New technology converts seaweed to renewable fuels and chemicals

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A team of scientists from Bio Architecture Lab (BAL), has developed breakthrough technology that expands the feedstocks for advanced biofuels and renewable chemicals production to include seaweed (macroalgae). The team engineered a microbe to extract the all the major sugars in seaweed and convert them into renewable fuels and chemicals, thus making seaweed a cost-effective, renewable source of biomass.

"About 60 percent of the dry biomass of seaweed are fermentable carbohydrates, and approximately half of those are locked in a single carbohydrate - alginate," said Daniel Trunfio, Chief Executive Officer at Bio Architecture Lab. "Our scientists have engineered an enzyme to degrade and a pathway to metabolize the alginate, allowing us to utilize all the major sugars in seaweed, which therefore makes the biomass an economical feedstock for the production of renewable fuels and chemicals."

BAL's scientific breakthrough is detailed in an article entitled "An Engineered Microbial Platform for Direct Biofuel Production from Brown Macroalgae", which appears on the cover of the January 20 issue of *Science* magazine.

"It is both an incredible scientific achievement and a distinguished honor to be published in *Science*, and I am very proud of our team," said Trunfio. "It is yet another strong validation of BAL's breakthrough technology."

Seaweed is an ideal global feedstock for the commercial production of biofuels and renewable chemicals because in addition to its high sugar content it has no lignin, it does not require arable land or freshwater to grow, and it is environmentally friendly. Globally, less than 3 percent of the coastal waters can produce seaweed capable of replacing over 60 billion gallons of fossil fuel. Today, in many parts of the world, seaweed is already grown at commercial scale. BAL currently operates four seaweed farms in Chile and has had great success in growing seaweed at economically viable production yields.

BAL was a co-recipient of an award from the highly selective U.S. Department of Energy's Advanced Research Projects Agency - Energy (ARPA-E), a new agency within the U.S. Department of Energy. This award was for the development of a process to convert sugars from seaweed into isobutanol.

"BAL's technology to ferment a seaweed feedstock to renewable fuels and chemicals has suggested an entirely new pathway for biofuels development, one that is no longer constrained to terrestrial sources," says ARPA-E Program Director Dr. Jonathan Burbaum. "When fully developed and deployed, large scale seaweed cultivation combined with BAL's technology promises to produce renewable fuels and chemicals without forcing a tradeoff with conventional food crops such as corn or sugarcane."

In addition to ARPA-E, globally the development of BAL's technology is also supported by the prestigious Concurso Nacional Grant provided by InnovaChile CORFO and Statoil, the Norwegian oil giant and the largest offshore oil and gas producer in the world.

More information: www.sciencemag.org/lookup/doi/ … 1126/science.1214547

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