

Synthetic biology algal oil: Is it “natural,” “sustainable” or necessary?

Consumers trust that when products are marketed as natural and sustainable, they will not contain ingredients produced via genetic engineering or synthetic biology. However, a new oil ingredient, produced using extreme genetic engineering techniques, is making its way into some consumer products that claim to be “natural.” Synthetic biology and its products are not subject to mandatory health and environmental assessment or oversight and will likely not be labeled when used in consumer products or food.

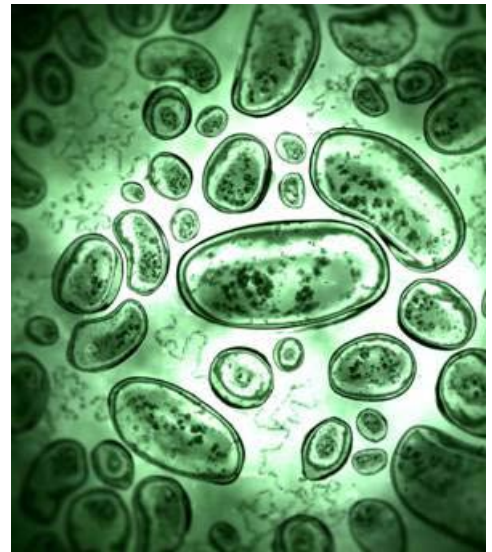
This new ingredient is being marketed as “natural” and “sustainable.” Its use in “natural” laundry soap and other products may set a precedent for other synthetic biology ingredients currently in development to enter consumer products and food without adequate oversight and safety assessment and be misleadingly labeled as “natural.” This could confuse consumers and potentially displace truly natural commodities currently produced by small farmers, such as coconut oil. This commercial use of synthetic biology also poses significant threats to the earth’s biodiversity and could speed rain forest and other habitat destruction by increasing demand for sugar as a feedstock.

What is synthetic biology?

Synthetic biology (synbio) is an extreme version of genetic engineering. Instead of swapping genes from one species to another (as in conventional genetic engineering), synthetic biologists employ a number of new genetic engineering techniques, such as using synthetic (human-made) DNA to create entirely new forms of life or to “reprogram” existing organisms to produce chemicals that they wouldn’t produce naturally.

What is the new synbio algal oil?

Solazyme, a synthetic biology firm from California, is marketing a range of new oils derived from genetically engineered algae. Solazyme has not disclosed exactly how its algae is engineered, however, it appears to be using synthetic biology techniques such as “directed evolution” to change the fatty acid profile in the oil. One strain of Solazyme’s algae has been re-engineered to secrete oil that contains unusually high levels of lauric acid, which is now being commercially sold as a lauric oil. Lauric acid is used in soaps and detergents and occurs naturally in coconut and palm kernel oils. Solazyme has additionally developed other oils produced by engineered organisms to replace cocoa butter, industrial oils and other soap and cosmetic ingredients.



Commercial use of synbio algal oil: “natural” and “sustainable?”

In the absence of regulations to protect human health and the environment, and labeling to ensure consumer right-to-know, synthetic biology is starting to enter household body care and cleaning products, such as Unilever’s Lux Soap and Ecover’s laundry detergent. In some cases these products are being marketed as “natural” and “sustainable.” However, the oils in these products are produced by synthetically engineered algae that are designed in labs and feed on sugar – something most people would not describe as “natural.”

The claims of “sustainability” for this technology are also questionable at best. While the industry claims that synbio could reduce impacts on land, synbio algae in fact require large amounts of sugar as a feedstock in order to live and produce commercial substances. Expanding sugarcane plantations to meet feedstock demand from a growing synbio industry could exacerbate the current destruction of critical savannah and rain forest ecosystems in Latin America (including some of Brazil’s most eco-sensitive areas), Africa and Southeast Asia.¹ Commodities currently

¹ Mendonca, Maria Luisa. “Brazil: sugar cane plantations devastate vital Cerrado region.” *Pacific Ecologist* 17 (2009): 25+. Academic OneFile. Web. 18 Aug. 2014.



produced by small farmers may be displaced in favor of synthetic biology products, and the land they preserve may in turn be converted into industrial-scale plantations for soy, beef or sugar.

Risk of environmental escape and contamination

Harmful algal blooms of naturally occurring algae are a major environmental problem. The escape of engineered synbio algae into the environment – either intentionally or otherwise – could have serious and unforeseeable consequences, including genetic contamination of wild species, disruption of natural ecosystems and release of chemical and biological pollutants.^{2,3} No containment strategies are foolproof, and we do not know how these genetically engineered algae will interact with the environment. While some types of pollution can be cleaned up, algae reproduces quickly. Once in the environment it may be impossible to recall or clean up.^{4,5}



Could synbio algal oil replace palm oil?

Solazyme proposes that the oil from genetically engineered algae could be a sustainable alternative to palm kernel oil, which is a lauric oil produced from the seeds of the oil palm tree. (Note: this is different from “palm oil” which is produced from the palm fruit.) However, a complete life cycle analysis may suggest that algal oil’s ecological footprint is not necessarily that sustainable and may do little to slow palm oil expansion. Palm kernel oil is only a small driver of palm plantation development, and because its market is cushioned by the larger sales of palm oil, the palm industry is likely to be able to compete with algal oil. It is more likely that the new synbio algae lauric oil will replace other lauric oils such as coconut oil and babaçu oil. The arrival of this replacement may therefore threaten the livelihoods of millions of sustainable coconut and babaçu farmers around the world whose communities and cultures depend on these commodities.⁶ Switching to an oil produced by synthetic, genetically engineered algae that feed on sugar produced via large-scale, chemical-intensive industrial monocultures (also notorious for slave-labor like conditions) also perpetuates the many social and environmental problems of the concentrated, corporate-controlled agricultural system.

Virtually unregulated, unassessed for safety and not labeled

Like traditional GMOs, the products of synthetic biology are virtually unregulated, not required to be assessed to ensure they are safe for our health and environment and aren’t currently required to be labeled. Companies like Solazyme are not revealing that synthetic biology methods are being used, and consumers are being asked to trust these biotechnology companies to self-regulate. Consumers want to know what they are buying and using.⁷

Synbio algal oil should not falsely marketed as “sustainable” or “natural,” nor should it be incorporated into consumer products unless there are regulations specific to synthetic biology, mandatory, transparent health and environmental safety assessments for people and the planet, and transparency about which specific synthetic biology techniques are being used.

More information on synthetic biology: www.foe.org/synbio, www.synbiowatch.org

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3 New Directions: The Ethics of Synthetic Biology and Emerging Technologies. Presidential Commission for the Study of Bioethical Issues. December 2010, Washington, D.C.
4 Snow, A. “Risk of Environmental Releases of Synthetic GEOs.” Presentation for the Presidential Commission for the Study of Bioethical Issues. July 8, 2010. <http://www.howplantswork.com/wp-content/uploads/2011/02/risks-of-environmental-releases-of-synthetic-geos.pdf>
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7 New Poll Finds Synthetic Biology Remains a Mystery. Woodrow Wilson Center and Hart Research. March 2013: http://www.synbioproject.org/news/project/synthetic_biology_remains_mystery/