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CO₂ to lactate valorization by *Acetobacterium woodii*

Acetobacterium woodii is an anaerobic acetogen capable of natively converting CO₂ as a carbon source with H₂ as an energy source into acetate via the Wood-Ljungdahl pathway. We engineered successfully the metabolism of *A. woodii* to establish an additional stable lactate production. In this *A. woodii* mutant, the gene of a D-lactate dehydrogenase was over-expressed, and several genes of a native lactate dehydrogenase complex were deleted. The methodology to generate such genetically modified *A. woodii* cells is well established. In our recently funded project, we plan to construct new strains with optimised metabolic performance. Using transcriptomic data and our "Design-Build-Test-Learn" (DBTL) cycles for strain construction, we will identify enzymes that have either a positive or negative impact on the production of lactate from CO₂ and H₂. The composition of the medium for cultivating *A. woodii* is crucial to scale the cultivation from bottle to bioreactor scale. Currently, it is unclear whether certain components are dosed too low and thus impair growth and production, while others, such as yeast extract, are used in excess and are problematic for industrial scale due to cost reasons. Using a Design of Experiments approach, the medium will be optimised to achieve optimal growth and production conditions with as few components as possible. I would like to explore options for a collaboration with the Biotechnikum of the Archaea Centre Regensburg to test our strains and new medium composition at scale in a pH-controlled 20-L bioreactor under gas fermentation conditions.

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