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Re-routing photosynthetic energy flow in the model Cyanobacterium *Synechocystis* 6803 for the production of fuels and chemicals

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Photosynthetic production of fuels and chemicals from carbon dioxide represents a cutting-edge and environment-friendly alternative to fossil based fuels and chemicals. Rerouting photosynthetic energy/carbon flow into desired products requires accurate and quantitative measurement of carbon partitioning towards target pools versus multiple competing pathways. We are performing fluxomic studies in the model cyanobacterium *Synechocystissp.* PCC6803 as part of a system biology platform, in order to better understand physiology and metabolism and guide future strain engineering efforts. Our fluxomic studies are based on stable-isotope labeling and Mass Spectrometry (MS) measurement. Briefly, we developed a highly selective and sensitive liquid chromatography–ion trap mass spectrometry (LC–MS/MS) method for identification and quantification of intracellular metabolites involved in central carbon metabolism (including glycolysis, pentose phosphate pathway and tricarboxylic acid cycle). Simultaneous separation of negatively charged compounds (including sugar phosphates, nucleotides, and carboxylic acids) extracted from *Synechocystis* cells was achieved on a common C18 reversed-phase column. Coupled with kinetic isotope labeling and non-stationary computational modeling, we generated high-resolution ^{13}C-flux maps for genetically-engineered strains, quantitatively profiling carbon metabolism that is especially applicable to cyanobacterial research. This methodology is applied to ongoing bioenergy research, including photosynthetic production of ethylene and alpha-keto acids from cyanobacteria.

Biography

Wei Xiong earned a Ph.D. in Biosciences in 2010 from Tsinghua University in Beijing. He was awarded the NREL Director's Fellowship in 2013. He is currently working with Dr. Jianping Yu in Bioscience Center, on photo-biological production of biofuel from cyanobacteria. This research project employs metabolomic and synthetic biology approaches to explore and re-engineer the central carbon metabolism in order to create robust biofuel producing strains.

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