Exam 3 review sheet

Chapter 7 endocrine

The specificity of a hormone depends on its receptors and associated signal transduction pathways
Hormone is a chemical secreted into the blood by a cell or group of cells for transport to a distant target
Hormones are effective at very low concentrations
Pheromones are chemical signals secreted into the external environment
Hormones bind to receptors to initiate cellular mechanism of action
Insulin is an example of a hormone with varied effects- in muscle and adipose tissues, it alters glucose transport proteins and enzymes for glucose metabolism. In the liver, it modulates enzyme activity
The variable responsiveness of a cell to a hormone depends on the cells receptor and signal transduction pathways.
Hormone activity is limited by terminating secretion, removing hormone from the blood or terminating activity at the target cell
Hormones have a half life; hormones in the blood are degraded into inactive metabolites by enzymes found in the liver and kidneys
Hormones bound to membrane receptors have their activity terminated by enzymes in the plasma (peptide hormones), or the entire complex is brought into the cell by exocytosis
3 types of hormones-peptide/protein hormones, steroid hormones, and amino acid derived hormones
Amine hormones act by modifying existing proteins, and activate second messenger systems
Secretory vesicles containing peptides are stored in the cytoplasm of the endocrine cell until needed
Peptide hormones are synthesized as inactive preprohormones, then processed to prohormones.
Preprohormones contain one or more copies of a peptide hormone, and the signal sequence is removed in the Golgi apparatus. Prohormones are chopped into active hormones and peptide fragments.
Peptide hormones dissolve in the plasma, have a short half-life
They bind to surface receptors on their target cells and initiate a rapid cellular responses thru signal transduction
G protein coupled adenylyl cyclase-cAMP system is the signal transduction system for many protein hormones
    ATP➔ cAMP➔activates protein kinase
Simplest reflex control pathways in the endocrine system where an endocrine cell directly senses a stimulus and responds by secreting a hormone
    In this type of pathway, the endocrine cell acts as both sensor and integrating center
Ex. PTH is secreted by 4 small parathyroid glands that lie behind the thyroid .
The parathyroid endocrine cells monitor plasma [Ca^{2+}] with the aid of G protein -coupled Ca2+ receptors on their cell membranes. When a certain number of receptors are bound to Ca2+, PTH is inhibited
Steroid hormones are synthesized as needed, because they are lipophilic➔ they could just slide out, are hydrophobic and generally bound to protein carriers
    Synthesized in the adrenal cortex

Steroid receptors are generally inside the target cells where they turn genes on or off and direct the synthesis of new proteins; some steroid hormones also bind to membrane receptors that use 2nd messenger systems for a more rapid response

Cell response is slower than with peptide hormones-most hormone-receptor complexes go to the nucleus where they turn genes on, causing new mRNA to be made (not rapid)+

Steroid hormones may bind to membrane receptors and have nongenomic effects

Amine hormones can behave like typical peptide hormones or like a combination of a steroid hormone and a peptide hormone

Many endocrine reflexes involve the nervous system, by either neurohormone or through neurons that influence hormone release

Neurohormones are chemical signals released into the blood stream

Pituitary gland is composed of the anterior pituitary, an endocrine gland, and the posterior pituitary, which is an extension of the brain

Posterior pituitary releases oxytocin and vasopressin: both made in the hypothalamus

Trophic hormones control the secretion of other hormones

Hypothalamic releasing hormones and inhibiting hormones control the secretion of anterior pituitary hormones

The hypothalamic trophic hormones reach the pituitary thru the hypothalamic hypophyseal portal system

6 anterior pituitary hormones: prolactin, growth hormone, FSH, LH, TSH and ACTH

The signals that regulate secretion of the anterior pituitary hormones come from neurohormones

These neurohormones are secreted into the circulation in the hypothalamus➔ to the pituitary through the hypothalamic-hypophyseal portal system

Hormones secreted into a portal system have an advantage over hormones secreted into general circulation-a much smaller amount is needed in the portal system

Hormones of \the anterior pituitary control many vital functions

In complex endocrine reflexes, hormones of the pathway act as negative feedback signals

If the combination of two or more hormones yields a result that is greater than additive, it is called synergism

If one hormone cannot exert its effects fully unless a second hormone is present, the second hormone is permissive to the first

If one hormone opposes the action of another, the two are antagonistic

Diseases of hormone excess are usually due to hypersecretion

Symptoms of hormone deficiency occur when too little hormone is secreted

Abnormal tissue responsiveness may result from problems with hormone receptors or signal transduction pathways

Primary pathologies arise in the last endocrine gland in a reflex

A secondary pathology is a problem with one of the tissues producing trophic hormones

Short loop negative feedback-pituitary hormones feed back to decrease hormone secretion by the hypothalamus

Ex. ACTH

Long loop negative feedback-last hormone in a pathway loops back to suppress secretion of its trophic hormones

Ex. Cortisol secreted from adrenal cortex feeds back to suppress secretion of hypothalamic corticotropin-releasing hormone (CRH) and adrenocorticotropin (ACTH)

Chapter 12 muscles

Muscles generate motion, force, and heat
3 types of muscle are skeletal, cardiac, and smooth
Skeletal and cardiac muscle are striated
    They appear striated because of the alternating light and dark bands
Skeletal muscles are attached to bones by **tendons**
    The **origin** is the end of the muscle attached closest to the trunk, or most stationary part of the bone
    The **insertion** is the more distal or mobile attachment
Smooth muscle is in blood vessels, tubes, urinary tract, bladder, stomach
    Its function is to influence the movement of material into out of, and within the body
Skeletal muscles are described as voluntary, but a certain degree of conscious control can be learned over smooth and cardiac muscle
Skeletal muscles are unique in that they contract only in response to a signal from a somatic motor neuron, they can't initiate their own contraction
Cardiac and smooth muscle have multiple levels of control-autonomic innervations, but also some types of smooth and cardiac muscle can contract spontaneously
At a flexible joint, muscle contraction moves the skeleton. Flexors bring bones closer together; extensors move them away from each other
    Flexor-extensor pairs are examples of antagonistic muscle groups
Skeletal muscle is a collection of muscle fibers, large cells with many nuclei
Fascicles are the bundles of muscle fibers that are sheathed in connective tissue
T-tubules allow action potentials to move rapidly into the interior of the fiber and release calcium from the SR
Myofibrils are intracellular bundles of contractile and elastic proteins
Thick filaments are made of myosin; thin filaments are made mostly of actin, although titin and nebulin hold thick and thin filaments in place
    Titin stabilizes the position of the contractile filaments and its elasticity returns stretched muscles to their resting length
Sr consists of longitudinal tubules with enlarged end regions called **terminal cisternae**
Myosin binds to actin, creating crossbridges between the thick and thin filaments
One sarcomere is composed of two **Z disks** and the filaments between them. A sarcomere is divided into **I bands** (thin filaments only), **an A band** that runs the length of a thick filament and a central **H zone** occupied by thick filaments only. The **M line** and Z disks represent attachment sites for myosin and actin.
The force created by a contracting muscle is called muscle tension, while the load is a weight or force that opposes contraction of a muscle
Tension generated in a muscle fiber is directly proportional to the number of high-force crossbridges bettween the thick and thin filaments
Sliding filament theory of contraction states that during contraction, overlapping thick and thin filaments slide past each other in an energy-dependent manner as a result of actin-myosin crossbridge movement
In relaxed muscle, tropomyosin partially blocks the myosin-binding site on actin. To initiate contraction, Ca^{2+} binds to troponin, unblocking the myosin-binding sites, and allowing myosin to complete its power stroke