Metabolic phenotyping of cyanobacteria with increased biofuel productivity

Yi Ern Cheah1* (yi.ern.cheah@vanderbilt.edu), Yao Xu2, Carl H. Johnson2, Jamey D. Young1,3

1 Chemical & Biomolecular Engineering, Vanderbilt University, Nashville, TN; 2 Biological Sciences, Vanderbilt University, Nashville, TN; 3 Molecular Physiology & Biophysics, Vanderbilt University, Nashville, TN

http://www.vanderbilt.edu/younglab

Project Goals: This project aims to identify and remove bottleneck reactions that limit carbon flux towards synthetic pathways in engineered autotrophic systems. The long-term goal is to develop an integrated experimental and computational workflow that can be progressively used to enhance the performance of industrially pertinent autotrophs.

To quantitatively assess in vivo autotrophic metabolism, our lab has previously developed isotopically nonstationary 13C-MFA (INST-MFA) (1-4) and applied it to assess the photoautotrophic metabolism of cyanobacteria (4) and plant leaves (5). More recently, we combined INST-MFA with rational metabolic engineering to improve the productivity of an isobutyraldehyde producing mutant of the cyanobacterium Synechococcus elongatus PCC7942 (6).

This presentation describes our further efforts to examine the metabolic phenotypes of strains with improved isobutyraldehyde productivity. Our work demonstrates the promising utility of INST-MFA at guiding the metabolic engineering of autotrophs intended for industrial applications.
References


This work is funded by the U.S. Department of Energy (DOE) Award DE-SC008118.