ENDOCRINE SYSTEM

• Hormone Basics
• Post-cranial Endocrine Glands
• Cranial Glands

Function: to regulate homeostatic processes via hormones
- blood glucose, growth

Hormone: molecules released by endocrine cells to communicate regulatory messages to other cells in the body

Pheromones: molecules which affect cells in other conspecifics
  e.g., for mating

Regulate:
• Growth
• Development
• Reproduction
• Metabolism
• Behavior
  • Circadian rhythm
Hormones Influence Ontogeny

• Insect metamorphosis

  – Brain Hormone directs an endocrine gland

  • Ecdysone
    - induces molting
Insect metamorphosis
- Brain Hormone directs an endocrine gland
- Ecdysone: induces molting
- Juvenile Hormone: inhibits metamorphosis

Hormones Influence Ontogeny

Endocrine Glands Secrete Hormones Carried by Circulatory System

Hormone Types Act in Different Ways
1. Peptide (amino acid chain) binds to cell surface receptor - Pathway changes cell activity
   - Protein binds to protein
   - Steroids enter cell & bind to receptor in nucleus - Initiate protein synthesis
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Regulation of Blood Calcium: Two Antagonistic Hormones

- Calcitonin
  - from Thyroid Gland
  - It decreases Ca\(^{2+}\) levels

- Parathormone
  - from Parathyroid Glands
  - It increases Ca\(^{2+}\) levels

Calcitonin tones it down
Parathormone pumps it up
Pancreas Cells Control Blood Glucose Levels

Leptin controls body fat levels

Adrenal Glands & Stress: Interface of Endocrine & Nervous Systems

- Nervous system induces
  - nor- & epinephrine release
  - which stimulate
  - glycogen breakdown
  - heart rate
  - respiration
  - metabolism
Adrenal Glands & Stress: Interface of Endocrine & Nervous Systems

- Nervous system induces:
  - nor- & epinephrine release
  - which stimulate
  - glycogen breakdown
  - heart rate
  - respiration
  - metabolism

- Hypothalamus induces:
  - glucose synthesis
  - higher blood pressure

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Hypothalamus Produces Neurohormones*

*Hormones from nerve cells.

- ADH (Antidiuretic Hormone)
  - ↓ blood osmolarity
  - increases water retention by kidneys
**Oxytocin**
- Stimulates smooth muscle contractions in the uterus & mammary glands

**Hypothalamus Produces Neurohormones**

**Pituitary as Tissue Director**

**Hypothalamus Also Controls Secretions By Anterior Pituitary**

- GnRH makes Pituitary release LH & FSH
  - Causing gonads to make testosterone, estrogen, & progesterone
  - Hormones responsible for normal sexual development
• **Thyroid Stimulating Hormone (TSH)** induces:
  - Thyroid to make thyroxine
  - Regulates metabolism
  - Hyperthyroidism
  - Hypothyroidism

• **Adrenocorticotropic Hormone (ACTH)** induces:
  - Adrenal glands to make:
    - glucocorticoids (raise blood glucose level)
    - Mineralcorticoids (promote absorption of Na+ and excretion of K+ by kidneys)

**Anterior Pituitary is Master Gland:**
It Makes TSH & ACTH