152d Isolation and Optimization of a Microbial Catalyst for the Conversion of Syngas to Ethanol and Acetic Acid

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The objective of this study is to determine if carbon monoxide, carbon dioxide, and hydrogen from gasified waste biomass (synthesis gas) can be converted economically into ethanol. Efforts to date have resulted in 13 cultures with the ability to produce ethanol up to concentrations of 100 ppm with carbon monoxide serving as the carbon and energy source. These 13 cultures were obtained from biofilms formed in Winogradsky columns that were in their 12th month of development. Work with these cultures will focus to identify incubation conditions, media formulations, and growth state that produce the highest cell yield and ethanol production rates. A review of the literature has shown the highest rate of conversion of synthesis gas into ethanol is 0.225 g ethanol/g cells/hr and will serve as the benchmark by which these cultures will be evaluated. In order to increase the probability of isolating a syngas fermenter, six-Winogradsky columns have been modified to use carbon monoxide, a major syngas constituent, as the substrate instead of the traditional cellulose. The columns were inoculated with microorganisms contained in the pond sediment. Within these columns, biofilms of carbon monoxide utilizing microorganisms are allowed to establish. Once the layers have formed they will be separated and evaluated for the ability to produce acetic acid and ethanol from CO, CO2, and H2.