



PhD Project

(will be assigned by SIRe)

Project Details	
Project Title	Molecular and Structural insights into the regulation of <i>dsz</i> operon for biodesulfurization of organosulfurs
Project Summary	<p>One of the major environmental concerns of recent times is emissions from fossil fuel combustion. To conform to the stringent emission regulations and to improve fuel quality, desulphurization of crude oil is essential. Conventionally, hydrodesulfurization is used for removing the sulfur from organosulfurs. However, the process cannot remove the sulfur from recalcitrant organosulfur compounds. For removing sulphur from the recalcitrant organosulphurs in crude oil, biodesulphurization via the 4S pathway has been suggested. This pathway is governed by the <i>dsz</i> operon. The exact mechanism of regulation of this operon is unknown. Recently, an activator of <i>dsz</i> operon, TetR family protein (TetR1, also called DszGR) from <i>Gordonia</i> sp. IITR100 has been isolated. The activation region of TetR1 was found to lie within the first 80bp (-305 to -385bp) of the 385bp long <i>Pdsz</i>. Promoter bending was found to be required for the activation of <i>dsz</i> operon and in this the role of IHF was implicated. However, the identity of the inducer molecule, whether it is the organosulfur or some of the intermediates is not known. Also, the transporters responsible for the uptake of these inducer molecules have not been identified. The binding of the inducer molecule with the activator protein, the resulting conformational changes and its binding to the DNA molecule will be essential to understand the interacting residues. The objectives will be</p> <ol style="list-style-type: none">To identify the inducer moleculesTo identify the transporter for the uptake of organosulfurTo delineate the molecular basis of ligand bound protein interaction with its cognate DNA using three-dimensional structures <p>Understanding the regulation of <i>dsz</i> operon will not only help in constructing strains with enhanced biodesulfurization activity but also provide deeper insights on the regulation of catabolic operons.</p>

PhD Supervisors			
Role	Faculty	Academic Unit in IITD	Email ID
Supervisor 1	Dr. Preeti Srivastava	DBEB	preeti@dbeb.iitd.ac.in
Supervisor 2	Dr. Ashok Kumar Patel	KSBS	ashok.kumar.patel@bioschool.iitd.ac.in
Supervisor 3	Dr. Neel Sarovar Bhavesh	ICGEB	neelsb@icgeb.res.in

Project requirements (Student qualifications, experience required, etc)

- MS Research or M. Tech in Biochemical Engineering and Biotechnology

Source of funding (IRD/FITT Project details, if any)

GATE (Institute Fellowship), CSIR-JRF, UGC-JRF

Role of Faculty Members involved:

Dr. Preeti Srivastava: Molecular biology (Identification of the inducer molecule and its uptake by bacterial cells)
Dr. Neel Sarovar Bhavesh: Structural Biology (Determining the structure of ligand bound activator and its binding with DNA)