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**Mutations That Alter the Bacterial Cell Envelope Increase Lipid Production**

Strategy improves yield of microbial lipids, paving way for replacement of petroleum-based fuels and chemicals.

**The Science**

Microbial production of lipids in high yield presents a significant challenge, often falling short of what can be theoretically obtained. This study characterized high-lipid mutant variants of *Rhodobacter sphaeroides* and showed that alterations to the bacterial cell envelope can result in increased accumulation of lipids relative to the parent strain.

**The Impact**

Knowledge of the mechanisms that limit microbial lipid production can reveal new strategies to increase lipid yield and increase the economic viability of alternatives to fuels or chemicals currently derived from petroleum.

**Summary**

Microbial lipids are potential replacements for petroleum-based fuels and chemicals; however their production often falls short of theoretical yield and strategies for improvement are needed. Researchers at Great Lakes Bioenergy Research Center examined a new class of *Rhodobacter sphaeroides* mutants that exhibited enhanced lipid accumulation relative to the parent strain. Chemical sensitivity profiles indicated that the high-lipid mutants were sensitive to drugs that target the cell envelope and changes in cell shape were observed, suggesting that previously undescribed alterations in the bacterial cell envelope can be used to increase bacterial lipid production. Importantly a subset of the HL mutants were able to secrete lipids, two which accumulated ~60% of their total lipids extracellularly, potentially enabling easy recovery of product from reactor medium. When one of the highest lipid secreting strains was grown in a fed-batch bioreactor its lipid content was comparable to that of oleaginous microbes, defined as those accumulating 20% or more of their dry cell weight as lipid. Knowledge of the biological mechanisms that limit lipid production can inform new genetic engineering and/or growth strategies and allow this important class of molecules to be adopted as fuels or chemicals on a larger scale.

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**Publications**

Lemmer, K.C. et al, “Mutations that alter the bacterial cell envelope increase lipid production.” *mBio* (2017), DOI: 10.1128/mBio.00513-17

**Related Links**

<http://mbio.asm.org/content/8/3/e00513-17>

**PM Recommendation for SC Web Publication**