RESPIRATORY SYSTEM (I)

Histology of the Upper Respiratory Tract, and Trachea & Primary bonchi

Objectives:

By the end of this lecture the student should be able to describe the microscopic structures of:

- **Vestibule** of the nasal cavity.
- **Respiratory mucosa** of the nasal cavity.
- **Nasal septum**.
- **Olfactory mucosa** of the nasal cavity.
- **Mucosa of the paranasal** sinuses.
- **Larynx.**

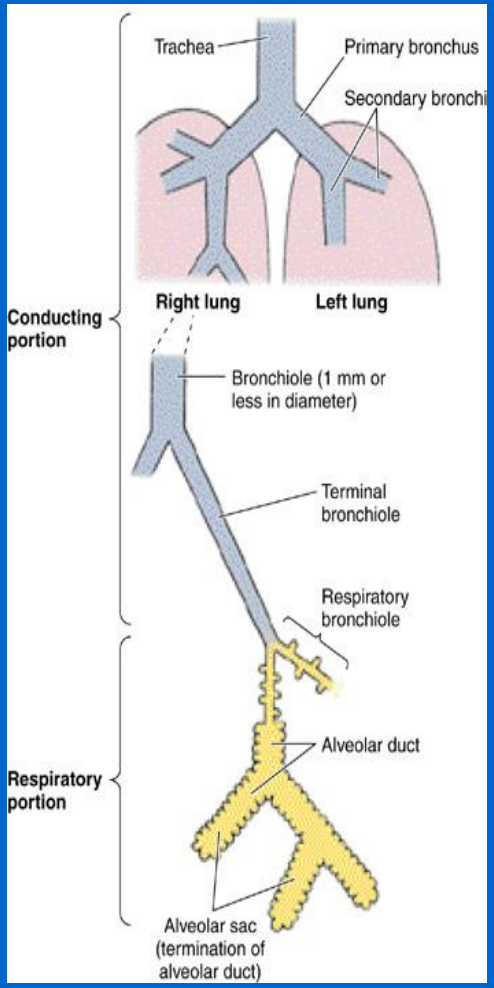
- The microscopic structures of the wall of:

  - Trachea.
  - Primary or extra-pulmonary bronchi.

RESPIRATORY SYSTEM

(A) Conducting portion :

1- Nasal cavity.
2- Nasopharynx.
3- Larynx.
4- Trachea.
5- Primary bronchi (extrapulmonary bronchi).
6- Intrapulmonary bronchi:
   - 2ry bronchi (lobar bronchi).
   - 3ry bronchi (segmental bronchi).
7- Primary bronchioles (preterminal bronchioles).
8- Terminal bronchioles.

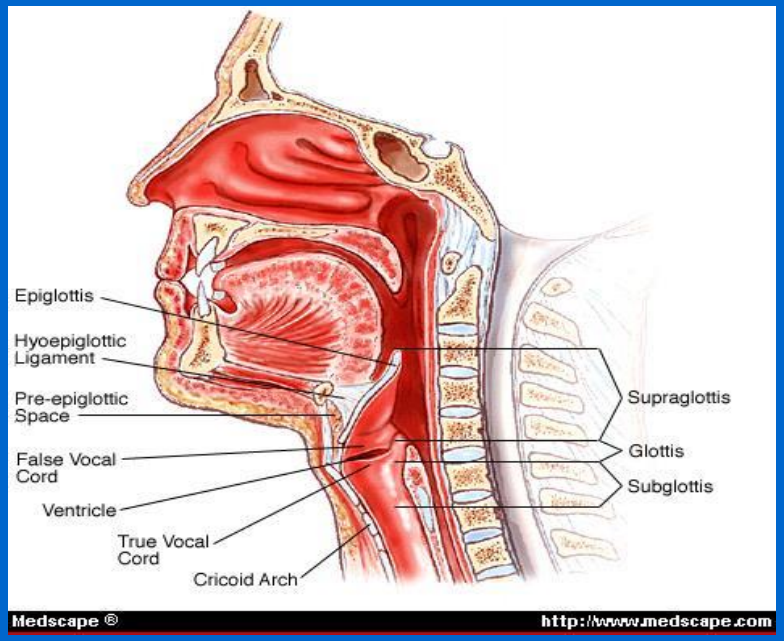


(A) Respiratory portion:

1- Respiratory bronchioles.
2- Alveolar ducts .
3- Alveolar sacs.
4- Pulmonary alveoli.

NASAL CAVITY (N.C.)

1. Anterior portion of N.C.: **Vestibule.**
2. Posterior portion of N.C.:
   - a- **Respiratory region.**
   - b- **Olfactory region.**



N.B. The nasal septum divides the nasal cavity into two halves (right and left).

VESTIBULE OF N.C.

Lining: is lined with thin skin.

1- Epidermis: (Keratinized stratified Squamous epithelium).

2- Dermis.

Contents:

1- Vibrissae: stiff hairs.

2- Sebaceous glands.

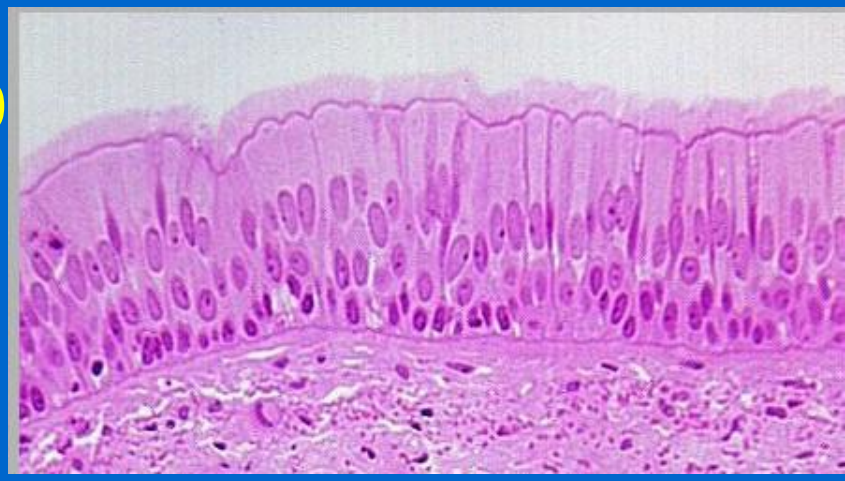
3- Sweat glands.

Wall:

1- Hyaline cartilage.

2- Cancellous (spongy) bone.

RESPIRATORY REGION (AREA) OF NASAL CAVITY



MUCOSA (MUCOUS MEMBRANE)

(A) Respiratory Epithelium:

Pseudo-stratified ciliated columnar epithelium with goblet cells.

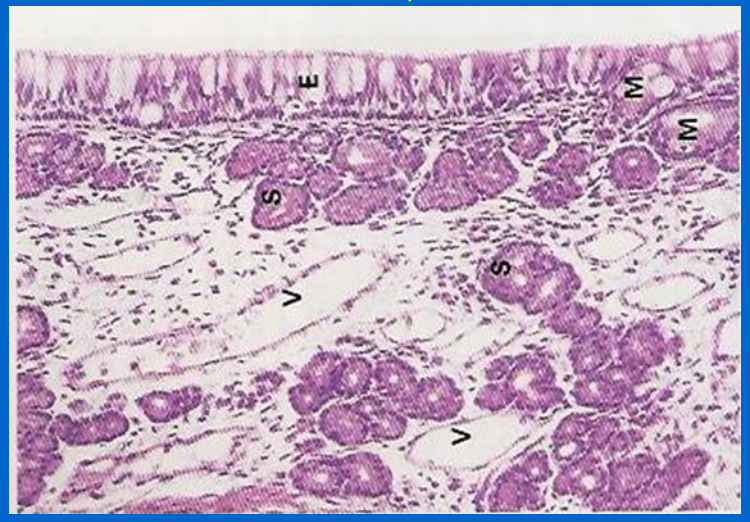
Main Types of cells (all touch the basement membrane)

1- Ciliated columnar cells.

2- Goblet cells.

3- Basal cells: are stem cells.

4- DNES cells: e.g. serotonin.



(B) **Lamina propria (Sub-epithelial C.T.)**:

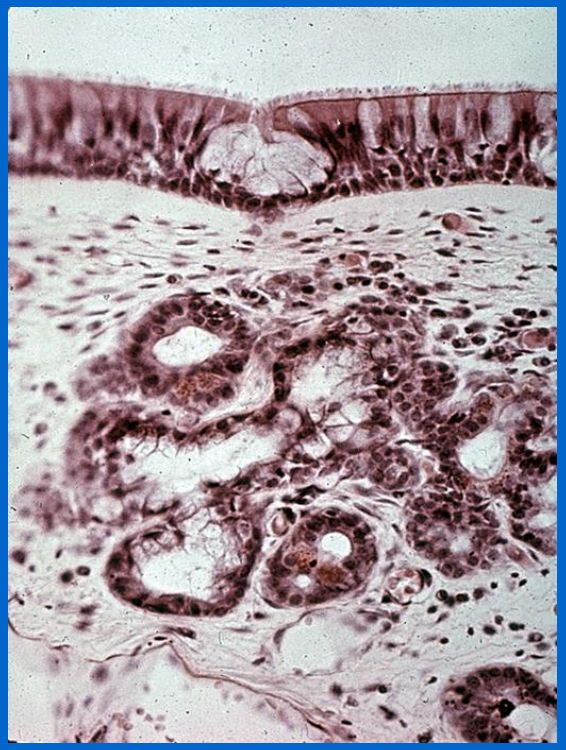
contains:

1- Large arterial plexuses & venous sinuses (Highly vascularized C.T.)

2- Many seromucous glands (acini).

3- Abundant lymphoid elements:

Including occasional lymphoid nodules, plasma cells & mast cells.



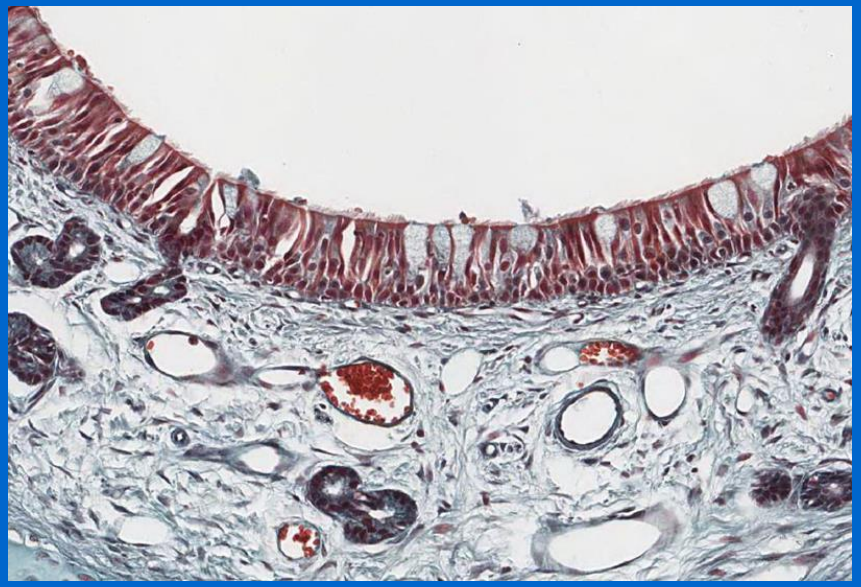
PARANASAL SINUSES

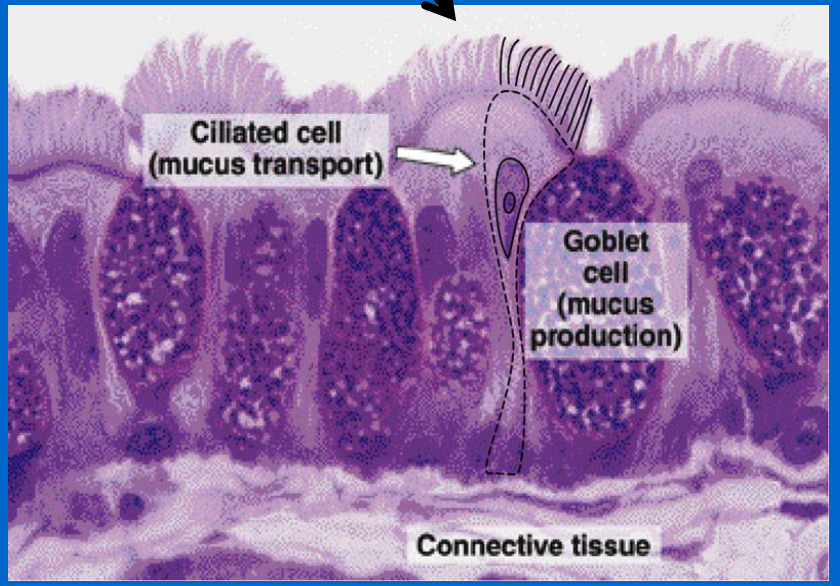
Lining: 1- Respiratory epith. (Mention…….)

2- Lamina propria.

CLINICAL APPLICATION:

Sinusitis.





OLFACTORY REGION (AREA) OF NASAL CAVITY (OLFACTORY MUCOSA)

Site: 1-Roof of nasal cavity.
2-Upper part of nasal septum.
3-over superior concha.

Structure:

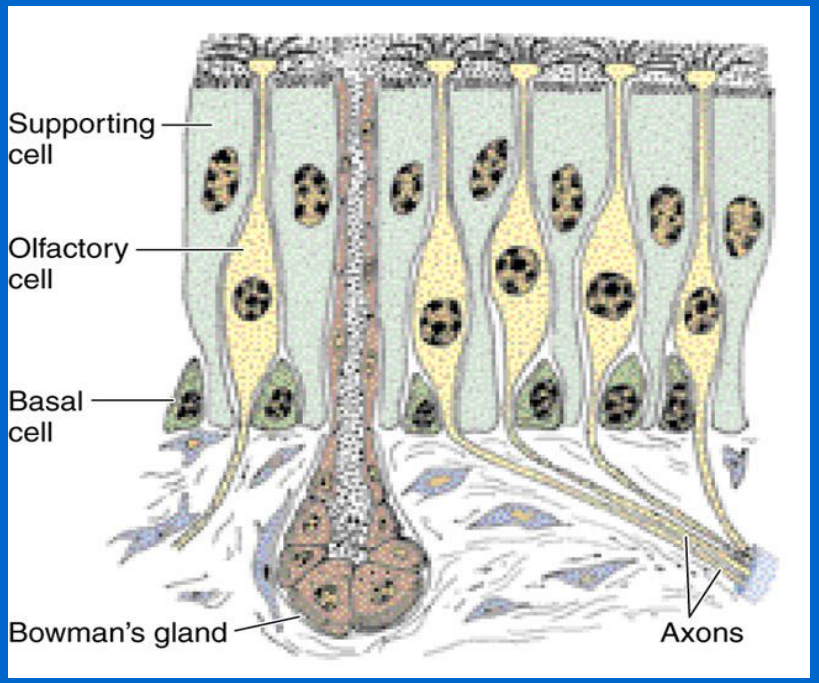
(A) Olfactory epithelium:

Pseudo-stratified columnar epith.

1- **Olfactory cells** (olfactory nerve cells)

2- **Sustentacular** (supporting) **cells.**

3- **Basal cells:** Pyramidal in shape, basal in position and act as stem cells.



OLFACTORY EPITHELIUM

1- Olfactory cells:

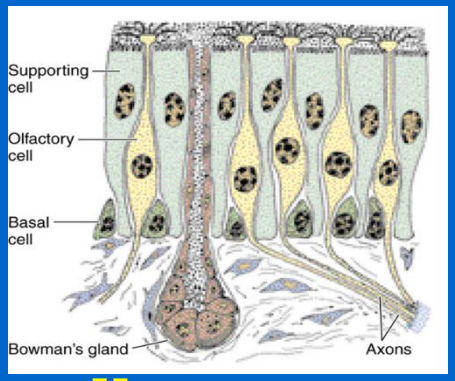
Are **bipolar neurons**

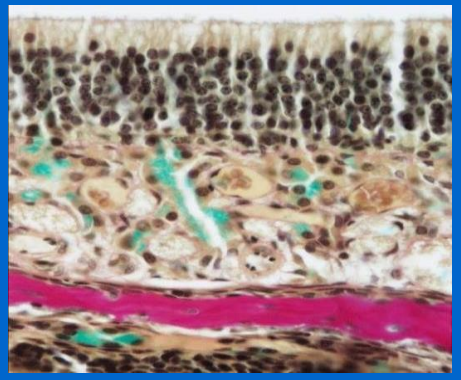
Dendrite has olfactory vesicle that has nonmotile cilia.

Axons are unmyelinated with Schwann-like cells.

Axons will collect in the lamina propria to form bundles of nerve fibers.

Bundles will collect to form the olfactory nerve.





2- Sustentacular (supporting) cells:

Are columnar cells.

Function:

Physical support and nourishment for olfactory cells.

(B) Lamina propria: contains:

1- Highly (richly) vascularized loose C.T.

2- Contents:

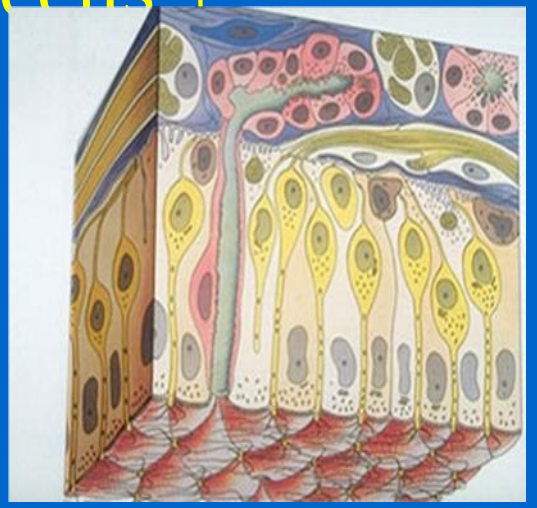
a) Bowman's glands (olfactory glands) : are serous acini.

b) Bundles of unmyelinated nerve fibers:

Are axons of olfactory nerve cells + Schwann-like cells (glial cells).

c) Rich vascular plexus.

d) Numerous lymphoid elements.

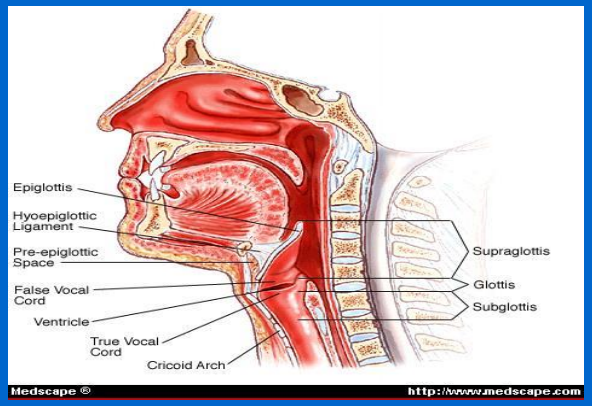


LARYNX

(A) Mucosa (Mucous membrane):

1- Epithelium.

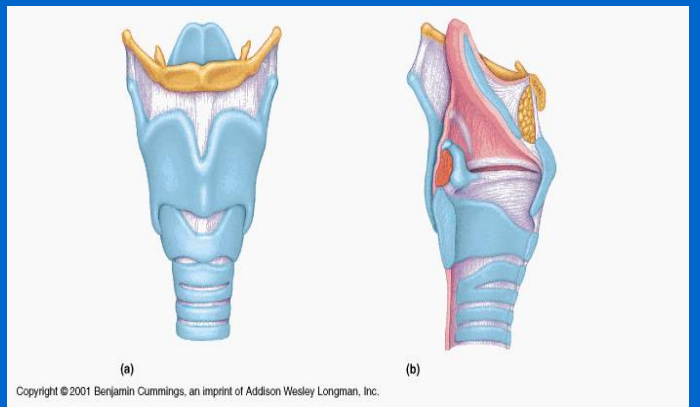
2- Lamina propria.



(B) Cartilages.

(C) Extrinsic and intrinsic muscles: all are skeletal.

(D) Ligaments.



LARYNX

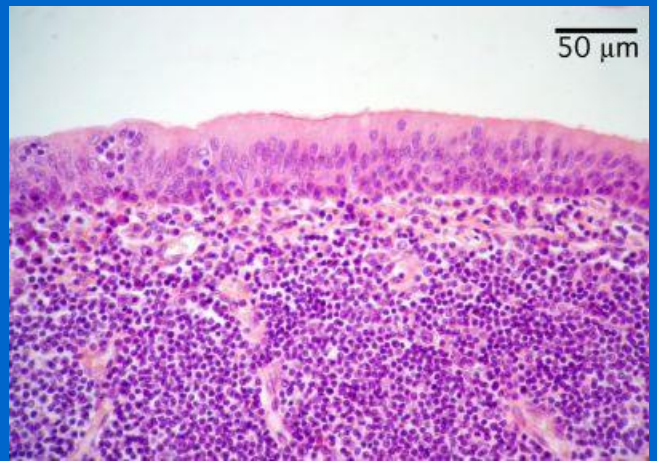
(A) Mucosa:

1- **Epithelium:** (2 types)

a- Respiratory epithelium:
Pseudostratified ciliated columnar epithelium with goblet cells.

b- Non keratinized stratified squamous epithelium:
In: -Vocal folds.
- Superior surface of epiglottis

2- **Lamina propria.**



LARYNX

(A) Mucosa (cont.):

There are 2 pairs of shelf-like mucosal folds:

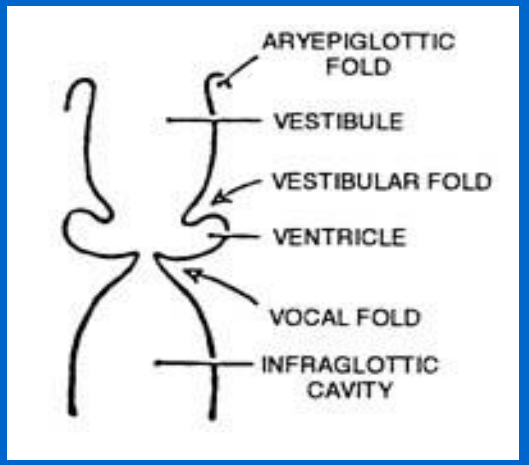
1- Vestibular folds:

Are immovable.

L/M: a- Respiratory epithelium.

b- Lamina propria:

Loose C.T. with seromucous glands lymphoid elements & adipose cells.



2- VOCAL FOLDS (CORDS): have:

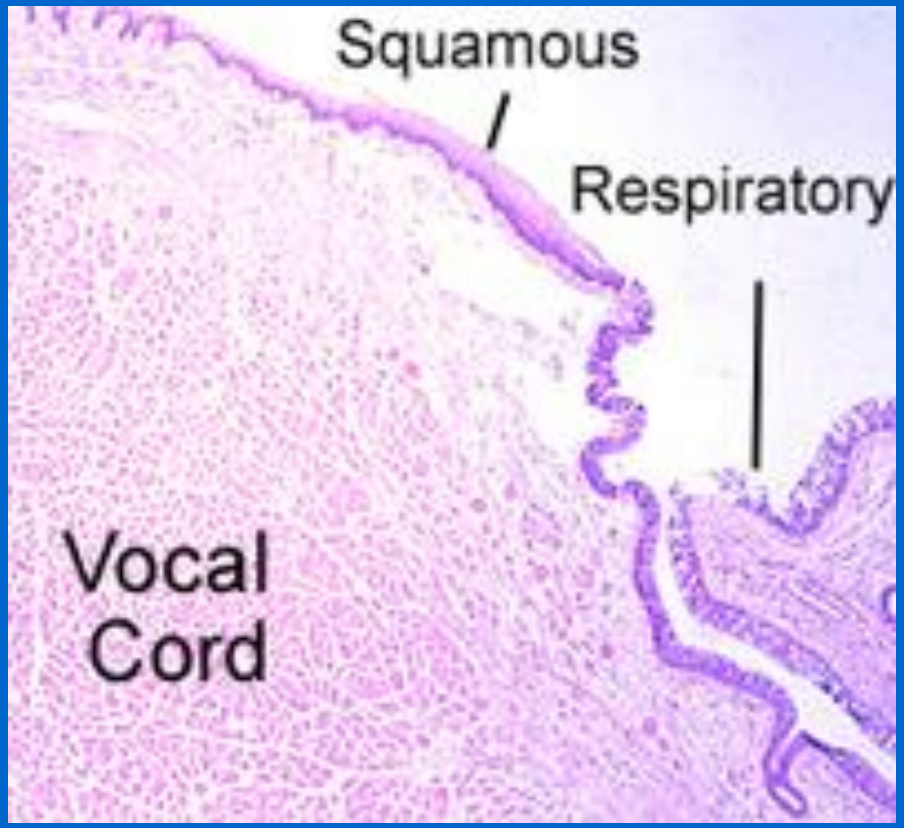
a- Epithelium: non keratinized stratified squamous.

b- Lamina propria: C.T. containing bundles of elastic fibers and skeletal muscle .

N.B. No lymphoid nodules,

No seromucous glands.

VOCAL FOLD



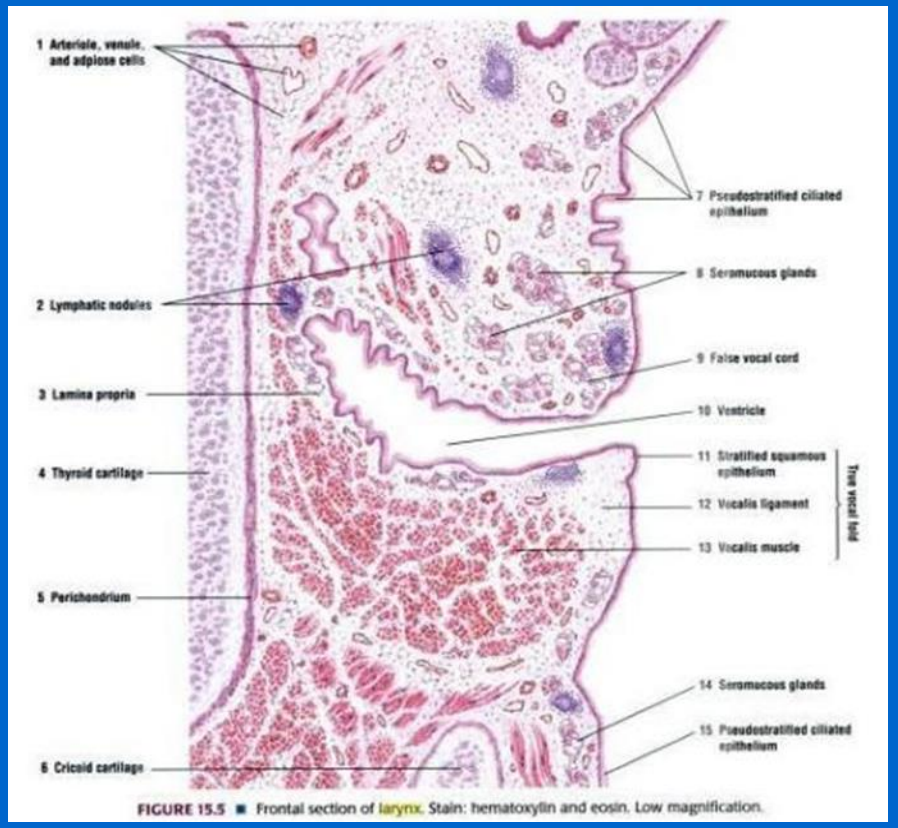
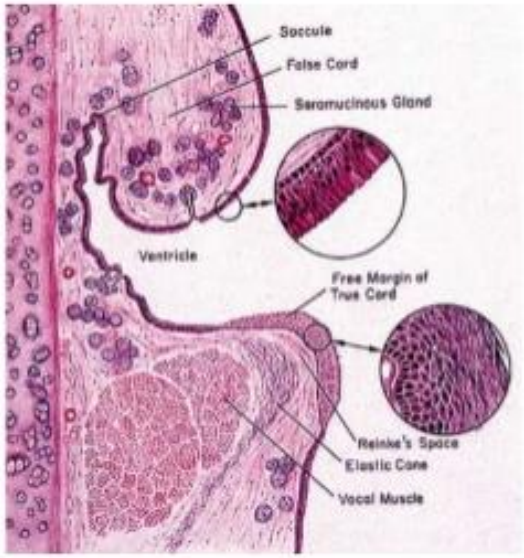


FIGURE 15.5 ■ Frontal section of larynx. Stain: hematoxylin and eosin. Low magnification.

VOCAL FOLDS

HISTOLOGY



- Histology of Supraglottis
- Epithelium
- Mucous glands
- Rich vascularity & lymphatic
- Histology of Glottis
- Epithelium
- Lamina propria – 3 layers
- Muscle layer- vocalis
- No mucous gland in free edge of vocal cord
- Cartilages

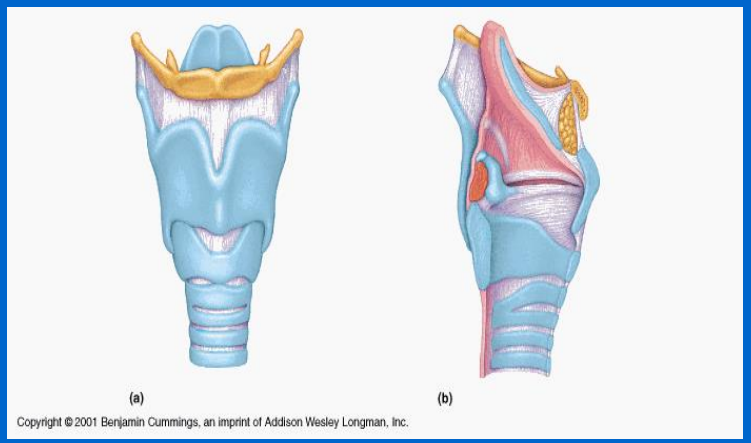
(B) Cartilages:

1- Hyaline cartilages:

e.g. Thyroid cartilage.

2- Elastic cartilages:

Epiglottis.



(C) Muscles: all are skeletal.

(D) Ligaments.

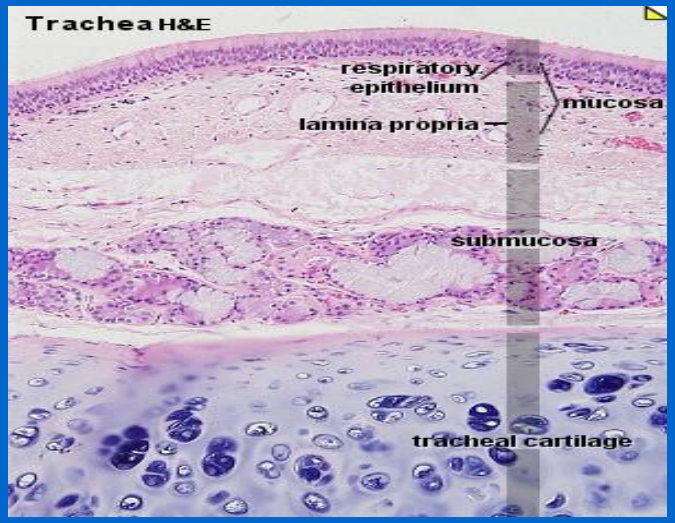
TRACHEA

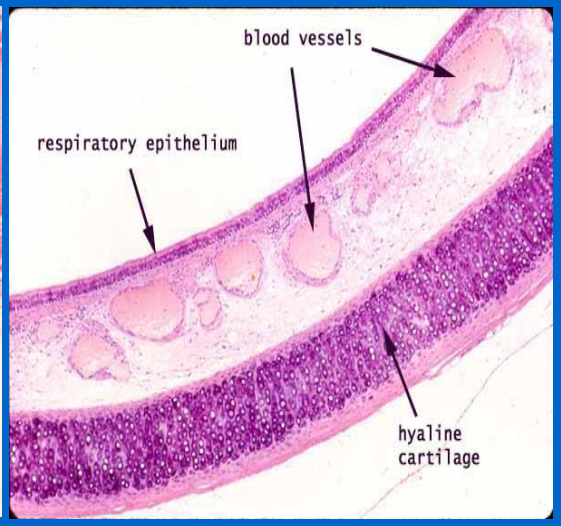
The wall of trachea is formed of:

(1) Mucosa.

(2) Submucosa.

(3) Adventitia.





MUCOSA OF TRACHEA

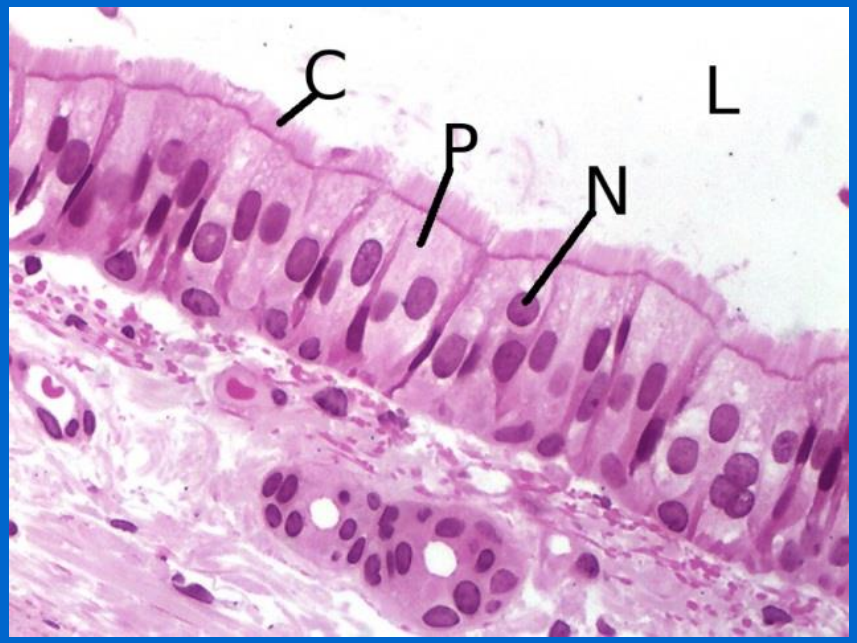
(1) **Epithelium:** Respiratory epithelium

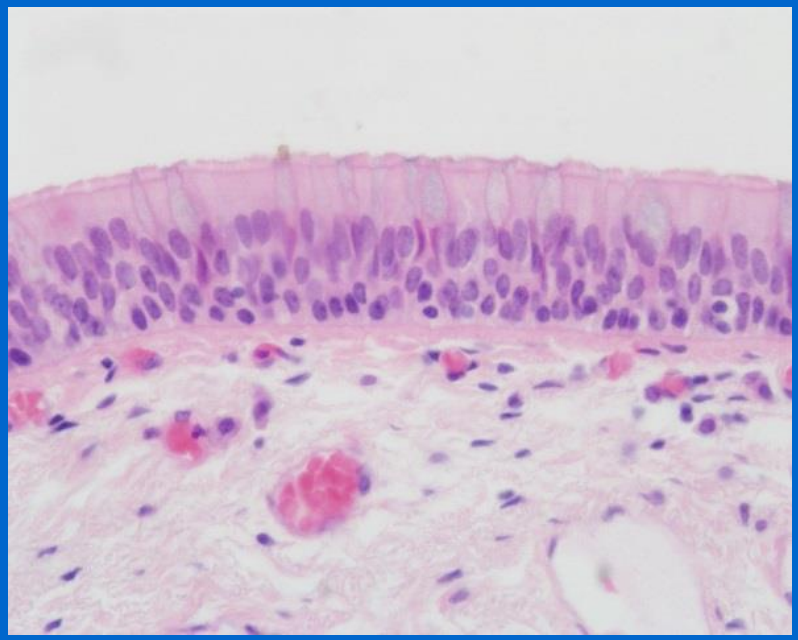
(2) **Lamina propria.**

(3) Elastic lamina:

It is formed of elastic fibers.

It separates lamina propria from submucosa.





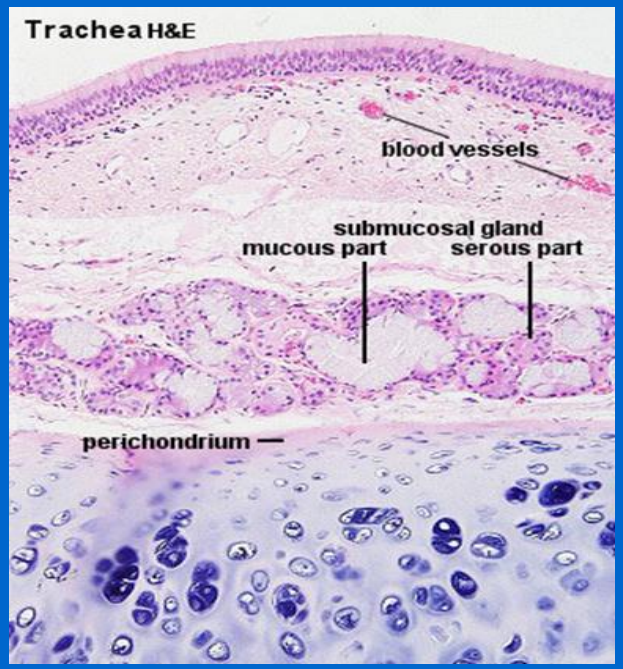
SUBMUCOSA OF TRACHEA

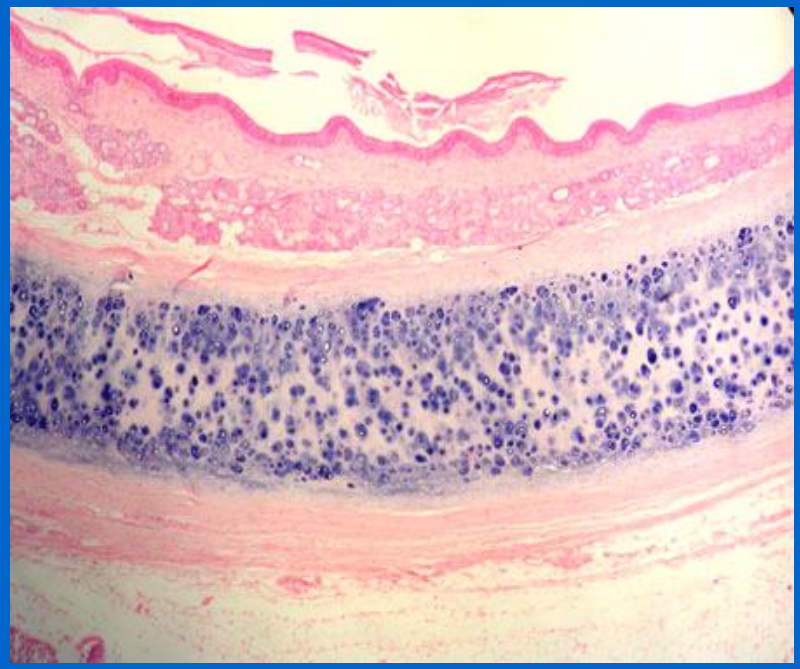
Contents:

1- C.T.

2- Numerous mucous & seromucous glands.

3- Lymphoid elements.





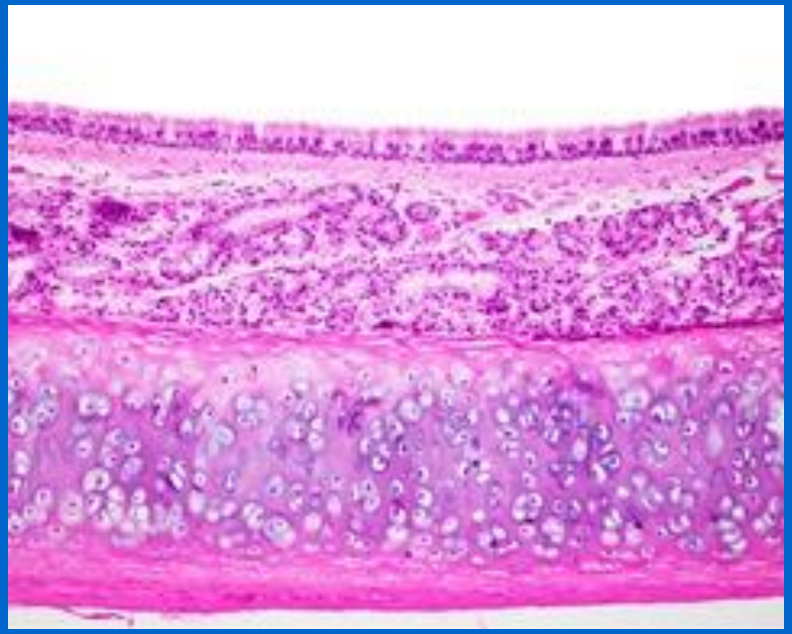
ADVENTITIA OF TRACHEA

Contents:

1- Fibroelastic C.T.

2- C-shaped rings (12-16) of hyaline cartilage.

Trachealis muscle (bundle of smooth muscle fibers) connects the 2 ends of each C-shaped (incomplete) rings of cartilage.



EXTRAPULMONARY BRONCHUS (1ry BRONCHUS)

Generally have the same histological appearance as the trachea.

THANK YOU