



Project Proposal for Ph.D.

Project Details	
Project Title	Investigation of the role of an ionizing radiation-induced small RNA, DrsS, in Mn homeostasis in <i>Deinococcus radiodurans</i> .
Project Summary	A growing interest in small RNA-mediated regulation in bacteria instigated the researchers to investigate their role in physiological processes. Considerable work on the identification of sRNAs and understanding their regulatory function in bacteria over the last few years has established that sRNAs utilize many different mechanistic pathways to regulate their target genes in nearly all physiological processes of the cell. The discovery of the increasing number of sRNA mechanisms, in either a single or overlapping regulatory network, reveals the diversity and layers of complexity of sRNA interaction with cognate target. The primary aim of this proposal is to unravel the mechanism of how a previously identified IR-induced sRNA, DrsS, regulates the Mn²⁺ homeostasis in <i>D. radiodurans</i>. In addition to that, we also aim to investigate how this IR-induced DrsS originates from its mRNA precursor as it shares an overlapping sequence with <i>sodA</i> and <i>dr_1820</i> genes. We believe that DrsS will posttranscriptionally upregulate the expression of some Mn-importer proteins and simultaneously repress the expression of Mn-exporter proteins under Mn-deficient conditions. Thus, identification of those transporter proteins would be one of the primary objectives of the study. The induction of DrsS while there is a demand for Mn import to the cell points to the identification of transcription factor(s) that trigger(s) DrsS expression. Among the three regulatory protein transcription factors, OxyR (Dr0615), the <i>Diphtheria</i> toxin repressor protein DtxR (Dr2539), and a homolog of ferric uptake protein Fur (Dr0865), that strictly control the Mn and Fe homeostasis, the one which controls DrsS expression must also be identified. Key Questions i. To investigate the role of transcription factors like OxyR (Dr0615), DtxR (Dr2539), and Fur (Dr0865) in the regulation of <i>drsS</i> gene expression. ii. Identification of Mn²⁺ importer proteins regulated by DrsS under Mn-demanding conditions in the cells and understanding their mechanism of regulation. iii. Investigation of the effect of DrsS on Mn²⁺ efflux proteins and understanding the role of DrsS in Mn homeostasis in <i>D. radiodurans</i>. iv. Exploitation of <i>D. radiodurans</i> for radioprotectant material design and synthesis.

Ph.D. Supervisors				
Role	Name of Faculty	Date of Superannuation (DD/MM/YYYY)	Academic Unit in IITD/Institute/University	Email ID (Official)
Supervisor 1	Tanmay Dutta	30/11/2044	Chemistry, IIT Delhi	dtanmay@chemistry.iitd.ac.in
Supervisor 2	Jaydeep Bhattacharya		School of Biotechnology, J. N. U.	jaydeep@jnu.ac.in

Project requirements (Student qualifications, experience required, etc.) *The candidate will be shortlisted based on common shortlisting criteria decided by ScRC (SIRe)
- MSc in Chemistry, Biochemistry, Biotechnology or any branch of Life Sciences, B. Tech. / M. Tech. In Biotechnology or Biochemical Engineering, or related areas - The student should have prior training in some of these aspects: Molecular and microbiology techniques. - The student should have a NET-JRF qualification.

Source of fellowship/funding
Students should have CSIR/UGC/DBT/ICMR -JRF or DST INSPIRE Fellowship

Role of Faculty Members involved:	
Supervisor-1	Dr. Tanmay Dutta’s laboratory will be carrying out the experiment related to identification and validation of small RNAs related to radiation resistance in <i>Deinococcus radiodurans</i> . His lab will also try to understand the mechanism of those sRNAs in radiation resistance.
Supervisor-2	Dr. Jaydeep Bhattacharya’s laboratory will be carrying out experiments related to the design and synthesis of radioprotective material using D. radiodurans cells.