Glycolysis II

Triose Phosphoisomerase (**TPI**)

- Intraconversion of GAP and DHAP
- Allows for production of 2 molecules of glyceraldehyde 3-P
- Rate of the reaction is limited to diffusion. The protein is catalytically perfect
- TPI activityallows the products of the first stae of glycolysis to proceed through the second stage as glyceraldehyde 3-phosphate

Glyceraldehyde 3-Phosphate Dehydrogenase (**GAPDH**)

- Lead to the first production of energy equivilants
- Withdraws 2 electrons / NAD+ is acceptor (reduction reaction)
- NADH leads to later production of ATP via ox phos
- BPG is an acyl phosphate and is therefore BPG is "high energy" mixed anhydride
- 1,3 BPG also leads to production of 1,2-BPG an allosteric regulator of hemoglobin
- There are 4 SH groups (Cys) and iodoacetate inactivates the thioester intermediate.

Phosphoglycerate Kinase (**PGK**)

- A kinase but different from the protein kinases discussed earlier (how so?)
- ATP produced through substrate level phosphorylation (O_2 is not involved such ans oxidative phosphorylation)
- The phosphoryl group of C1 of 1,3 BPG is transferred to the beta phosphoryl of ADP
- The active site is closed off from water once the substrate binds similar to the mechanism found with hexokinase
- The formation of 1,3 BPG has a positive standard state free energy change. The reaction can proceed due to thermodynamic coupling with the PGK reacton

Phosphoglycerate Mutase (**PGM**)

- Isomerase or mutase reaction
- Phosphate is transferred from 3 PG to the enzyme at a histadine residue
- Histadines are often involved in phosphate transfer this is not a kinase and is different from the phosphorylation observed with serine threonine and tyrosine
- The thermodynamics are essentually even so it is easily reversable
- This reaction is nessesary for the formation of enolase another high energy intermediate

Enolase

- Dehydration of water - formation of an enol group - high energy product
- Mg^{+2} binds before substrate
- Floride inhibits by forming tightly bound complex with Mg^{+2} at active site

Pyruvate Kinase (**PK**) key glycolytic enzyme

- Substrate level phosphorylation / ATP produced by the release of free energy f rom PEP
- Transfer of phosphoryl to ADP produced second ATP
- Spontaneous shift (tautomerize) from enol to keto form yielding pyruvate
- Dehydration of 3PG would not produce a high energy enol phosphate.

Energy of glycolysis

- which reactions are exothermic and endothermic how does this relate to regulation
- total amount of ATP produced by metabolism of glucose to pyruvate - net gain of 2 ATP (fate of NADH depends on cell type and oxidation state of the cell)
- maximum value of 3 ATP can be formed from NADH