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An essential role of the *rel* gene in aerobic nitrogen fixation by *Anabaena sp*. PCC 7120, a heterocyst forming filamentous cyanobacterium

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Stringent response defines a regulatory effect exerted by alarmone (p)ppGpp accumulation as a mechanism to survive starvation and a variety of harsh environmental conditions. A failure to disrupt the *rel* gene in two unrelated strains of cyanobacteria has led to an opinion that in cyanobacteria this gene is essential. However, inactivation by single recombination producing a truncated and presumably partially functional version of *rel* (*all1549*) in *Anabaena sp*. PCC 7120 was claimed to result in the failure to differentiate heterocysts specialized cells that perform aerobic nitrogen fixation. Contrary to these results, we isolated fully segregated double recombinants with rel gene inactivated by the Ω cassette insertion which produced morphologically normal heterocysts but failed to grow diazotrophically (Fox- phenotype). Initial mutant clones were very sick, had altered pigmentation and died rapidly in the stationary phase (Dsp phenotype) but repeated sub-culturing resulted in gradual improvement of growth and restoration of normal pigmentation. We found an identical compensatory mutation in the *rpoB* (*alr1594*) gene encoding RNA polymerase beta subunit in several independent original mutants with improved growth characteristics. However, this mutation did not restore stationary phase survival or diazotrophic growth, while the *rel* gene supplied on autonomously replicating plasmid restored the wild-type phenotype. Currently we are trying to elucidate the nature of the Fox- and Dsp phenotypes caused by *rel* disruption.

Biography

Grigorii Gladkov is currently a PhD student working at the Laboratory of Rhizospheric Microflora in All-Russia Research Institute for Agricultural Microbiology under the supervision of Dr. I. Ya. Khudyakov. He has received his Master's degree in Microbiology from the Saint-Petersburg State University. His main interests are cyanobacteria genetics and biotechnology, focusing in cyanobacteria heterocyst differentiation.

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