

# Analysis of a Genetic Adaptation for Glycerol Utilization: Implications for Microbial Fuel Cells

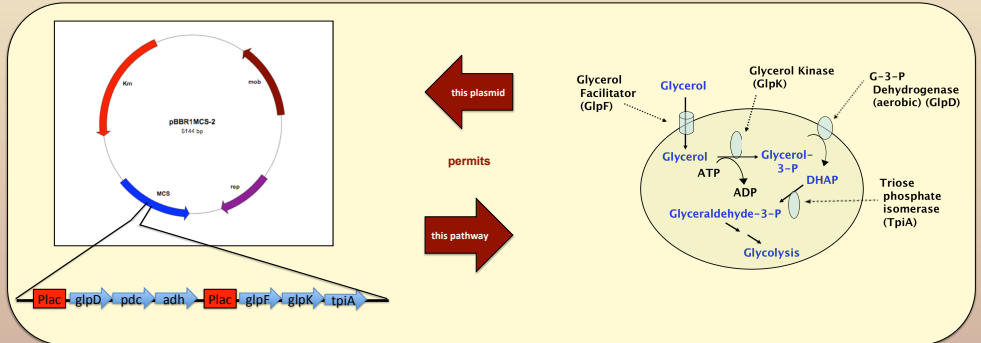
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## Introduction

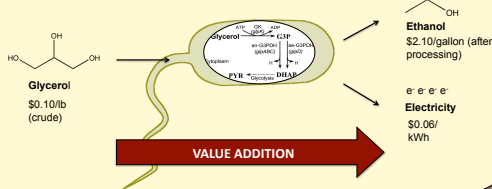
Biodiesel promises a renewable source of energy yet is unable to be an economically viable alternative to petroleum. One way to solve this is to convert glycerol, a by-product of the biodiesel production process, to higher value commodities. *Shewanella oneidensis* can respire insoluble extracellular substrates such as electrodes. Furthermore, when the pGUT2PET plasmid is transformed into wild type *S. oneidensis*, the non-redox balanced conversion of glycerol to ethanol is permitted.

### So what?

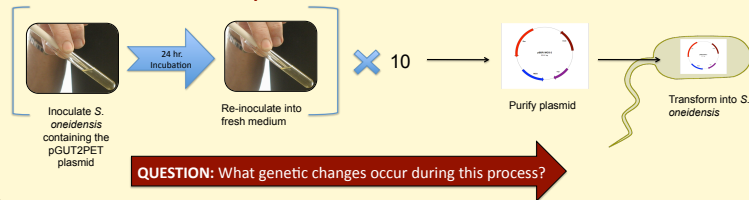
This engineered bacterium permits the generation of two higher value products (ethanol and electricity) from the original glycerol feedstock. Since any future industrial application of this microbe will necessitate optimization of all its parameters, we were interested in studying how *S. oneidensis* grows faster on glycerol.



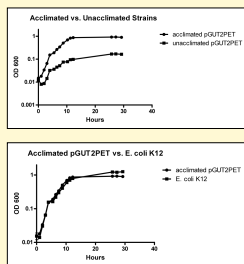
## Implications of Pathway in *S. oneidensis*



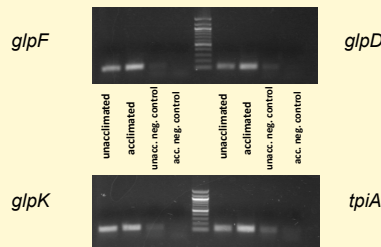
## pGUT2PET Acclimation Protocol



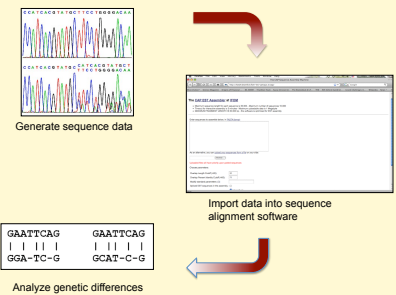
## Step 1: Prove Plasmid as Repository of Change



## Step 2: View Expression Levels of Genes Using RT-PCR



## Step 3: Sequence and Compare Plasmids



## What We Knew Before This Study

- pGUT2PET conferred growth on glycerol to *S. oneidensis*
- pGUT2PET permitted non-redox balanced conversion of glycerol to ethanol
- *S. oneidensis* is capable of extracellular electron transfer to an electrode

## What This Study Added to Our Knowledge

- An acclimation protocol can select for faster growing strains of *S. oneidensis* on glycerol
- The repository of these changes is on the pGUT2PET plasmid
- Differential expression of genes is manifested on the acclimated plasmid

## Future Directions

1. Analyze all sequencing data
2. Investigate how the genetic changes would manifest at the protein level
3. Repeat experiment under anaerobic conditions
4. Determine use for microbe in biodiesel production systems

## Acknowledgements

- Dr. Jeff Gralnick
- Jeff Flynn
- Elizabeth Covington
- Gralnick Lab
- UROP Funding
- Robin Wright and Sarah Corrigan
- CBS Imaging Center

