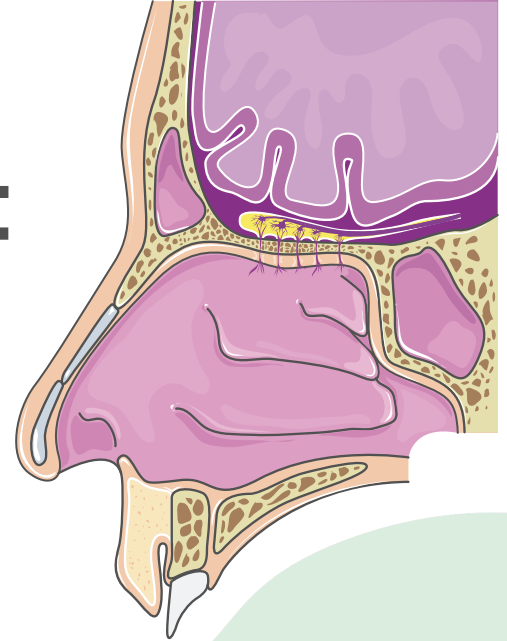


Histology of Upper tract

Color index:

- Main text -Important -Notes
- Boys' slides -Girls' slides -Extra

Editing file



Objectives

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

01

Vestibule of the nasal cavity.

02

Respiratory mucosa of the nasal cavity.

03

Nasal septum.

04

Olfactory mucosa of the nasal cavity.

05

Mucosa of the paranasal sinuses.

06

Mucosa of the pharynx.

07

Larynx.

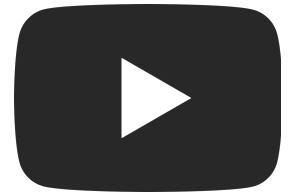
08

Trachea.

09

Primary or extrapulmonary bronchi.

For better understanding watch this video



Respiratory system

Conducting portion: مجرد توصيل ويساعد في تنقية الهواء وترطيبه

- 1- Nasal cavity.
- 2- Nasopharynx.
- 3- Larynx.
- 4- Trachea.

5- **extrapulmonary bronchi:** *خارج الرئة = Extrapulmonary

- 1ry bronchi

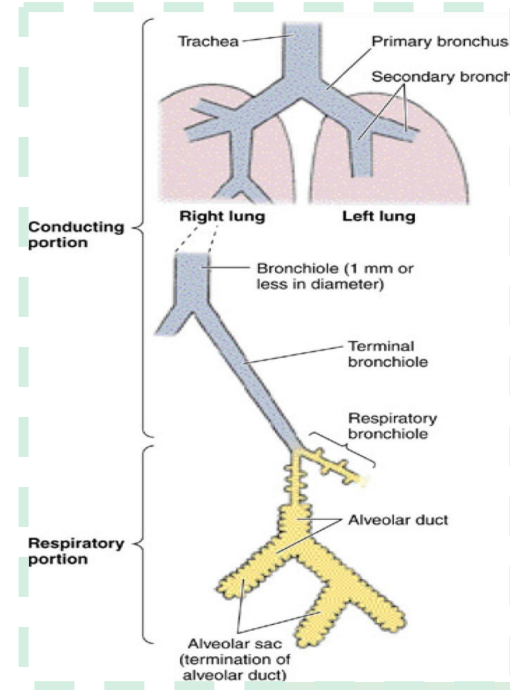
6- **Intrapulmonary bronchi:** *داخل الرئة = Intrapulmonary

- 2ry bronchi (lobar bronchi).
- 3ry bronchi (segmental bronchi).

- 7- Pre-terminal bronchioles (1ry bronchioles).
- 8- Terminal bronchioles.

Respiratory portion: تبادل الغازات يحدث فيها

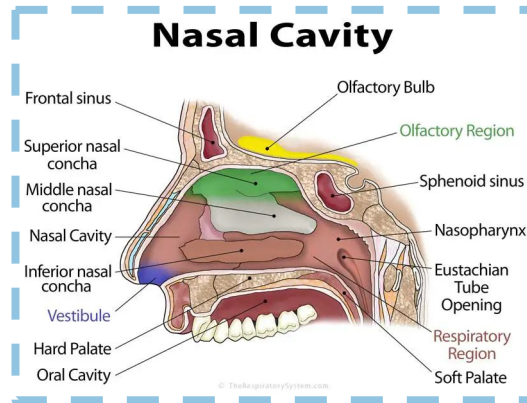
- 1- Respiratory bronchioles.
- 2- Alveolar ducts.
- 3- Alveolar sacs.
- 4- Pulmonary alveoli.



Nasal Cavity

Anterior Part:

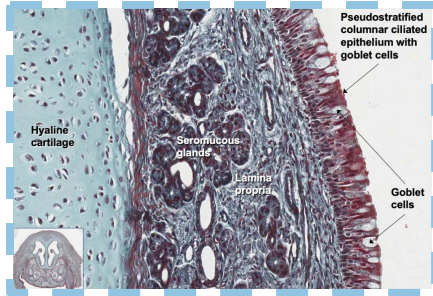
- **Dilated**, called the **Vestibule**.
- Lined by **thin hairy skin**:
 - 1- **Epidermis**: keratinized stratified squamous epithelium.
Shedding لأنه معرض للـ
 - 2- **Dermis**: with numerous skin appendages:
 - **Vibrissae**: short, stiff hairs that filter large particles from inspired air.
 - **Sebaceous glands**. غدد دهنية
 - **Sweat glands**.
- **Wall is reinforced by**:
 - 1- Hyaline cartilage.
 - 2- Cancellous (spongy) bone.



Posterior Part:

- 1- **Respiratory region**.
 - 2- **Olfactory region**. لتمييز الروائح
- **Projecting** from the bony lateral wall are 3 bony shelves called **conchae** or turbinates (↑ surface area & create turbulence, thus enhancing air conditioning).
 - **The nasal mucosa** filters, warms, and humidifies the inhaled air and also is responsible for the perception of odors.

The nasal septum

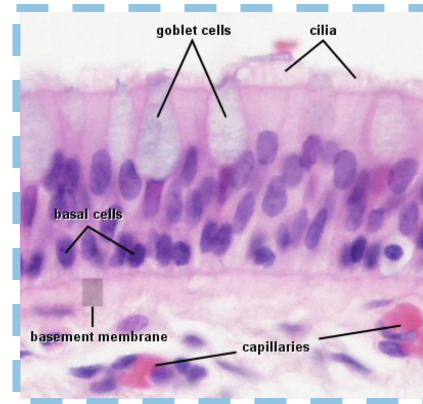


- divides the nasal cavity into two halves; right and left.
- Formed of a plate of **hyaline cartilage** covered on both sides by respiratory mucosa (respiratory epithelium on a lamina propria) **except its upper part (covered by olfactory mucosa)**.

Respiratory mucosa

Respiratory epithelium:
a pseudostratified ciliated columnar epithelium with goblet cells.

Lamina propria:
subepithelial CT.



Lines the respiratory region of the nasal cavity which is all the nasal cavity **except the vestibule and the olfactory region**.

Respiratory mucosa



Respiratory epithelium	Definition	Pseudostratified ciliated columnar epithelium with goblet cells.
	Main types of cells	<p>Four main types of cells (all in contact with the basement membrane):</p> <ol style="list-style-type: none"> 1-Ciliated columnar cells. (they can't divide) (motile cilia) 2-Goblet cells: produce mucus. 3-Basal cells: stem cells for both ciliated & goblet cells. تفرز مخاط 4-DNES (Diffuse Neuro-Endocrine System) cells: secrete hormones, e.g. serotonin.
Lamina propria (subepithelial CT)	Definition	Richly vascularized loose CT (Large arterial plexuses & venous sinuses) (Lie below the respiratory epithelium)
	Contains	<ol style="list-style-type: none"> 1-Many seromucous glands (acini). 2-Abundant lymphoid elements: including occasional lymphoid nodules, plasma cells & mast cells. (for mucosal immunity)

Olfactory mucosa

Lining:

Over the superior concha.

Roof of the nasal cavity.

upper part of the nasal septum.

modified By:

Thicker with No goblet cells.

Cilia are nonmotile.

Serous glands in its lamina propria (Bowman's glands).

Composed of:

Olfactory epithelium.

Lamina propria.

Next slides >>

Olfactory Epithelium	Definition	Pseudostratified columnar epithelium. (لان الروائح عبارة عن مواد كيميائية تذوب في المحلول المائي وليس المخاط (non-motile cilia فقط لزيادة المساحة لزيادة كفاءة حاسة الشم ولا تقوم بالفلتره)	
	Cells (all in contact with the basement membrane):	Olfactory cells: bipolar neurons:	<ul style="list-style-type: none"> -Dendrite has olfactory vesicle from which extend long nonmotile olfactory cilia. -Axons are unmyelinated with Schwann-like cells. -Axons collect in the lamina propria to form bundles of nerve fibers (olfactory nerve).
		Sustentacular (supporting cells):	<ul style="list-style-type: none"> -Columnar cells with microvilli. - Provide physical support, nourishment, & electrical insulation for olfactory cells.
		Basal cell:	<ul style="list-style-type: none"> -Short, pyramidal cells, not reaching the surface. -They are stem cells for both sustentacular & olfactory cells (Unlike nerve cells anywhere else in the body, the olfactory neurons are able to recover or regenerate after injury.)

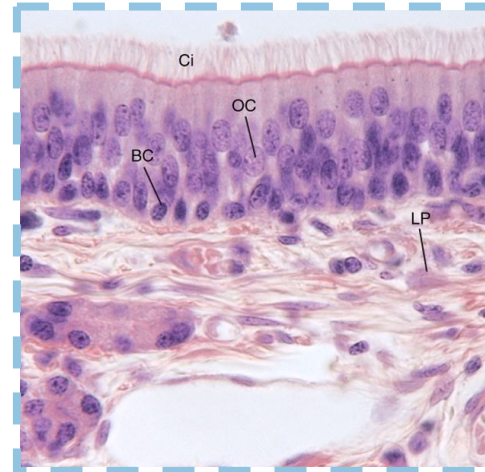
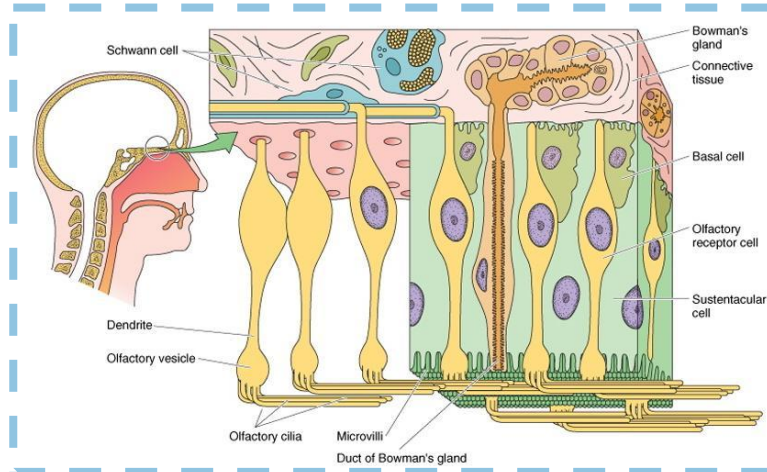
**Lamina Propria:
(Sub-epithelium
C.T.)**

Definition

Richly vascularized loose CT

Contains

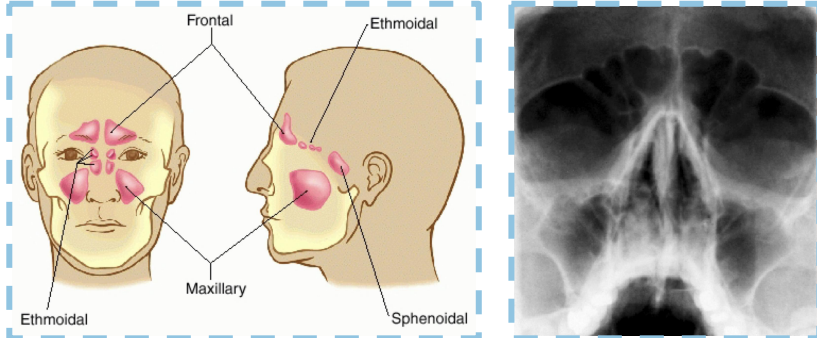
- 1-**Bowman's glands** (olfactory glands): serous acini.
(عندها قناة تبسط الجزيئات الكبيرة حقت الروائح عشان يصير لها امتصاص وتذوب)
- 2-Bundles of unmyelinated **nerve fibers**: axons of olfactory cells covered by Schwann-like cells (glial cells).
- 3-Numerous **lymphoid elements**.
(There is no goblet cells or mucus glands)



Paranasal sinuses

They are large air spaces in ethmoid, sphenoid, frontal and maxillary bones. (It's important to memorize their names)

They communicate with the nasal cavity and have the same lining, i.e. **Respiratory epithelium** whose cilia beats toward the nasal cavity (makes the skull lighter and resonance of voice.)



PHARYNX

Subdivided into 3 regions:

Nasopharynx

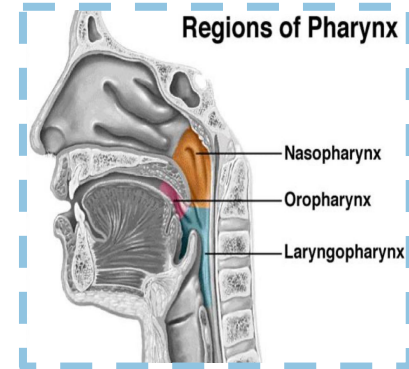
The Nasopharynx is lined by a **respiratory epithelium**.

In its posterior aspect, the lamina propria contains the pharyngeal tonsil.

Oropharynx

Laryngopharynx

Both the oropharynx and the laryngopharynx are lined by a **stratified squamous epithelium**. (Non-keratinized) (Protective Epithelium)



Explanation: meaning of words
Naso > nose, Oro > mouth,
Larynx > Larynx (throat)

LARYNX

Situated between the pharynx and the trachea, and it's responsible for phonation (talking) and prevents the entry of food or fluids into the lower respiratory tract (with the help of epiglottis).

The wall is reinforced by:

Hyaline cartilages: thyroid, cricoid and body of arytenoid.

Elastic cartilages: epiglottis, corniculate, cuneiform, and the tips of arytenoids.

The cartilages are connected by **ligaments**, and their movements are controlled by **intrinsic and extrinsic skeletal muscles**.

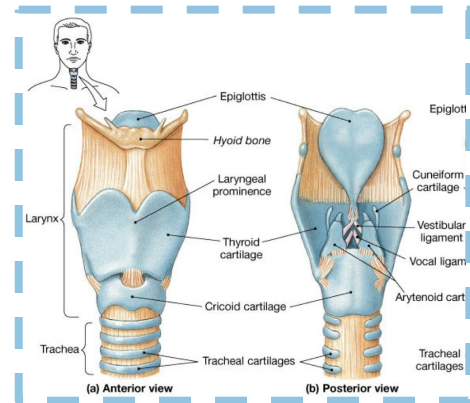
Dr's Note:

Large cartilages are hyaline cartilage **EXCEPT: Epiglottis** It is elastic cartilage.

Small cartilages are elastic.

The main function of larynx is to protect the lower respiratory tract.

Intrinsic muscles are inside the larynx, and extrinsic muscles are from outside the larynx.



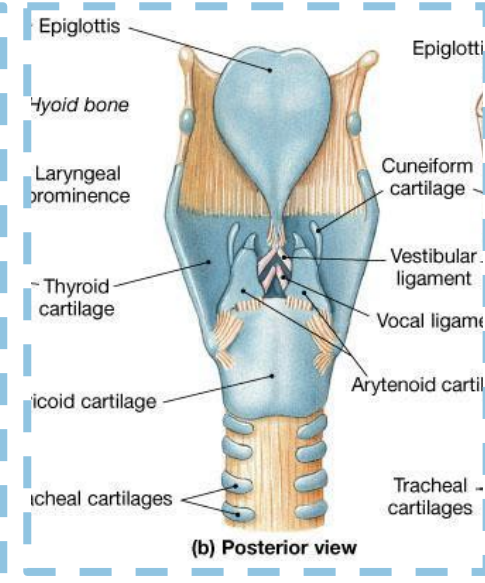
Epiglottis

It is a leaf like structure that provides a cover over the laryngeal opening to prevent the entry of food or fluids to respiratory passage.

It has a core of **elastic cartilage**;

-Its **inferior (laryngeal) surface** is covered by **respiratory mucosa**.

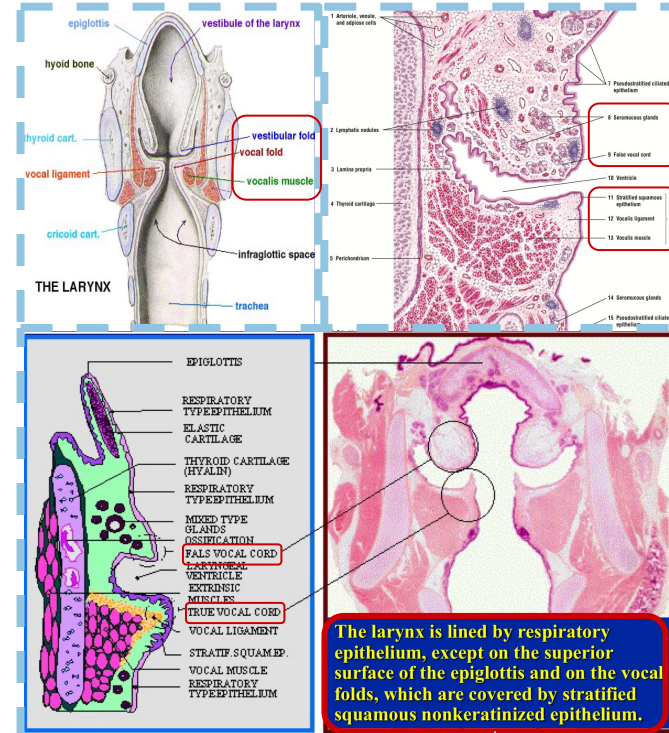
-its **superior (lingual) surface** is covered by a protective mucosa with **a non-keratinized stratified squamous epithelium** that is directly continuous with the epithelium covering the dorsal surface of the tongue.



Lumen of larynx

The lumen has 2 pairs of shelf-like mucosal folds.

<p>Vestibular folds (False vocal cords)</p>	<p>Vocal folds (True vocal cords)</p>
<p>Immovable, only for protection.</p>	<p>Their vibrations produce and modulate sound, covered by stratified squamous non-keratinized epithelium.</p>
<p>covered by respiratory epithelium.</p>	<p>Lamina propria: -Vocal ligament: dense, Elastic CT. -Vocalis muscle: skeletal muscle attached to the vocal ligament.</p>
<p>lamina propria: Loose CT with seromucous glands, lymphoid elements, and adipose cells.</p>	<p>-No seromucous glands, No lymphoid element.</p>



IMPORTANT

Trachea

The wall of trachea is formed of:

1 Mucosa

- Epithelium:

Respiratory epithelium.

- Lamina propria:

Fibroelastic CT with mucous and seromucous glands and lymphoid elements.

(The fibroelastic CT gives the trachea elasticity and allows it to move)

- Elastic lamina:

A dense layer of elastic fibers that Separates the lamina propria from the submucosa.

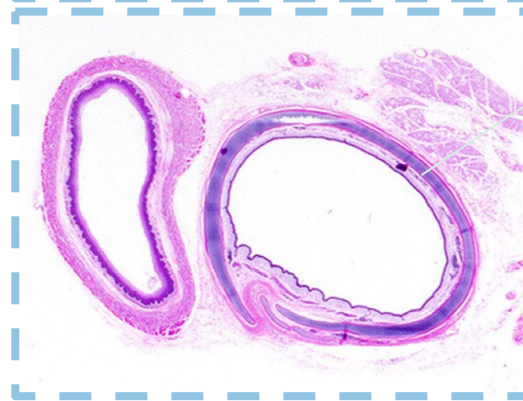
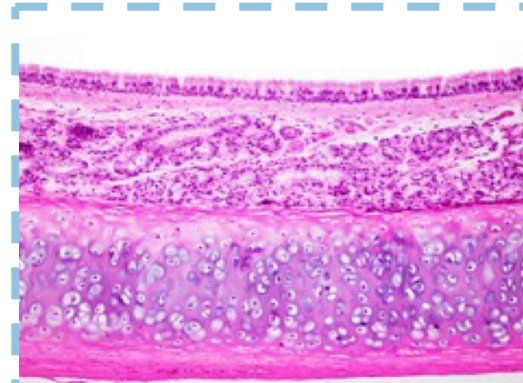
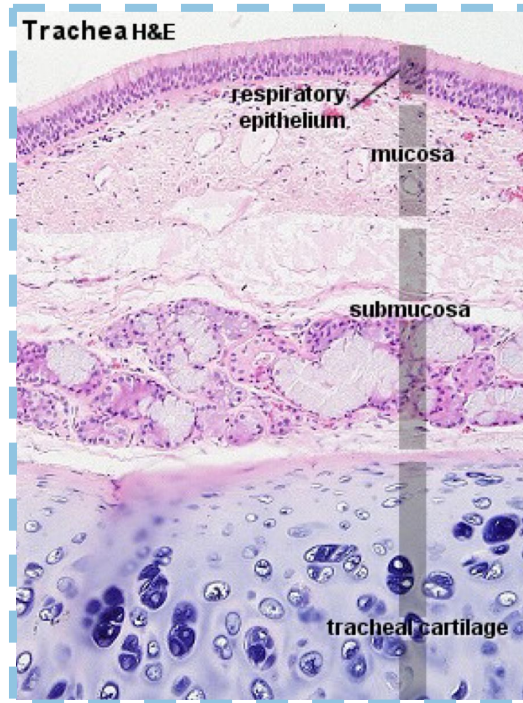
2 Submucosa

- Fibroelastic CT.
- Numerous mucous and seromucous glands.
- Lymphoid elements.

3 Adventitia

- Fibroelastic CT: Provides flexibility to the trachea and permits its elongation during inspiration.
- C-shaped rings (10-12) of hyaline cartilage.
- Trachealis muscle (bundle of smooth muscle fibers) connects the **open** ends of each C-shaped ring of cartilage **posteriorly**.
(It's contraction helps in coughing).

Cont.. Trachea



C shaped

Extrapulmonary bronchi (1ry bronchi)

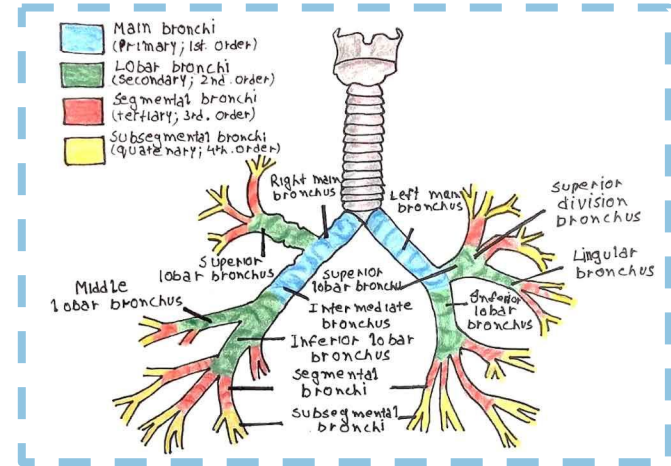
Generally have the same histological structure as the trachea.

The **Right bronchus trifurcates** (Divide into 3 branches)

The **Left bronchus bifurcates** (Divide into 2 branches)

Giving branches that enters the substance of the lungs as intrapulmonary bronchi.

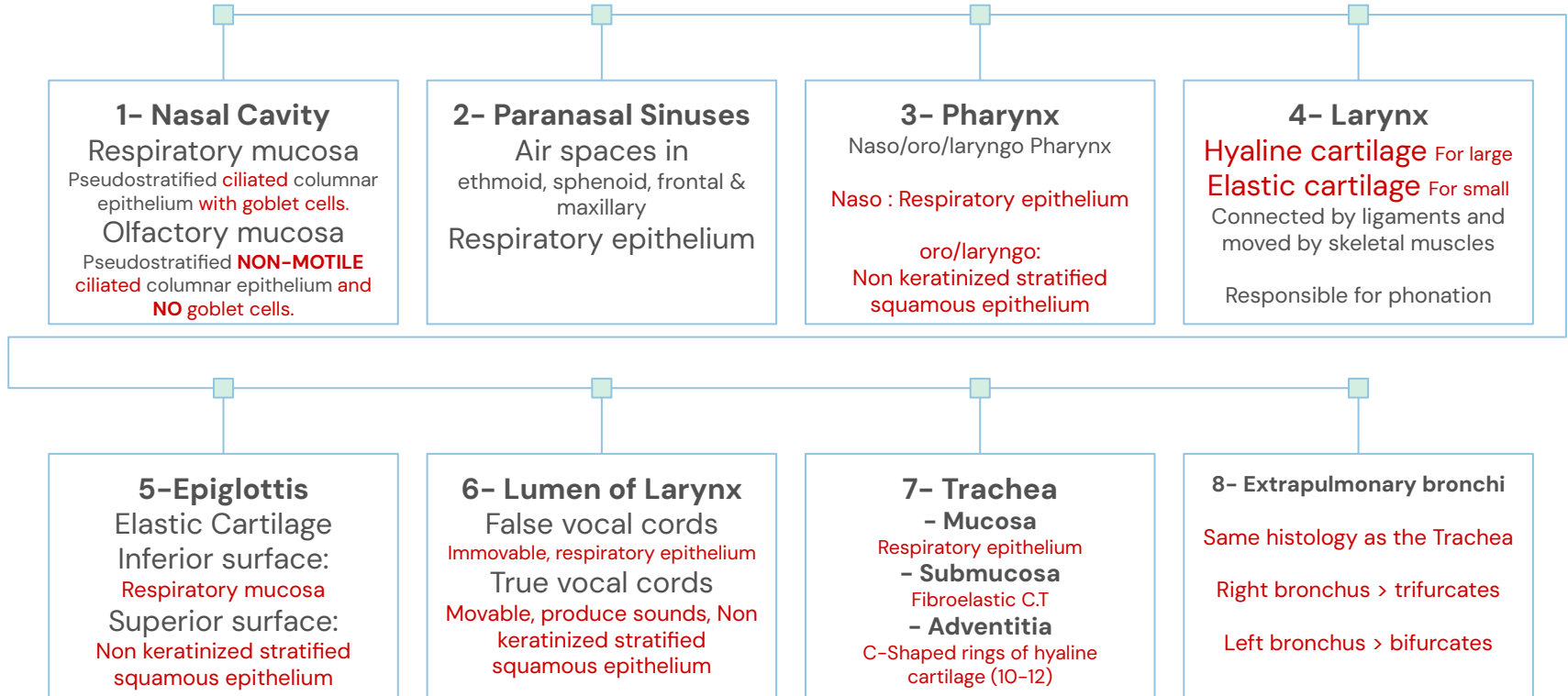
(Each branch of the primary bronchus will deliver air to lobes of the lung, keep in mind that the Right lung has 3 lobes while the Left lung has 2 lobes. These branches are called Lobar or Secondary bronchi)



Picture for additional information (NOT FROM SLIDES)

Summary – Histology of the URT

The Upper respiratory tract which is also the conducting zone (which transfers air) consists of:



MCQs:

Q1: Which of the following is not hyaline cartilage?

A-Thyroid

B-Cricoid

C-Body of arytenoids

D-Epiglottis

Q2: Which of the following is in olfactory mucosa and not in respiratory mucosa?

A-Motile cilia

B-Goblet cells

C-Seromucous glands

D-Non-motile cilia

Q3: Which of the following is covered by respiratory epithelium?

A-Oropharynx

B-Nasopharynx

C-Vocal folds

D-Superior surface of epiglottis



1-D
2-D
3-B

MCQs:

Q4: What reinforces the wall of the anterior portion of nasal cavity?

A-Hyaline cartilage & compact bone

B-Elastic cartilage & compact bone

C-Hyaline cartilage & spongy bone

D-Elastic cartilage & spongy bone

Q5: Where is the vestibule located in relation to the nasal cavity?

A-Anteriorly

B-Posteriorly

C-Superiorly

D-Inferiorly

Q6: Seromucous glands are not found in which of the following?

A-Trachea

B-Vestibular folds

C-True vocal cords

D-Respiratory mucosa



4-C

5-A

6-C

HISTOLOGY TEAM



Abdullah Muhanna



Huda Bassam



Ahmad Addas



Lama AlRasheed



Waleed AlAnazi



Jana AlAhaideb



**Abdulaziz
AlObathani**



Shadin AlAbbas



Rahaf AlDawood

