LAB 2: THE CONNECTIVE TISSUE AND EPITHELIUM

The focus of this week’s lab will be pathology of connective tissue and epithelium. The lab will introduce you to the four basic tissue types: epithelium, connective tissue, muscle, and nerve. Our pathology cases studies will focus on some of the tissues of the reproductive, respiratory, gastrointestinal and urinary systems that you will see in lab. This lab will help you identify types of epithelium and understand how their morphology is altered in disease states. Recall from lecture that there are different types of epithelium that are categorized based on cell shape and thickness of cell layers. Simple epithelia are usually one cell layer thick and the different types include: squamous, cuboidal, columnar, and pseudostratified columnar. In contrast stratified epithelia are usually multiple cell layers thick and include: squamous (keratinized and non-keratinized), cuboidal, columnar, and transitional. You will learn to recognize these epithelia and identify changes in epithelia during pathogenesis.

Cells respond and adapt to stress in different ways. The can become hypertrophic where the cell increases in size or atrophic where they shrink in size. The can also increase in number—called hyperplasia. They can also change from one adult differentiated cell to another differentiated cell during regeneration; this is referred to as metaplasia. Metaplasia often occurs when cells change from one type of epithelium to another and can predispose cells to malignant transformation.

Carcinoma refers to a malignant cancer of epithelial origin. Adenocarcinoma is a malignant cancer of glandular epithelial origin. Many cancers are of epithelial origin; we will discuss a few carcinomas and other disorders of epithelia in this lab.

The cases we will cover are:

A. Serous Cystadenocarcinoma of the Ovaries
B. Cystic Teratoma
C. Squamous Cell Carcinoma of the Lung
D. Reflux Esophagitis
E. Barrett’s Esophagus
A. SEROUS CYSTADENOCARCINOMA OF THE OVARIES

CC/HPI: A 56 year old white nulliparous woman is referred for evaluation of a pelvic mass found on a routine physical. She reports an increased frequency in micturition and irregular periods until they ceased three years ago. She also has a history of breast cancer in her 20s.

PE: Physical exam reveals a large cystic mass the size of a grapefruit in right pelvis that can be felt above the pubic symphysis.

Labs/Imaging: CA-125 levels elevated; Liver function tests are normal. CT reveals a cystic pelvic mass in the right ovary.

Pathology: A representative histological section of the cystic mass is shown:

Questions for everyone to consider:

What type of epithelium usually covers the surface of the ovary?

What epithelium type lines the tumor shown here (derived from the epithelium covering the ovary)?

Questions if you have been assigned this case:

Conversion from one epithelium type to another is referred to as…

What is CA-125? Why is it elevated here?
What genetic mutations are most strongly associated with breast and ovarian cancer?

**B. CYSTIC TERATOMA**

**CC/HPI:** A 25-year-old woman complains of weight loss and intense right lower abdominal pain and nausea that began when she went jogging yesterday afternoon. Intermittent episodes of similar pain have occurred over the past several days. She has regular menstrual cycles with average flow and no dysmenorrhea. She had her last period three weeks ago.

**PE:** Physical exam reveals mild hypotension; normal heart rate (HR 90). She has right lower quadrant tenderness; pelvic exam reveals tender, mobile 6 cm right adnexal mass.

**Labs/Imaging:** CBC normal. Pregnancy test negative. X Ray (KUB) shows irregular calcified mass in region of right ovary. Pelvic US shows cystic tumor about 8 cm in diameter replacing the right ovary.

**Pathology:** A representative histological section from a patient with this condition is shown:

![Histological section](image)

**Questions for everyone to consider:**

What abnormal tissue types are seen in this section?

Are these normally found in the ovary?

**Questions if you have been assigned this case:**

What three germ cell layers are found during embryogenesis?

What tissues are derived from each germ cell layer?
What cell in the ovary is capable of becoming all of these tissues (which cell can become an embryo)?

C. SQUAMOUS CELL CARCINOMA OF THE LUNG

**CC/HPI:** A 54-year-old man presents with dyspnea (shortness of breath), hoarseness, cough, and hemoptysis (coughing blood). He has an 80-pack-year smoking history. Over the past two months he had significant loss of appetite and weight.

**PE:** Physical exam reveals marked cachexia; clubbing of the fingers; mild wheezing at rest; chest is barrel shaped (emphysematous) and movements diminished on right; dullness to percussion over right middle lobe; no breath sounds heard over right middle lobe; vocal fremitus reduced in same area.

**Labs:** CBC reveals normocytic, normochromic anemia. Gram and ZN stains of sputum for acid-fast bacilli are negative; sputum contains malignant cells. CT reveals hilar mass on right side, producing an obstructive atelectasis of right middle lobe. Bronchoscopy reveals right-sided hilar mass obstructing right middle bronchus.

**Pathology:** Sections from the bronchus representing early progression of this disease are shown below:

![Pathology images](Image)

**Questions for everyone to consider:**

What are the brush-like structures present on the surface of the epithelium shown in the section on the left? Are they present in the section on the right?

What cell normally found in the bronchus is hyperplastic in the section in the middle? What is its normal function in the bronchus?

**Questions if you have been assigned this case:**

What type of epithelium is shown in the section on the left?
The section on the right shows what type of epithelium lining the bronchus?

This epithelial transition is referred to as…

D. REFLUX ESOPHAGITIS

CC/HPI: A 35-year-old obese man who is a chronic smoker presents to his primary care physician with heartburn. His heartburn worsens when bending and lying down at night, preventing him from sleeping; it is promptly relieved with antacids. He also has a history of alcohol abuse.

PE: Physical exam unremarkable.

Labs/Imaging: Continuous esophageal pH monitoring correlates symptoms with posture, meals, and reflux. UGI series shows small hiatal hernia and spontaneous reflux to mid-esophagus. Esophagogastroduodenoscopy shows erythema, friability, and erosion over esophageal mucosa.

Pathology: A biopsy sample from the esophagus obtained by endoscopy is shown:

Questions for everyone to consider:

What epithelium lines the inner esophageal surface?

What are the bright pink cells present in this section?

Questions if you have been assigned this case:
What is reflux esophagitis? How does the sensation of “heartburn” relate to what is occurring in the esophagus?

What sphincter usually prevents reflux of stomach acid into the esophagus?

Where did the bright pink cells present in this sample come from?

**E. BARRETT’S ESOPHAGUS**

**CC/HPI:** A 50-year-old man presents with a long-standing history of retrosternal burning, belching, and water brash, especially after meals. He is a chronic smoker and alcoholic and is under treatment for gastroesophageal reflux dyspepsia.

**PE:** Physical exam normal.

**Labs/Imaging:** UGI endoscopy reveals linear streaks of red, velvety mucous at gastroesophageal junction. Barium swallow reveals fine reticular pattern distal to an esophageal stricture and gastroesophageal reflux.

**Pathology:** A biopsy sample from the esophagus obtained by endoscopy is shown:

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**Questions for everyone to consider:**

What epithelium normally lines the inner esophageal surface?
What epithelium is resent in this section?

Questions if you have been assigned this case:

What are the clear cells seen in the section on the left? What do they secrete?

Where is this type of epithelium usually found? A conversion from one epithelial type to another is an example of what?

Barrett’s esophagus increases the risk for what kind of cancer?