Crystal Structure of a Cyanobacterial BLUF Protein, Tll0078

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The sensor proteins for blue-light using the FAD (BLUF) domain belong to the third family of the photoreceptor proteins using a flavin chromophore, where the other two families are phototropins and cryptochromes. We have determined the crystal structure of the Tll0078 protein from *Thermosynechococcus elongatus* BP-1, which contains a BLUF domain bound to FAD, at 2 Å resolution.

The crystals belonged to space group $P2_12_12_1$ with cell dimensions of a=89.5 Å, b=109.9 Å, and c=169.9 Å. The asymmetric unit contains 10 monomers of Tll0078 (one decamer). Five Tll0078 monomers are located around the non-crystallographic five-fold axis to form a pentamer, and two pentamers related by two-fold noncrystallographic symmetry form a decameric assembly. The monomer consists of two domains, the BLUF domain at the N-terminal region and the C-terminal domain. The overall structure of the BLUF domain consists of a five-stranded mixed β-sheet with two αhelices running parallel to it. The isoalloxazine ring of FAD is accommodated in a pocket formed by several highly-conserved amino acid residues in the BLUF domain.

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