

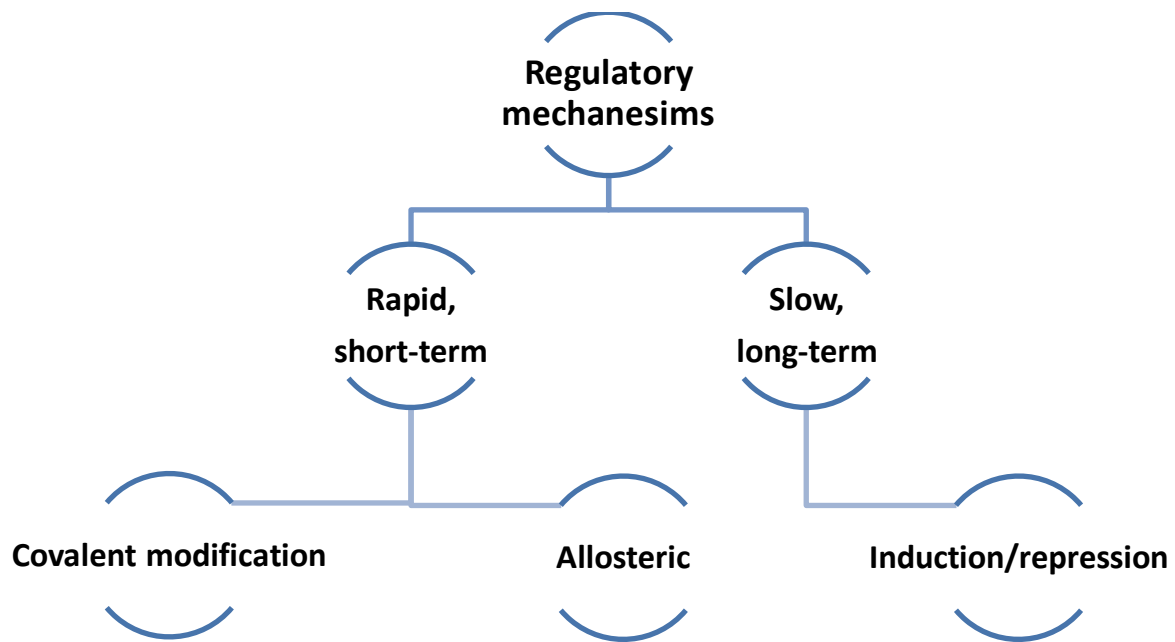
Major Metabolic Pathways of Glucose

Definition of pathway: Series of chemical reactions that have one goal

Site of metabolic pathway:

- Cellular tissue
- Subcellular tissue

Reactions: Few are rate-limiting (They are found only in irreversible pathways)



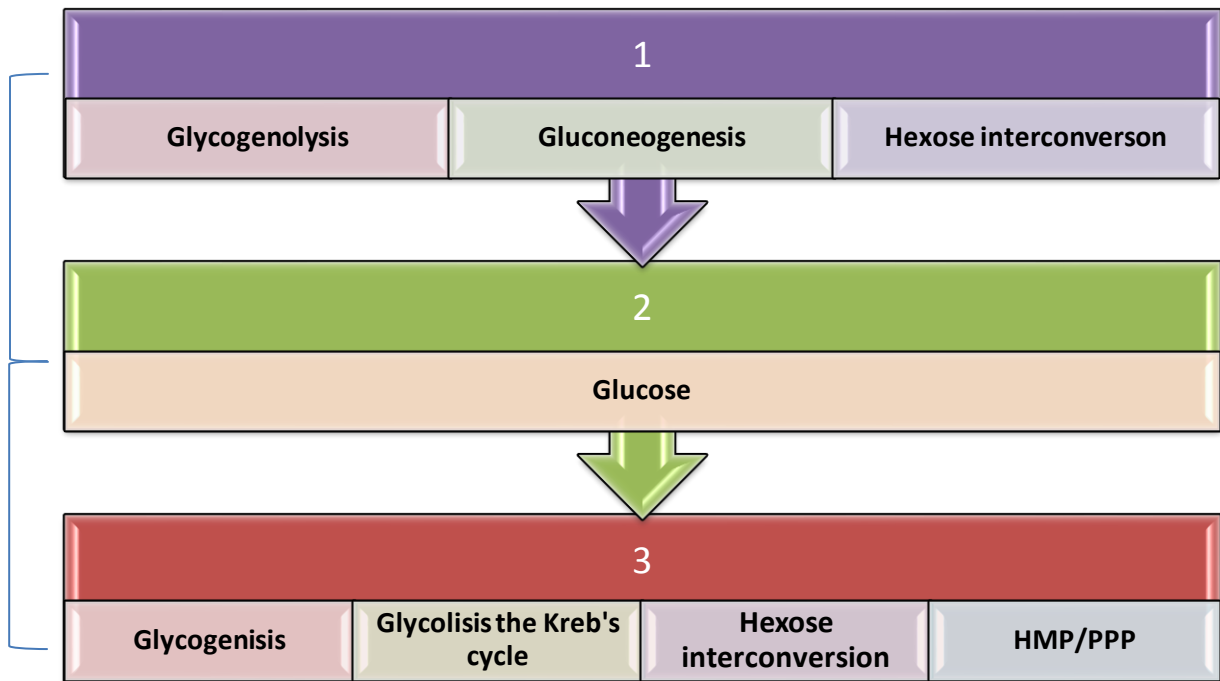
Allosterics: Allo: other Steric: place

Allosteric means a place other than the substrate binding site

Induction: stimulating of gene expression

Repression: inhibition of gene expression

Production and Utilization



Hexose interconversion: e.g.: If a lactating women needs lactose (which is made of glucose and galactose) and there is not enough galactose, fructose can transform to galactose

Glycogenolysis doesn't form glucose immediately while gluconeogenesis forms glucose immediately

Catabolic and Anabolic

Catabolic:

- Glycolysis (amphibolic – 9 catabolic steps and 1 anabolic) –Mainly catabolic-
- Krebs cycle: Mainly catabolic
- Glycogenolysis
- HMP

Anabolic:

- Gluconeogenesis
- Glycogenesis

Lysis: Break down Genesis: synthesis

Glycogenesis and Glycogenolysis

Glycogenesis:

Synthesis of glycogen from glucose

Mainly liver and muscle, Cytosol

Glycogenolysis

Degradation of glycogen into glucose

Mainly liver and muscle, Cytosol

Any cell that has cytosol can undergo glycogenesis or glycogenolysis but mainly in liver and skeletal muscles

Hexose Monophosphate Pathway (HMP) or Pentose Phosphate

Pathway (PPP]

1- Important source for NADPH

Which is used in reductive synthesis (When the cell needs oxygen)

2- Source for metabolically active ribose

Which is used for production of nucleotides

For nucleic acid

For co-enzymes

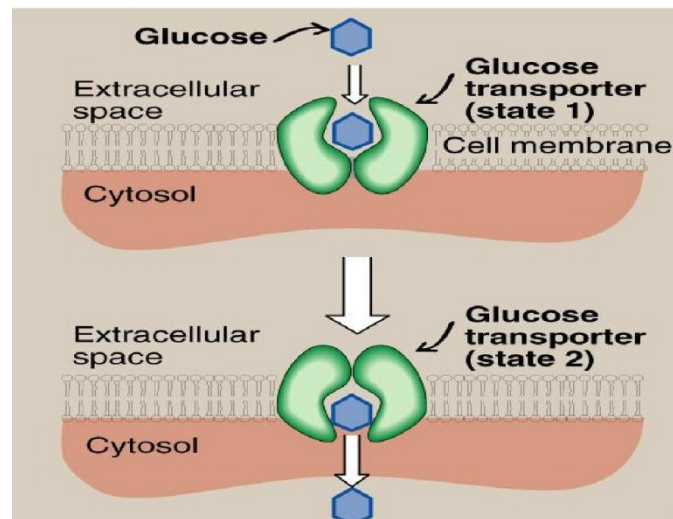
Glucose Transport

Na⁺-Monosaccharide Co-transporter:

- Against concentration gradient
- Energy dependent
- Carrier-mediated
- Coupled to Na⁺ transport
- Small intestine, renal tubules

Na⁺-Independent Facilitated Diffusion:

- With concentration gradient
- Energy Independent
- Glucose Transporters (GLUT 1-14)
- Facilitated Diffusion



Glucose Transporters

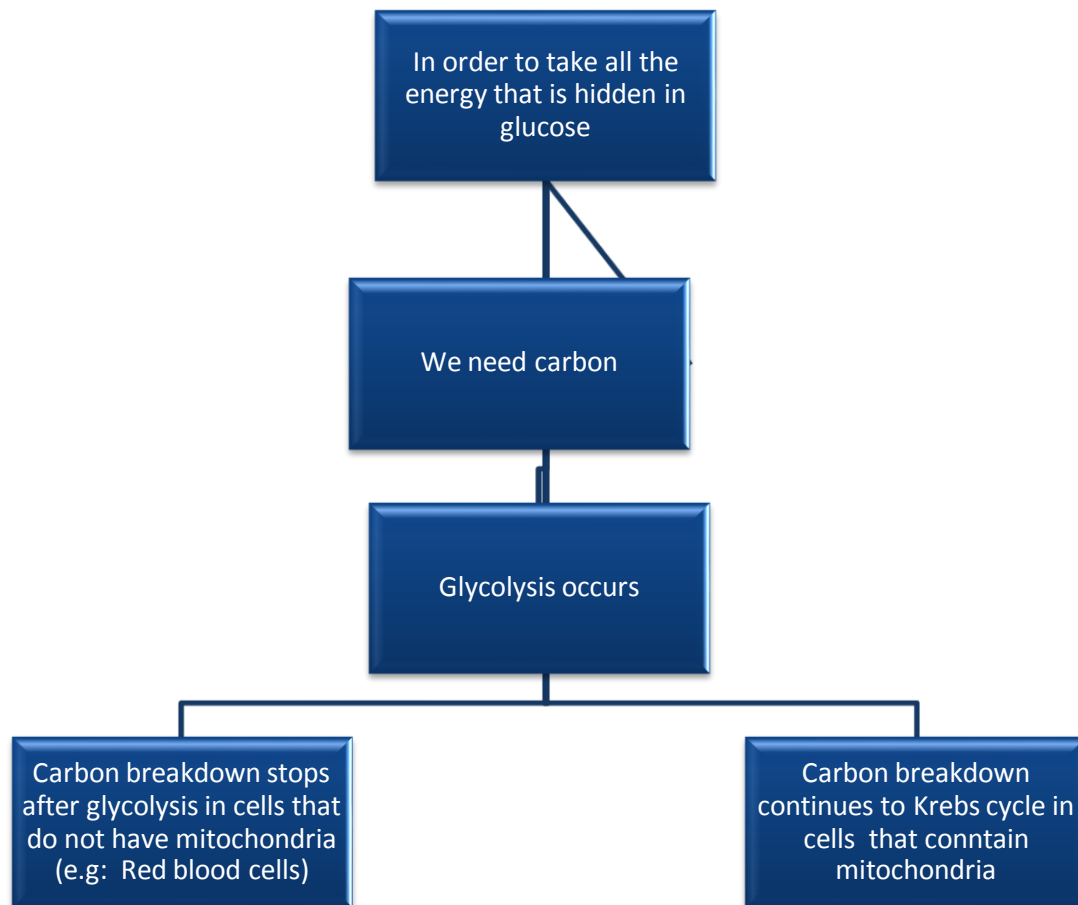
- ✓ Tissue specific expression pattern
- ✓ All Glut are found in cell membrane except Glut 7 which is found in Endoplasmic Reticulum membrane(of the liver)
- ✓ All Glut are found all the time except Glut 4 which is found only when needed (when insulin binds to its receptor) if Glut 4 is not needed it stays in blood vesicles

Glut 1	RBCs and brain
Glut 2	Liver, kidney & pancreas
Glut 3	Neurons
Glut 4	Adipose tissue & skeletal muscle
Glut 5	Small intestine & testes
Glut 7	Liver (ER-membrane)

Functions of GLUT

Glut 1, 3 & 4	Glucose uptake from blood to tissue
Glut 2	Blood & cells (either direction from tissue to blood or from blood to tissue)
Glut 5	Fructose transport (Fructose is one of the nutrients for spermatozoa)

Glycolysis



Objectives of glycolysis

- Major oxidative pathway of glucose (because Krebs cycle cannot happen without it)
- The main reactions of glycolytic pathway

- The rate-limiting enzymes/Regulation

- ATP production (aerobic/anaerobic)

- Glycolysis breaks glucose to pyruvate (aerobic 8 ATP) or lactate (anaerobic 2 ATP)

- First cells that are harmed when glycolysis is inactive are RBCs

- Pyruvate kinase deficiency hemolytic anemia