

Synthetic Biology and Sustainability

Creating a synthetic *Bacillus subtilis* strain to sustainably produce pharmaceuticals and high value chemicals

Available master Projects

- 1. A structural study on Methanol dehydrogenase 3
Protein production, crystallization, crystallography, protein engineering, electron microscopy
- 2. Optimizing the *B. subtilis* methylotrophic strains
Cloning, metabolic engineering, synthetic biology, growth
- 3. Methylotrophic *B. subtilis* growth curves in 96 wells plates
Robotics, spectroscopy, creating a new protocol, bacterial growth. Testing for project 2.

Why? What? How?

Bacillus subtilis and methylotrophy

Microbial produced pharmaceuticals, polymers and high value chemicals all require the carbon source glucose as feedstock. Glucose is produced via agriculture of sugarcane, sugar beets or sugar palm. The production process of sugar is costly and time consuming. The prices of sugar have been rising in recent decades and will keep rising since the demand of glucose for microbial production is increasing as well as consumption. It would be advantageous to grow these high value compound producing microbes on a carbon source other and preferably cheaper than glucose. There are a number of reasonable cheap carbon sources available. The less covalently bound carbon groups, the cheaper the feedstock. It has been known that there are prokaryotes with the ability to grow on alcohols like methanol and ethanol. Ethanol is a product high in demand but methanol is a product that cannot be consumed and is easily produced from natural gas and is a waste product from fermentation.

Methanol seems to be a good substitute as a carbon source for glucose. As an inspiration we use the organism *Bacillus methanolicus* to create a methylotrophic *Bacillus subtilis* using genes from *B. methanolicus*. The choice for *B. subtilis* as single cell factory is due to its GRAS status (Generally Recognized As Safe) by the WHO and the vast amount of genetic tools available for this organism. It is a widely used organism in industry to produce enzymes and specialty chemicals.

The ultimate goal is to have *B. subtilis* grow well on methanol as the sole carbon source and incorporation of a metabolic pathway to produce high value chemicals and pharmaceuticals.

If you would like to be a part of this research, please contact us via the mail address below!

Pharmaceutical
Biology