Figure 22-2

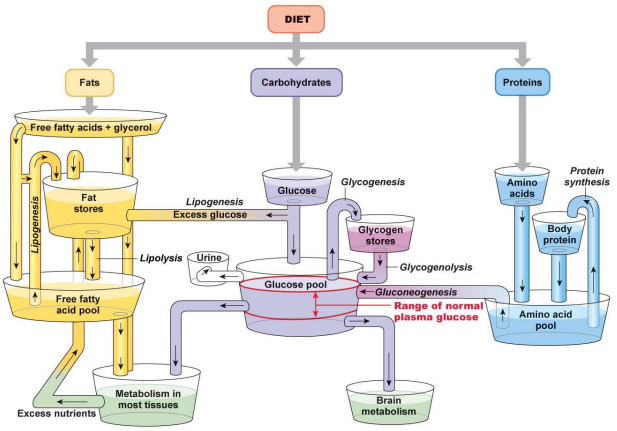






Figure 22-3, overview

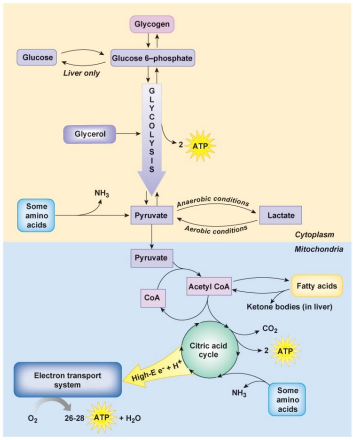






Figure 22-4

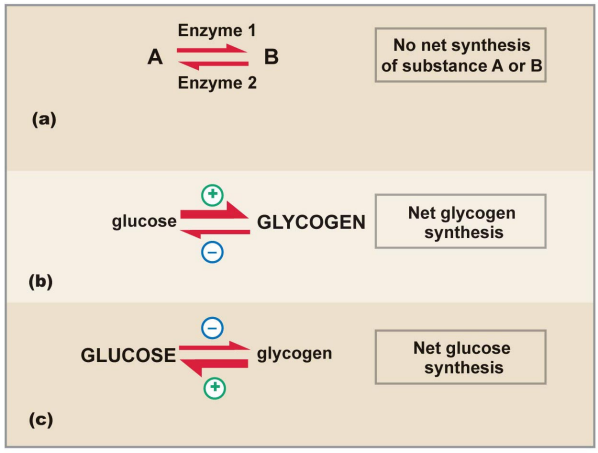






Figure 22-5

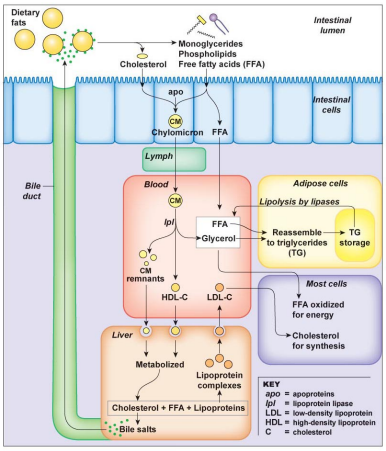






Figure 22-7, overview

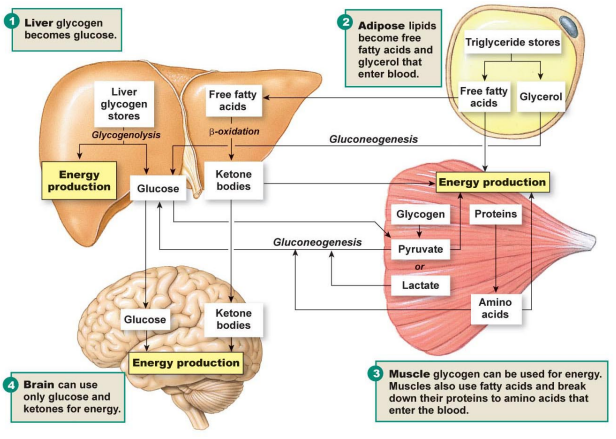






Figure 22-8

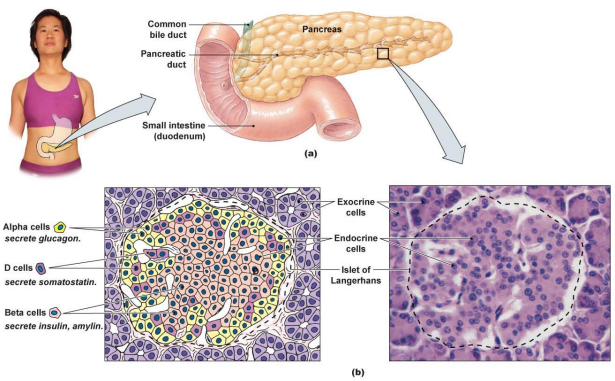

Figure 22-9

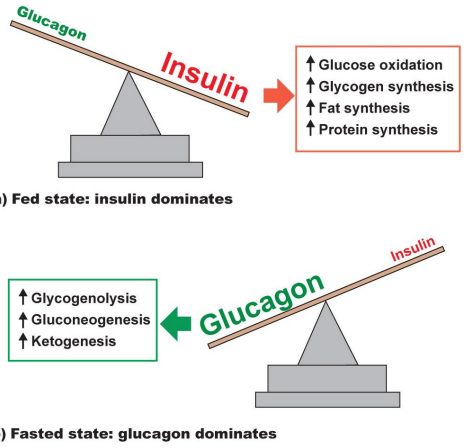





Table 22-2

**TABLE 22-2 Fates of Nutrients in the Fed State**

| |
|---|
| CARBOHYDRATES (absorbed primarily as glucose) |
| 1. Used immediately for energy through aerobic pathways* |
| 2. Used for lipoprotein synthesis in liver |
| 3. Stored as glycogen in liver and muscle |
| 4. Excess converted to fat and stored in adipose tissue (glucose → pyruvate → acetyl CoA → fatty acids) |
| PROTEINS (absorbed primarily as amino acids) |
| 1. Most amino acids go to tissues for protein synthesis* |
| 2. If needed for energy, amino acids converted in liver to intermediates for aerobic metabolism |
| 3. Excess converted to fat and stored in adipose tissue (amino acids → acetyl CoA → fatty acids) |
| FATS (absorbed primarily as triglycerides) |
| 1. Stored as fats primarily in liver and adipose tissue* |




Table 22-3

**TABLE 22-3 Insulin**

| | |
|---|---|
| Cell of origin | Beta cells of pancreas |
| Chemical nature | 51-amino acid peptide |
| Biosynthesis | Typical peptide |
| Transport in the circulation | Dissolved in plasma |
| Half-life | 5 minutes |
| Factors affecting release | Plasma [glucose] > 100 mg/dL; ↑ blood amino acids; GLP-1 (feedforward reflex). Parasympathetic activity amplifies. Sympathetic activity inhibits. |
| Target cells or tissues | Liver, muscle, and adipose tissue primarily; brain, kidney, and intestine not insulin dependent |
| Target receptor | Membrane receptor with tyrosine kinase activity; pathway with insulin-receptor substrates |
| Whole body or tissue action | ↓ Plasma [glucose] by ↑ transport into cells or ↑ metabolic use of glucose |
| Action at cellular level | ↑ Glycogen synthesis; ↑ aerobic metabolism of glucose; ↑ protein and triglyceride synthesis |
| Action at molecular level | Inserts GLUT transporters in muscle and adipose cells; alters enzyme activity. Complex signal transduction pathway involved. |
| Feedback regulation | ↓ Plasma [glucose] shuts off insulin release. |
| Other information | Growth hormone and cortisol are antagonistic. |




Figure 22-10

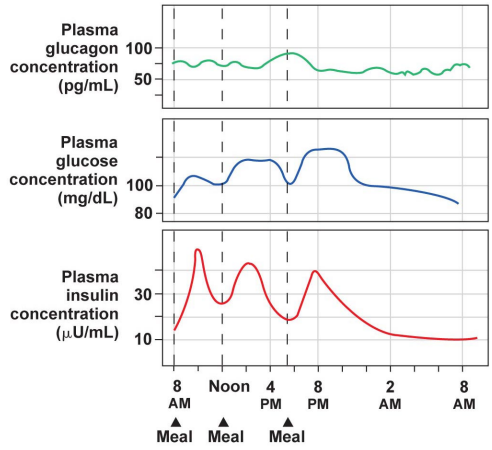





Figure 22-11, overview

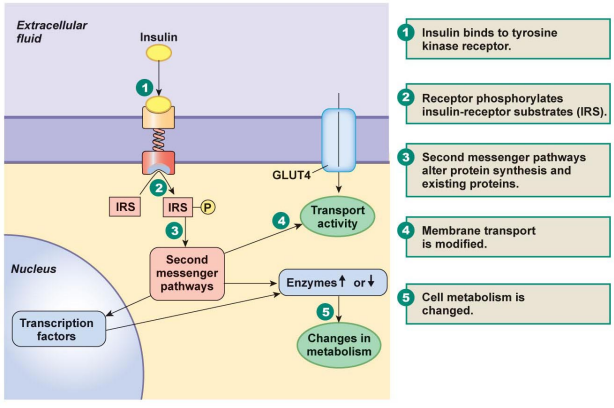





Figure 22-12

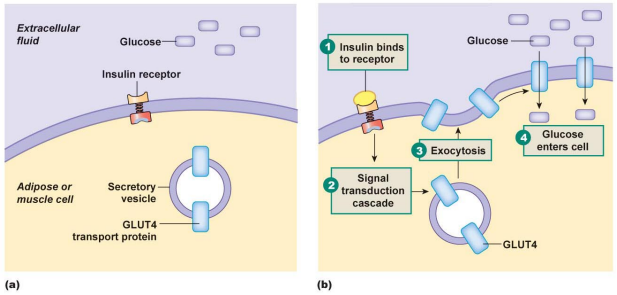

Figure 22-13

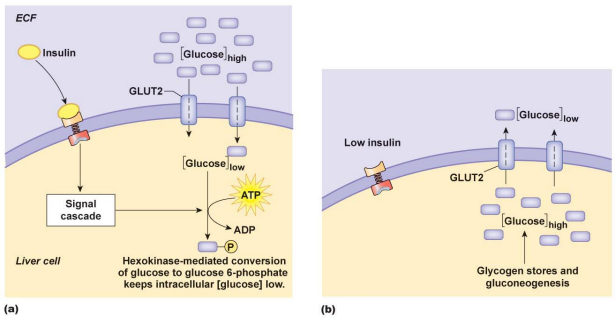





Figure 22-14

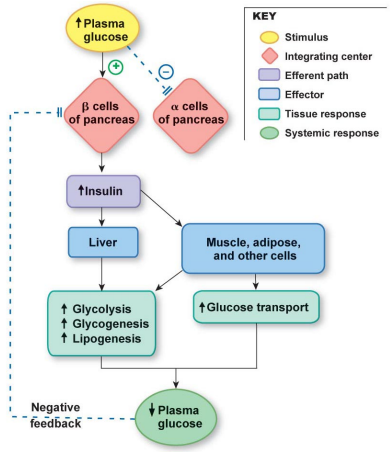





Table 22-5

**TABLE 22-5 Glucagon**

| | |
|---|---|
| Cell of origin | Alpha cells of pancreas |
| Chemical nature | 29-amino acid peptide |
| Biosynthesis | Typical peptide |
| Transport in the circulation | Dissolved in plasma |
| Half-life | 4–6 minutes |
| Factors affecting release | Enhanced secretion when plasma [glucose] < 65-70 mg/dL; ↑ blood amino acids |
| Target cells or tissues | Liver primarily |
| Target receptor/ second messenger | G protein–coupled receptor linked to cAMP |
| Whole body or tissue action | ↑ Plasma [glucose] by glycogenolysis and gluconeogenesis; ↑ lipolysis leads to ketogenesis in liver |
| Action at molecular level | Alters existing enzymes and stimulates synthesis of new enzymes |
| Feedback regulation | ↑ Plasma [glucose] shuts off glucagon secretion |
| Other information | Member of secretin family (along with VIP, GIP, and GLP-1) |




Figure 22-15

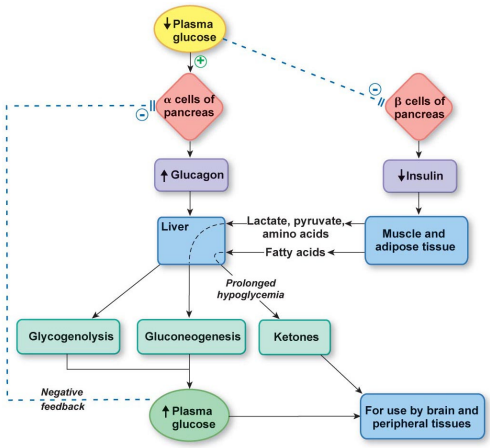





Figure 22-16

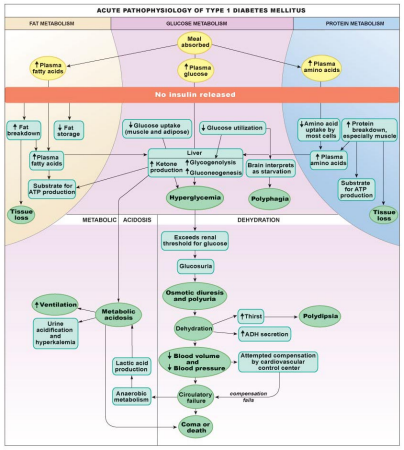





Figure 22-17

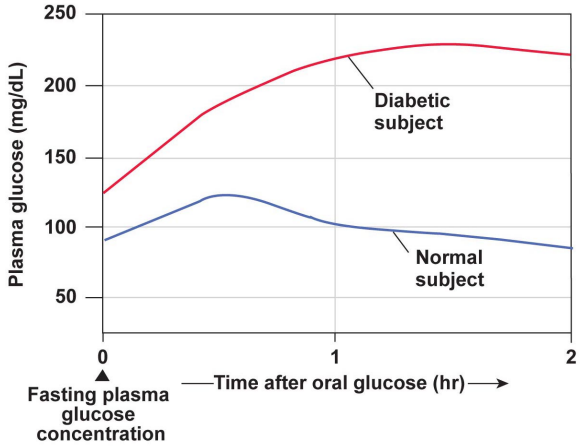

Figure 22-18

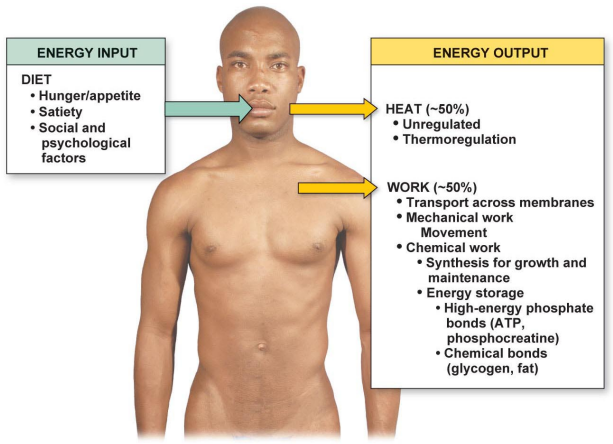





Figure 22-19

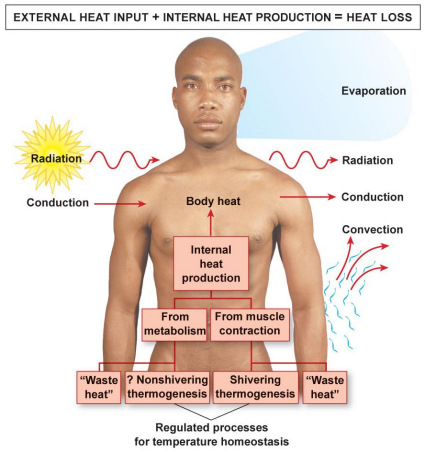





Figure 22-20, overview

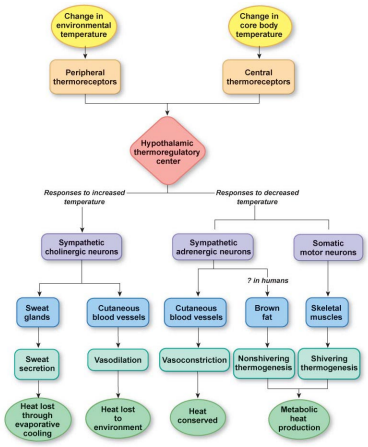





Figure 22-21, overview