

Engineering the oleaginous yeast *Rhodospiridium toruloides* for the production of lipids and lipid-based chemicals

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Project Goal: The goal of this project is to engineer the oleaginous yeast *Rhodospiridium toruloides* for the production of lipids and lipid-based chemicals.

Natural lipids can be used to produce a wide variety of compounds, including fuels (biodiesel), lubricants, surfactants, solvents, waxes, and creams. These lipid-derived compounds, or so-called oleochemicals, potentially offer a renewable alternative to traditional petroleum-based manufacturing. Oleaginous yeast naturally produce lipids from simple sugars when some other essential nutrient such as nitrogen is limiting. In these regards, they potentially offer an economical and renewable route for natural lipid production from low-cost, plant-based sugars

We are investigating *Rhodospiridium toruloides*, a red basidiomycetous yeast, that naturally produces lipids at high titers. This oleaginous yeast produces lipids from a wide variety of common sugars, including glucose, xylose, cellobiose, arabinose, and sucrose. However, far less is known about this oleaginous yeast than the model *Yarrowia lipolytica*. In addition, the genetics are still quite primitive. Despite these limitations, we have made significant progress increasing lipid production in *R. toruloides*. In particular, we have been able to engineer a strain that doubles lipid production during batch growth and quintuples it during fed-batch growth using glucose as a feedstock [1-2]. However, these strains have significantly lower productivities when xylose is the feedstock [3]. To address these lower productivities on xylose, we are also investigating the mechanism of pentose utilization in *R. toruloides*.

References

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