

LIVER

Processes & Distributes Nutrients

- Major nutrient distribution center in vertebrates
- After absorption, nutrients (except TAGs) go to liver
- Sugars, amino acids, some lipids are processed & distributed to other organs & tissues

(Tissue: a group of cells that work together for the same purpose

Organ: a group of tissues that work together for the same purpose)

- Liver has extraordinary flexibility & range in metabolism
- Well adapted to serve as distribution center
- To export nutrients in correct proportions to organs
- To smooth out fluctuations (caused by intermittent way food is taken) in metabolism
- To process excess AA into urea etc. (to be disposed of by kidneys)
- Liver active in enzymatic detoxification of foreign organic compounds (drugs, food additives, preservatives, other harmful agents)

Detoxification: enzymatic hydroxylation of insoluble org. comp. to make them soluble for further breakdown & excretion

In the LIVER - Sugars follow 5 metabolic routes

- Free D-glucose is converted to glucose-6-phosphate (G6P)
- D-fructose, D-mannose & D-galactose are also converted to G6P
- G6P - crossroad of CARBS metabolism in liver
- 5 Major routes taken by G6P

But route taken depend on min.by min.& hr. by hr. supply & demand

G6P converted into

- 1) Blood glucose
- 2) Glycogen
- 3) Fatty acids & cholesterol
- 4) CO_2 (oxi.degradation)
- 5) Pentose phosphates

1. Conversion into blood glucose

- G6P dephosphorylated (E: G6Phosphatase)
- Glucose enters the blood
- This pathway - most important
- As blood glucose (BG) conc. Must be kept constant to provide high energy for brain & other tissues

2) Conversion into glycogen

- G6P not needed immediately to form BG is converted to glycogen
- E: Phosphoglucomutase, glycogen synthase

3) Conversion into Fatty acids & cholesterol

- Excess G6P is degraded via glycolysis into pyruvate
- Pyruvate forms acetyl-CoA (E: pyruvate dehydrogenase)
- Acetyl-CoA form malonyl-CoA
- Malonyl-CoA gives FA (fatty acid synthesis)

- FA form **TAGs & phospholipids** (lipogenesis)
- TAGs & phospholipids exported to other tissues by plasma lipoproteins
- Some acetyl-CoA form **cholesterol**

4) **CO₂ (oxidative degradation)**

- Acetyl-CoA oxidized via **CAC (krebs cycle)**
- Yields energy as **ATP**
- However, FA are major oxidative fuel for **CAC** in liver

5) Conversion into Pentose phosphates (degradation)

- **Substrate** for pentose phosphate pathway-
G6P
- **Yields:**
 - 1.** Reducing power as **NADPH** (used in FA & cholesterol biosynthesis)
 - 2.** **D-ribose-6-phosphate** (used as precursor in nucleotide biosynthesis)

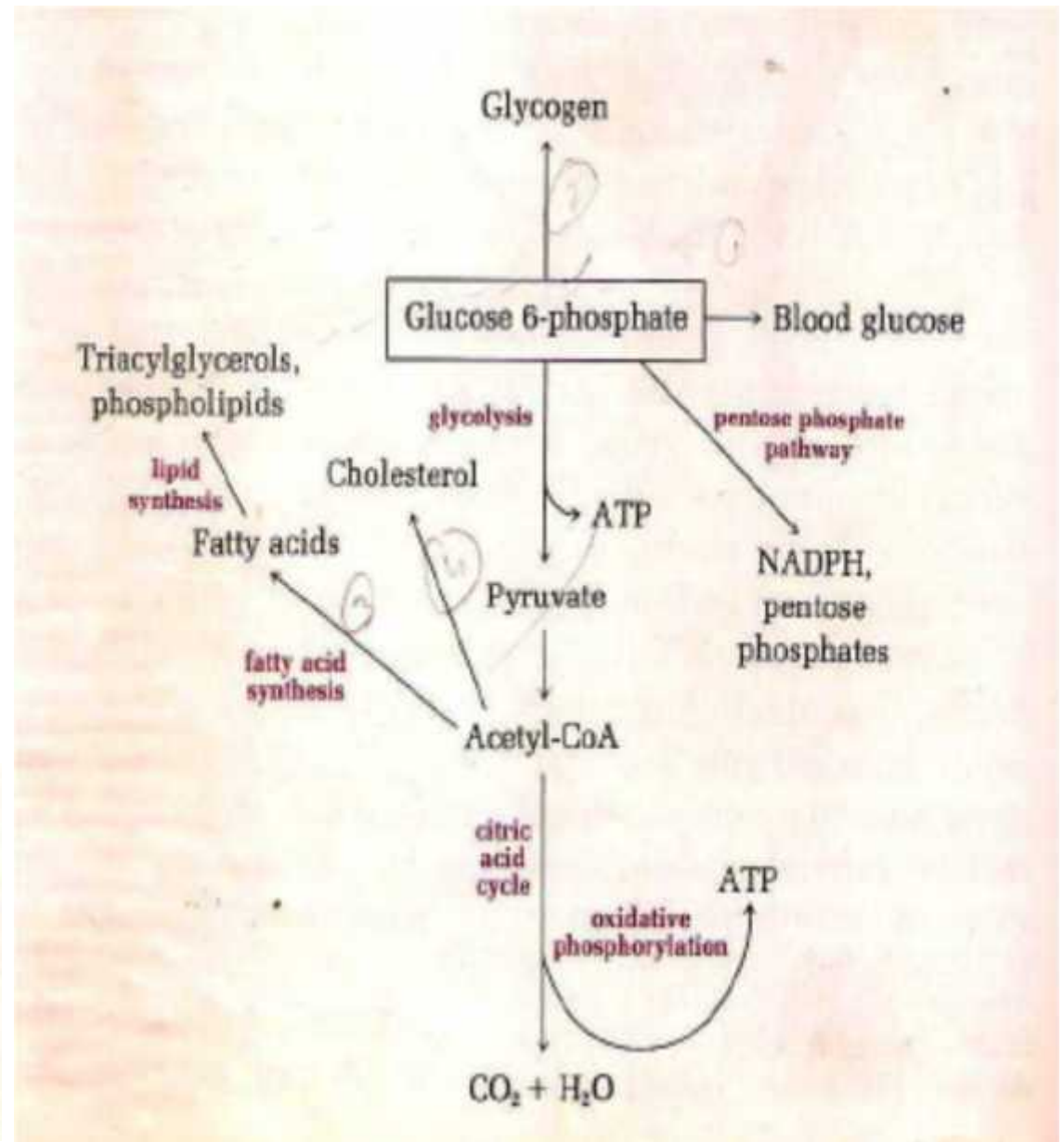


Figure 24-9
 Metabolic pathways for glucose 6-phosphate in the liver. Here, as well as in Figures 24-10 and 24-11, biosynthetic pathways lead upward, degradative pathways downward, and distribution to other organs horizontally.