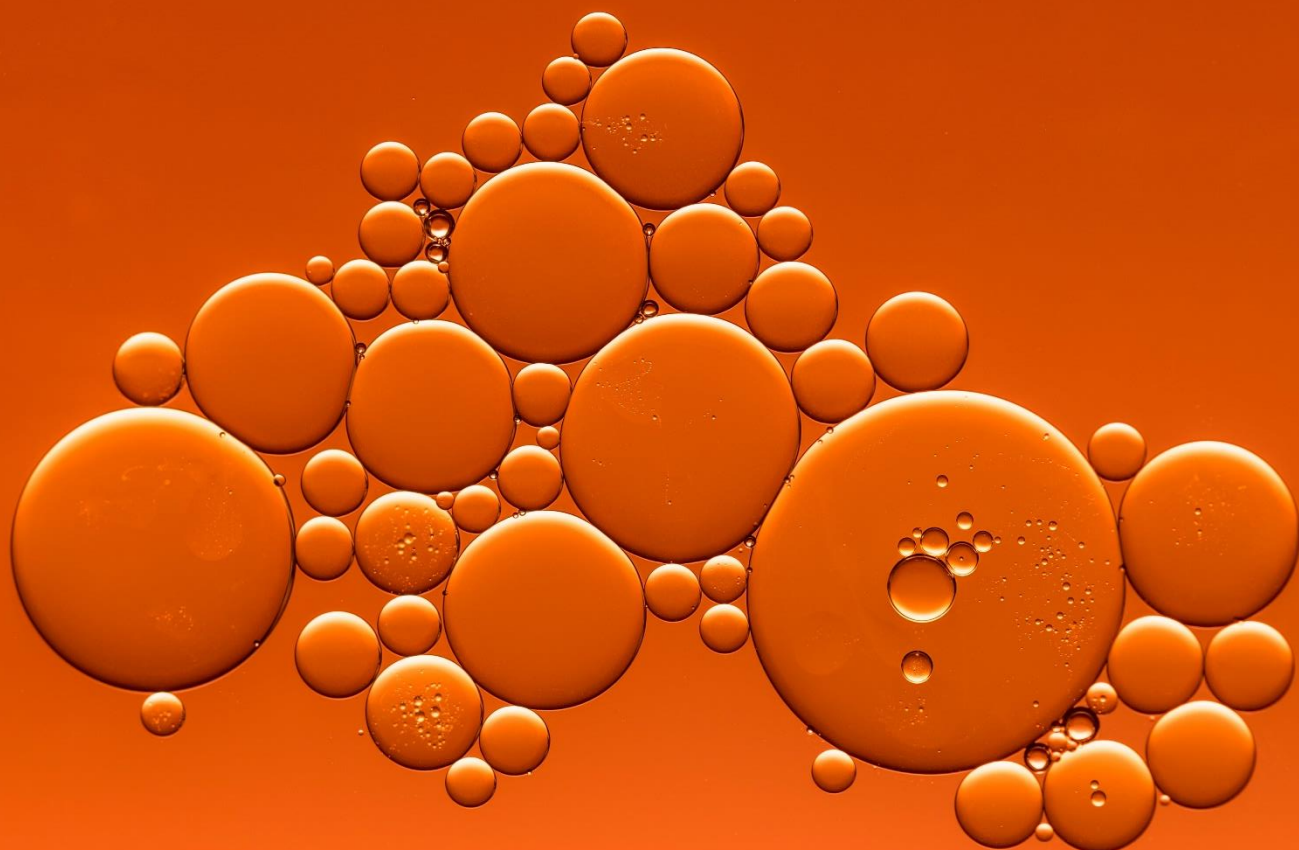




Single Cell Oil Production

Genetic tools to increase microbial yield and purity of fatty acids

Report by **Connectomix**



Overview

- Biotechnological Strategies
- Principles of Fatty Acid Biosynthesis
- Fatty Acid Biosynthesis tools in selected Microorganisms



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Authors' note on the report

Overview

This report contains collected literature information about fatty acid metabolic pathways optimization with a focus on catalytic improvements of enzymes. We sought all available literature studies that indicate enzymes that can be upregulated, downregulated or mutated to achieve higher product yields of palmitic, oleic and stearic acids in the selected microbes.

Replacing Palm Oil and Other Conventional Oils

It is predicted that the market for palm oil will grow with the annual rate of 2% in the future. Currently, global production stands at 70 million tons of palm oil per year. With constant growth of demand, the environmental burden of palm oil is increasing. Deforestation and replacement of rich forest biodiversity with structurally simple ecosystems such as palm oil plantations leads to irreversible loss of biodiversity and increased greenhouse gas emission.

How can we replace palm oil? Given that other crops have far lower yields than oil palm, their land footprint would be higher. We need innovative new solutions. Microbes can reach substantially higher purity, yield and resource efficiency than any crops, while offering a logistically flexible production area. Hence, microbial oil, also known as single cell oil (SCO) are one of the most promising technologies available for sustainable oil production for food, cosmetics, and other industries.

Note on Future Prospects

Single Cell Oil has a significant potential to disrupt many markets that are using different oils. Bioengineering of microbes allows higher yield and purer fatty acid production. Adjustable lipid profiles of microorganisms will enable production of many desired oils currently being used in industries such as food industry, cosmetics, and pharmaceutical with substantially lower environmental costs.



Abbreviation

FA	Fatty Acid
FFA	Free Fatty Acid
HOX	Hydrogen Oxidizing Bacteria
PUFA	Poly-unsaturated Fatty Acids
CoA	Coenzyme A
ACP	Acyl Carrier Protein
FAB	Fatty Acid Biosynthesis
FAS	Fatty Acid Synthesis
FAD	Fatty Acid Degradation
TE	Thioesterase
TCA	Tricarboxylic Acid Cycle
ER	Endoplasmic Reticulum
MPT	Malonyl/Palmitoyl Transacylase
DAG	Diacylglycerol
TAG	Triacylglycerol
GPAT	Glycerol-3-Phosphate Acyltransferase
SCP	Single Cell Protein
SCO	Single Cell Oil