

**Lecture 25**

**Beginning Glycogen Metabolism**

Glycogen Degradation

Mobilization of glucose

Glycogen synthesis

Formation of the glucose storage unit

---

---

---

---

---

---

---

---

Glycogen is a highly branched polymer of glucose.

- 1) Straight chains:  $\alpha$ -1,4 linkage
- 2) Branch points:  $\alpha$ -1,6 linkage ~ every 10 units.
- 3) Initiator primer molecule: glycogenin

Non-reducing ends

---

---

---

---

---

---

---

---

**Primary storage sites are skeletal muscle and liver.** Skeletal muscle cells contain glycogen for their own needs (2% by wt.). Liver cells contain glycogen primarily for the needs of the body as a whole (10% by wt.). Glycogen is stored as dense granules in the cytoplasm.

**Glycogen granules**

**Why glycogen? Why not Fatty Acids?**  
 Glucose is sole RBC and primary Brain fuel  
 Utilization of glucose can proceed under anaerobic conditions. (Glycolysis)  
 Glycogen has many branch-points for rapid, regulated mobilization.

---

---

---

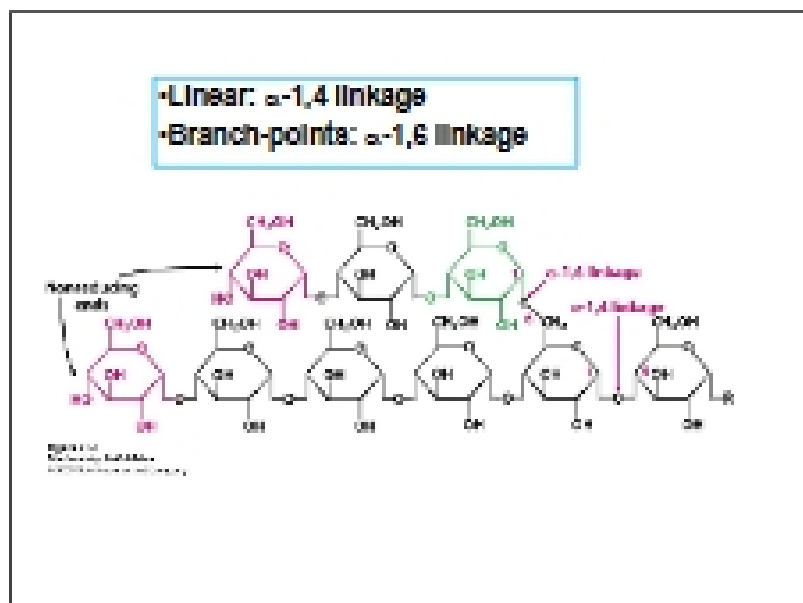
---

---

---

---

---




---

---

---

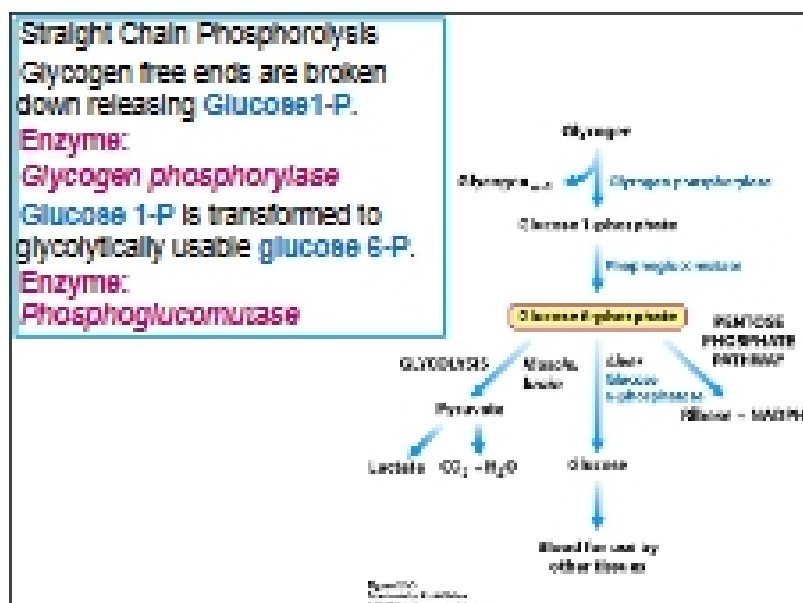
---

---

---

---

---




---

---

---

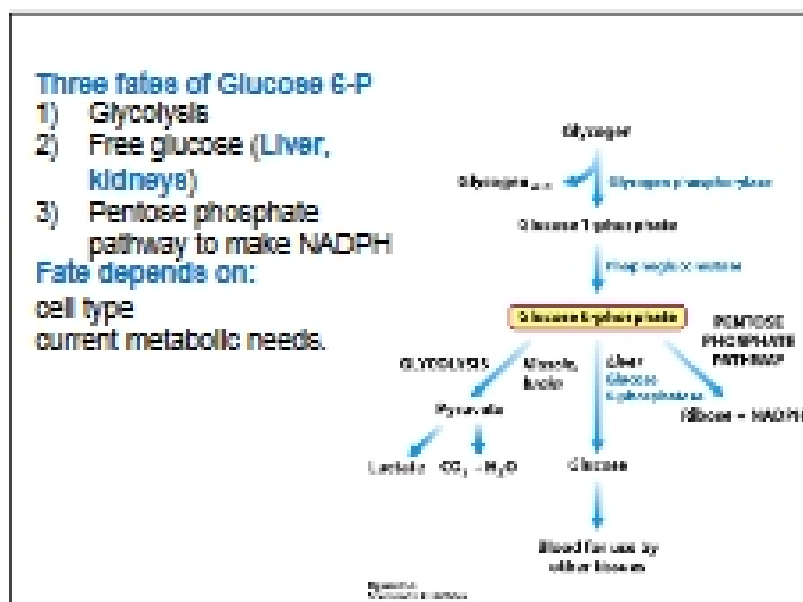
---

---

---

---

---




---

---

---

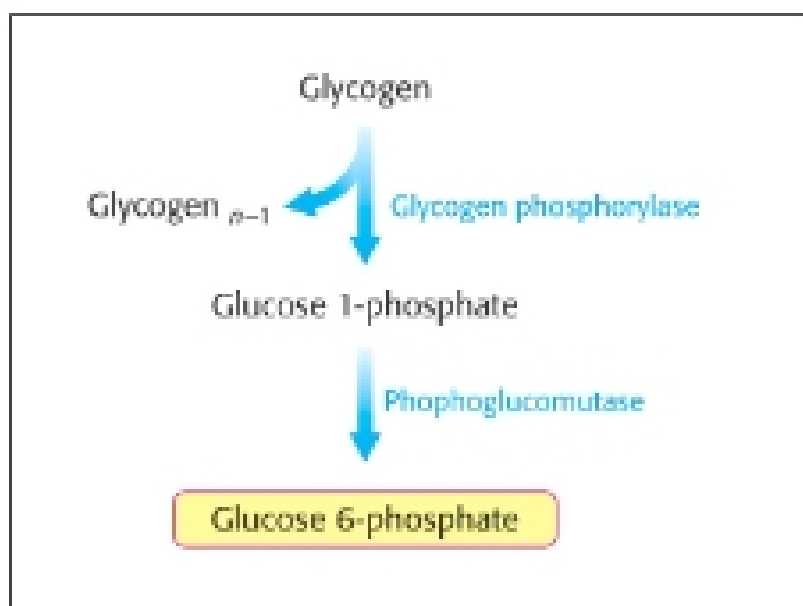
---

---

---

---

---




---

---

---

---

---

---

---

---

**Glycogen Phosphorylase**  
 Cleaves glucose through addition of inorganic phosphate.  
 Can catalyze phosphorolysis of the straight chain to within 4 glucosyl units of a branch point.  
 Yields:  $\alpha$ -Glucose 1-P monomers  
 Energetically favorable: Released glucose is phosphorylated.  
 Also favorable because this intermediate cannot diffuse out of cell.

---

---

---

---

---

---

---

---

**Glycogen Phosphorylase overview:**  
 Dimeric enzyme that cleaves  $\alpha$  - 1,4 glycosidic bond between C1 and the glycosidic oxygen, through phosphate addition.  
 Cofactor: **Pyridoxal Phosphate**

**It is important to make sure that this is a phosphorylytic not a hydrolytic reaction. A loss of the phosphate must not occur. Must exclude water from this reaction.**

---

---

---

---

---

---

---

---