Endocrine System

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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
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.
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.
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 (oh, joy!)
The Thyroid Gland

- **Location**
  - anterior aspect of the neck
  - inferior to the larynx
• **Structure**
  - butterfly shaped
  - 2 lateral lobes and a medial isthmus
Histology of thyroid

- Thyroid follicles
  - Secrete thyroxin
  - Primary determinant of metabolic rate
- parafollicular cells
  - secrete calcitonin
  - Encourages deposition of Ca++ into bone
Blood capillary

Thyroglobulin (TGB)

Lymphatic vesicle
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
Thymus

- Located below manubrium of sternum
- Hormones: thymosin, thymopoietin
- Function: T-cell education
HISTOLOGY OF THE THYMUS GLAND

Histologically, each lobe of the thymus is subdivided by collagenous septa into lobules. Each lobule consists of a peripheral cortex composed of lymphocytes and a medulla lacking lymphocytes but containing glandular tissue. Various thymic hormones produced by the medulla regulate the differentiation of T lymphocytes, for example, thymosin and thymopoietin.
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 fasiculata
- Zona glomerulosa
- Zona reticularis
Hormones of adrenal cortex

• glomerulosa
  - Mineralocorticoids (aldosterone)
  - controls blood potassium, salt, volume

• Fasciculata
  - Glucocorticoids (cortisole, 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
Histology of Adrenal gland

- Zona glomerulosa
- Zona fasciculata
- Zona reticularis
- medulla
- capsule
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 primary cell types
    • Alpha secrete glucagon
    • Beta secrete insulin

• Maintain blood sugar levels
Pancreas
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)