

Chapter 17: Functional Organization of the Endocrine System

I. General Characteristics of the Endocrine System

A. Terminology

1. What does the term endocrine imply? _____

2. Endocrine glands secrete _____
3. A hormone is a ligand (chemical substance) that:
 - a. _____
 - b. _____
 - c. _____
 - d. _____

B. Endocrine versus Nervous System Regulation

1. Increasing or decreasing hormone concentration in body fluids is referred to as _____
 - a. The effects produced are in relation to hormone _____
2. The all-or-none of action potentials in the nervous system is referred to as _____
 - a. What represents a weak stimulus? _____
 - b. What represents a strong stimulus? _____
3. Compared to the nervous system, the responses of the endocrine system are:
 - a. Usually _____
 - b. Longer _____
 - c. More _____
4. The two systems cannot be separated either _____ or _____
 - a. Where does a neurohormone come from and what does it do? _____

 - b. Some neurons directly _____ endocrine glands and influence _____
 - c. Some hormones from endocrine glands affect _____ and significantly _____

D. Types of Chemical Signals

1. Intercellular chemical signals allow _____
 - a. The nervous system uses _____ & _____
 - b. The endocrine system uses _____
2. Autocrine chemical signals are released by cells and have a _____ effect on _____
3. Paracrine chemical signals are released by cells and affect _____ without being _____
4. Pheromones are chemical signals _____ the environment that modify the _____ & _____ of _____

II. Chemical Structure of Hormones

A. Chemically hormones can be either:

1. _____
2. _____
3. _____
4. _____

B. Glycoprotein hormones are composed of _____ & _____

C. Lipid hormones are either _____ or _____

III. Control of Secretion Rate

A. The secretion of each hormone is controlled by a _____ so that the body activity it regulates is _____ & _____

B. Three major patterns of hormone regulation:

1. Pattern One

- a. Involves the action of a substance other than a _____
- b. The action causes hormone levels to _____ or _____

2. Pattern two involves _____ of the endocrine gland

- a. Neurons synapse with cells that _____
- b. When action potentials occur in the neurons they release _____

1. If stimulatory it causes _____
2. If inhibitory it causes _____
3. Pattern three involves control of secretory activity of one endocrine gland by a _____ or _____ secreted by _____
4. In addition to the major patterns a few hormones are regulated in a _____ mechanism

IV. Transport and Distribution in the Body

A. Hormones are dissolved in _____ and transported either in a _____ or bound to _____

B. Free Hormone Molecules

1. Free hormones can diffuse from _____ to _____
2. The rate of hormone movement is concentration dependent:
 - a. When blood hormone levels are higher _____
 - b. When blood hormone levels are lower _____

C. Protein Bound Hormones

1. Hormones bind to plasma proteins in a _____
2. There is an equilibrium between the _____ & _____
 - a. The equilibrium is important because only _____ diffuse

D. Since hormones circulate in the blood they are _____

V. Metabolism and Excretion

A. What limits the length of time that hormones are active? _____

B. What is a half-life? _____

1. What type of hormone has a relatively short half-life? _____
 - a. Their concentrations within the blood _____
 - b. They regulate activities that have a _____ & _____
2. Lipid-soluble hormones commonly are combined with _____
 - a. The combination reduces rate of _____ & increases _____
 - b. Hormones with a long half-life have _____ blood levels

C. Hormones removed from the blood in four major ways:

1. Excretion by:
 - a. _____ into the _____
 - b. _____ into the _____
2. Metabolized or chemically modified by _____ in the blood
3. Actively transported into cells and _____
4. Conjugation by:
 - a. _____ attaches _____ to the hormone

VI. Interaction of Hormones with Their Target Tissues

A. Define the following terms:

1. Ligand _____
2. Binding site _____
3. Receptor site _____
4. Specificity _____

B. What determines which cells will respond to a particular hormone? _____

C. Drugs with structures similar to ligands _____

1. A drug may _____ the receptor or _____ of the receptor

D. Target Cell Responsiveness

1. Response to a given ligand concentration is _____ in some cases and _____ in others
2. The term "down-regulation" refers to _____
 - a. Two known mechanisms for down-regulation are:
 1. Decreases in the rate receptors are _____
 2. Increases in the rate receptors are _____
 - a. Ligand and receptor are taken into the cell by _____
3. Tissues that exhibit down-regulation are adapted to _____
4. Tissues that do not exhibit down-regulation respond to hormones maintained _____
5. The term "up-regulation" refers to _____

VII. Classes of Hormone Receptors

A. Categories of Ligands

1. Ligands that cannot pass through the plasma membrane
 - a. They are _____ molecules and _____ molecules
 - b. They interact with _____
 1. The receptor sites are exposed to _____
 - c. The ligand binding to the receptor site initiates a _____
2. Ligands that pass through the plasma membrane
 - a. They are _____ and _____
 - b. They _____ through the membrane and bind to _____
 1. Intracellular receptors are in the _____ or the _____
 - c. The ligand and receptor bound together then interact with:
 1. _____ or
 2. _____

B. Membrane-Bound Hormone Receptors

1. Receptors That Directly Alter Membrane Permeability
 - a. Protein molecules that make up part of _____
 - b. When the ligand binds to the receptor site it alters the _____

 1. This causes the channel to either _____ or _____
 2. These channels are called _____
 - c. The result is a change in the _____
 - d. Examples:
 1. What type of channel does serotonin bind to? _____
 2. Acetylcholine causes skeletal muscle contraction by _____
2. Receptors That Activate G Proteins
 - a. List the three subunits of a G protein from largest to smallest:
 1. _____
 2. _____
 3. _____
 - b. Why are they called "G proteins"? _____

- c. When inactive a G protein has a guanine diphosphate bound to _____
- d. The activation of G proteins by a receptor involves:
1. _____ binds to the receptor on the outside of the cell
 2. Causes the receptor to _____
 3. As a result the receptor joins with _____ inside the cell
 4. This binding causes GDP to be released from _____
 5. This allows the more abundant guanine triphosphate to bind to the _____ which _____
 6. Then the G proteins separate from the _____
 7. The activated _____ subunit separates from _____ & _____
 8. The activated _____ produces cellular responses by altering the activity of molecules:
 - a. Within _____
 1. Such as opening or closing _____
 - b. Inside _____
 1. Altering the activity of _____
 9. After a short time:
 - a. The activated _____ is turned off because _____
 - b. The _____ then recombines with the _____ & _____
3. Receptors That Alter the Activity of Intracellular Enzymes
- a. Ligand binds to membrane-bound receptor and directly _____
 1. Increases or decreases _____
 2. Results in the _____
 - b. The mediators or phosphorylated proteins activate _____
 - c. What is the cascade effect? _____
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C. Intracellular Hormone Receptors

1. Intracellular receptors are either in the _____ or in the _____
2. The activation of DNA by receptors involves:
 - a. Lipid-soluble ligands cross into the cell by the process of _____

- b. If the receptor is in the cytoplasm:
 1. The ligand _____ to its receptor
 2. The receptor and ligand _____ into the nucleus & _____
 - c. If the receptor is in the nucleus:
 1. The ligand _____ into the nucleus
 2. Then binds to _____ and then _____
 - d. "Fingerlike" projections interact with _____
 - e. This increases the synthesis of _____
 - f. The _____ molecules then move to the _____
 - g. They attach to _____ and increase the _____
 - h. The newly synthesized _____ produce the _____
3. Ligands operating in this manner have a _____
 - a. During this time _____
 4. The cells _____ return to _____