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Applied and Environmental Microbiology Research Shows Promise of Low-Cost Biofuel Production from Sugar Beets

Research reported in the December issue of the American Society of Microbiology's journal *Applied and Environment Microbiology* on the development of a thermostable enzyme opens the way to a new pathway for low-cost biofuel production using sugar beet pulp as feedstock. ("Thermal Stabilization of *Erwinia chrysanthemi* Pectin Methylesterase," Applied and Environmental Microbiology, Dec. 2009, pp. 7343-7349, Vol. 75, No. 23).

Thermostability, or the ability to perform at high temperatures, is needed in biofuel and other industrial applications so enzymes can survive in the higher temperatures of commercial production systems and use the higher temperatures to speed up conversion reactions. The pectinmethylesterase (pme) enzyme developed by the Hood College/Atlantic Biomass team was fashioned to function in the sugar beet production environment of 65^0C (approximately 150^0F) which is at the top end for this class of enzymes.

"This development alone is important for opening up the use of beet pulp and similar agricultural residues for biofuel production," said Atlantic Biomass president and founder Bob Kozak. "More important, the development of this enzyme led us to an understanding of how enzymes break down plant cell walls and overcome biomass recalcitrance." Using this research, Atlantic Biomass is currently patenting that process in addition to the pme enzyme. "Overcoming biomass recalcitrance is the Holy Grail of economical biofuel production," Kozak pointed out. "I think we're finally on the right path."

Probably the most important discovery included in the paper is that two of the changes in enzyme structure were not predicted by enzyme computer models. "It was the innovative approach that Craig came up with and the hard work of the entire team that led to these discoveries," said Kozak.

"The work by Craig Laufer and his students at Hood has been outstanding, especially considering our limited funding," continued Kozak. "Many people think major scientific work comes only from "big-name" universities or Federal labs. I think getting our research in a journal as important as AEM shows that colleges such as Hood and small businesses such as Atlantic Biomass play an important role in scientific discovery."

"I hope members of Congress and the Obama Administration recognize this as they consider energy and science funding for the Department of Energy," Kozak emphatically stated. The limited funding that was used for this research came from the Maryland Technology Development Corporation, Mr. Kozak, and a Phase I STTR grant from the National Science Foundation.

As for the future of this work, Atlantic Biomass is actively looking for partners to apply this work to other biofuel enzymes and to commercialize this process. "Finding money to get through the Valley of Death of commercialization with frozen venture and credit markets has been tough," said Kozak. "We keep at this because I know there are innovative people out there who don't follow the conventional wisdom and are willing to become a part of the solution to the national security and environmental problems that could be solved by sustainable advanced biofuels."

Atlantic Biomass Conversions, Inc., is a Frederick, Maryland, HUB-zone biotech-biofuel company focused on developing cutting-edge systems to produce advanced biofuels from sustainable, non-food biomass.