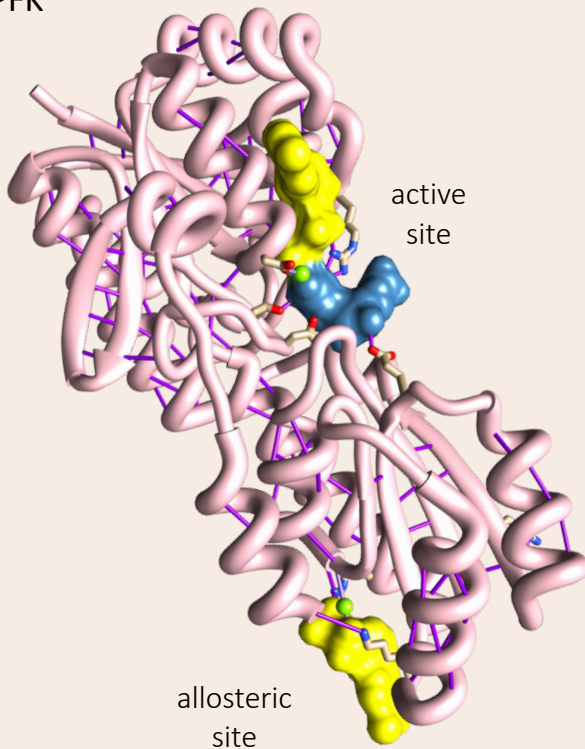


ENZYME OF ENERGY PATHWAY

1PFK

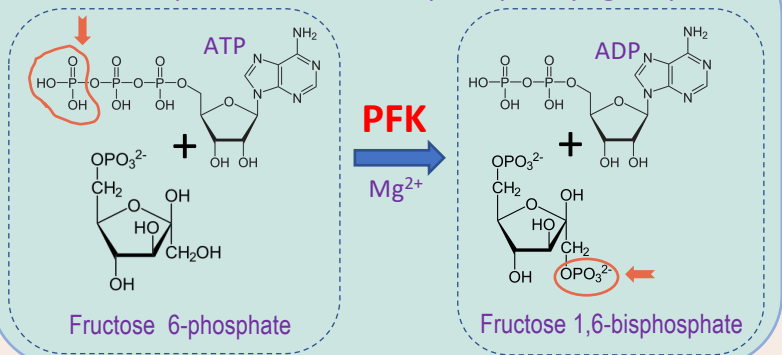


PFK

Phosphofructokinase

- a key enzyme regulating **glycolysis** (carbohydrate metabolism energy pathway)
- regulated by **feedback inhibition** (the product of the pathway)

Catalyzes transfer of a phosphoryl group



STRUCTURE

- consists of 320 amino acids in *E. coli* and ~780 amino acids in human PFK¹
- forms homotetramers, heterotetramers, or octameric structures, depending on the organism and tissue
- **active site** binds fructose 6-phosphate and ATP
- **allosteric site** binds ATP
- alternative splicing results in multiple transcript variants

LOCATION

- in cytoplasm of bacteria, plants, fungi, and animals
- humans have 3 genes, each coding one of 3 isoforms²
 - **PFKP** (platelets) – chr. 10
 - **PFKM** (muscle) – chr.12
 - **PFKL** (liver) – chr. 21
- muscle cells contain homotetramers consisting of four PFKM subunits
- in red blood cells, both PFKM and PFKL subunits randomly tetramerize

FUNCTION

- enzyme catalyzing the 3rd step of glycolytic pathway (a committed step to glycolysis)
- transfers a phosphoryl group from ATP to a fructose-6-phosphate, producing fructose 1,6-bis-phosphate
- inhibited by high levels of ATP binding to allosteric site
- activated by fructose 6-phosphate and ADP
- requires Mg^{2+} as a cofactor

Type VII Glycogen Storage Disease (GSD-VII / Tarui disease)³

- a rare inborn error of metabolism caused by mutations in the PFKM gene
- prevalence estimated to 1/1,000,000 people
- inherited as an autosomal recessive disorder
- symptoms include intolerance to physical activity, muscle cramps, stiffness, and pain
- treatment based on low carbohydrate and high protein diet