

Tandem presentation: by Steffen Lindner-Mehlich & Frank Kensy

**The Formate Bioeconomy: Synthetic formatotrophy for assimilation of formate synthesized from electricity and CO<sub>2</sub>.**

Our increasing understanding of the biochemical logic underlying cellular metabolism allows us to use design principles to engineer microbes tailor-made to address economic and ecologic challenges. One of these major challenges is to replace fossil resources in fuel and chemical production with a circular and sustainable bioeconomy. In order for this to become a real alternative, such processes cannot be based on sugars but rather need to run on a sustainable and highly available feedstock: CO<sub>2</sub>.

Formate, which can be efficiently produced from electricity and CO<sub>2</sub>, can serve as the sole carbon and energy source for microbial growth. However, natural formate assimilation pathways are either inefficient or operate in organisms which are difficult to engineer and provide a narrow product spectrum. A strategy to overcome these restrictions is to engineer synthetic formate assimilation routes in model industrial organisms.

The establishment of such routes will be covered by the first part of the talk. We will describe our strategy of pathway engineering that uses a variety of selection strains to stepwise verify the function of modules of the pathway and, finally, to generate a strain whose growth is entirely dependent on the pathway.

In the second part of the talk, we will focus more on the implementation strategy of the Formate Bioeconomy in industry. We will discuss the product focus of the platform strains and the integration of the electrolyzer with the bioreactor.