

Regulatory mechanisms controlling the metabolism of glycogen

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Glycogen is a wide-spread reserve polymer important for the survival to environmental stresses of all kinds of organisms. In the cyanobacterium *Synechocystis* sp. PCC 6803, glycogen is necessary to overcome dark and starvation periods. During nitrogen limitation, glycogen synthesis and degradation are required for survival. Cells that are unable to produce glycogen fail to properly enter the state of dormancy that allows them to cope with nitrogen-starved conditions, and cells incapable to degrade glycogen are impaired in the awakening process. Given the important role of this polysaccharide, its metabolism is subjected to a complex regulation. The activity of the enzymes involved in glycogen synthesis and degradation must be tightly controlled to ensure rapid access to the sugar stores when required. Such a responsive and fine control is achieved via post-translational modifications, including phosphorylation, redox-induced modifications, and allosteric interactions. The known regulatory mechanisms of the glycogen synthesis and degradation machinery will be summarized and discussed. Interestingly, some of these mechanisms are not specific of cyanobacteria, but evolutionary conserved from bacteria to humans.