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Introduction to Session 2

Applied Biological Research

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Applied biological research has been carried out since early humans learned to ferment starchy crops into potable ethanol. In fact, it is proposed that humans evolved from a nomadic lifestyle so that they could grow crops necessary for ethanol production rather than for basics, such as bread! Ethanol was considered a major liquid fuel at the turn of the century with the early Model Ts using dual carburetors that could run on ethanol or gasoline. Although the relative price of gasoline is probably lower now than at any point in the last 20 years, particularly in North America, environmental concerns and the drive to develop alternative markets for agricultural products continue to fuel the desire to produce liquid fuels from renewable sources.

The first half of the session on applied biological research deals with the use of enzymes to hydrolyze cellulose. Research in this area has always been motivated by the potential of enzymes to result in complete hydrolysis, and recovery, of the cellulose-derived glucose. Although significant gains have been made in enzyme production, a considerable amount of work is still required to enhance the efficiency of the cellulase enzymes. The articles in this session describe various ways of trying to increase the efficiency of the hydrolysis step.

The other articles in this session describe other areas where applied biological research can impact on fuel and chemical production. The use of thermophilic organisms and enzymes can greatly increase the efficiency of biological processes particularly when the organism in question is capable of both hydrolyzing cellulose and fermenting glucose to ethanol! Other potential sources of sugars and chemicals include the marine algae that requires sunlight and minimum amounts of other material. Microbes have been successfully used in many bioremediation situations. One area

of particular interest to the coal industry is microbially mediated organic sulfur removal. As well as the direct use of microbes and enzymes, "tools," such as monoclonal antibodies, can be used to help understand and increase the efficiency of many applied biological processes. It is possible that the "tools" of biotechnology will have more of an impact on alternative fuels and chemical production rather than the microbes or enzymes themselves. The use of systems, such as labeled monoclonal antibodies or enzymes, allow us to "probe" the various mechanisms involved in the utilization of various substrates and could help enhance a variety of processes in the food, feed, agriculture, energy, and chemical fields.