Medical School Histology Basics
Endocrine System

VIBS 289 lab

Larry Johnson                           Texas A&M University
OBJECTIVE

GAIN A GREATER APPRECIATION OF THE DIVERSITY OF FUNCTIONS OF THE ENDOCRINE SYSTEM

RECOGNIZE DIFFERENT ORGANS, UNIQUE FEATURES OF ORGANS, AND CELLS THAT MAKE THE ENDOCRINE SYSTEM
Function of endocrine system

“The endocrine system is the collection of glands that produce hormones that regulate metabolism, growth and development, tissue function, sexual function, reproduction, sleep, and mood, among other things.”

http://www.livescience.com/26496-endocrine-system.html
Fig. 16-1  Hypophysis (panoramic view, sagittal section). Stain: hematoxylin-eosin. Low magnification.

Fig. 16-2  Hypophysis (sectional view). Stain: hematoxylin-eosin. Medium magnification.
Slide 74: Pituitary (Masson’s trichrome)

Adenohypophysis
- Pars Distalis
- Pars Tuberalis
- Pars Intermedia

Neurohypophysis
- Infundibular Stem/Stalk
- Median Eminence (of the tuber cinereum)
- Pars nervosa

Pars nervosa
Pars distalis
Pars intermedia
Carcinoma
Infundibular stalk
Slide 74: Pituitary (early carcinoma in posterior lobe)

Pars distalis

Chromophobes  Acidophils  Basophil

Pars nervosa

Pituicyte nuclei  Herring body
Herring bodies in pars nervosa of Hypophysis
Herring bodies
Pituitary (Herlant's stain) pars intermedia

Pars distalis

pars intermedia

pars nervosa
Pars distalis of Pituitary (Herlant's stain) with chromophobe cells, acidophils, and basophils
Pars distalis of Hypophysis

Basophils

Chromophobes

Acidophils

Diagram showing the Pars distalis of the Hypophysis with different cell types labeled.
Follicular cells

Parafollicular cells produce follicle colloid

Follicles

colloid

follicle

Fig. 16-5 Thyroid Gland: Canine (general view). Stain: hematoxylin-eosin. Low magnification.

Fig. 16-6 Thyroid Gland Follicles: Canine (sectional view). Stain: hematoxylin-eosin. High magnification.
Components of a thyroid gland:
1. Colloid
2. Follicular cells
3. Capillary
Figure 12–4  Thyroid hormone secretion is regulated indirectly by the nervous system. When stimulated by nerve cells in higher centers of the brain, specific neuroendocrine cells in the hypothalamus secrete TSH-releasing hormone (TRH). TRH travels via the pituitary stalk to the pituitary gland, where it stimulates the release of thyroid-stimulating hormone (TSH). TSH enters the bloodstream and travels to the thyroid gland, where it induces the production and release of thyroid hormone. The thyroid gland releases its product into the bloodstream (capillaries and target tissue), which then circulates throughout the body.
Thyroid – parafollicular cells

Parafollicular cells produce calcitonin

FUNCTIONS OF BONE

CALCIUM REGULATION

Parathroid hormone (stimulates osteoclast production)

Calcitonin (removes osteoclast’s ruffled boarder which PREVENTS RESORPTION)

Remember that these HORMONES are INVOLVED IN TIGHT REGULATION of free CA++ as 1/4 OF FREE CA++ IN BLOOD IS EXCHANGED EACH MINUTE.
Adrenal

Zona Glomerulosa

Zona Fasciculata

Zona Reticularis

Medulla
Oxytocin has a pronounced stimulating effect on the smooth muscle of the uterus. This may assist in parturition. It is, therefore, employed by physicians to augment:

**ADRENAL OR SUPRARENAL GLANDS**

The adrenals ('ad', near; 'ren', kidney) are two small yellowish masses of tissue lying above or near the kidneys (Fig. 29).

- **ZONA GLOMERULOSA**
- **ZONA FASCICULATA**
- **ZONA RETICULARIS**

Medulla
ZONA GLOMERULOSA

ZONA FASCICULATA

ZONA RETICULARIS

FACTORS ACTING ON THE GLAND
Angiotensin and ACTH stimulate the synthesis of:
- Zona glomerulosa
- Capillaries

HORMONES SECRETED
- Mineralocorticoids (aldosterone)
- Glucocorticoids (cortisol and corticosterone)
- Androgens (dihydroepiandrostosterone androstenedione)

ACTH stimulates the synthesis of:
- Zona fasciculata
- Glucocorticoids?
- Androgens

ACTH stimulates the synthesis of:
- Zona reticularis
- Androgens

sinusoids
Adrenal -cortex and medulla
Adrenal cortex and medulla

Central adrenal vein

cortex

medulla

Chromaffin cells
Adrenal -cortex and medulla

Chromaffin cells are basophilic

Sinusoids

 zona glomerulosa

 zona reticularis

 zona fasciculata
Adrenal - central vein

central vein
Smooth muscle
Fig. 16-9  Hypophysis: Pars distalis, Pars Intermedia, and Pars Nervosa (Human). Stain: Mallory-azan and orange G. 80x

Fig. 16-10  Thyroid Gland and Parathyroid Gland. Stain: hematoxylineosin. 80x

Fig. 16-11  Adrenal (Suprarenal) Gland: Cortex and Medulla.
Fig. 16-7  Thyroid and Parathyroid Glands: Canine (sectional view).  Stain: hematoxylin-eosin.  Low magnification.
Parathyroid – chief cells and oxyphils
Parathyroid – chief cells and oxyphils
Parathyroid – chief cells and oxyphils

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Osteoporosis due to hyperparathyroidism
Cells of island of Langerhans

- alpha cells
- beta cells

Pancreatic duct

Pancreatic acini
Pancreas - Islets of Langerhans

Islet cells

Pancreatic acinar cells
Pancreas

monkey

Pancreatic acinar cells

Islet cells
Rat pancreas

Islet cells

Pancreatic acinar cells

Blood vessels

sinusoids
Rich vascular supply

Leydig cells

Seminiferous tubules

Leydig cells
Seminiferous tubules

Leydig cells

the rich vascular supply
tubular cristae in mitochondria
Corpus Luteum

Follicle
PINEAL BODY (Slide 290 Human Pineal)

- Sand granules (brain sand)
- Pinealocytes
- Connective tissue capsule
VARIATIONS IN THE MICROVASCULARATURE

COMMON
ARTERIOLE ⇒ CAPILLARY ⇒ VENULE

VENOUS PORTAL SYSTEM
CAPILLARY ⇒ PORTAL VEIN ⇒ CAPILLARY

( ENDOCRINE EXAMPLE? )

ARTERIAL PORTAL SYSTEM
CAPILLARY ⇒ PORTAL ARTERIOLE ⇒ CAPILLARY

( ENDOCRINE EXAMPLE? )
Releasing hormones are distributed in the second capillary bed of the venous portal system.
Human pituitary

PORTAL VEIN
In stalk

(1st CAPILLARY in hypothalamus)

2nd CAPILLARY
Pars distalis

VENOUS PORTAL SYSTEM
ISLETS Of LANGERHANS

First capillary network of the ARTERIAL PORTAL SYSTEM modifies blood composition with insulin / glucagon

Second capillary network uses the modified blood composition with insulin (+) / glucagon (-) to regulate acinar cell protein enzyme production
Rat pancreas

1st CAPILLARY

2nd CAPILLARY

ARTERIAL PORTAL SYSTEM

Islet cells
In summary

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Questions on the endocrine system

1. The pituitary has little effect on regulation of hormone secretions in which of the following?
   a. ovary
   b. adrenal cortex
   c. **adrenal medulla**
   d. a and b
   e. a, b, and c

2. Calcium concentrations in the blood are affected by:
   a. **calcitonin from the thyroid**
   b. resorption of bone by osteocytes
   c. parathyroid hormone from the parafollicular cells
   d. a and b
   e. a, b, and c

3. Which region of the adrenal - hormone produced match?
   a. zona glomerulosa - aldosterone
   b. zona fasciculata - cortisol
   c. zona reticularis - androgens
   d. a and b
   e. **a, b, and c**
Many illustrations in these VIBS Histology YouTube videos were modified from the following books and sources: Many thanks to original sources!

Butterfly in our backyard.
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