

STUDY GUIDE CHAP 18 ENDOCRINE SYSTEM

1. **Definitions** - hormone, endocrinology, endocrine gland, exocrine gland; up and down regulation
2. Know the difference between positive and negative feedback systems. If a diagram is given, be able to justify why it is positive or negative feedback system.
3. How does the nervous system compare to the endocrine system? What areas of overlap exist between the nervous and endocrine systems?
4. What cells in the body are exposed to hormones, and what factors determine whether a cell
- 5.
6. reacts to a particular hormone?
7. If a cell reacts to a hormone, how might that cell change its behavior or appearance
8. Know the location and function of the following organs, glands, structures, and tissues.
Hypothalamus, Posterior pituitary (neurohypophysis), Anterior pituitary (adenohypophysis), Pancreas, Adrenal glands, Testes, Ovaries, Parathyroid glands, Thyroid gland
Islets of Langerhans, Hypophyseal portal veins
7. Understand the types of hormones and mode of action for Hydrophilic (water soluble) and Hydrophobic (fat soluble) hormones. How would you critique the various hormone mechanism of action models on their physiological accuracy
Types of hormone systems: Endocrine, Paracrine, Autocrine
Hydrophilic mechanism: First messenger, Membrane receptor, G protein, Second messenger, Protein Kinase, cAMP
Hydrophobic mechanism: Transport protein, Receptor, Activated receptor-hormone complex, gene expression
Check the pictures in the text book systemically detailing the pathways of hormone action
8. Understand how hormones interact and how hormone activity is controlled in the body.
Hormone interaction: Synergistic effects, Permissive effects, Antagonistic effects.
Hormone Control: Enzyme amplification, up-regulation, Down regulation
9. Know how the different classes of hormones are transported in the blood. What are some examples of lipid soluble and water soluble hormones? Which category do steroid hormones fit into?
10. Review where the following hormones are released, what conditions stimulate / inhibit their release, what their target cells are, how they change the behavior of their target cells and disorders associated with hyper/hypo-secretion:

List of hormones:

Hypothalamus: (releasing Factors) Growth Hormone Releasing hormone, Thyrotropin Releasing Hormone, Gonadotrophic Releasing Hormone, Prolactin releasing Hormone,

Corticotropin Releasing Hormone **(inhibiting factors)** Growth Hormone Inhibiting Hormone or Somatostatin, Prolactin Inhibiting Hormone, Dopamine

Posterior Pituitary or neurohypophysis: Releases two hormones produced by the Hypothalamus, ADH and Oxytocin

Anterior Pituitary Gland or Adenohypophysis: **(Somatotrophs)** Human Growth Hormone “hGH,” **(Thyrotrophs)** Thyroid-Stimulating Hormone “TSH,” **(Gonadotrophs)** Follicle-Stimulating Hormone “FSH,” Luteinizing Hormone “LH,” **(Lactotrophs)** Prolactin “PRL,” **(Corticotrophs)** Adrenocorticotrophic Hormone “ACTH,” Melanocyte Stimulating Hormone “MSH”

Thyroid Gland: (Follicular cells) T₃ and T₄, **(Parafollicular cells)** Calcitonin

Parathyroid Gland: (Principal cells) Parathyroid Hormone “PTH”

Adrenal Gland Cortex: (Zona glomerulosa) Mineralocorticoids- Aldosterone, **(Zona fasciculata)** Glucocorticoids- cortisol, corticosterone, cortisone, **(Zona reticularis)** androgens- Dehydroepiandrosterone DHEA

Adrenal Gland Medulla: (Chromaffin cells) Epinephrine and Norepinephrine

Pancreas: Islets of Langerhans (Alpha cells) Glucagon, **(Beta cells)** Insulin, **(Delta cells)** Somatostatin or insulin-like growth factor, **(F cells)** Pancreatic polypeptide.

Ovaries: (granulosa or follicular cells) Estrogen and Progesterone, **(Corpus luteum)** Estrogen, Progesterone, Relaxin, and Inhibin

Testes: (Leydig cells) Testosterone and Dihydrotestosterone “DHT,” **(Sertoli cells)** Androgen-binding protein “ABP” and Inhibin.

Placenta: Human Chorionic Gonadotropin (HCG), Human placental lactogen or human Chorionic Somatomammotropin, Placental prolactin, relaxin, progesterone, estrogen

Pineal Gland: serotonin and melatonin.

Kidneys: Erythropoietin

Thymus: Thymopoietin

11. Know the following endocrine disorders and medical terms:

acromegaly, Giantism, Dwarfism, Grave’s disease, Diabetes insipidus, Diabetes mellitus, Cretinism, Endemic goiter, Cushing's disease, Addison's disease, hyperglycemia, hypoglycemia, seasonal affective disorder.

12. Understand the relationship between the hypothalamus and the pituitary gland. The anatomy and the communication between the two do the same for the anterior and posterior Pituitary

13. know the stages of the general adaptation response and the characteristics of each including hormones involved

14. Discuss the possible applications and side effects of use of anabolic steroids

Example of studying a hormone - you may complete other hormones in the list the same way.

Growth hormone (GH) targets muscle cells and the epiphyseal plate of growing bones and causes them to increase in size and divide

Growth Hormone

Stimuli:

1. Plasma amino acids – especially arginine
2. Starvation – begin to catabolize proteins for fuel, increases amino acids in plasma
3. Hypoglycemia
4. Exercise, stress, trauma
5. Sleep

Effects:

1. Stimulates growth of long bones and muscles
2. Increases protein synthesis – positive nitrogen balance
3. Stimulates lipolysis (Hormone Sensitive Lipase) to spare blood glucose
4. Inhibits glucose utilization - diabetogenic effect
5. Stimulates release of IGF-1 from the liver and kidney

Excess:

1. Gigantism – physical enlargement due to hypersecretion during childhood
2. Acromegaly – hypersecretion during adulthood, growth of hands, feet, facial bones
3. Hypoglycemia (Diabetes) & Atherosclerosis – from increased fat mobilization

Deficiency:

Dwarfism - Caused by decreased release, or receptor insensitivity

Antidiuretic Hormone (Vasopressin) ADH –

Stimuli:

1. Increased extracellular fluid osmolarity at the osmo-receptors local in the hypothalamus.
2. Decreased blood pressure / volume sensed by carotid, aortic and atrial baroreceptors.
(dehydration, acute blood loss)
3. Non-specifics: trauma, pain, anxiety

Effects:

1. Increases the return of water to the bloodstream at the kidney tubules
2. vasoconstriction

Alcohol consumption inhibits ADH

Clinical Problems:

1. **Diabetes insipidus** – can be caused by injury to the hypothalamus

This condition is not serious as long as the person is conscious and can drink fluids
There is no change in blood glucose levels associated with diabetes insipidus

2. **Too Much ADH:** SIADH (Syndrome of Appropriate ADH Secretion)

- Slow water excretion leading to dilute plasma, hypertension
- Cause is usually due to non-pituitary tumor secretion