc)

B. Tech or M. Tech in Biotechnology/Chemistry/Biomedical Engineering with experience in microbial and mammalian cell culture AND/OR polymer characterization

Source of fellowship/funding

(CSIR/UGC/DBT/ICMR/ICAR/NEET-PG/DST-INSPIRE/IRD/FITT Project details, if any)

Candidate with his/her own fellowship

Role of Faculty Members involved:

The supervisors have expertise in the following areas relevant for the project.

Supervisor 1: Design of biomaterials for tissue engineering applications

Supervisor 2: Bioprocessing and microbial engineering

Supervisor 1 and 3 will guide the selection of microbes for biopolymer production and optimization of growth and culturing conditions. Supervisor 2 will guide the use of the biopolymers and their investigation for tissue engineering applications. The complementary expertise of the supervisors is critical for the project.