
Cycle 2 – Energy Research Grants (FY07/08)

Enzymes for Enhancing Ethanol Production from Lignocellulose

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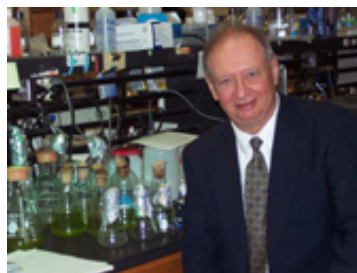
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ABSTRACT.

The production of ethanol from plant biomass, in conjunction with corn kernels, is necessary if ethanol is to partially replace automotive petroleum. However, current technology for the production of cellulosic ethanol is limited by inefficient production of cellulose from lignocellulose fibril and the enzymatic conversion of cellulose to fermentable sugar. The USDA and National Renewable Energy Laboratories are developing effective processes to release cellulose from the lignocellulose fibril at neutral to alkaline pH. However, the enzymes necessary for sugar generation from cellulose remain limited to a select few that are optimally active at acid pH. The objective of our research is to isolate novel enzymes from viruses, bacteria, insects and nematodes that occupy niches favoring the evolution of unique cellulases and hemicellulases. Our group has identified alkaline active cellulases and hemicellulases from microbes in alkaline lakes in the Nebraska Sandhills and in chlorella viral and western corn rootworm extracts. Furthermore, genes with predicted cellulase/hemicellulase activity, and other cell wall degrading enzymes, including an endo-1,4-xylanase, have been identified from the viral and insect genomes. ***Our primary research objective is to identify, express, and characterize selected enzymes from these unique biological systems that are compatible with alkaline pretreatment of plant cellulosic material.***