Algae for Fuel; Fungi for Fuel

Posted by steven.reynolds | January 13, 2010

Grant Powers Algae Fuel Research

There are a lot of things standing in the way of Shulin Chen's quest to make energy from algae, the simple, light-loving organisms we usually associate with pond scum, seaweed and deck slime.

But in a world of rising greenhouse gases and dwindling energy options, he's forging ahead.

"We don't have other choices," said Chen, a professor of biological systems engineering. "We have to do it. We make progress one step at a time, but I believe eventually we're going to have a biofuel industry using algae. We have to. There's little other option."

His effort took a significant step toward reality recently with word of a $2 million federal appropriation to develop energy-rich algae, the technology to grow them all year, and a way to convert them into fuel and other products.

As a potential fuel source, microalgae are hard to beat. They grow fast, doubling their mass several times a day. They take up a fraction of the space required to grow other biofuels. And loaded with fat, they are the fried cheese of the biofuel world.

"The idea of fuel from algae is accepted," said Chen. "The challenge is to make it work. With electricity, we have alternative sources. We can do hydropower. We can do solar energy. We can do wind energy. But liquid transportation fuel is something where we don't have other options. We have to get that from

biomass, either from crop residues or algae. Crop residues are a good source but limited. Algae has the highest potential."

Chen, who has patents pending on several algae culture, harvesting and nutrient-recycling systems, plans to use the federal money to improve ways to produce and process algae. He says WSU is currently one of the major players among universities in this relatively new field.

"The money we're receiving will put us one step up," he said, "and make us a lot more competitive to become a leader in this area."

by Eric Sorenson

Shulin Chin, a biosystems engineering scientist, is working on getting liquid fuel from algae.

Clean-tech venture capitalist Shawn Lesser recently named WSU one of the top ten "clean tech" research universities in the nation. Learn more by visiting this link: http://bit.ly/8wme2J.

Undergrad Wins DOE Competition, Speeds Investigation of Fungal Genetics

A WSU Tri-Cities student and Pacific Northwest National Laboratory intern earned top honors at the U.S. Department of Energy's 2009 Science and Energy Research Challenge Poster Competition, held recently in Oak Ridge, Tenn., for research that could help scientists use fungi to make chemicals

used in plastic and fuels.

During her PNNL internship, Meyer, a junior majoring in science, dove into the genetics of Aspergillus niger, a black mold commonly found in soil. She worked with Bruno to advance how researchers delete genes from A. niger. Her efforts greatly improved the efficiency and speed of lab processes. The work could provide a way to use mold to make plastics and other chemicals from broken-down plant matter, called biomass.

A.niger is incredibly efficient at making citric acid, a natural preservative that gives food a sour taste. Bruno and other PNNL scientists want to reproduce that degree of efficiency in other fungi, like Aspergillus terreus, which makes itaconic acid. Itaconic acid has the potential to replace some of the petroleum used in plastic production.

To do so, PNNL researchers are trying to find out which of A. niger's genes are key for the creation of citric acid. But finding, deleting and testing specific genes is usually a tedious process that can take weeks for each gene. Bruno, however, learned about a new, time-saving method while attending the Fungal Genetics Conference in March. And Meyer was the perfect person to apply it to A. niger, Bruno said.

"Kristen is very detail oriented," Bruno said. "Sometimes she's even able to correct me. You can trust that her research will be precise."

Once suspect genes were identified, Meyer easily removed the marker gene, allowing A. niger to operate as usual. Being able to restore the gene with little effort is especially important when working with strains like A. niger. This keeps such strains healthy, allowing researchers to keep samples thriving so they can further study them after target genes are identified.

With Meyer's help, this method dramatically sped up the whole process for A. niger. Instead of being able to delete target genes just 18 percent of the time, the new method does it 95 percent of the time, Bruno said. Now PNNL researchers only need about a week to identify genes, enabling them to study several groups of genes at once.

Meyer has proved so valuable in the lab that PNNL and WSU have hired her part-time to do more research in BSEL. In between chemistry classes, she continues to investigate gene deletion and also examines metabolic processes — although she hopes to spend the 2010-2011 academic year studying biomedicine and public health in Ecuador.

"My goal is to work in the medical field," Meyer said. "I want to earn an M.D.

and a Ph.D., so that I can do both research and clinical work."

Meyer won a $3,000 scholarship for her efforts. She was one of 100 undergraduate interns from various DOE national labs who were invited to participate in the competition.

WSU Tri-Cities science major Kristen Meyer and PNNL molecular biologist Kenneth S. Bruno stand next to Kristen's winning poster describing her research into the genetics of a fungi that might be useful in the manufacture of plastic and fuels.

For more details on PNNL's bio-based product research program, including Meyer's project, please visit http://bit.ly/6e0W2V.

For a complete list of winners in the 2009 Science and Energy Research Challenge, please visit http://bit.ly/7DFbGc.

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