

***Yarrowia lipolytica* strains for Usual and Unusual lipid production and new tools for system biology and genetic engineering in this yeast**

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Yarrowia lipolytica is one of the most promising chassy yeast for lipids and lipid-derived compounds production [1]. Identification of key genes involved in the lipid turnover, as well as genetic engineering strategies, like deletion of the glycogen synthase (Δ gsy1) [2] or overexpression of lipid droplet protein *LDP1(OIL1)* [3], improving lipid production, will be presented. Despite of achieving increased accumulation of lipids in *Y. lipolytica* cells, the process is still not economically feasible. Thus, novel strategies decreasing the overall bioprocess cost have been implemented, like extending the range of carbon sources that could be utilized by the yeast [4], including xylose, fructose, galactose, cellobiose, cellulose, as well as raw material such as inuline, raw starch, industrial cellulose pulp and xylose-rich agave bagasse hydrolysate [5, 6]. Apart from higher accumulation of typical storage lipids, *Y. lipolytica* has been engineered to synthesize conjugated linoleic acids (CLA) [7], odd chain fatty acid [8] and cyclopropane fatty acid (CFA) [9], which are all highly desired fine products.

Finally, to enable rapid and high-throughput genetic engineering strategies, a molecular biology toolbox dedicated for *Y. lipolytica* has been expanded by developing CRISRP-Cas9 or Golden Gate systems. The latter, developed by our group [10], enables rapid assembly of complex, multi-gene expression cassettes, bearing complete beta carotene [11] and violacein [12] synthesis pathways, or xylose utilization machinery [5]. This toolbox is available at Addgene (plasmid ID numbers 120730-120793) to the *Y. lipolytica* community [13, 14].

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