#10 - Histology

Objectives:
- Examine the histology of selected body organs using Anatomy & Physiology Revealed® software and microscope slides.
- Be able to identify each organ and the specific structures indicated for each.

Equipment: Remember to bring photographic atlas.

I. Anatomy & Physiology Revealed ® Histology Images:

A. Preparation
1. Start the Anatomy & Physiology Revealed® software by double clicking its icon.
2. Select the appropriate System (as indicated in the tables below) from the Module (top center) drop down menu.
3. On the home screen, click the microscope icon (top center, icon).
4. Using the directions on the following pages, find all of the structures on your lists and answer the questions in the laboratory report pages. *NOTE – Not all structures named by APR, so use the following figures as reference for study as well.*

<table>
<thead>
<tr>
<th>Structure</th>
<th>Anatomy &amp; Physiology Revealed ® Instructions</th>
</tr>
</thead>
<tbody>
<tr>
<td>central vein</td>
<td>The liver tissue is divided into thousands of small hexagonal units called lobules. There is a central vein in the center of the hexagon. The organization of the liver tissue is a reflection of its vascular supply. Blood enters the liver, travels in sinusoid between rows of hepatic cells, reaches the central vein, then leaves the lobules and merges into branches of the hepatic vein.</td>
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<tr>
<td>hepatocytes</td>
<td>1. From the Module dropdown menu, chose the 12. Digestive system.</td>
</tr>
<tr>
<td>sinusoid</td>
<td>2. Click the microscope icon (top center, icon).</td>
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<tr>
<td></td>
<td>3. Choose Liver from the Topic menu.</td>
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<tr>
<td></td>
<td>4. Choose LM: Low magnification from the Select View menu.</td>
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<tr>
<td></td>
<td>5. To highlight the structures click on the name in the list on the left. View the central vein (Central v.) (APR Fig. 1).</td>
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<tr>
<td></td>
<td>6. Switch to LM: Medium magnification to view the sinusoids and hepatocytes (in the Hepatic cords). The sinusoids are spaces between hepatic cords (APR Fig. 2).</td>
</tr>
</tbody>
</table>

APR Fig. 1 (low mag.)

APR Fig. 2 (medium mag.)
2. Pancreas

The histology of pancreas includes two distinct parts: the lightly staining endocrine portion (pancreatic islets or islets of Langerhans) and the darker staining exocrine portion (acini, plural of acinus). The contrast of tissue staining makes pancreatic islets standout like “small islands” scattered in the sea of acini. The islets produce hormones (e.g. insulin, glucagon) for metabolism, while the acini secrete pancreatic enzymes for digestion in the small intestine.

<table>
<thead>
<tr>
<th>Structure</th>
<th>1. Choose <strong>Pancreas</strong> from the <strong>Topic</strong> menu.</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>2. Choose <strong>LM: Medium magnification</strong> from the <strong>View</strong> menu.</td>
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<tr>
<td></td>
<td>3. Identify the <strong>pancreatic islets</strong> – lightly staining cell clusters that look like small islands (APR Fig. 3). They are the endocrine portion of the pancreas. The <strong>pancreatic islets</strong> secrete hormones (ex. insulin &amp; glucagon).</td>
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<tr>
<td></td>
<td>4. Observe the <strong>acini (exocrine pancreas)</strong> – the darker staining cell clusters surrounding the <strong>islets</strong> (APR Fig. 3). Acini secrete digestive enzymes.</td>
</tr>
</tbody>
</table>

3. Ovary

Ovaries produce the hormones estrogen and progesterone. The major histology in the ovaries includes follicles of different stages and the corpus luteum which appears after ovulation.

<table>
<thead>
<tr>
<th>Structure</th>
<th>1. From the <strong>Module</strong> dropdown menu, chose the <strong>14. Reproductive</strong> system.</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>2. Click the <strong>microscope icon</strong> (top center, icon).</td>
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<tr>
<td></td>
<td>3. Choose <strong>Ovary</strong> from the <strong>Topic</strong> menu.</td>
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<tr>
<td></td>
<td>4. Observe the different stages of ovarian <strong>follicles</strong> (APR Fig.4).</td>
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<td>5. Choose <strong>Secondary follicle</strong> from the <strong>Topic</strong> menu.</td>
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<tr>
<td></td>
<td>6. Observe the single <strong>oocyte</strong> – the large cell inside every follicle (APR Fig. 5).</td>
</tr>
</tbody>
</table>
II. Microscope Histology Slides

A. Digestive System

The digestive system includes the gastrointestinal tract (GI tract) and several accessory organs (liver, pancreas, etc). There are four histological layers comprising the GI tract (mucosa, submucosa, muscularis, serosa). Regional modifications along the tract reflect their functions. For example, a thicker muscularis layer of stomach suggests a stronger mechanical contraction. In the same way, the arrangement of glandular structures along the GI tract (e.g. gastric glands, intestinal glands, pancreas, liver, Brunner’s gland, etc.) indicates locations where chemical digestion occurs.

1. Esophagus

Structures to be identified:

- **lumen**
- **layers:**
  - **a. mucosa**
    - stratified squamous epithelium
  - **b. muscularis**

Major characteristics include the stratified squamous epithelium lining the lumen for surface protection and the muscularis for deglutition.

This slide should be viewed first using the **scanning (4x) objective**.

1. View the whole section by circling around the **lumen** first, then the circumference.

2. Similar to other parts of the GI tract, the unique four-layered gut walls can be identified as:
   (1) mucosa that lines the lumen, (2) submucosa, (3) **muscularis**, and an outermost (4) **adventitia**. Study these four layers with more emphasis on **stratified squamous epithelium** of the mucosa and the **muscularis** layer. In order to view the cells within the layers use the 10x and 40x objectives. **adventitia**: the outermost connective tissue covering, it is similar to the serosa in other parts of the GI tract.

2. Duodenum

Structures to be identified:

- **lumen**
- **layers:**
  - **a. mucosa**
    - villi
    - simple columnar epithelium
    - goblet cells (secrete mucus)
  - **b. submucosa**
    - duodenal (Brunner’s) glands
  - **c. muscularis**
  - **d. serosa**
The duodenum is the first part of the small intestine, where most chemical digestion takes place. In the duodenum, secretions from various glands (pancreas, liver, intestine) mingle with the acidic chyme from the stomach.

View the slide on the scanning (4x) objective first.
1. Identify the four-layer walls of duodenum (mucosa, submucosa, muscularis, serosa).
2. Find the following structures:
   (1) villi — finger-like structures in the mucosa which extend into the lumen
   (2) duodenal glands — appear as clusters of multiple circular structures embedded in submucosa
3. Locate a single villus using the 4x-objective, then switch to 10x-objective (low power).
   (1) Study the simple columnar epithelia that cover the villus using 40x-objective (high power).
   (2) Identify the goblet cells scattered among the epithelia.

B. Reproductive System
3. Uterus

Structures to be identified:
- endometrium
- myometrium
- lumen

The histology here focuses on the endometrium and myometrium of the uterine wall. The endometrium is subject to cyclic changes that result in menstruation. The myometrium is relatively large and is responsible for contraction during child labor.

View the uterus using the 4x-objective.
1. Find the following structures:
   (1) endometrium — layer closest to the lumen and containing many glands with tube-like structures
   (2) myometrium — layer of smooth muscle tissue deep to the endometrium
   (3) The lumen is the space inside the uterus, the endometrium lines the lumen

4. Testis

Structures to be identified:
- seminiferous tubule
- sperm (spermatozoa)
- Leydig (interstitial) cells

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The testes produce sperm and the hormone testosterone. The major structures in the testes are the seminiferous tubules, where sperm cells of different stages together with their supporting (Sertoli) cells are located. Outside the tubules are the interstitial (Leydig) cells which make testosterone.

1. Using the 10x objective:
   (1) View the many oval seminiferous tubules.
   (2) The Leydig (interstitial) cells can be seen between the tubules and often appear as triangular cluster of cells.
2. Observe using the 40x objective:
   (1) View the interior of an individual tubule to see the developing sperm cells. The most mature developing cells, sperm (spermatozoa) have their tails in the lumen of the tubule. If drawing, use high power.

5. Spermatozoa / Sperm

   Structures to be identified:
   - head • flagellum

1. As the sperm smear may not be at the center of the slide, a careful scanning using the 4x-objective may be required. The sperm head can usually be identified as fine black specks near a pinkish staining region.
2. Switch to 10x and then 40x-objective to study the sperm head and its flagellum tail. Ask your instructor for help if you have difficulty finding it.

III. Laboratory Report questions:

   Answer the following questions on the Laboratory Report answer sheet at the end.

   A. Name the organ of the following tissue.
   B. Name the labeled cells.
   C. Name the labeled structure.

   D. Name the organ of the following tissue.
   E & F. Name the structure E and provide its function F.
   G & H. Name the cells G and provide their function H.
I. Name the organ of the following tissue.

J. Name the labeled structures.

K. Name the labeled cell.

L. Name the organ of the following tissue.

M. Name the labeled structure.

N. Name the labeled cells.

O. Name the organ of the following tissue.

P. Name the labeled cells.

Q. Name the organ of the following tissue.

R. Name the labeled cells.

S. Name the organ of the following tissue.

T & U. Name the labeled layers.

V. Name the following cells.

W, X, Y & Z. List the four tissue layers of GI tract (W, X, Y & Z) in order from most superficial to deep.
## Laboratory #10 Report

Name:___________________________

### Answer Sheet

<table>
<thead>
<tr>
<th>A.</th>
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<td>B.</td>
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<td>M.</td>
<td>Z.</td>
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Slide Drawings
(as directed by your instructor)

Slide name: ______________________
Magnification: ______
Labels

Slide name: ______________________
Magnification: ______
Labels

Slide name: ______________________
Magnification: ______
Labels

Microscope Check: ____________

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