Poison of Glycolytic pathway

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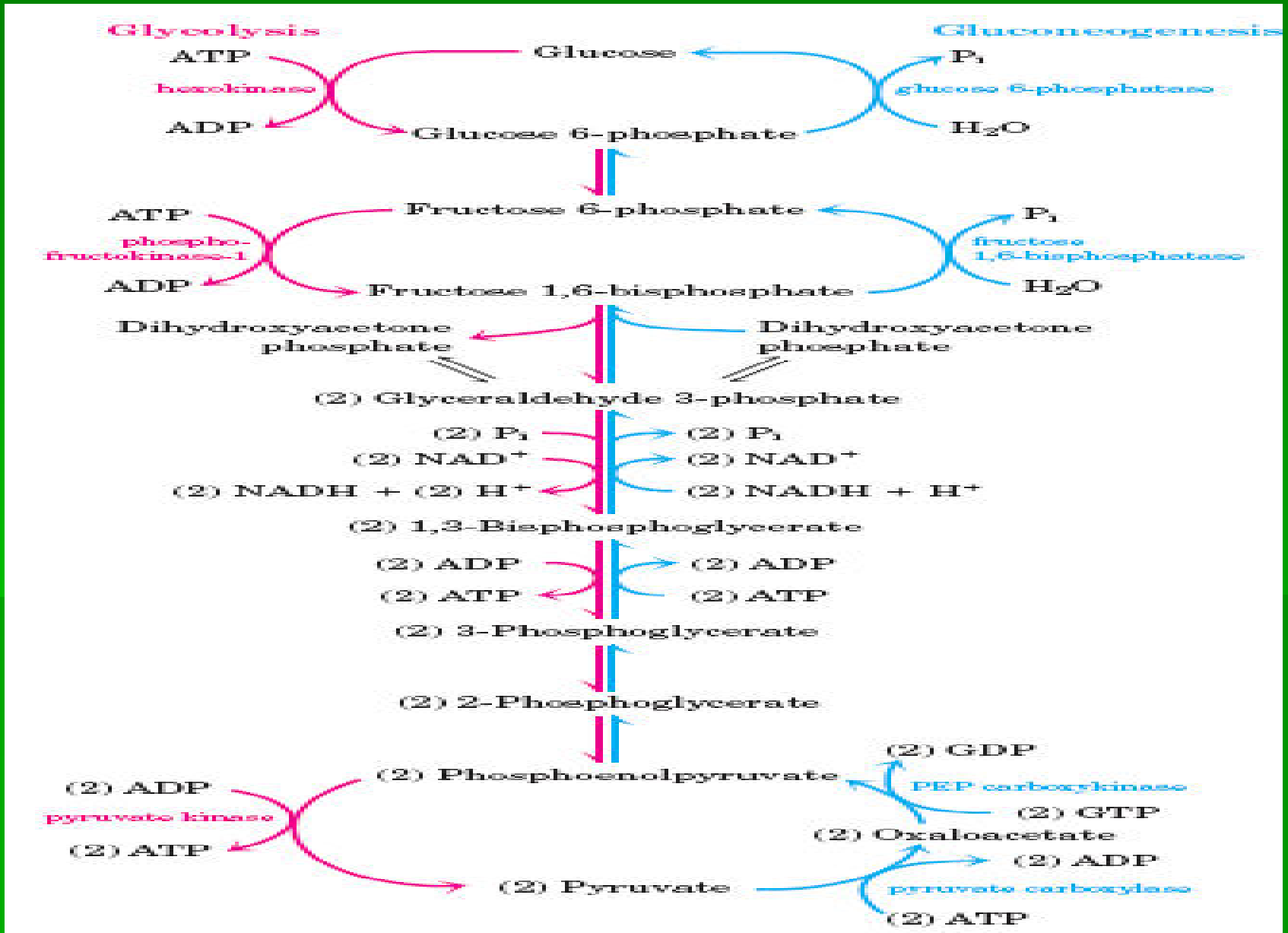
- The Poison of the glycolytic pathway works by taking over binding and active site of the enzymes that catalized substrate in the glycolityc pathway

- The poison include :
  * sulfhydryl reagent
  * fluoride
  * Mercury
  * Arsenate

Glycolytic Pathway

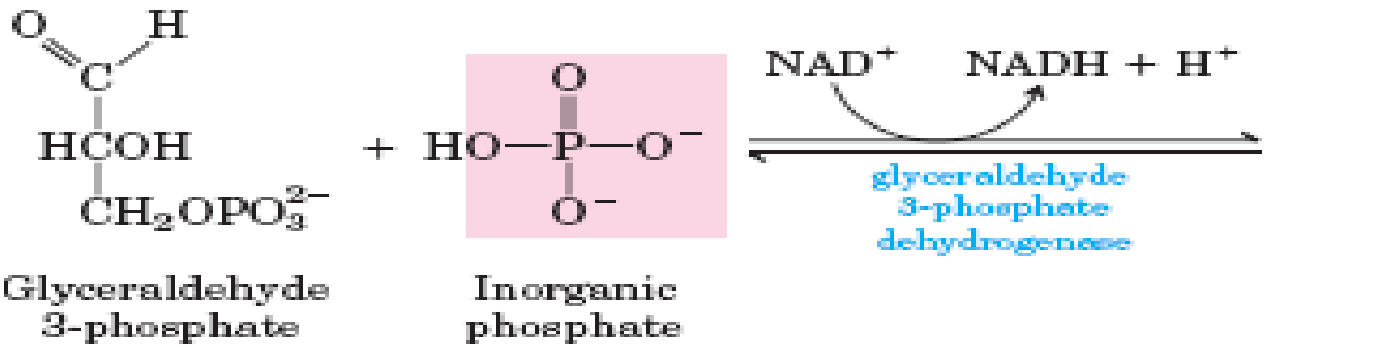


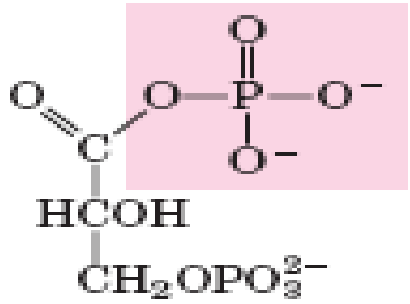
Sulfhydryl Reagent

- Sulfhydryl reagent are usually mercury containing compound or alkylating compound
- Sulfhydryl reagent bring about anhibition at the level of gliceraldehyde-3-phosphate dehydrogenase
- Gliceraldehyde-3-phosphate dehydrogenase catalizes :

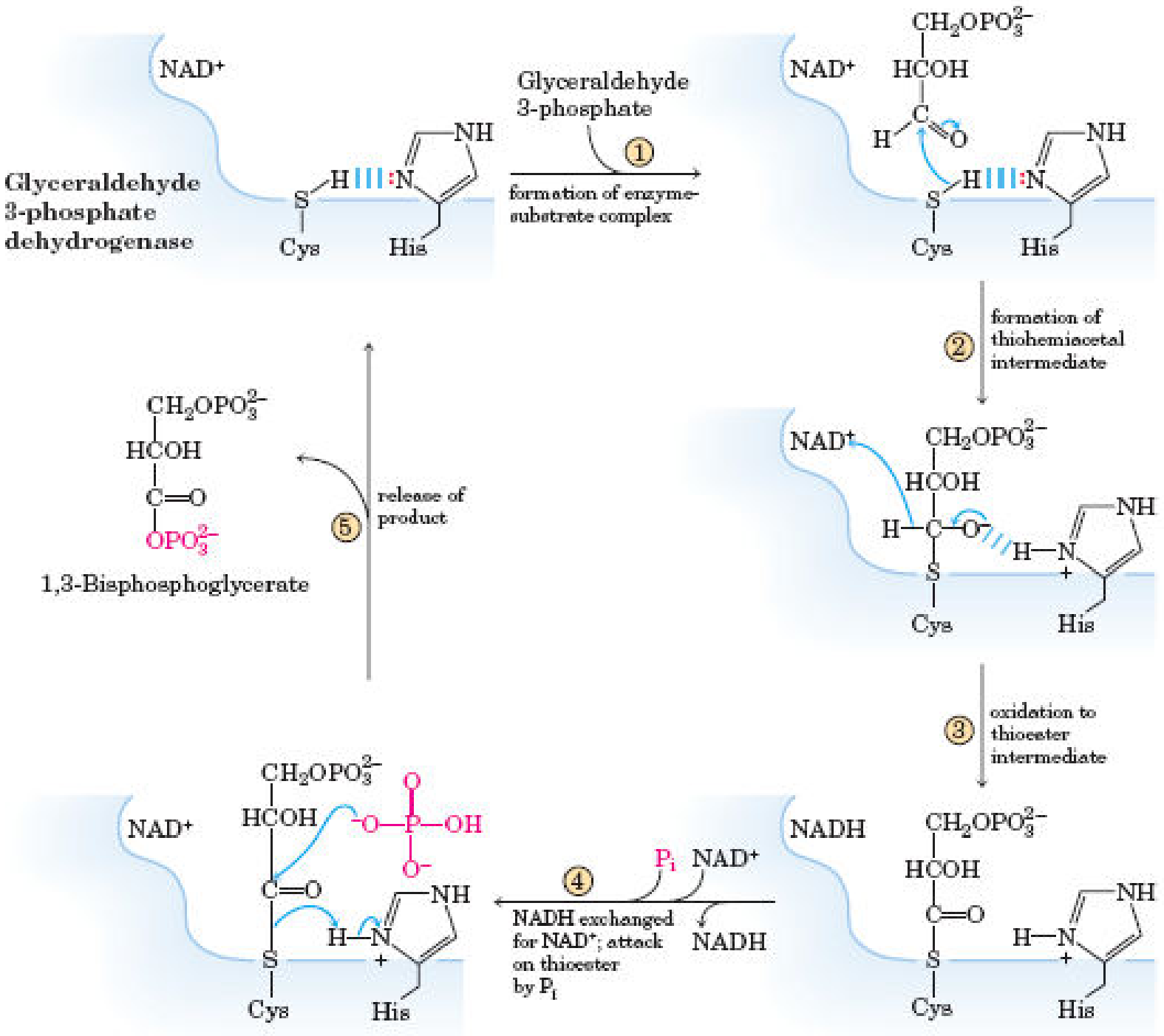
Gliceraldehyde-3-p+ NAD+ +pi ⟷ 1,3-bisphosphateglycerate + NADH+H+

- The aldehide of glyceraldehide-3-phosphate reacts with the cystein thiol to form a thiohemiacetal
- Enz-cys ——SH





1,3-Bisphosphoglycerate

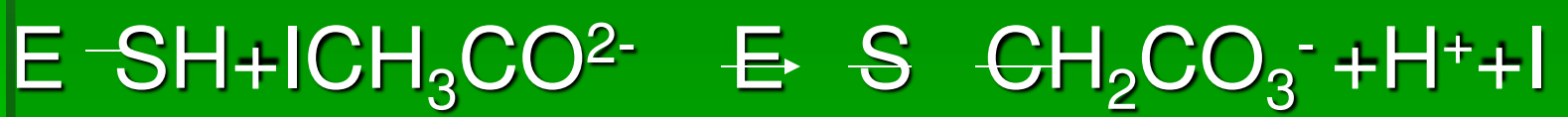

Glyceraldehyde 3-phosphate dehydrogenase
NAD+
Cys
His
Glyceraldehyde 3-phosphate
1
formation of enzyme-substrate complex
CH2OPO3 2−
HCOH
2
formation of thiohemiacetal intermediate
3
oxidation to thioester intermediate
NADH
4
Pi
NADH exchanged for NAD+; attack on thioester by Pi
5
release of product
1,3-Bisphosphoglycerate

- Enz-cys —S—CH(OH)—CH(OH)— $CH_2OPO_3^{2-}$

Thiohemiacetal Intermediate

- If in the reaction have sulfhydryl reagent, sulfhydryl reagent will react with the sulfhydryl group of glyceraldehyde 3 phosphate to prevent the formation of the thiohemiacetal.

Glyceraldehide 3 Phosphate Dehidrogenase | **methyl mercury chloride** | **inaactive enzyme**

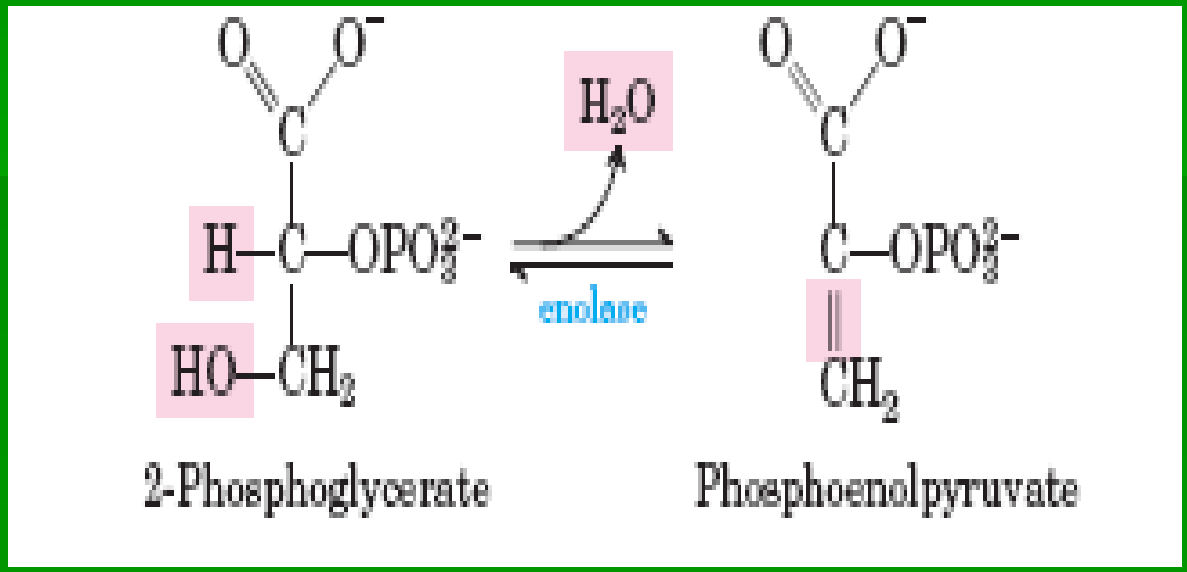


iodoacetate | **Inactive enzime**

Fluoride Inhibitor

Enolase catalize

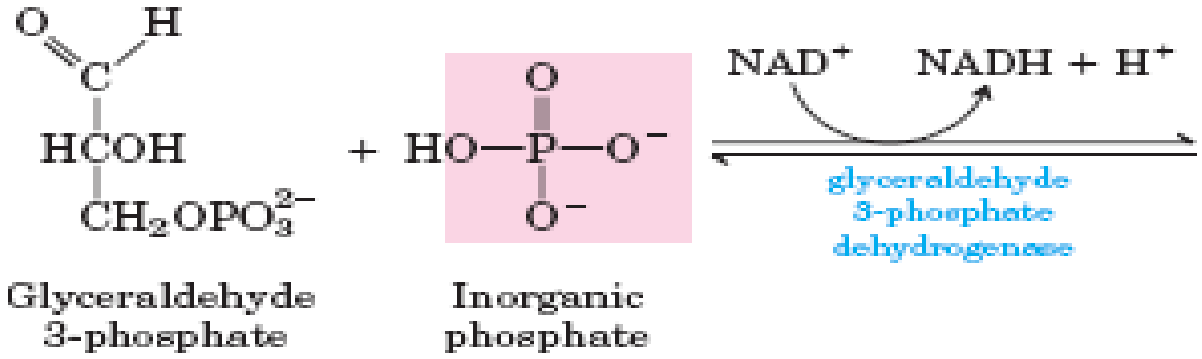
2-Phosphoglycerate ⟷ Phosphoenolpyruvate + H_2O



This Mg^{2+} dependent dehydration reaction is inhibite by fluride

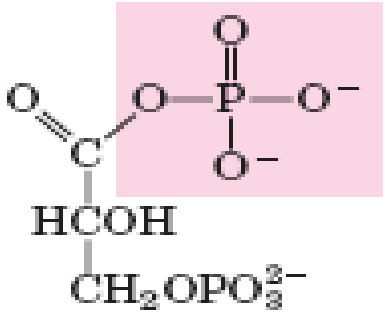
Mg^{2+} and inorganik phosphate are belived to form an ionik complex with fluride

Arsenate Inhibitor



Glyceraldehyde 3-phosphate

Inorganic phosphate



1,3-Bisphosphoglycerate

$\Delta G'^{\circ} = 6.3$ kJ/mol

- The arsenate is look like inorganic phosphate and is able to substitute the phosphate in enzime catalized reaction

D-glycerakdehide-3-phosphate + $HAsO_4^{2-}$ + NAD+ ⟶ 1-arsenato-3-phospho-D-glycerate + NADH + H+

- 1-arsenato-3-phospho-D-glycerate is unstable

1-arsenato-3-phospho-D-glycerate + H_2O ⟶ 3-Phospho-D-glycerate + $HAsO_4^{2-}$ + H^+

The presence of arsenate, 1,3-bisphosphate is not formed, resulting in the loss capacity to synthesize ATP

- The consequence is that net ATP synthesis does not occur when glycolysis happens
- The presence of arsenate, glycolysis does not generate ATP, which can be used to meet the energy of a cell

References

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Thank You