Production of Succinic Acid by Metabolically Engineered *Escherichia coli*

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Succinic acid (succinate) and its derivatives have a wide range of applications in the food and chemical industries. Although several microorganisms can produce succinate by fermentation of glucose and other renewable resources, *Escherichia coli* has many advantages including rapid growth, simple nutritional requirements and the ease of genetic manipulation. One unique feature of succinate production by this organism is that the process consumes as much as 1 mole of carbon dioxide per mole of succinic acid generated, and thus it is a means to sequester CO_2 while generating a chemical product.

This undergraduate research project focuses on succinate production in a "two-phase" fermentation using chemically defined media. The two-phase process involves an aerobic growth phase followed by an anaerobic production phase. The goal over the next year is to compare several strains for succinate production. These strains have perturbations in glucose uptake and in central metabolism. The base strain, AFP111, contains mutations in pyruvate formate lyase (*pfl*), lactate dehydrogenase (*ldhA*) and the phosphotransferase system (*ptsG*). Additional strains studied were AFP111/pTrc99A-*pyc* (containing pyruvate carboxylase), AFP111 *poxB* (pyruvate oxidase mutation), AFP111 *adhE* (alcohol dehydrogenase mutation), AFP111/pTrc99A-*glk* (overexpressed glucokinase). Preliminary results and experimental plans will be described.