

Cyanophycin Synthetase-Like Enzymes of Non-Cyanobacterial Eubacteria: Characterization of the Polymer Produced by a Recombinant Synthetase of *Desulfitobacterium hafniense*

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Some bacterial genomes were found to contain genes encoding putative proteins with considerable sequence homology to cyanophycin synthetase CphA of cyanobacteria. Such a gene from the Gram-positive, spore-forming anaerobe *Desulfitobacterium hafniense* was cloned. Expression in *Escherichia coli* resulted in the formation of a polydispers copolymer of aspartic acid and arginine, with a minor amount of lysine, of about 30 kDa molecular mass. In contrast to cyanophycin, this polymer was water-soluble. The structure of the polymer formed by the synthetase from *Desulfitobacterium hafniense* was studied by enzymatic degradation with the cyanophycin-specific hydrolase cyanophycinase, and by chemical and mass-spectroscopic analyses. Despite of the differences in solubility, indicating that both polymers cannot be completely identical, the chemical structure was found to be very similar to that of cyanophycin. The results suggest that the use of cyanophycin-like polymers as a nitrogen-rich reserve material is not restricted to cyanobacteria, and that such polymers may not necessarily be stored in granules.