The Endocrine System

Endocrine system

- Comprised of ductless glands that secrete hormones into the blood stream
- Hormones travel through circulation until they reach their target cell
  - Results in a slow but a prolonged response
- Exocrine glands have ducts and secrete a substance onto the surface of the skin or into a cavity

Major glands of the endocrine system

1. Anterior pituitary gland
2. Posterior pituitary gland
3. Thyroid gland
4. Parathyroid glands
5. Adrenal glands
6. Pancreas
7. Testes
8. Ovaries
9. Thymus gland
10. Pineal gland

The Pituitary

- Located beneath the hypothalamus which helps to regulate its functioning
- Divided into the anterior and posterior pituitary
- The two components operate in different ways

Anterior pituitary gland

- Controlled by hypothalamic-releasing and hypothalalmic-inhibiting hormones
- Hormones produced by the anterior pituitary:
    1. Thyroid-stimulating hormone (TSH): stimulates the thyroid to produce thyroid hormones
    2. Adrenocorticotropic hormone (ACTH): stimulates the adrenal cortex to produce cortisol
    3. Gonadotropic hormones: stimulate gonads to produce sex cells and hormones
    4. Prolactin (PRL): stimulates mammary glands to develop and produce milk only after childbirth
    5. Growth hormone (GH): promotes skeletal and muscular growth

What happens when the body produces too much or too little GH?

- Pituitary dwarfism – too little GH is produced during childhood; results in small stature
- Giagantism – too much GH is produced during childhood; results in excessive growth
- Acromegaly – overproduction of GH as an adult that results in larger than normal feet, hands, and face

Posterior pituitary gland

- Neurons in the hypothalamus have axons that extend down into the posterior pituitary; the synaptic knobs of these neurons release hormones directly into circulation
    - Antidiuretic hormone (ADH): released in response to dehydration
        - Decreases urine production
    - Oxytocin: stimulates uterine contractions during childbirth and promotes milk let down; plays a role in ejaculation in males

Thyroid gland

- A large gland located below the larynx
- Iodine is needed in the diet to allow the thyroid gland to produce the hormones:
  - Tetraiodothyronin and thyroxine (T_3/T_4): regulates metabolism
- The thyroid also secretes calcitonin: helps lower blood Ca^{2+} levels by stimulating the deposition of calcium in the bones
- What if someone lacks iodine in their diet?
- Can they still produce T_3 and T_4?
- TSH continues to stimulate the thyroid to secrete T_3 and T_4
  - Forms a goiter

Hyposecretion of T_3 and T_4

- Hypothyroidism – low blood levels of thyroid hormones
  A. Congenital hypothyroidism: thyroid does not develop properly and is characterized in a short, stocky person that may be mentally retarded
  B. Myxedema: hypothyroidism in adults characterized by lethargy, weight gain, loss of hair, cold intolerant and thick, puffy skin
- Hyperthyroidism – excess thyroid hormones in the blood
  A. Graves disease: characterized by enlargement of the thyroid gland, protrusion of the eyes, increased heart rate, weight loss and insomnia
  B. Thyroid tumor: can also cause hyperthyroidism