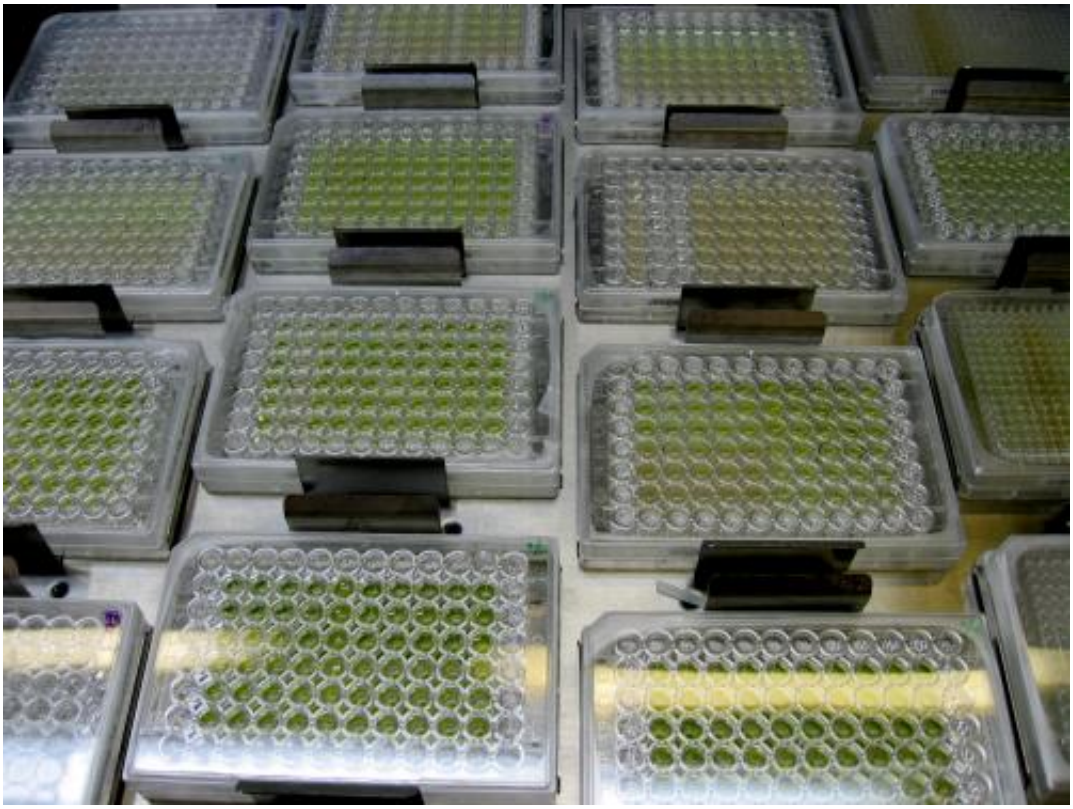
'Pharmaceutical' approach boosts oil production from algae

April 8 2013



Using an approach from pharmaceutical chemistry, UC Davis chemists are screening for compounds that boost fuel production by microscopic green algae. Credit: Annaliese Franz, UC Davis

Taking an approach similar to that used for discovering new therapeutic drugs, chemists at the University of California, Davis, have found several compounds that can boost oil production by green microscopic

algae, a potential source of biodiesel and other "green" fuels. The work appears online in the journal *Chemical Biology*.

Microalgae are single-celled organisms that, like green plants, use photosynthesis to capture carbon dioxide and turn it into complex compounds, including oils and lipids. Marine algae species can be raised in saltwater ponds and so do not compete with food crops for land or fresh water.

"They can live in saltwater, they take sunlight and carbon dioxide as a building block, and make these long chains of oil that can be converted to biodiesel," said Annaliese Franz, assistant professor of chemistry and an author of the paper.

Franz, graduate students Megan Danielewicz, Diana Wong and Lisa Anderson, and undergraduate student Jordan Boothe screened 83 compounds for their effects on growth and oil production in four strains of microalgae. They identified several that could boost oil production by up to 85 percent, without decreasing growth.

Among the promising compounds were common antioxidants such as epigallocatechin gallate, found in green tea, and butylated hydroxyanisole (BHA), a common food preservative.

The team has carried out growth experiments in culture volumes of up to half a liter. They calculate that some of the chemicals they analyzed would be cost-effective when scaled up to a 50,000 liter pond. After oils have been extracted from the algae, the remaining mass can be processed for animal feed or other uses.

Franz came to UC Davis in 2007 with a background in pharmaceutical chemistry. Given the campus's emphasis on biofuels, she started thinking about applying high-throughput techniques used to screen for new drugs

to looking for compounds that could affect microalgae.

The idea, Franz said, is to look for small molecules that can affect a metabolic pathway in a cell. By setting up large numbers of cell cultures and measuring a simple readout in each, it's possible to screen for large numbers of different compounds in a short time and home in on the most promising.

Using an approach from pharmaceutical chemistry, UC Davis chemists have identified compounds that can boost fuel production by microscopic green algae. Here algae incubate in the lab of Dr. Annaliese Franz. Credit: Andy Fell, UC Davis

"The basic concept comes from the pharmaceutical industry, and it's been used for human cells, plants, yeast, but not so far for algae," she said.

"There are many cases where small molecules are having an effect to treat a disease, so it makes sense that if you can affect a pathway in a human for a disease, you can affect a pathway in an algal cell," Franz said.

Patents on the work are pending. The research was funded by Chevron Technology Ventures through a cooperative agreement with UC Davis.

Provided by UC Davis