

Nutrient starvation in cyanobacteria: Proteases help to survive

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Background: Cyanobacteria have evolved remarkable mechanisms that help them respond to rapid environmental changes. They are able to activate or suppress the production of proteins that are important for nutrient stress acclimation, such as nutrient-uptake proteins. In cyanobacteria, the regulation of protein production mainly functions at the level of transcription, and many proteins are involved to form a complex regulatory network. One key component of this network, which accelerates the production of many nutrient stress-inducible proteins, is an FtsH protease complex.

Findings: We have shown that an FtsH1/3 protease complex is involved in the response to nutrient depletion in the model cyanobacterium *Synechocystis* PCC 6803. It is important for quick and proper acclimation to iron, phosphate, carbon, and nitrogen starvation. When we reduced the level of the FtsH1/3 complex, the cells were not able to produce proteins such as nutrient-uptake proteins that help them cope with stress. On the other hand, when we increased the amount of FtsH1/3 complex, these proteins accumulated unnecessarily in the cell. FtsH controls the production of these nutrient-uptake proteins at the level of transcription. We believe that under nutrient starvation, the FtsH proteases digest transcription factors, the DNA binding proteins, which in times of plenty would otherwise prevent the transcription of nutrient-uptake proteins.