ENDOCRINE SYSTEM
Functions

• Works in tandem with the nervous system to regulate body processes
• Both are extrinsic control mechanisms of metabolism (most often)
  – Nervous system is quick
  – Endocrine system is longer lasting
• Mechanism of action: secretion of hormones
The Pituitary Gland

- Inferior to the hypothalamus of the brain
- Supported by the sella turcica
- Surrounded by arteries of the Circle of Willis
- 3 parts
  - Anterior, posterior, pars intermedia
The Pituitary Gland

Anterior pituitary
- Pars tuberalis
- Pars intermedia
- Pars distalis

Optic chiasm

Posterior pituitary
- Infundibular stalk
- Pars nervosa

Hypophyseal fossa in sella turcica of sphenoid bone

Hypothalamus

Median eminence

Mammillary body

Infundibulum
Anterior Pituitary

• Adenohypophysis or pars distalis
• Glandular tissue
• secretes many hormones
  – TSH, FSH/LH, GH, PRL, ACTH
• bordered posteriorly by the pars tuberalis
  – thin epithelial extension in contact with the infundibulum.
Anterior Pituitary

Thyrotropic cells secrete thyroid-stimulating hormone (TSH), which acts on the thyroid gland.

Mammotrophic cells secrete prolactin (PRL), which acts on mammary glands and testes.

Corticotrophic cells secrete adrenocorticotropic hormone (ACTH), which acts on the adrenal cortex.

Pars intermedia cells secrete melanocyte-stimulating hormone (MSH), which acts on melanocytes in the epidermis.

Somatotrophic cells secrete growth hormone (GH), which acts on all body tissues, especially bone, muscle, and adipose connective tissue.

Gonadotropic cells secrete follicle-stimulating hormone (FSH) and luteinizing hormone (LH), which acts on the gonads (testes and ovaries).
Hypothalamopituitary portal vessel

- Blood supply to the anterior pituitary is a portal circuit
- Releasing hormones from hypothalamus into the first capillary bed (median eminence)
- Venous drainage transports these neurohormones to a second capillary bed supplying the anterior pituitary
Hypothalamopituitary portal vessel

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Pars Intermedia

• Poorly developed in humans
• In most animals cells line vesicles filled with colloid
  – MSH (melanocyte stimulating hormone)
  – Beta (β) endorphins

• Infundibulum
  – stalk of neuron fibers and minute neuroglial cells (pituicytes)
  – Connects the pituitary to the brain
  – Directly connected to the posterior pituitary (axons secrete hormones)
Posterior Pituitary

• Neurohypophysis
• contains axon terminals from the hypothalamus
• Hormones
  – ADH: blood volume regulation
  – Oxytocin: uterine contractions
• **Location**
  
  – anterior aspect of the neck
  
  – inferior to the larynx
• **Structure**
  
  – butterfly shaped
  – 2 lateral lobes and a medial isthmus
Histology of the Thyroid

- Thyroid follicles
  - Secrete thyroxin (T4)
  - Primary determinant of metabolic rate
- parafollicular cells
  - Secrete calcitonin
  - Encourages deposition of Ca^{++} into bone
Parathyroid Glands (4):

- **Location**
  - posterior aspect of the thyroid
- **Size**
  - 3-8mm
  - yellow-brown glands
Histology of Parathyroid Gland

• principal cells and oxyphil (storage) cells
  – Secrete parathyroid hormone

• Function
  – raises the level of calcium in blood
Adrenal Glands

• Location
  – superior aspect of the kidneys

• Structure
  – Two regions
    • Cortex
    • Medulla
  – pyramid shaped
Capsule

Adrenal cortex

Adrenal medulla
Regions of adrenal cortex

- Zona glomerulosa
- Zona fasiculata
- Zona reticularis
Hormones of adrenal cortex

• Glomerulosa
  – Mineralocorticoids (aldosterone)
  – controls blood potassium, salt, volume

• Fasciculata
  – Glucocorticoids (cortisol, cortisone)
  – suppresses immune function, raises blood glucose

• Reticularis
  – Gonadocorticoids
  – promotes development of male secondary sex characteristics
Hormones of the adrenal medulla

• Medulla
  – Modified Sympathetic Ganglion
  – involved in “fight or flight”
  – Produces epinephrine and norepinephrine
The Pancreas

- Contains a head, body, and tail
- Exocrine and endocrine functions
Pancreas

• Exocrine
  – acinar cells form rings of tissue = acini
  – secretes digestive enzymes and bicarbonate into the pancreatic duct

• Endocrine
  – Islets of Langerhans
  – minute endocrine glands
  – 2 cell types
    • Alpha secrete glucagon
    • Beta secrete insulin

• Maintain blood sugar levels
Blood capillary

Exocrine acinus

Alpha cell
(secretes glucagon)

Beta cell
(secretes insulin)

Delta cell
(secretes somatostatin)

Pancreatic islet
(islet of Langerhans)

F-cell (secretes pancreatic polypeptide)