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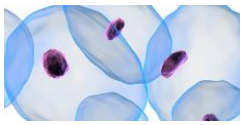

Rewiring the central metabolism of *Pseudomonas Putida* for improved production of bioplastics

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Type of thesis: Experimental

Required competences: Basic molecular biology techniques: Bacterial cultivation and transformation, PCR, gel electrophoresis, plasmid assembly methods.

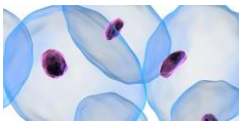
Acquired competences: Advanced synthetic biology techniques: CRISPR/Cas tools, DNA and gene synthesis, growth experiments, HPLC analysis, NADPH and fluorescent essays. Metabolic engineering of *P. putida*: Generation of knock-outs, knock-ins, as well as overexpression and downregulation of endogenous and synthetic genes.

Date: 28-02-2020

Description

Combustion of fossil fuels is the largest source of carbon dioxide (CO_2) emissions, contributing to 67 % of global-warming responsible greenhouse gasses[1]. In spite of this, the current global economy is still 80 % dependent on fossil fuels to sustain the nonstop human population growth[2]. One of the major challenges of the 21st century is to meet the stifling global market demand for building block chemicals and polymers, while ensuring environmental sustainability[1-2]. The urgent need to drastically move away from fossil fuels has boosted the regenerative circular economy. The use of microorganisms as cell factories for the production of bio-based chemicals using renewable feedstocks holds the promise to strongly contribute to such economy, lowering the carbon footprint.

In this relevant context we aim at engineering *P. putida* for improved production of "green" chemicals, such as bioplastics. In order to achieve it, we will design and implement synthetic metabolic routes in the genome of *P. putida* with the help of CRISPR-Cas tools as well as synthetic modules to fine-tune gene expression.



References

[1] Corfee-Morlot, J., I. Westphal, M., & Spiegel, R. (2019). 4 Ways to Shift from Fossil Fuels to Clean Energy | World Resources Institute. Retrieved from https://www.wri.org/blog/2019/01/4-ways-shift-fossil-fuels-clean-energy.

[2] Antink, R., Bakker, P., Coke-Hamilton, P., van Doorninck, M., Drinkwater, J., Dunlop, K., Eveillard, P., Haas, W., van Houten, F., Ishii, N., Katainen, J., Lopes Cardozo, M., Pantsar, M., Potočnik, J., Raworth, K., Saran, S., Steiner, A., Schmid, H., Sijbesma, F., Waughray, D., Webster, K., Wijkman, A., Watts, M. & Van Begin, G. (2019). Circularity Gap 2019. Retrieved from https://www.circularity-gap.world/.

[3] European Commission. (2017). Circular Economy Research and Innovation - Connecting economic & environmental gains (pp. 10-11). Brussels: European Commission.