

## MICROBIAL SYSTEMS FOR CONVERSION OF SYNGAS TO BIO-BASED PRODUCTS

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Synthesis gas, a mixture of CO, H<sub>2</sub>, and CO<sub>2</sub>, can be created via gasification of any carbohydrate material. Fermentation of syngas by carboxydrotrophic microbes allows for it to be converted into interesting bio-chemicals. Organisms involved in the fermentation of syngas use the CO or H<sub>2</sub> in the gas as electron donor, fixating CO<sub>2</sub> into the final end products. Currently acetate and ethanol are relatively well established products from syngas fermentation and there is interest to broaden the scope towards production of more complex products. However, genetic engineering of carboxydrotrophic organisms and the knowledge of their metabolism is rather limited, making it difficult to 'create' strains producing these products.

A possible way to broaden the scope of products is via co-cultivation of microbes which can make use of each other's products. We established a co-cultivation of *Clostridium autoethanogenum*, a well-known carboxydrotrophic acetogen, together with *Clostridium kluyveri*, a well characterized organism employing the reverse  $\beta$ -oxidation pathway. *C. autoethanogenum* uses the syngas to produce a mixture of acetate and ethanol. *C. kluyveri* subsequently uses these products to perform chain elongation. This results in a co-culture producing a mixture of C4 and C6 acids and alcohols using carbon monoxide as a sole substrate.

This co-culture poses an interesting way for production of more complex and valuable products from syngas. Basic characterization of these co-cultures has been done and currently the research focus lies on how the species interact with each other and how environmental factors influence their production patterns and metabolism.