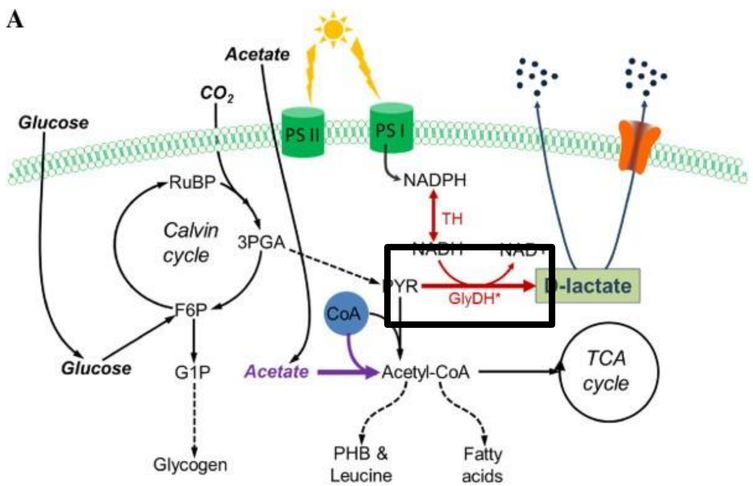
Flux Balance Analysis of *Synechocystis* sp. PCC 6803 for the production of D-lactate

Parker Poole, Environmental Engineering
Mentor: Dr. Arul Mozhy Varman
SEMTE

Flux Balance Analysis

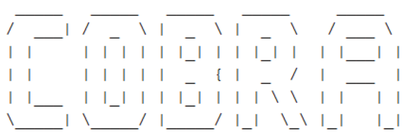
(1) Understand metabolic network:



https://doi.org/10.1186/1475-2859-12-117

(2) COBRA Toolbox for modeling:

- Allows for FBA to analyze and quantify the flux of metabolites through a metabolic network



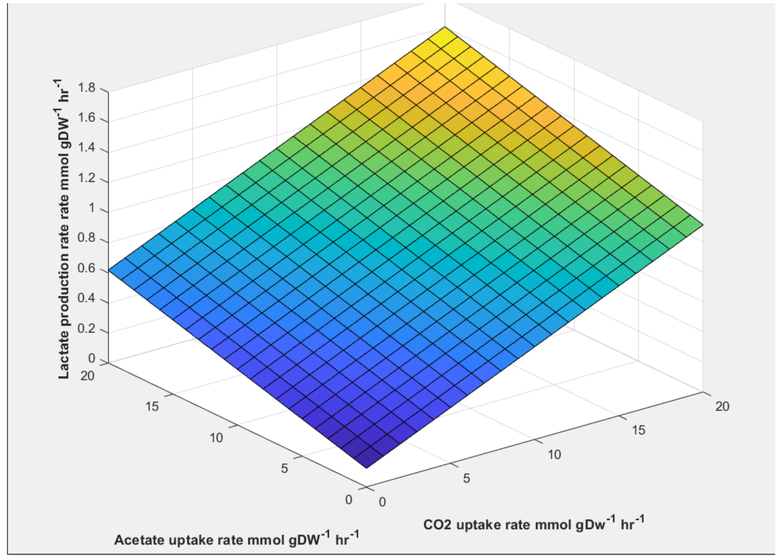
- Wild type *Synechocystis* PCC 6803 lacks efficient lactate dehydrogenase
- Inserted efficient glycerol dehydrogenase (GlyDH*)

(3) Model lactate production:

```
model = changeObjective(model,{'LDH_D'});
model = changeRxnBounds(model, {'EX_o2_e'},-1000,'l');
model = changeRxnBounds(model, {'EX_photon_e'},-1000,'l');
```

Line (1): Maximizing D-lactate production
Line (2): Providing large amount of oxygen to prevent limiting factor
Line (3): Providing large amount of light to prevent limiting factor

(4) Quantify flux flow (function of CO2 and acetate):



- Lactate production per acetate and CO2 injection (mmol gDW^{-1} h^{-1})
- Greatest production as acetate and CO2 flux increases

Acknowledgements

- Nima Hajinajaf
-> Ph.D. student
-> Mentored me on FBA

- Dr. Varman
-> Mentored me on Metabolic Engineering

FURI

Ira A. Fulton Schools of Engineering
Arizona State University