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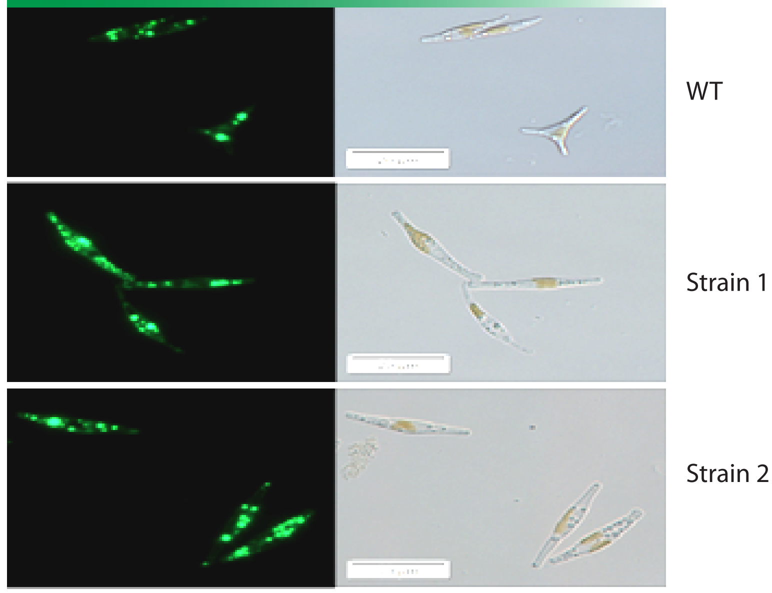

Lipid body staining in *P. tricornutum*

Genetically Engineered Algae Strains with Highly Elevated Lipid Production

Invention Summary: Rutgers scientists have developed algae strains with up to a 50% greater efficiency of converting solar energy to lipids.

In microalgae, protein synthesis and carbohydrate storage compete with lipid production for fixed carbon. By manipulating the carbon "decision tree" they hypothesized they could control cellular lipid productivity. The researchers identified a specific protein in the diacylglycerol acyltransferase (DGAT) family as a key enzyme in controlling the flux of carbon into storage lipids in algae.

The marine alga *Phaeodactylum tricornutum* was used as the model system and transformed to overexpress the DGAT family gene. Approximately two-fold enhancement in cellular triacylglycerol (TAG) production was observed in select stable transformants. Further analysis has revealed that the overexpressing clones could produce up to 30% more lipids per unit area than wildtype strain and hence are 30% more efficient in converting carbon to lipids.

Additionally, the quantum requirement for incorporating carbon into lipid was reduced by 20% in the overexpressing strains, indicating a more efficient transduction of light energy into lipid production in the strains.

Market Applications: Enhanced lipid productivity for applications in fields of:

- Biofuel
- Cosmetics and beauty
- Food, feed and nutrition

Advantages:

- 2-fold improvement in cellular TAG synthesis
- up to 30% increase in lipid production per unit area of culture
- 20% reduction in quantum requirement
- The model alga *P. tricornutum* survives in seawater and even wastewater
- Applicable for other algae species

Intellectual Property & Development Status: Patent pending. Available for licensing and/or research collaborations.