LABORATORY 19 - RESPIRATORY SYSTEM (first of two laboratory sessions)

OBJECTIVES:

LIGHT MICROSCOPY: Be able to recognize respiratory epithelium. Be able to identify the structure of concha, the structure of larynx and its components including epiglottis, false and true vocal folds and their characteristics (epithelium, cartilage, elastic ligaments and distribution of glands); the structure of trachea, bronchi and types of bronchioles. Analyze the different types of epithelium, connective tissue, e.g. lamina propria, smooth muscle and cartilage where present.

ELECTRON MICROSCOPY: Recognize respiratory epithelium and its characteristics

ASSIGNMENT FOR TODAY'S LABORATORY

GLASS SLIDES

SL 110 Concha
SL 184 Epiglottis (elastic tissue stain)
SL 17 Epiglottis
SL 36B Larynx (even desks)
SL 36A Larynx (odd desks)
SL 15B Trachea

ELECTRON MICROGRAPHS

Texts: J. 17-3, 17-4; W.12.8

HISTOLOGY IMAGE REVIEW - available on computers in HSL

Chapter 19, Respiratory System
Frames: 1289-1311

SUPPLEMENTARY ELECTRON MICROGRAPHS

Rhodin, J. A.G., An Atlas of Histology
Copies of this text are on reserve in the HSL.
Respiratory system pp. 348 - 365

A. CONCHA and NASAL RESPIRATORY EPITHELIUM - SL 110 (W. 12.2, 12.3)

1. Mucosa. All of the internal passageways of the body that connect to an opening to the external environment and have a moistened surface are lined by a "mucosa" or "mucous membrane" that is composed of two components in the respiratory system.
   a. The surface of a mucosa is an epithelium that has a moistened surface. In different regions, different types of epithelium may comprise the surface. In the case of the respiratory system the predominant type of epithelium found is ciliated, pseudostratified, columnar epithelium with goblet cells.
   b. The connective tissue below the epithelium is called the "lamina propria". Lamina propria usually consists of loose c.t. and always includes a variable amount of diffuse lymphoid tissue.
   c. The epithelium that lines the concha varies somewhat, although respiratory epithelium predominates. The basement membrane that is typical for respiratory epithelium is very thick, as in this example
   d. Lamina propria
      1) Within this connective tissue identify the glands and ducts. (In this section most glands appear to be serous secreting.
      2) Is there diffuse lymphoid tissue present here as indicated above? Why would you expect lymphoid tissue to be present normally?
      3) An unusual feature of the lamina propria that is found in the concha is the presence of an extensive venous plexus (blue arrows). What is its function?
2. Locate bone (green arrows) that forms the supportive core of the concha. Is the bone cancellous or compact?

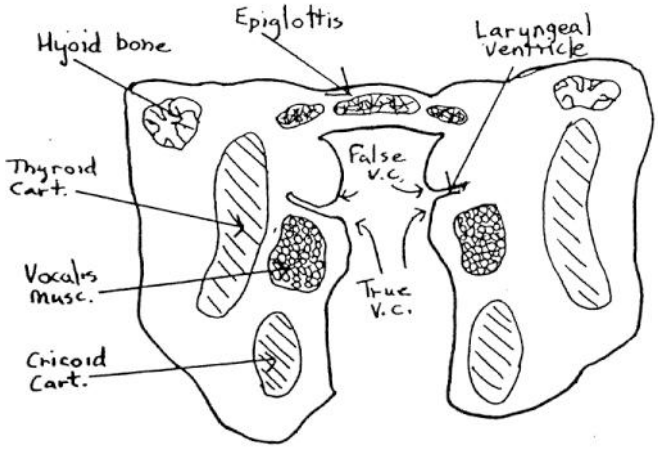
B. EPIGLOTTIS – Two slides of epiglottis will be studied. (SL 17 Adult Epiglottis) Longitudinal section of epiglottis.
1. Mucosa. (SL 17)
   a. Epithelium - Two types of epithelium are present: stratified squamous and pseudostratified columnar. Find the area where there is a transition from one type to the other. Can you determine which surface faces the tongue (anterior surface) and which surface faces the larynx (posterior surface)?
   b. Locate the diffuse lymphoid tissue that is present in the lamina propria.
2. Elastic cartilage forms the supportive core of the epiglottis
3. Glands. Small compound tubular alveolar glands are evident adjacent to the cartilage. Are the glands mucous, serous or both?

SL 184 (scan) (Child Epiglottis, elastic tissue stain) C-shaped section, see diagram below. This is a cross section of epiglottis. The elastic fibers of the cartilage are stained.

C. LARYNX SL 36B (all even desks, some odd desks, is labeled SL 36 as a glass slide) (This slide is a frontal section of the larynx, and should be similar to the drawing to the right). Note that cartilage and connective tissue are immature.

1. At low magnification identify the following structures with the aid of the tissue map.

   a. base of epiglottis
   b. true and false vocal folds
   c. laryngeal ventricle separates the true and false vocal folds, may be limited to one side only)
   d. thyroid and cricoid cartilages (these are hyaline cartilage).
   e. hyoid bone (present on some slides)



2. Mucosa
   a. Epithelium - Most of the larynx is lined with respiratory epithelium. However, the epithelium changes to stratified squamous (non-keratinized) over the true vocal fold. (The epithelium over this region may be sloughed off in some slides.) Characterize the epithelial lining of the entire larynx.
   b. Lamina Propria - Glands, both mucous and serous, are found in most regions (absent in true vocal cord). The connective tissue is variable loose to dense. Elastic fibers are abundant, but most numerous in the vocal ligament in the true vocal fold.

3. True Vocal Fold- This region differs from the other parts of the larynx in several respects. The epithelium is stratified squamous. (In some slides the plane of the section passes through a region of respiratory epithelium). Glands are absent from the lamina propria and the elastic fibers of the vocal ligament are numerous. Muscle fibers of the vocalis muscles are evident in cross section. Blood supply within this region is minimal.

4. Other components of larynx to observe.
   a. Extrinsic (constrictor) and intrinsic (e.g. vocalis) muscles of larynx
   b. Nerve bundles (external surface), arteries and veins
   c. Although not part of larynx proper, the hyoid bone appears on some slides near the level of, but lateral to, the base of the epiglottis.

LARYNX (Child) SL 36A (some odd desks only) This slide is an oblique cut in which both false and true vocal cords are demonstrated with epithelium intact. This slide only contains ½ of the larynx (either right or left half), and should appear somewhat like ½ the drawing above (turned sideways). Review distribution of glands, elastic fibers, hyaline, and elastic cartilage.

D. TRACHEA SL 15B (scan) – The trachea connects the larynx and bronchi (J. 17-6; W. 12.6, 12.7, 12.8). Slide 15 is a section from a child's trachea. The organization of the various tissues in the trachea serves as a basic pattern for the remainder of the air conducting passages.

1. Mucosa - Respiratory epithelium lines the trachea. Although the epithelium lies on a thick basement membrane, it may be difficult to see in this slide (med, high).

2. Lamina Propria - Observe the numerous elastic fibers within the lamina propria (cut in cross section) beneath the basement membrane.

3. Submucosa - Small mucous and serous glands present (med).

4. Hyaline cartilage in large C-shaped sections

5. Smooth muscle bundles forming trachealis muscle (red arrows) on posterior surface.

6. (Optional) Trachea SL 111. This section is from an elderly individual. Compare to SL 15B, especially cartilage.

7. Electron Microscopy (J. 17-3; W. 12.9) Review structure of cilia.

OBJECTIVES FOR LABORATORY 19: RESPIRATORY SYSTEM I

1. Using the light microscope or digital slides, identify:

- Concha
  - Respiratory epithelium
  - Basement membrane (thick)
  - Lamina propria
    - Glands (mostly serous on our slides)
    - Venous plexus
    - Diffuse lymphoid tissue
  - Bone (cancellous)
- Epiglottis
  - Epithelium
    - Stratified squamous non keratinized (on anterior side and tip)
    - Respiratory (posterior side)
  - Lamina propria
    - Glands and diffuse lymphoid tissue
  - Elastic cartilage
- Larynx
  - Mucosa
    - Respiratory epithelium (stratified squamous over true vocal fold)
    - Lamina propria
  - False vocal fold
    - Glands – mucus and serous
  - True vocal fold
    - Stratified squamous epithelium
    - Vocal ligament
    - Vocalis muscle
  - Laryngeal ventricle
  - Hyoid bone
  - Epiglottis
  - Thyroid cartilage
  - Cricoid cartilage
  - Nerves, arteries, veins, skeletal muscle
- Trachea
  - Mucosa
    - Respiratory epithelium
    - Lamina propria
    - Elastic fibers
    - Diffuse lymphoid tissue
  - Submucosa
    - Elastic fibers
  - Hyaline cartilage
  - Trachealis muscle

2. On electron micrographs, identify:

   Review structure of cilia and respiratory epithelium.