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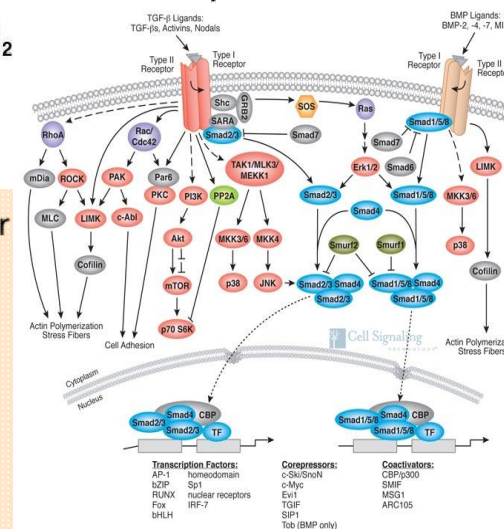
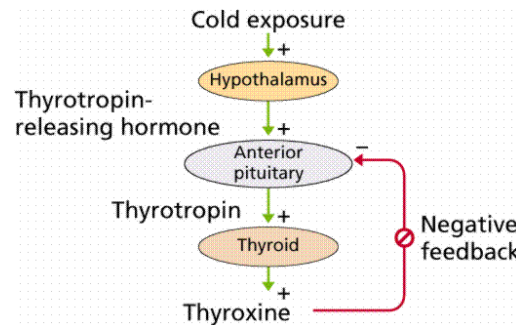
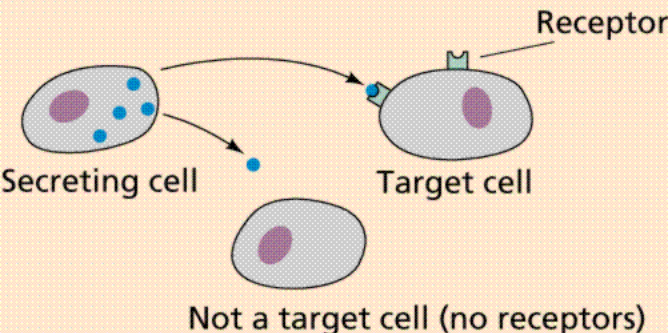
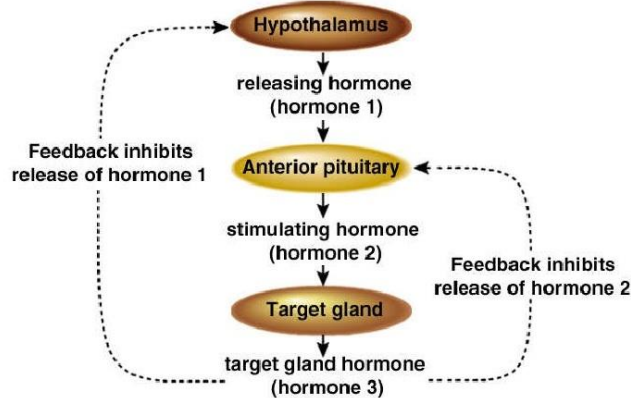
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Integration of Metabolism: hormones & Cellular Signaling

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Endocrine Glands



Feeding

Insulin

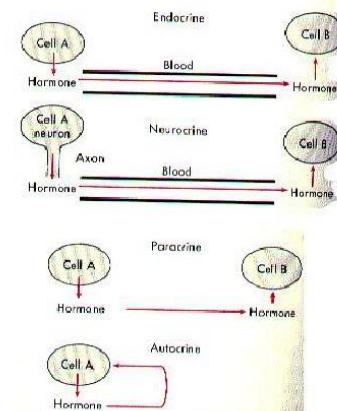
PI3K pathway

Per2 ↑

MAPK pathway

Per2 ↑

Types of cell-to-cell signaling



Endocrine Hormones: travel via bloodstream to target cells

Neurocrine hormones: released from nerve terminals

Paracrine hormones: act on adjacent cells

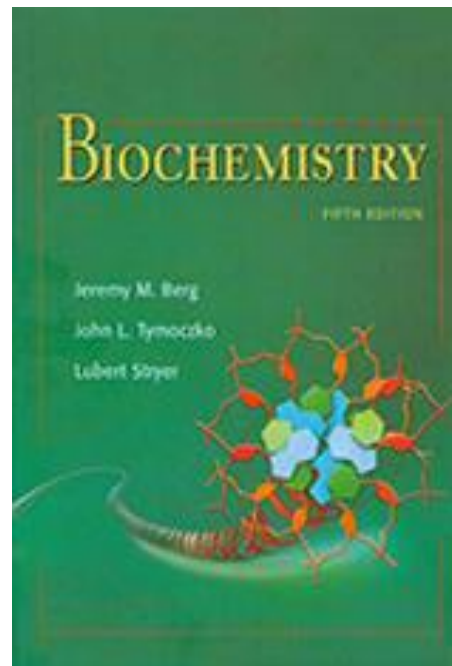
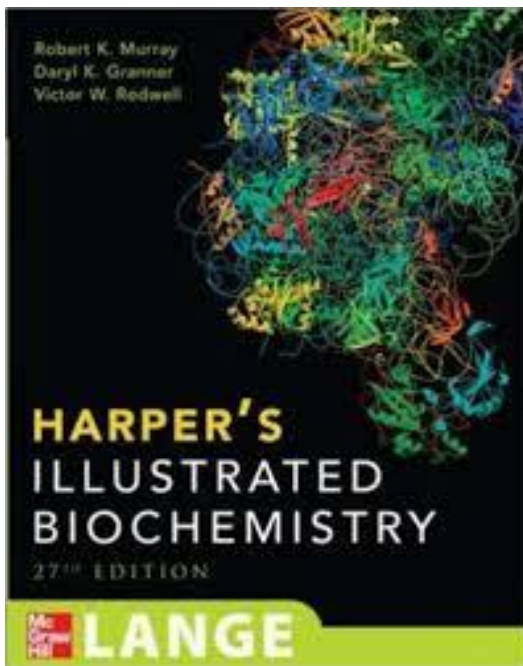
Autocrine hormones: Released and act on the cell that secreted them.

Intracrine Hormones: act within the cell that produces them.



Resources for the 4 lectures

- Harper's Illustrated Biochemistry
- Stryer's Biochemistry
- Campbell's Biochemistry





Hormones: The Remote Controllers

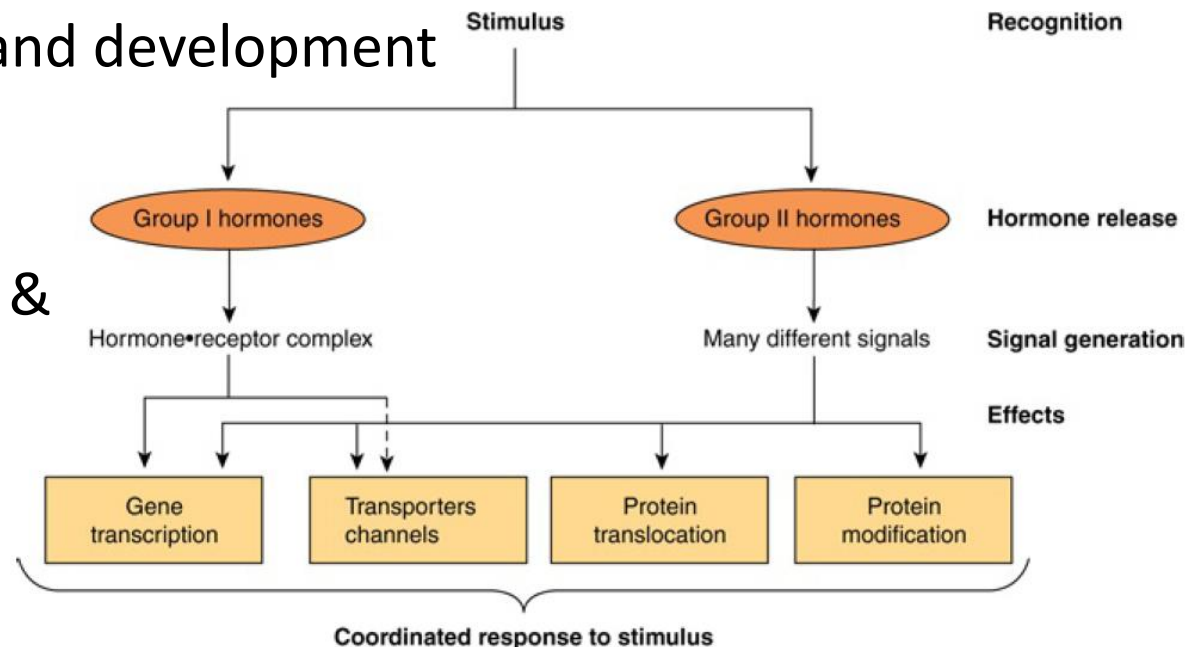
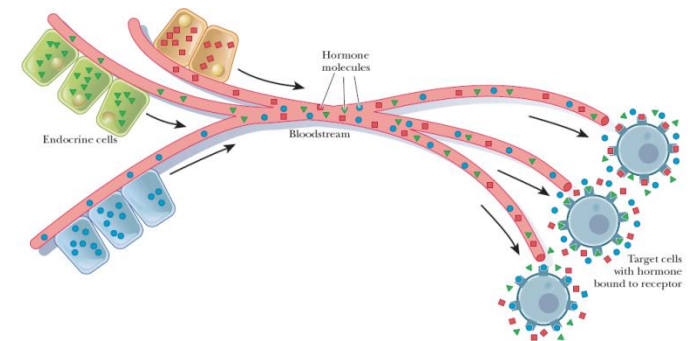
- What are hormones? Organic, blood, low amounts, source & target

- Functions:

- They help maintain homeostasis
- Mediate responses to external stimuli
- Play roles in growth and development

- Classes:

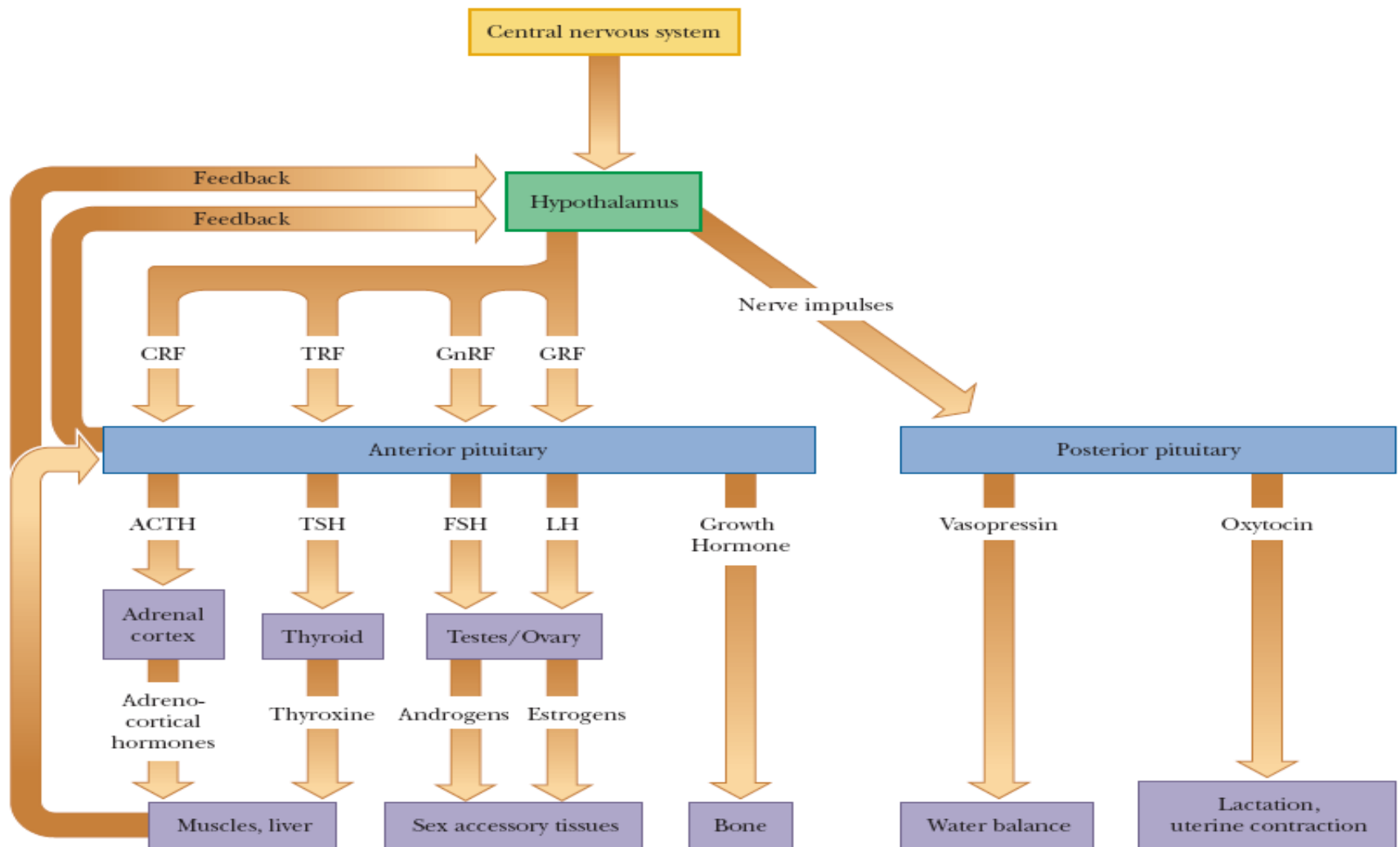
- Endocrine hormones
 - Distance; stability; & concentration
- Paracrine hormones
- Autocrine hormones





Nervous vs./& Endocrine

Two systems act individually and together in regulating the human physiology





THE TARGET CELL CONCEPT

- 200 types of differentiated cells in humans
 - Only a few produce hormones! (<50 known hormones)
 - All of the 75 trillion cells in a human are targets to one or more
-
- **One hormone → several cell types**
 - **One cell type → several hormones**
 - **One hormone → several effects**



THE TARGET CELL CONCEPT

- Several factors determine the response of a target cell to a hormone:

Factors affect the concentration of the hormone at the target cell

- ✓ The rate of synthesis and secretion
- ✓ How close the source from target (dilution)
- ✓ The K_d of the complex
- ✓ The rate of conversion of inactive form to the fully active form
- ✓ The rate of clearance



THE TARGET CELL CONCEPT

- Several factors determine the response of a target cell to a hormone:

Factors affecting the target cell response

- ✓ The number and relative activity of receptors
- ✓ The metabolism within the target cell
- ✓ The presence of other factors within target necessary for response
- ✓ Up- or down-regulation of receptors
 - ✓ Post-receptor desensitization of the cell



Receptors Discriminate Precisely

- Major challenge:
 - Atto- to nano-molar range (10^{-15} to 10^{-9} mol/L) vs. Structurally similar molecules (sterols, amino acids, peptides, and proteins): micro- to milli-molar (10^{-6} to 10^{-3} mol/L) range

