

Precision Labeling of Membrane Fatty Acids in *Bacillus subtilis* and its Impact on the Cellular Proteome and Lipidome

Background

- The recent development of a novel isotopic labeling approach for the cell membrane of *Bacillus subtilis* 168 has enabled a new class of experiments.
- This approach allows defined membrane composition *in vivo* by blocking *de novo* fatty acid (FA) biosynthesis in a strain lacking the ability to catabolize FAs.
- But how does this approach alter the cellular proteome and lipidome?

Approach

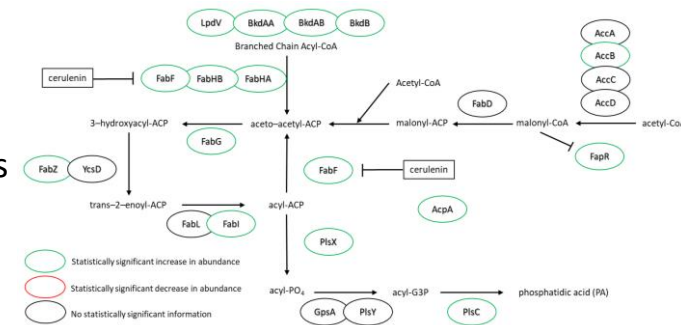
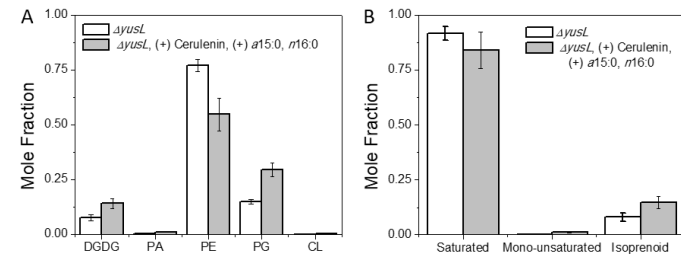
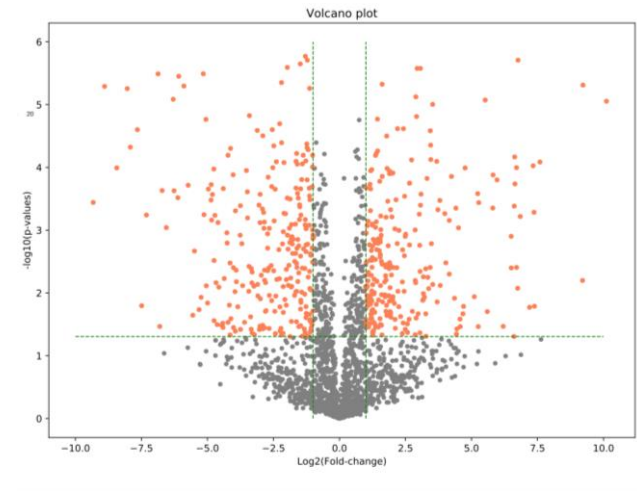
- Pairing shotgun proteomics with an analysis of the cellular membrane composition in cells of *B. subtilis* 168 grown under FA-labeling or non-labeling conditions, we investigated the systemic changes induced by the labeling procedure itself – a necessary step for future studies.

Outcome

- Proteomic analysis elucidated cell-wide changes in protein expression; specifically in the abundance of enzymes in the FA biosynthesis and degradation pathways.
- The lipid headgroup composition and isoprenoid lipid content were both altered in ways that may be compensating for the loss of FA diversity.

Significance

- Realizing the potential of this new *in vivo* experimental platform to study membrane biophysics and nanostructure; this study provides needed details of how the experimental system reacts to our labeling approach.
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Nickless JD, Poudel S, Chatterjee S, Farmer A, Cordner D, Campagna SR, Giannone RJ, Hettich RL, Myles DAA, Standaert RF, Katsaras J, and Elkins JG, Impact of fatty-acid labeling of *Bacillus subtilis* membranes on the cellular lipidome and proteome (2020), *Front. Microbiol.*, doi: 10.3389/fmicb.2020.00914.