Metabolomics-2013
OMICS Group Conferences
Accelerating Scientific Discovery
2nd International Conference and Exhibition on
Metabolomics & Systems Biology
April 8-10, 2013 Hilton Chicago/Northbrook, USA

Understanding carboxylic acid toxicity through omics analysis

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Abstract

Short chain carboxylic acids are a known inhibitor of *Escherichia coli* and thus the fermentative production of these biorenewable chemicals is challenging. We have used omics analysis to identify the *E. coli* response network under octanoic acid stress. The important perturbed genes are grouped into four components: acid resistance, membrane-bound proteins, stress-response genes, and stringent-response genes. Investigations into the activation of acid resistance genes led to the determination of the intracellular pH. Addition of octanoic acid decreased the intracellular pH as a function of octanoic acid concentration. Cyclopropane fatty acids (CFA) confer an acid resistance phenotype in *E. coli*; however, the membrane CFA content decreases upon addition of octanoic acid. CFA over expression can restore CFA in the membrane, but it does not increase the growth rate. *E. coli* is naturally resistant to low pH environments. Therefore, it may be possible to engineer the natural acid resistance pathways found in *E. coli.*

Biography

Liam Royce is a Ph.D candidate at Iowa State University under the direction of Assistant Professor Laura Jarboe. Jarboe has 17 papers published in top microbiology and biotechnology journals. This work was supported by the NSF Engineering Research Center for Biorenewable Chemicals (CBiRC), NSF award number EEC-0813570.