

Move over Maize

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Article by Chris O'Malley.

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A firm hatched out of the Indiana University School of Medicine has raised \$150,000 toward bringing to market yeasts that could be a cure for one of the biggest bioengineering challenges of the day.

IU molecular biologist Mark Goebel and his assistants started down the path toward modifying yeasts to study cell division and its implications for curing diseases. But they took a different road after realizing a strain of yeast they created could yield the alternative fuel ethanol.

Not just any ethanol, mind you—cellulosic ethanol. To some it's the holy grail of producing ethanol cheaply by using grasses and other common plants rather than the food staple corn.



IBJ Photo/Waldak Kurylonek

Josh Heyen, a researcher at the IU School of Medicine, helped develop a yeast strain with promise in ethanol fermentation. It will be commercialized by Xylogenics Inc.

Corn is rich in yeast's favorite sugar, glucose, making it the main ingredient for the Midwest's ethanol refining industry. Trouble is, demand for corn to make ethanol has pumped-up food prices. The higher demand also has made ethanol more expensive to produce, making it that much less competitive with gasoline.

Unfortunately, fermenting ethanol on the cheap from basic plant matter has been as elusive as cracking the sound barrier in an old-fashioned airplane. Grasses and other more humble plant matter contain glucose, as does the corn kernel. But these plants harbor other complex sugars in their cell walls that yeasts won't readily ferment, such as xylose.

As long as there's even a trace of glucose is present, yeast will wrinkle its nose at xylose.

"The big home-run is that we're breaking down the xylose," said Mike Neibler, CEO of Xylogenics.

The Indianapolis-based start-up expects the IU Research and Technology Corp. will file the final U.S. patent documents on its genetically altered yeast strain within weeks. Xylogenics and IU also must negotiate a royalty agreement so the firm can license the technology to ethanol producers and their suppliers. "We really don't want to be in the yeast manufacturing businesses," said Neibler.

He's hoping to present the vision for Xylogenics at the Jan. 8 meeting of the Indiana Venture Club in hopes of raising more money for the effort.

Neibler said the firm will need about \$2 million initially, much of that for the cost of producing small batches of ethanol and verifying yields from the company's yeasts.

Goebl, an IU professor of biochemistry and molecular biology, is chief science officer of Xylogenics. He also works on behalf of the Richard G. Lugar Center for Renewable Energy at IUPUI.

Xylogenics estimates that its genetically altered yeast could, conservatively, increase U.S. ethanol production by at least 30 percent. If so, its yeasts could produce big revenue.

Considering royalties and the number of gallons of ethanol likely to be used nationwide, Xylogenics believes it could collect more than \$65 million in 2011. The estimated use of ethanol is based on a 2007 Congressional mandate. By 2022, the mandated level is 36 billion gallons, which company founders estimate could fetch the company more than \$500 million.

The company says its "Xylanol" yeast also can help improve corn fermentation, improving its production yield by about 3 percent.

To the extent Xylogenics' yeast could make ethanol a more viable alternative to imported oil, it could fuel further construction of ethanol distilleries. Indiana has nine operating and about as many others planned or under construction. "This would be good for the state of Indiana," said Cary Woods, chairman of Xylogenics.

State's ethanol expertise

Whether Xylogenics is on to something or not commercially, at this stage, is hard to say. So-called breakthroughs in cellulosic ethanol have been heralded in recent years yet ultra-low-cost production remains elusive.

At the least, Xylogenics stands to further Indiana's reputation in cellulosic ethanol research.

Clearly, Xylogenics went down a different path. "The genetic engineering carried out by other labs is quite elegant but it seems as though they had overlooked a critical component that we have now addressed, said Josh Heyen, a member of Goebel's research team.

In recent years they've been altering yeasts as part of research into the cell division cycle and its implications for new medicines, said Ross Cocklin, a team member.

"Ethanol production wasn't our focus at the time," said Goebel.

Mainstream application

Xylogenics' CEO Neibler figures the yeast fermentation process has the most potential.

For one, it's not new technology and already is widely used at existing ethanol refineries. "It's the least disruptive technology in the market today."

Xylogenics Inc.

What: Developer of bio-engineered yeast for the production of the automotive fuel ethanol from biomass such as grass and straw.

Employees: five

History: Founded in November as the result of medical-related research by a team led by Mark Goebel, professor of biochemistry and molecular biology at IUPUI

Funding: more than \$150,000 from Indiana University School of Medicine, its faculty foundation, and the Lugar Center for Renewable Energy. Possible additional funding from private investors.

Breakthrough: mutated a strain of yeast to switch off its propensity to crave glucose in favor of xylose and other sugars common to ordinary grasses and other plants currently not cost-effective to ferment into ethanol

Competitors: other developers of yeast and emerging technologies, such as microbes and gasification, to convert plant matter to ethanol

Source: Xylogenics Inc.

Edited for content

Xylogenics