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# Sessions 2 and 7: Advances in Microbial Science and Technology

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The Microbial Science and Technology Sessions emphasized a variety of approaches used for development of superior recombinant microorganisms for fermentation of multiple sugars typically present in any lignocellulosic hydrolyzate to fuels and chemicals. Efficient conversion of lignocellulosic biomass to liquid transportation fuels is a major goal for many in these sessions. The Session 2 contained six oral presentations and 62 poster presentations and Session 7 contained an additional six oral presentations and 49 posters. A brief overview of each oral Session and a summary of topics presented during the poster sessions are provided below.

Session 2 opened with a comparison of different pretreatments for corn stover, followed by fermentation using different recombinant organisms. Next, the metabolic engineering of a novel thermophilic *Geobacillus* sp. capable of high-yield ethanol production was discussed. The pathway for D-galacturonic acid catabolism in fungi was elucidated in the third presentation and determined to be different from any previously described pathway. Butanol production from engineered *Escherichia coli* and improvements in solventogenic *Clostridium* butanol production were the topics for another presentation. Metabolic pathway engineering of *Thermoanaerobacterium saccharolyticum* for efficient ethanol production and reduction of cellulase loading emphasized a consolidated bioprocessing approach. New methods for isolating novel biocatalysts and enzymes from lignocellulose-degrading insects rounded out this first session.

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The Session 7 oral presentations addressed approaches used to develop superior recombinant microorganisms for lignocellulosic biomass conversion and also addressed some of the problems observed with inhibitors from dilute acid-based and liquid hot-water-based pretreatments. The session addressed the problems of integrated bioprocesses developed for production of fuels and chemicals such as simultaneous saccharification and fermentation (SSF) and consolidated bioprocessing. Efficient integration of enzymatic saccharification and fermentation will definitely help to reduce the overall production cost of fuels and chemicals from lignocellulosic biomass. The oral session topics included substrate-selective uptake to remove acetate and convert sugar mixtures, expression of ethanol and hydrogen synthesis pathway genes during growth on cellulose in *Clostridium thermocellum*, ZWF1 overexpression in *Saccharomyces cerevisiae* for protection of cells from furfural-induced damage, and engineering *E. coli* for conversion of glycerol to ethanol and coproducts. It also included engineering *S. cerevisiae* for succinic acid production and production of substituted aromatics from biomass-derived feedstock by engineered solvent-tolerant *Pseudomonas putida*.

The poster session included a wide variety of topics such as enzyme (cellulase, xylanase, ligninase, and lipase) production, cell immobilization, solid-state fermentation, continuous fermentation, coculture fermentation, SSF, fed-batch SSF, and pilot plant thermophilic anaerobic digesters. In addition, there were posters on microbial transformation, production of lactate, nissin, succinic acid, and surfactin, engineering microorganisms for production of L-valine, L-threonine, isopentenol, gluconolactone, riboflavin, surfactants, ethanol, butanol, and hydrogen, and high-throughput isolation of ethanologenic extreme thermophiles. Different biomass types used in conversion and/or extraction processes were presented including *Miscanthus*, banana, wheat straw, sugarcane bagasse, cheese whey, green coconut, rice bran, and citrus wastes. Genomic and transcriptomic analyses were presented for fungal degradation of biomass and xylose and cellobiose fermentation by yeasts, and new software was presented for a number of applications. Novel yeasts and bacteria were highlighted for important traits useful in bioconversion or bioremediation processes including removal of mercury from coal and textile dye degradation. This session clearly shows that significant process is being made related to microbial science and technology for production of fuels and chemicals from lignocellulosic feedstocks.