Microbial conversion of lignocellulose to food and chemicals

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Lignocellulose is the most abundant biomass on earth. It mainly consists of the polysaccharides cellulose, hemicellulose and lignin. Oleaginous yeasts can convert the mixed monosaccharides derived from hydrolysates of cellulose and hemicellulose to lipids (mainly triglycerides)[1, 2], red oleaginous yeasts additionally generate carotenoids and extracellular glycolipids. Yeast lipids can be used as sustainable replacement of vegetable oils such as palm oil in biodiesel, feed and food production[3, 4, 5]. In our recently started project, we are investigating the physiology of oleaginous yeasts when producing lipids and other valuable compounds. To enable following the kinetic of lipid accumulation we established methods for monitoring intracellular lipid content[6, 7]. We are also establishing novel extraction methods based on fractionation of the oleaginous yeasts with supercritical solvents. As we intent using yeast- derived compounds in food production, we are also performing toxicological analyses to avoid risks due to toxic compounds, which might be transferred from lignocellulose to the yeast biomass. Our project will explore new, sustainable resources to produce food and high- value chemicals and add value to residues from agriculture and forestry[8].

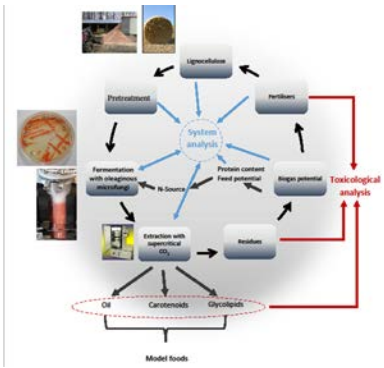

Figure 1. Survey of the research project. Lignocellulose is converted to food and high value compounds using red- oleaginous yeasts to reach a circular, sustainable process.

[1] J. Brandenburg et al. *Yeast* **2016**, *33*, 451-462.
[2] J. Brandenburg et al. *Appl Microbiol Biotechnol* **2018**, *102*, 6269-6277
[3] H. Karlsson et al. *Biotechnol Biofuels* **2016**, *9*, 229
[4] H. Karlsson et al. *Biotechnol Biofuels* **2017**, *10*, 273
[5] J. Blomqvist et al. *Sci Rep* **2018**, *8*, 15945
[6] V. Shapaval et al. *Biotechnol Biofuels* **2019**, *12*, 140
[7] M. Chmielarz et al. *Biotechnol Biofuels* **2019**, accepted
[8] V. Passoth & M. Sandgren *Appl Microbiol Biotechnol* **2019**, *103, 5105-5116*