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Introduction to Session 2

Applied Biological Research

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The papers in this session continue in the tradition of presenting research findings directed at the development of new and enhanced biological processes through applied biological research. The majority of the research discussed entails the use of newer, molecular biological approaches, that add significantly to our ability to understand and control microbial activities.

The papers by Kotter et al. and Ho describe efforts to increase the versatility and utility of the traditional fermentation yeast, *Saccharomyces cerevisiae*. Both groups report success in the cloning and expression of xylose metabolizing genes in *Saccharomyces cerevisiae*. Additionally, Kotter et al. report the cloning of the genes for starch metabolism into this same organism.

Dunahay et al., from SERI, have been developing genetic transformation systems for microalgae of potential industrial importance. They report the transfer and expression of markers for stable transformation in *Chlorella ellipsoidea*, as well as work being done on genes involved in lipid accumulation in algae.

Irwin et al. described a combine molecular biological and biochemical approach to understand cellulase activity. Their work involves both a determination of the DNA sequences of structural genes, as well as biochemical determinations of catalytic sites.

Teh Tong and Cameron take a molecular biological approach to improving 1,3-propanediol production by creating a model system for the purpose of engineering the metabolic pathway involved. Their paper presents the results of studies with a genetically engineered *E. coli*, in which the 1,3-propanediol pathway has been transferred via a cosmid vector.

The work of Harcum et al. describes enhanced heterologous protein production and, in particular, genetic techniques used to gain an understanding of amino acid regulation. This knowledge has been incorporated into a metabolic modeling framework that enables the prediction of nutrient feeding policies that circumvent stress responses.

Finally, in a somewhat more traditional vein, Tanenbaum et al. report on the production of extracellular polysaccharides (EPS) from xylose and hemicelluloses, and additionally, how the substitution of xylose for glucose results in selective EPS formation or changes in the percentages of noncarbohydrate substituents in these polymers.