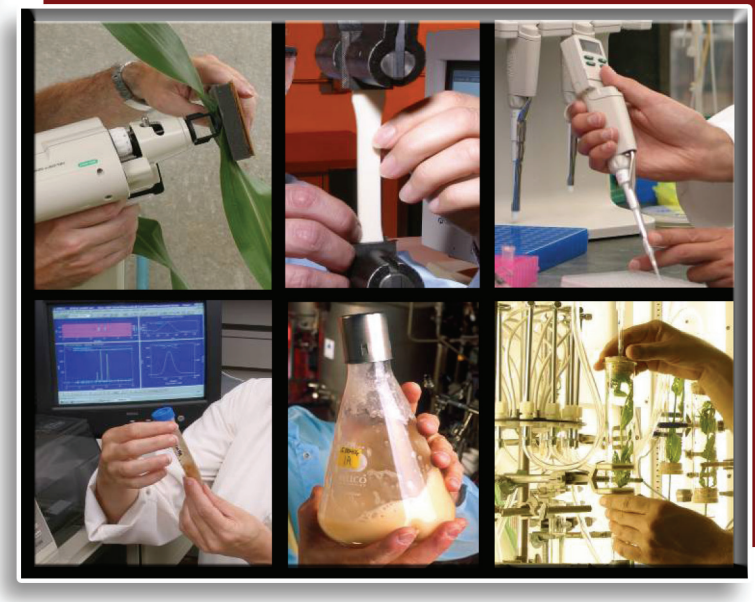
USDA • ARS • NCAUR

Metabolic Engineering & Fermentation



CURRENT RESEARCH FOCUS

Ethanol

Evaluation of new energy crops for production of fuel ethanol

Switchgrass, reed canary grass, alfalfa

Pretreatment and deconstruction

Chemical and thermal pre-treatments of lignocellulosic biomass

Discovery and development of new, economically efficient enzymes for conversion of lignocellulosic biomass (cellulose, hemicellulose) to simple sugars

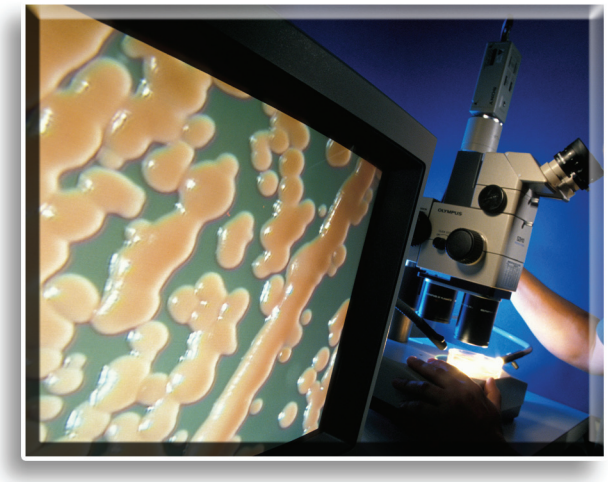
New protein expression systems for production of hydrolytic enzymes for conversion to biomass polysaccharides

Conversion

Saccharification and fermentation processes for conversion of agricultural residues (wheat straw, rice hulls, corn fiber) to fuels and chemicals

Metabolic engineering of lactic acid bacteria as industrially robust biocatalysts for fuel ethanol production

Development of yeasts capable of using all sugars derived from biomass to produce ethanol



Increasing efficiency of ethanol production

Development of a novel, biological abatement strategy for removal of fermentation inhibitors present in biomass hydrolysates

Development of yeast strains that are tolerant to fermentation inhibitors present in biomass hydrolysates

Develop methods to detect new ways to control bacterial contamination in industrial fermentations

Butanol

Development of high productivity fermentation systems for production of butanol from lignocellulosic hydrolyzates

Investigate novel methods for economic product recovery from dilute fermentation broths

Hydrogen

Investigate the biological production of hydrogen from agricultural resources

Development of technologies for the application of microbial fuel cells in the conversion of agricultural biomass into hydrogen

Facility Highlights

270,000 total sq. ft.

170 individual laboratories

65,000 sq. ft. pilot plant

The world renowned ARS Microbial Culture Collection of more then 85,000 bacteria, yeast and fungi

Pilot plant fermenters (30L to 100L)

Bench top fermenters (500 ml to 10L)

Advanced laboratory robotic workcell for high-throughput functional proteomic screenings

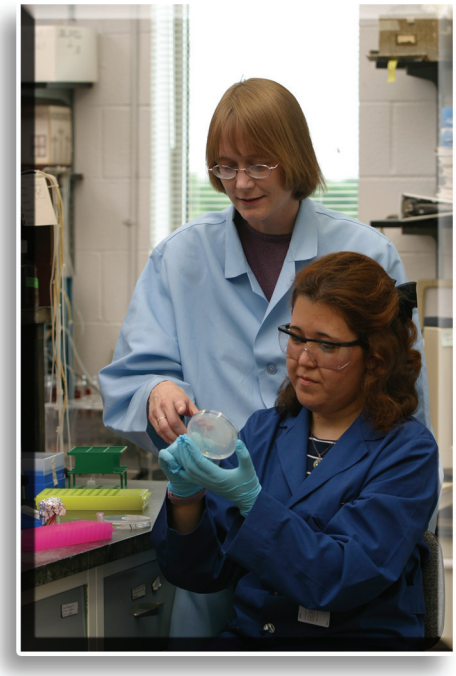
MALDI-TOFS (Matrix-Assisted Laser-Desorptive Ionization Time-Of-Flight Spectrometer)

Controlled environment for cultivation of yeast, fungi and bacteria, including strict anaerobes

Cell separation and unique product recovery tools

DNA facility for synthesis and sequencing

High pressure, supercritical fluid laboratory



Significant Collaborations

Aventine Renewable Energy / Purdue University / U.S. DOE (NREL): Hot water treatment of wet milled corn fiber to produce additional ethanol in a commercial ethanol plant

National Corn to Ethanol Research Center / Illinois Corn Marketing Board / Univ. of Illinois / Western Illinois Univ.: Research to promote commercialization of new methods in the conversion of corn to ethanol and add value to the dry grind ethanol process

Midwest Consortium for Sustainable Biobased Products: Purdue / Univ. of Illinois / Michigan State Univ. / Iowa State Univ. / Argonne National Laboratory / Ames Laboratory: Developing further uses of Distillers Grains (DG) for production of alternative chemical and fuel products

NCERC / Southern Illinois University Edwardsville: Developing a biosensor to detect bacterial contaminants of fuels ethanol plants

National Center for Agricultural Utilization Research

1815 N University St. Peoria IL 61604
309.685.4011
www.ncaur.usda.gov

For more information contact:

Dr. Michael Cotta, Research Leader, Fermentation Biotechnology
michael.cotta@ars.usda.gov

Dr. Joseph Rich, Research Leader, Bioproducts and Biocatalysts
joseph.rich@ars.usda.gov