12. Integration of Multi-Omic Data for Advanced Consolidated Bioprocesses

Intawat Nookaew¹ (nookaewi@ornl.gov), Dan Olsen,² Mirko Basen,³ Manesh Shah,¹ Visanu Wanchai,¹ Cong Trinh⁴, Philip D. Hyatt,¹ Steve D. Brown,¹ Miriam L.L and,¹ Michael R Leuze,¹ Robert L. Hettich,¹ Robert M. Kelly⁵, Mike Adams,³ Lee Lynd,² David W. Ussery,¹ and Paul Gilna¹

¹BioEnergy Science Center, Oak Ridge National Laboratory, Oak Ridge, Tennessee; ²Dartmouth College, Hanover, New Hampshire; ³University of Georgia, Athens; ⁴University of Tennessee, ⁵North Carolina State University

http://bioenergy.org

Project Goals: The BioEnergy Center (BESC) is focused on the fundamental understanding and elimination of biomass recalcitrance. BESC’s approach to improve accessibility to the sugars within biomass involves (1) designing plant cell walls for rapid deconstruction and (2) developing multi-talented microbes or converting plant biomass into biofuels in a single step [consolidated bioprocessing (CBP)]. BESC researchers provide enabling technologies in characterization, ‘omics, modeling and data management in order to (1) understand chemical and structural changes within biomass and (2) to provide insights into biomass formation and conversion.

Within the BESC project, several multi-level ‘omic datasets, such as gen...
individual strains will be further evaluated with fermentation data as well as transcriptome data to evaluate the impact of complex mutations on ethanol production and undesired fermentation products. We found a non-targeted point mutation in a developed strain impacted on cofactor specificity of AdhE that is beneficial for ethanol production.

Third, we present a predicted transcript-based annotation of the C. bescii genome, based on transcript RNA-seq, 5’RACE RNA-seq and extracellular proteomics for a variety of growth conditions in different carbon sources to determine all transcribed genes, identity of small RNAs/CRISSPR, and map the intensity of transcription along the chromosome. Those experimental data will capture the missing features from standard computational gene annotation. Global transcriptional landscapes of C. bescii can be used to design strategies for further strain improvements. Mapping of transcript expression levels and gene regulatory patterns will be identified through the integration of transcriptome, extracellular proteome using network analysis across different growth conditions to inform metabolic modeling and metabolic engineering efforts.

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