Scientists develop technology to produce sugar from photosynthetic bacteria

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Researchers from the Wyss Institute for Biologically Inspired Engineering at Harvard and Harvard Medical School have engineered photosynthetic bacteria to produce simple sugars and lactic acid. This innovation could lead to new, environmentally friendly methods for producing commodity chemicals in bulk. Their research findings appear in the June issue of *Applied and Environmental Microbiology*.

This photosynthetic factory could also reduce the carbon dioxide emissions associated with transporting sugar globally from producing countries; lead to greater availability of biodegradable plastics; and allow capture of harmful CO2 emissions from power plants and industrial facilities.

In addition to its positive environmental impact, the technology offers potential economic advantages. Because the production methods use photosynthesis--the process by which living things are assembled using only CO2 and sunlight--the cost of making sugars, lactic acid, and other compounds would be significantly lower than traditional methods.

"What we're doing is using genetic engineering to get organisms to act the way we want them to—in this case producing food additives," said Wyss Institute senior staff scientist Jeffrey Way, Ph.D. "These discoveries have significant practical implications in moving toward a green economy."

In addition to Dr. Way, researchers on this effort include Wyss Institute

core faculty member Professor Pamela Silver, Ph.D., also of Harvard Medical School; and Henrike Niederholtmeyer, Bernd T. Wolfstadter, and David Savage, Ph.D., all of Harvard Medical School.

Sugar is primarily produced from sugar cane, which grows only in tropical and subtropical climates. By enabling production almost anywhere in the world, this living cellular manufacturing plant could greatly reduce the cost and emissions associated with transporting millions of tons of sugar to consumers every year.

It could also expand the availability of biodegradable plastics by reducing the cost of lactic acid, a key building block in their production.

The current work by Dr. Way and Dr. Silver's team is the latest innovation in a wide-ranging program in which the Wyss Institute is working with various partner institutions to develop environmentally sustainable ways to produce biofuels, hydrogen, and other high value chemicals and food additives.

"Our mission at the Wyss Institute is to use Nature's design principles to create solutions in medicine, manufacturing, energy, and architecture that will lead to a more sustainable world," said Don Ingber, Ph.D., M.D., Founding Director of the Wyss Institute. "This work is an important step in that direction."

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