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Introduction to Session 2

Applied Biological Research

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This session deals with biological research pertinent to the development of new substrates and improvement of known pathways for the production of enzymes and other metabolic products by genetic improvements of microorganisms or adjustments of culture conditions. Improvements in ethanol production continue to attract research attention. On the genetic front, studies are presented on potential improvement of xylose fermentation in yeasts by cloning of xylulokinase gene and genetic manipulation of bacteria to decrease production of organic acids. Such mutants can be used for construction of strains that can produce other desired fermentation products, such as ethanol. Other studies deal with the evaluation of thermotolerant yeasts for simultaneous saccharification and fermentation of cellulose, and the evaluation of limiting factors in the fermentation of xylose to ethanol by xylose isomerase containing yeast *Schizosaccharomyces pombe* or by the yeasts *Candida shehatae* and *Pichia stipidis*. Improvement of ethanol production by *Zymomonas mobilis* through uncoupling of fermentation and growth is also presented. The improvement of cellulase enzyme production by growing the Rut C-30 mutant of a fungus *Trichoderma reesei* on mixtures of xylose and cellulose has been investigated, as well as improvements of production of inulinase and amylase by genetic techniques. Inulin is an abundant fructose polymer in roots and fibers of certain plants, and in the future could serve as a new source of highly sweet fructose syrups and as a substrate for fermentation processes. Potential applications of microorganisms for conversion of syngas to chemicals are discussed in one study. Since syngas can be cheaply produced in large quantities and high yields by

thermal gasification of coal and virtually any other carbonaceous material, the potential of this unconventional substrate should not be overlooked. Finally, several papers deal with other important aspects of applied microbiology, such as improvements in production of acetone and butanol, evaluation of oxidant effects on anaerobic digestion, overproduction of amino acids (phenylalanine), metabolism of aromatic compounds by thermophilic bacteria, and development of biosensors.