

Tools and hosts for making valuable molecules in eukaryotic algae

Krishna K. Niyogi

Howard Hughes Medical Institute, Dept. of Plant and Microbial Biology, University of California, Berkeley, CA 94720-3102 and Physical Biosciences Division, Lawrence Berkeley National Laboratory, Berkeley, CA 94720

A variety of eukaryotic algae can be grown industrially for the production of high-value small molecules such as vitamins, pigments, and oils. Although some algal species can be grown heterotrophically in fermenters using organic carbon compounds, photoautotrophic growth in open ponds or photobioreactors using light and CO₂ is an attractive alternative for other species. Many products of interest are synthesized and accumulated naturally by algae, and their production can be improved simply by classical mutagenesis and molecular genetic modification. Synthetic biology offers possibilities to produce novel molecules in algae beyond those that are found in nature. Depending on the algal species, the tools available for genetics and synthetic biology range from non-existent to advanced. We are working on developing tools and resources for promising algal hosts such as *Nannochloropsis oceanica* CCMP1779.