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Structural and functional studies on proteins involved in mediating electrical conductivity in *Geobacter sulfurreducens*

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Dissimilatory metal-reducing bacteria (DMRB), such as Geobacter spp., adopted a distinct metabolic strategy in which they acquire energy by coupling intracellular oxidation of organic fuels with reduction of insoluble extracellular electron acceptors like metals and minerals in oxygen-limiting subsurface environments. *Geobacter sulfurreducens* belongs to deltaproteobacteria which has diverse roles in bioremediation, electron transfer (ET), bioenergy production and detoxification of many toxic metals. The phenomenon of short range ET (<25 Å) has been investigated in several proteins like cytochrome c, metallo-proteins etc. *Geobacter sulfurreducens* produces protein PilA-N, annotated as type-IV pilin protein, helps in extracellular electron transfer (EET) to reducing metals like Fe (III) oxides present in their sub-surface environment. Here, we are focusing on the purification of proteins involved in EET for structural studies. The operon of pilA includes proteins namely, PilB, PilT, PilC, PilS, PilR, PilA-C and PilA-N which are primarily involved in the expression, assembly and regulation of PilA nanowire. We have cloned, expressed and purified PilB, PilT, PilC, PilS and PilA-N suitable for structural, biophysical and biochemical studies. Though the structure of pilA monomer has been solved by NMR and low resolution structure has been solved by X-ray fiber diffraction still high resolution structure of PilA assembly is not available. PilA-N shares structural homology with other structurally characterized PilA proteins from Neisseria gonorrhoeae but lacks C-terminal globular head domain. So, it is of great interest to understand how PilA monomers assemble to form functional pilus. Since, it is challenging to crystallize pili proteins we are using fusion protein strategy to limit long range assembly to solve structure of defined oligomeric state of PilA. We have succeeded in creating a fusion protein which forms hexameric assembly in solution. Work is under progress to crystallize this fusion protein and gain structural insights for pilA assembly. This study will help us better understand the molecular basis for pilA assembly and underlying mechanism of electrical conductivity.

Biography

Vipul Solanki is pursuing his PhD under the guidance of Dr. Krishan Gopal (Scientist, G N Ramachandran Protein Centre, CSIR-IMTECH, India). He has research experience and expertise in the field of Molecular Biology, Protein Biochemistry, Bioinformatics and Proteomics. His research work comprises biophysical and biochemical characterization of proteins of *Geobacter sulfurreducens* which has bioremediation function associated with heavy metal decontamination and electron conductivity.

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