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18/MHS01/271

HISTOLOGY ASSIGNMENT.

**HISTOLOGICAL BASICS OF UPPER RESPIRATORY SYSTEM( CONDUCTING PORTION) ATTACKED BY CORONA VIRUS.**

The conducting system begins as a system of cavities( nasal cavity, paranasal sinuses and nasopharynx) which begin the cleansing, warming and moistening of air drawn in through the anterior nares ( the nostrils).

THE NASAL CAVITY

The nose is subdivided into nasal cavities by the nasal septum. The nasal cavity and paranasal sinuses are lined by respiratory mucosa, the major function of which is to adjust the temperature and humidity of inspired air. Particulate matter entering the nares is usually trapped by the hairs of that site, but some smaller particles are caught on the respiratory mucosa. These functions are enhanced by a large surface area provided by the turbinate bones which project into the nasal cavity. Part of the nasal mucosa, contains receptors for the sense of smell. Olfactory mucosa is extensive in lower animals, but in man it is confined to a small area in the roof of the nasal cavity.

NASAL MUCOSA

The mucosa of the nasal cavities consists of pseudostratified ciliated columnar epithelium containing numerous mucin-secreting goblet cells. This is called the respiratory epithelium and is found elsewhere in the conducting part of the respiratory tract. The respiratory epithelium has an unusually thick basement membrane. It is supported by lamina propria rich in blood vessels as well as serous and mucous glands. The secretions of these glands and epithelial goblet cells trap small particles in the inspired air into the a thin layer of surface mucous. This mucus layer is propelled toward the pharynx by the coordinated movement of the cilia. This is sometimes known as the muco-ciliary escalator. From the pharynx, most of the mucos swallowed and the gastric acid destroys any present bacteria. The temperature of the inspired air is adjusted close to the body as a result ofwarming by the rich plexus of blood vessels. The air is also humidified by contact with the gland secretions, particularly those of the serous glands.

NASOPHARYNX

The nasopharynx is lined by the pseudostratified ciliated columnar epithelium but patches of squamous epithelium occur with increasing age, particularly near the lower end and most extensively in smokers. The lamina propria contains some serous and mucous glands, but the dominant feature of the mucosa at this site is the presence of large masses of lymphoid tissue which forms the component of waldeyer ring of lymphoid tissue, protecting the entry portals of the respiratory and gastrointestinal systems. This lymphoid tissue is particularly prominent in chidren and young adults and usually bulges out into the lumen of the nasopharynx, producing an appearance similar to that seen in the lingual tonsil with epithelial crypts. This is called the nasopharyngeal tonsil or adenoid.

LARYNX

The larynx is a tubular segment of the respiratory system formed by irregularly shaped plates of hyaline and elastic cartilage. The laryngeal epithelium corresponding to the mechanically exposed areas consists of stratified squamous nonkeratinized epithelium. The mucosa form two pairs of folds; false and true vocal cords, which extend to the lumen of the larynx. In the laryngeal epithelium, dendritic antigen –presenting langerhans cells can be found. In the rest of the larynx, the epithelium is ciliated columnar pseudostratified with a rich population of goblet cells. Except in the true vocal cords, lamina propria consists of rather loose connective tissue and contains groups of small branched tabuloalveolar glands.

TRACHEA

 The trachea is a wide flexible tube, the lumen of which is kept open by 20 tracheal cartilages, which are c-shaped rings of the hyaline cartilage. The gaps between the rings of the cartilages are filled by the trachealis muscle- a bundle of smooth muscle, and fibro-elastic tissue. Together these hold the lumen of the trachea open, but allows flexibility during inspiration and expiration. The respiratory mucosa and submucosa are adapted to warm and moisten the air, and to trap particles in the mucous. The respiratory mucosa is made up of the epithelium and lamina propria. The epithelium is tall columnar pseudostratified with cilia, serous cells, basal cells and brush cells and goblet cells. The supporting lamina propria underneath the epithelium contains elastin, that plays a role in the recoil of the trachea during inspiration and expiration, together with blood vessels that warm the air. The submucosa contains glands which are mixed sero-mucous glands. The watery secretions from the serous glands humidify the inspired air. The mucous, together with mucous from the goblet cells traps particles from the air which are transported upwards towards the pharynx by the cilia on the epithelium. This helps the lungs free of particles and bacteria.

BRONCHUS

The basic structure of the wall of the main bronchus is similar to that of the trachea but differs in many details:

* The respiratory epithelium is less tall and contains fewer goblet cells
* The upper lamina propria contains more elastin
* the lamina propria is separated from the submucosa by a layer of smooth muscle which becomes more prominent in more distal bronchi.
* The submucosa contains fewer seromucous glands
* A cartilage support is in flattened interconnected plates rather than distinct rings.

The cells in the main bronchus are pseudostratified, the bases of all cells reaching the basement membrane but not all the cells reaching the luminal surface. The ciliated and goblet cells can be distinguished. The underlying lamina propria contains elastic fibres and occasional mast cells. The ciliated epithelial cells have numerous surface cilia each several microns long in order to sweep mucous up the bronchus. Scattered goblet cells are recognisable by their bulbous surface outline, lack of cilia and the presence of small surface projections associated with mucous secretions. The fragile cilia are particularly vulnerable to damage and destruction by inhaled toxic chemicals and by bacterial and viral infections.

Segmental bronchus: as bronchi diminish in diameter, the structure progressively changes to resemble more closely that of the large bronchioles. The epithelium, is tall and columnar with little pseudostratifaction. Goblet cell numbers are greatly diminished. The lamina propria is thin, elastic and completely encircled by smooth muscle which is disposed in a spiral manner. This arrangement permits contraction of the bronchi in both length and diameter during expiration. Seromucinous glands are sparse in the submucosa. These glands are rarely found within smaller airways. The cartilage framework is reduced to a few irregular plates. Cartilage does not usually extend beyond tertiary bronchi. The submucosa merges with the surrounding adventitia and then with the lung parenchyma. Small aggregates of lymphocytes, part of the mucosa-associated lymphoid tissue, are seen in the adventitia.

BRONCHIOLE

A bronchiole is an airway of less than 1mm diameter which has neither cartilage nor submucosal glands in its wall. The epithelium is composed of ciliated columnar cells and few goblet cells. In the terminal and respiratory bronchioles, goblet cells are replaced by clara cells, tall columnar cells with apical secretory granules. The wall is also composed of smooth muscles, the tone of which controls the bore of the tube and therefore resistance to airflow within the lungs. A distended thin-walled pulmonary artery branch Art lies next to the bronchiole.

Terminal bronchioles are the smallest diameter passages of the purely conducting portion of the respiratory tree. Beyond this, branches become increasingly involved in gaseous exchange. Each terminal bronchiole divides to form short, thinner walled branches called respiratory bronchioles which contain a small number of single alveoli in their walls.