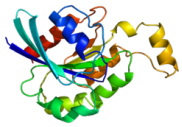
Chem 332 Biochemistry

Glycogen Synthesis and Gluconeogenesis

Learning Objectives, Study Guides



Learning Objectives

- Know the structure of glycogen and how it impacts the availability of glucose
- Understand the actions of the debranching enzyme.
- Relate the role of glucose 6-phosphatase in the release of glucose by the liver.
- Explain the roles of UDP-glucose and inorganic pyrophosphatase in the synthesis of glycogen.
- Explain the difference between phosphorylase a and phosphorylase b.
- Know the differences between the muscle and liver phosphorylase isozymes.
- Describe the major compositional features of phosphorylase kinase and its activation by protein kinase A.
- Relate the importance of calmodulin to glycogen metabolism.
- Explain the roles of protein phosphatases and kinases in the regulation of glycogenolysis and glycogenesis.
- Know how insulin, epinephrine and glucagon impact glycogen metabolism and how these hormones signal
- For the key reactions that we studied the reaction mechanism, relate NOT MEMORIZE the critical steps describing how the enzyme catalyzes the reaction
- Understand how phosphorylase and synthase are regulated including the structural details that give the enzymes these functions
- Explain the impact of glycogen storage diseases with the metabolic steps impacted by the disease (Cori, Von Gerke, McArdle)
- Relate how all of the phosphorylation/dephosphorylation steps regulate glycogen metabolism
- Phosphorylase Kinase and Phosphoprotein Phosphatase-1 play a critical role in regulating this metabolism. Understand the structure and regulation for each. Also compare the differences for PPI in muscle vs liver.
- Relate the flow of glucose in liver vs muscle for different hormonal states
- Know how PEPCK (based on the three papers) impacts glucose flux and the possible role of mitochondrial PEPCK. Also interpret and discuss the metabolic influence of cytosolic PEPCK in muscle
- Know how carbons from muscle metabolism is transported to liver for gluconeogenesis

Study Notes from Dr P: *To start, learn the structure of glycogen and its basic metabolic steps. After that you MUST dig into the regulation and structure of the key steps to get this section. Seeing the big picture of phosphorylation/dephosphorylation is important while you get the details. As always look for tissue differences and integration of these metabolic pathways.*