ANSWERS TO CHAPTER 10

CONTENT LEARNING ACTIVITY

Chemical Signals
A. 1. Intracellular chemical signals; 2. Intercellular chemical signals
B. 1. Autocrine; 2. Paracrine; 3. Hormones and neurohormones; 4. Neuromodulators and neurotransmitters; 5. Pheromones

Receptors
A. 1. Intracellular receptors; 2. Membrane-bound receptors; 3. Intracellular receptors; 4. Membrane-bound receptors; 5. Intracellular receptors; 6. Membrane-bound receptors; 7. Intracellular receptors
B. 1. Ion channels; 2. Enzymes; 3. G protein; 4. GTP; 5. cAMP; 6. cGMP; 7. Phosphate

Hormones
A. 1. Endocrine glands; 2. Exocrine glands; 3. Hormones; 4. Target tissues; 5. Receptors
B. 1. Protein; 2. Peptide; 3. Amino acid derivatives; 4. Steroids; 5. Prostaglandins

The Pituitary and Hypothalamus
A. 1. Hypothalamus; 2. Infundibulum; 3. Anterior pituitary; 4. Posterior pituitary
B. 1. Releasing hormones; 2. Hypothalamic-pituitary portal system; 3. Nerve cells in hypothalamus

Hormones of the Anterior Pituitary
1. Growth hormone (GH), 2. Adrenocorticotropic hormone (ACTH), 3. Luteinizing hormone (LH), 4. Follicle-stimulating hormone (FSH), 5. Prolactin

Hormones of the Posterior Pituitary
1. Antidiuretic hormone (ADH), 2. Oxytocin

The Thyroid Gland
A. 1. Thyroid follicles; 2. Thyroid hormones; 3. Parafollicular cells; 4. Calcitonin
B. 1. Hypothyroidism; 2. Hypothyroidism; 3. Hyperthyroidism; 4. Hypothyroidism
C. 1. Decreases; 2. Decreases; 3. Increases; 4. Increases; 5. Decreases

The Parathyroid Glands
A. 1. Increases; 2. Increases; 3. Increases; 4. Decreases; 5. Increases
B. 1. Hyperparathyroidism; 2. Hypoparathyroidism

The Adrenal Glands
1. Adrenal medulla; 2. Adrenal cortex

The Adrenal Medulla
1. Decrease; 2. Increase; 3. Increase; 4. Increase; 5. Increase

The Adrenal Cortex
A. 1. Glucocorticoids; 2. Cortisol; 3. Mineralocorticoids; 4. Aldosterone; 5. Androgens
B. 1. Increases; 2. Increases; 3. Decreases; 4. Increases
C. 1. Increases; 2. Decreases; 3. Increases; 4. Increases; 5. Decreases; 6. Increases; 7. Increases

The Pancreas, Insulin, and Diabetes
A. 1. Pancreatic islets; 2. Insulin; 3. Diabetes mellitus; 4. Glucagon
B. 1. Decreases; 2. Increases; 3. Decreases; 4. Increases
C. 1. Decreases; 2. Increase; 3. Increases; 4. Increase; 5. Decrease
D. 1. Increase; 2. Decrease; 3. Increases; 4. Increase; 5. Increases; 6. Increases; 7. Decrease

The Testes and Ovaries
A. 1. Testosterone; 2. Increase; 3. Estrogen and progesterone; 4. Menstrual cycle; 5. Ovaries; 6. Anterior pituitary hormones
B. 1. Increases; 2. Increase; 3. Decrease

Thymus Gland, Pineal Body, and Other Hormones
1. Thymosin; 2. Melatonin; 3. Digestive hormones; 4. Prostaglandins; 5. Erythropoietin; 6. Human chorionic gonadotropin

QUICK RECALL

1. Water balance, uterine contractions and milk release, metabolism and tissue maturation, ion regulation, heart rate and blood pressure regulation, blood glucose control, immune system regulation, and reproductive functions control
2. Autocrine chemical signals, paracrine chemical signals, hormones, neurohormones, neuromodulators, neurotransmitters, and pheromones
3. Proteins, peptides, amino acid derivatives, and lipids
4. Blood levels of chemicals, hormones, and nervous system
5. Growth hormone (GH), adrenocorticotropic hormone (ACTH), thyroid-stimulating hormone (TSH), luteinizing hormone (LH), follicle-stimulating hormone (FSH), prolactin, and melanocyte-stimulating hormone
6. Anterior pituitary
7. Posterior pituitary
8. Adrenal cortex
9. Adrenal cortex
10. Thyroid gland (parafollicular cells)
11. Adrenal cortex
12. Adrenal medulla
13. Ovaries
14. Anterior pituitary
15. Anterior pituitary
16. Pancreas
17. Pineal body
18. Parathyroid glands
19. Posterior pituitary
20. Ovaries
21. Thymus gland
22. Thyroid gland (follicle cells)
23. Testes
24. Anterior pituitary
25. Pancreas

WORD PARTS

1. hormone
2. antidiuretic
3. antidiuretic
4. adrenocorticotropic; gonadotropins
5. prolactin
6. prolactin

MASTERY LEARNING ACTIVITY

1. A. An endocrine gland lacks a duct, releases its secretions into the blood, and produces hormones.

2. D. Other hormones, other chemicals in the blood, and the nervous system all regulate hormone secretion.

3. B. Lipid-soluble hormones diffuse through the cell membrane, and cause the production of new RNA, which in turn guides the production of specific proteins. Protein or peptide hormones bind to receptors on the cell membrane and either increase membrane permeability or activate intracellular messengers.

4. D. The pituitary gland is composed of two parts, the anterior pituitary, which, during development, is derived from the mouth, and the posterior pituitary, which is derived from the brain.

5. A. Releasing hormones from the hypothalamus travel through blood vessels in the hypothalamic-pituitary portal system and control the secretions of the anterior pituitary.

6. D. Hormones secreted in the posterior pituitary are produced in the hypothalamus in neuron cell bodies, travel to the posterior pituitary within the axons of these neurons, and are released from the axons. Posterior pituitary hormones include ADH and oxytocin.

7. A. Growth hormone stimulates the growth of bones, muscles, and other organs by increasing protein synthesis. It also resists protein breakdown, and favors fat breakdown.

8. D. Hypersecretion of growth hormone in children can result in giantism. In adults, however, only certain bones respond to the growth hormone, resulting in a condition called acromegaly. Dwarfism can be caused by hyposecretion of growth hormone.

9. C. LH and FSH are hormones produced in the anterior pituitary that regulate growth and function of the gonads. They stimulate sex hormone production (LH), and production of sperm cells or oocytes (FSH).

10. B. Removal of the thyroid gland eliminates thyroid hormone production. In response to decreased thyroid hormone secretion, TSH is released in larger amounts. Calcitonin is released by the parafollicular cells of the thyroid, and removal of the thyroid stops calcitonin production.

11. A. Parathyroid hormone has effects that increase the calcium level in the blood. PTH increases the breakdown of bone, releasing more calcium into the blood, increases calcium reabsorption from the urine, and increases active vitamin D formation.

12. D. The adrenal medulla produces epinephrine and norepinephrine, which increase heart rate, blood pressure, blood flow to skeletal muscle, metabolic rate, and also increase amounts of glucose and fatty acids in the blood. Blood flow to internal organs is decreased.

13. E. The adrenal cortex secretes three major classes of steroids: glucocorticoids, of which cortisol is the major example, mineralocorticoids, of which aldosterone is the major example, and androgens.

14. E. Cortisol increases the breakdown of fats and proteins and increase blood sugar levels. Cortisol also decreases the intensity of the inflammatory response.

15. D. Aldosterone causes increased sodium and water retention, but eliminates potassium from the body.

16. B. A decrease in blood pressure increases renin production in the kidney. Renin causes the formation of angiotensin I, which is converted into angiotensin II. Angiotensin II increases aldosterone production. Aldosterone increases water retention, which increases blood volume (and blood pressure). Angiotensin II also constricts blood vessels, which helps raise blood pressure.

17. D. Insulin promotes the uptake of glucose and amino acids, both of which can be used as an energy source. In the liver and in skeletal muscle, the glucose is stored as glycogen. In adipose tissue glucose is converted to fat. The amino acids can be used to synthesize proteins or glucose.

18. E. Symptoms consistent with hyposecretion of insulin would include acidosis, hyperglycemia, increased urine production, thirst, and hunger.

19. E. All of these hormones are secreted in response to decreased blood glucose levels.

20. E. Thymosin helps in the development of T cells in the thymus gland. Erythropoietin is secreted by the kidneys in response to reduced oxygen levels in the blood. Human chorionic gonadotropin is produced by the placenta; its function is similar to LH. Melatonin is produced by the pineal body, and is thought to play a role in the onset of puberty. Prostaglandins are produced in many tissues; they do not travel long distances, and cause blood vessel dilation, smooth muscle contraction, inflammation, and pain.

FINAL CHALLENGES

1. Rapid sexual development in a prepubertal boy is indicative of hypersecretion of sex steroids. The two most likely tissues are the testes and adrenal glands. Because the testes are of normal size, it is possible that removal of an adrenal tumor could cure the boy.

2. Without sufficient iodine, thyroid hormones are not synthesized. Without the negative feedback effects of thyroid hormones, TSH levels would be elevated.

3. Pheochromocytoma results in overproduction of epinephrine and norepinephrine by the adrenal medulla. These chemicals produce the same effects as stimulation of the sympathetic division of the autonomic nervous system (see chapter 8). Consequently, one expects dilated pupils.

4. With low levels of cortisol, ACTH production is not inhibited by negative feedback.