

Highlights Gluconeogenesis

1. Glycerol is a breakdown product of fat metabolism. Glycerol can be metabolized in glycolysis by conversion to glycerol-3-phosphate and then to DHAP, a glycolytic intermediate.
2. Gluconeogenesis accomplishes the reverse of glycolysis - synthesis of glucose from pyruvate using four different enzymes to replace three energetically unfavorable reactions in glycolysis.
3. Gluconeogenesis does not occur in all tissues of the body. The primary gluconeogenic organs of the body are the liver and part of the kidney.
4. The enzymes unique to gluconeogenesis Pyruvate Carboxylase and PEP carboxykinase (PEPCK) instead of Pyruvate Kinase of glycolysis, Fructose 1,6 Bisphosphatase (F1,6BPase) instead of Phosphofruktokinase (PFK) from glycolysis, and Glucose-6-phosphatase (G6Pase) instead of Hexokinase from glycolysis.
5. F1,6BPase and G6Pase act by similar mechanisms, clipping a phosphate from their substrates and thus avoiding synthesis of ATP, which is what would be required if the glycolysis reactions were simply reversed.
6. One reaction of gluconeogenesis occurs in the mitochondrion. It is catalyzed by pyruvate carboxylase and yields the four carbon intermediate, oxaloacetate. The carboxyl group is added in forming oxaloacetate thanks to the coenzyme biotin, which carries carbon dioxide for attachment. The remaining reactions all occur in the cytoplasm, except for the G6Pase reaction, which occurs in the lumen of the endoplasmic reticulum.
7. Anabolic and catabolic pathways occurring at the same time and place create a futile cycle. Futile cycles generate heat, but that is the only product they make. Consequently, cells usually set up controls that turn one off when the other is turned on. If the same molecule has opposite effects on catabolic and anabolic pathways, the molecule is a reciprocal regulator of the pathways. Reciprocal regulation of catabolic and anabolic pathways is a very efficient means of control.
8. The Cori Cycle is a cycle of the body where the lactate of working muscles is dumped into the bloodstream. It travels to the liver where it is converted to pyruvate and used to make glucose in gluconeogenesis. The glucose is then dumped into the bloodstream, where it travels back to the muscles that need it.