

Molecular Markers In Key Photosynthesis-Related Proteins Provide Novel Insights Into The Origin Of Photosynthesis And Differences Amongst Cyanobacterial Lineages. Radhey S. Gupta, Department of Biochemistry, McMaster University, Hamilton, Canada (gupta@mcmaster.ca).

Genome sequences are enabling identification of novel molecular characteristics that are specific for different groups of photosynthetic bacteria as well as those providing novel insights into the origin and spread of photosynthesis.[1] In proteins playing key roles in photosynthesis, our work has identified several conserved signature indels (CSIs) that are specific for either particular lineages of photosynthetic bacteria or are uniquely shared by the members of certain groups. The presence/absence of some of these CSIs in the BchL, BchX and NifH proteins provides evidence that the anoxygenic photosynthesis mediated by BchX homologs originated prior to the oxygenic photosynthesis requiring BchL; the distribution pattern of these CSIs also suggests that the BchL homologs from *Helicobacteriaceae* are primitive in comparison to the other photosynthetic bacteria [2]. A number of other CSIs in the BchL, BchN and BchB proteins provide evidence that the homologs of these proteins in the Chlorobi are derived from Chloroflexi, whereas those in Proteobacteria have been acquired from Clade C cyanobacteria. Within Cyanobacteria, the Clade C cyanobacteria, comprising of marine unicellular cyanobacteria, constitute a major lineage whose members differ from other cyanobacteria in numerous molecular characteristics in a broad range of proteins, including in several key-photosynthesis-related proteins (viz. BchL, BchN, BchB and photosystem I assembly protein). The observed differences suggest that photosynthesis in the clade C Cyanobacteria should differ from other cyanobacteria in important regards and further studies exploring such differences should be of interest.

References

1. Gupta RS. Molecular Markers for Photosynthetic Bacteria and Insights into the Origin and Spread of Photosynthesis. *Advances in Botanical Research* 2013; **66**: 37-66.
2. Gupta RS. Origin and Spread of Photosynthesis based upon Conserved Sequence Features in Key Bacteriochlorophyll Biosynthesis Proteins. *Mol Biol Evol* 2012; **29**: 3397-412.