

SESSION 2

Applied Biological Research

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Conversion of biomass to ethanol and other chemicals has been a subject of intensive studies over the last 20 years. The critical elements in this process are hydrolysis of biomass to sugars and microbial fermentation of sugars to ethanol. Recent advances in developing biological catalysts to improve the overall economics of this process are presented in this session.

Being able to convert pentoses and glucose in hydrolysates simultaneously to ethanol is a trait actively pursued by many laboratories. The approach has been to add ethanol-fermentative genes into substrate-versatile microbe or to add sugar-metabolizing genes into good ethanol fermentors. In this session, the results of using a genetically engineered *Zymomonas* to ferment xylose, arabinose, and glucose are presented. The basic physiology of ethanol production in various ethanol microbes is also presented. Another important aspect of this process is the production of efficient cellulase systems to hydrolyze biomass to sugars. The crystalline structure of cellulose and the feedback inhibition of cellulase activity by its reaction products hindered the use of biomass as a sugar source. A presentation on the cellulase system in *Clostridium acetobutylicum* is included in this session.

With advances in genetic engineering such as these, we could expect a commercially viable process that converts inexpensive biomass to ethanol in the near future.