Cyanobacteria

Omics and Manipulation

Edited by

Dmitry A. Los

Institute of Plant Physiology
Russian Academy of Sciences
Moscow
Russia

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Preface

Cyanobacteria are represented by a diverse group of microorganisms that, being a part of marine and freshwater phytoplankton, significantly contribute to the planetary fixation of atmospheric carbon and evolution of molecular oxygen via photosynthesis. Ancient cyanobacteria (~2.5 billion years of history) participated in the formation of Earth's oil deposits. Modern cyanobacteria grow fast; they do not compete for agricultural lands and resources; they efficiently convert excessive amounts of CO_2 into biomass, thus participating in both carbon fixation and organic chemical production. Many cyanobacterial species are easily transformable and, thus, may be genetically manipulated to produce photosynthetic carbohydrates, fatty acids, or alcohols as renewable sources of fourth-generation biofuels. Genetic modification of strains is a powerful tool to redirect the biosynthetic pathways of cyanobacteria to desirable end-products, including those that have never being produced by these organisms. In addition, cyanobacteria are studied and used as a rich source of bioactive metabolites with unique structural features and biological activities, including antiviral and antibacterial agents, cytotoxins, antioxidants, and other bioactive compounds.

In this volume, the reader will find a collection of chapters devoted to cyanobacterial omics (genomic, transcriptomics, proteomics, etc.) targeted for understanding the basic principles of cyanobacterial metabolism. This fundamental knowledge is then converted into metabolic engineering in order to produce valuable compounds, e.g. pharmaceuticals, biofuels, bioplastics, etc. Such a systemic approach fits well to the concept of the 'Green Planet', which implies the sustainable development on the basis of green (photosynthetic bacteria, plants, algae, cyanobacteria) technologies that produce renewable and clean foods, energy, and materials.

The international team of authors would like to bring the attention of the readers to the latest achievements in biology of cyanobacteria – photosynthetic microorganisms with great academic and industrial potential.