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Improving Biofuel Production by Using Efflux Pumps to Limit Solvent Toxicity

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Biofuels can be produced by microbes that break down plant matter or sugars to make fuel. However, biofuel-producing microbes are limited by the intrinsic toxicity of the solvent like biofuels they are trying to produce. The more fuel the cell produces, the more toxic the surrounding environment becomes. RND efflux pumps are a class of membrane transporters that confer resistance to a wide variety of toxins, including solvents. We focus on investigating the role of native, as well as heterologously expressed, efflux pumps in *E. coli*. Targeted studies focus on the well-characterized *E. coli* AcrAB-TolC system, and efflux pumps from solvent resistant bacteria such as *Pseudomonas putida*. Because efflux pumps are likely to be specific to certain fuel molecules and stressors, a wider range of native and heterologous efflux pump systems must be tested against different fuel compound exposure, growth conditions, and in different engineered hosts. To address our broad goal of improving solvent resistance using efflux pumps, a high-throughput approach has been initiated to create a library of expression vectors representing all efflux pumps from *E. coli* as well from other organisms known to be naturally resistant to solvents.

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