Lab 2 - Part 1

Endocrine System

Slide Study Tips:

- The main thing to memorize is the organ name, specific part(s) or cell name(s), and the hormone(s) produced.
- *What the hormones do is tested on in Lecture.* I will talk about the function of hormones in lab (out of habit and for the purposes of repetition) but 99% of the time the questions on function are saved for lecture exams.
- Specific magnifications to spend more time on, and visual recognition tips are listed with each slide.
- You can chose to memorize the abbreviations if you desire to. Just don't misspell them on a lab quiz!

Slide 2-2-1 Pituitary Gland:

*40X and 100X are needed to know if you are looking at the pituitary gland versus another organ and what part of the pituitary gland is being specifically observed at 400X.

□ Pituitary Gland (Hypophysis)
— found sitting in the sella turcica of the sphenoid bone.
— connected to the hypothalamus above it by the infundibulum.
— is divided into the anterior pituitary & posterior pituitary.

□ Anterior Pituitary Gland (Adenohypophysis)
— much bigger than the posterior pituitary.
— looks like a bunch of different multicolored cells.
— the stain used does not differentiate the cells here.
— makes and secretes the following hormones:
- Growth Hormone (GH or hGH)
- Prolactin (PRL)
- Thyroid Stimulating Hormone (TSH)
- Adrenocorticotropic Hormone (ACTH)
- Luteinizing Hormone (LH)
- Follicle Stimulation Hormone (FSH)

□ Posterior Pituitary Gland (Neurohypophysis)
— much smaller than the anterior pituitary.
— the nerve axons here look like a bunch of "squiggly lines".

□ Supraoptic Nucleus neurons
— hypothalamus neurons that make and secrete the hormone:
- Antidiuretic Hormone (ADH) (also called Vasopressin)

□ Paraventricular Nucleus neurons
— hypothalamus neurons that make and secrete the hormone:
- Oxytocin (OXT or OX) — Paraventricular Nucleus

□ Pituicytes
— astrocyte-like neuroglial cells that assist in storing & releasing the hormones ADH and OXT seen surrounding the axons.

Slide 2-2-2 Thyroid Gland:

*40X and 100X are needed to know if you are looking at the Thyroid Gland, but 400X is best if getting a question on the specific cells. This slide is just of the Thyroid Gland by itself. Slide 2-2-3 has the Thyroid Gland and the Parathyroid Gland on it.

□ Thyroid Gland
— found sitting in the anterior part of the lower neck.
— has a left and right lobe connected by isthmus.
— Thyroid gland is shaped like a “bow-tie”.
— some people (about 18% to 44%) have a “pyramidal lobe”.

□ Thyroid Follicular Cells (Follicular Cells)
— also called “Thyrocytes”.
— found surrounding / bordering the colloid-filled follicles.
— makes and secretes the following hormones:
- Triiodothyronine (T3)
- Thyroxine (T4)

□ Colloid-filled Follicle
— the “pink lake” of fluid the follicular cells are surrounding.
— assembles and stores the T3 and T4 hormones.

□ Parafollicular Cells (C cells)
— pale pink cells NOT in direct contact with the colloid.
— makes and secretes the following hormone:
- Calcitonin (CT)

Slide 2-2-3 Thyroid & Parathyroid Gland:

* Obviously I need slide 2-2-3 to ask questions about the Parathyroid Gland, but sometimes I use it for the Thyroid Gland too. 40X and 100X are helpful to see both glands, and 400X for specific cells. Just the details of the Parathyroid Gland are listed here. The Thyroid Gland information would be the same as in Slide 2-2-2.

□ Parathyroid Gland
— *usually* humans have 3, 4 or 5 of these small glands.
— glands are *usually* found on the posterior side of the thyroid.
— some people (about 18% to 44%) have a “pyramidal lobe”.

□ Chief Cells
— numerous dark purple-stained cells.
— makes and secretes the following hormone:
- Parathyroid Hormone (PTH)

□ Oxyphil Cells
— few light purple-stained cells.
— unknown function!

Slide 2-2-4 Adrenal Gland:

*40X and 100X are needed to know if you are looking at the Adrenal gland versus another organ and what part of the Adrenal gland is being specifically observed at 400X. I included the shapes and sizes one would see on gross anatomy to emphasize how very tiny these glands in adults really are. They also have a yellowish color just like the fat surrounding them, so finding them in a cadaver can take some time! I am not testing on that size and shape info… it is just some interesting facts I like. Most of the testing can be done at 40X or 100X with this slide.

□ Adrenal Gland (Suprarenal Gland)

— found sitting on the superior pole of the kidneys.
— the right Adrenal gland is pyramid-shaped and smaller.
— the left Adrenal gland is crescent-shaped and larger.
- ~ 3 cm in width
- ~ 5 cm in length
- ~ 1 cm in thickness

— they are retroperitoneal (like the kidney), surrounded by fat.
— organ is divided into the adrenal cortex & adrenal medulla.

□ Adrenal Cortex

— all 3 “zones” are stimulated by Adrenocorticotropic Hormone.

□ Zona Glomerulosa

— smallest, outermost zone with cells in “ball-like” arrangement.
— makes & secretes the following “mineralocorticoid” hormone:
- Aldosterone

□ Zona Fasciculata

— largest, middle zone with cells in “radial columns”.
— makes & secretes the following “glucocorticoid” hormone:
- Cortisol

□ Zona Reticularis

— innermost zone with cells in a “branchy pattern”.
— makes & secretes the following “androgen” hormones:
- Testosterone (and its precursor molecules)
- Estrogen (and its precursor molecules)

□ Adrenal Medulla

— is stimulated by sympathetic nervous system neurons that originate from the thoracic spinal cord (T5 to T11).

□ Chromaffin Cells

— “Chromaffin” is a portmanteau of “chromium” & “affinity” which refers to the chromium salt stain used to see them.
— makes & secretes the following “catecholamine” hormones:
- Epinephrine (EPI) (Adrenaline) (80%)
- Norepinephrine (NE) (Noradrenaline) (20%)

Slide 2-2-5 Pancreas:

*40X and 100X are needed to know if you are looking at the Pancreas versus another organ, but 400X is probably all you will really look at to see the cells. The Endocrine System is the main topic of this lab, but I included the name of cells with exocrine function as they constitute about 98% of the pancreas and are part of the Gastrointestinal System. Note that the pancreas slides you will see have NOT been stained to specifically show you which cells are Alpha and Beta cells within the Islet of Langerhans. You can see the Islet as separate from the rest of the pancreatic acinar cells, but that is about it.

□ Pancreas
— has endocrine and exocrine glands as part of it.
— retroperitoneal organ with a head, neck, body, and tail portion.
— found behind the stomach.

□ Islets of Langerhans (Pancreatic Islets)
— the "endocrine gland" portion of the pancreas.
— these cells belong to the Endocrine System.
— only makes up about 1 to 2% of the pancreas volume.
— about 1 million pancreatic islets are in the pancreas.
— has 5 main types of cells (*we will only test on the first two.*)
- **Alpha cells (20%)**
- **Beta cells (about 70%)**
- Delta cells (<10%)
- Epsilon cells (<1%)
- Gamma cells (<5%)

□ Alpha Cells
— 20% of the volume of the Islet of Langerhans
— makes and secretes the following hormone:
- Glucagon (GCG)

□ Beta Cells
— about 70% of the volume of the Islet of Langerhans
— makes and secretes the following hormone:
- Insulin (INS)

□ Pancreatic Acinar Cells
— the "exocrine gland" portion of the pancreas.
— makes up about 98 to 99% of the pancreatic volume.
— these cells belong to the Gastrointestinal System.
— makes and secretes digestive ENZYMES into the duodenum.