Moorella thermoacetica, a workhorse creating value from various gaseous substrates

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Abstract:

The fermentation of waste gas streams to produce high value compounds is an attractive alternative to traditional biomass hydrolysate fermentation. Industrial waste gases as well as carbon- and energy-rich syngas obtained from gasification of organic-residues can serve as substrate for acetogenic bacteria, but are left unused to date.

Moorella thermoacetica is the model acetogenic bacterium and an ideal production organism for gas fermentation processes. Its ability to grow at elevated temperatures of 60°C allows recovery of chemical compounds that have a low boiling point (such as acetone) from the vapor phase.However, production of higher value compounds using *Moorella* requires a better understanding of its metabolism, as well as reliable tools that enable genetic modification.

In the pursuit for making *M. thermoacetica* into an industrially relevant production strain, we studied various relevant aspects: Assessing the cost-effectiveness of acetone production utilizing *M. thermoacetica* as production host, analyzing the response to different substrates by looking at variation in the expression profile (RNA-seq). Technology enabling reliable genetic engineering is very limited, and we have focused on overcoming this challenge through development of selection systems, and improving the transformation.
The gained expertise on cell-level and on process scale will help to make the former model organism an industrially relevant organism for converting waste gas streams into valuable compounds.