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A new path to ethanol

Novozymes races to turn crop waste, not corn, into fuel

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CORRECTION

A story in the Business section Tuesday about ethanol misspelled the corporate name Procter & Gamble. The story also incorrectly referred to enzymes as living organisms. Enzymes are proteins produced by living organisms, and they speed up chemical reactions, including those used to make ethanol.

FRANKLINTON -- The search for better and cheaper ways to make ethanol spans the globe and is consuming millions of dollars.

Only two companies seem close to success. One is in Silicon Valley. The other is on a sprawling campus surrounded by acres of farmland in Franklin County. So far, Franklin County is in front.

Danish, French and U.S. scientists and executives working for Novozymes are attacking a problem that has stumped their colleagues in business and academia: how to make ethanol comparable in cost or cheaper than gasoline without raising food costs.

Novozymes, a Danish company with its U.S. headquarters in Franklinton, is the world's largest producer of enzymes, living organisms essential in brewing beer, baking bread, treating wastewater and making detergents.

In the past decade, Novozymes has turned more of its attention to ethanol. Last year, the company generated about \$200 million selling enzymes that break down corn kernels, the only crop now used in full-scale ethanol production. But that is last century's science.

The next generation of ethanol production -- known as biomass conversion -- is the quest that scientists are pursuing so diligently in Franklinton and at Novozymes' second research hub in Davis, Calif. Novozymes is focusing on farm waste and crops such as switch grass. Replacing corn kernels with biomass crops promises to not affect food prices as ethanol demand rises.

The United States, by far Novozymes' largest market, plays an important role in the company's goal of becoming a key player in the emerging ethanol industry, said Lars Hansen, president of Novozymes North America. "In the U.S., we have the political will and the resources," Hansen said.

Novozymes has teamed with two companies that together received \$110 million from the Department of Energy to build refineries that make ethanol from biomass. The plants will be designed to use corn stalks, corn cobs or switch grass.

The federal dollars are part of about \$900 million the Department of Energy has pledged in the past two years to kick-start next-generation ethanol production.



Novozymes made about \$200 million last year selling enzymes that break down corn kernels, used to produce ethanol. Now its researchers are working on next-generation technology.

Staff File Photo by Ethan Hyman

Novozymes and its main competitor -- Genencor, a subsidiary of Danish Danisco that is based in Palo Alto, Calif. -- are also investing their own money. Much of the sales that the two companies generated last year from enzymes that break down corn kernels is being pumped back into research to develop enzymes that break down biomass, said Lars Topholm, a Danish analyst who tracks Novozymes and Danisco.

Novozymes pulls ahead

Genencor has always been the smaller competitor, Topholm said. A patent dispute that Novozymes won last year in U.S. federal court caused Genencor to fall further behind, he said. Genencor had to pay about \$15 million and lost business to Novozymes, stunting its enzyme sales to ethanol biorefineries that use corn kernels at about \$60 million last year.

With that, Novozymes clearly emerged as the market leader, increasing its ethanol business about 50 percent to about \$200 million in sales, Topholm said. "I have little doubt Novozymes is also the technological leader," he said.

In 2001, the companies each received \$17.8 million in federal research funding to develop an enzyme cocktail that is the foundation for biomass conversion.

In the past 18 months, Novo-zymes has announced partnerships with Poet and ICM, two Midwest companies that received \$80 million and \$30 million, respectively, in federal funding to build biomass conversion ethanol plants. Poet and ICM will use enzyme cocktails genetically engineered by Novozyme scientists in California and tested in Franklinton. Genencor isn't saying whether it has any partnerships.

Novozymes is committing more resources to research and development. Hansen said biomass conversion has become the company's largest single research project.

"They're stepping up funding massively," Topholm added.

Some of that money is going toward a \$4 million laboratory expansion on the Franklinton campus. The lab expansion is dedicated to biomass conversion research and is projected to be completed in the fall. Novozymes expects to hire about 50 scientists and support staff in the next two to three years to bolster the work of the existing 20 scientists on site.

"This is where biomass conversion from an application standpoint is happening in the U.S.," said Emmanuel Petiot, who heads the worldwide development of Novozymes' biofuels business from his Franklinton office. "We need facilities to test our enzymes and mimic the situation in the field."

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