University of Mosul
Lecture No.: 4
College of Veterinary Medicine
Date:2024-2025
Unit of Scientific Affairs
Website: https://uomosul.edu.iq/veterinarymedicine

Lecture title: Digestive system

Lecturer Affiliation: ***Ghada Abdulrhman Sultan , BVMS, MSc, Scientific degree (Assistant Prof.), Department of Anatomy, College of Veterinary Medicine, University of Mosul, Mosul, Iraq***

https://orcid.org/0000-0002-9639-6446

https://www.researchgate.net/profile/Gh-Sultan

Gas exchange area

The gas exchange area,also referred to as parenchyma,can be organized into either functional or structural units. The functional unit of the gas exchange area is called the **acinus,** or terminal respiratory unit . The acinus includes all air spaces distal to a single terminal bronchiole, including branching respiratory bronchioles, alveolar ducts, alveolar sacs, and alveoli.

The **lobule** is a structural unit rather than a functional unit. It comprises a cluster of acini that is separated from adjacent clusters by connective-tissue septa. These connective-tissue septa are termed **interlobular septa** and are composed of collagen and elastic fibers and blood vessels. Both bronchial arteries and pulmonary veins are located in interlobular septa.

The lungs of cattle, sheep, and pigs are highly lobulated and have complete septa.

The lungs of horses have incomplete septa and are considered poorly lobulated. Carnivores do not have interlobular septa.

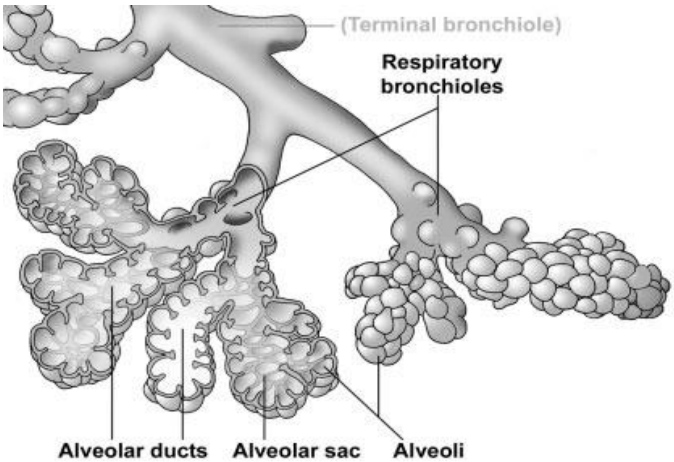
Respiratory bronchioles

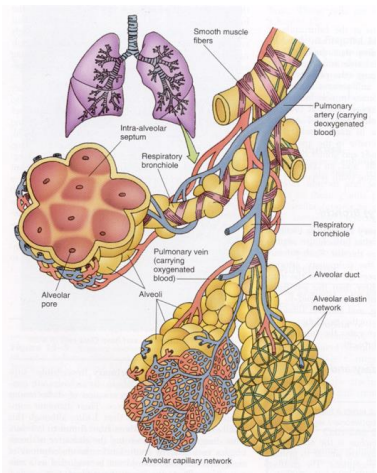
The histologic appearance of respiratory bronchioles is similar to that of terminal bronchioles, with the exception that the epithelium is interrupted by alveoli . The smooth muscle is arranged in fascicles that underlie the simple columnar or cuboidal epithelium. The alveoli open between these muscle bundles.

Alveolar ducts and alveolar sacs

The walls of an alveolar duct are composed of the open sides of alveolar air spaces and the terminations of the interalveolar septa that separate these alveoli.Spiraling bands of smooth muscle and elastic fibers oriented perpendicular to the long axis of the alveolar ducts lie underneath the epithelium at the terminations of the interalveolar septa.

The alveolar ducts terminate in clusters of alveoli called **alveolar sacs.**





Alveoli

The basic unit for gas exchange in the pulmonary parenchyma is the **alveolus**. Alveoli are epithelium-lined spheroid air spaces that open into an alveolar sac, alveolar duct, or respiratory bronchiole; they are separated by interalveolar septa.

The alveolar epithelial lining, located adjacent to the air space, comprises two epithelial cell types: type I and type II alveolar epithelial cells. The **type I** or **squamous alveolar epithelial cell** (respiratory epithelial cell) is flat with a central nucleus and rests on a continuous basal lamina This cell type covers approximately 97% of the interalveolar septal surface in all the species studied thus far. The average surface area of a type I cell ranges from 5000 to 7000 μm2. The **type II** or **granular (great) alveolar epithelial cell** is a cuboidal cell with a central nucleus. This cell type

covers the remainder of the interalveolar septal surface area (approximately 3%). Its alveolar surface bears microvilli and ranges

from 100 to 280 μm2 per cell. The type II alveolar cell is the progenitor cell for both type I and type II cells.

Pulmonary **alveolar macrophages** are like wise present on the air side of the interalveolar septa .

Interalveolar septa are thin sheets of connective tissue containing a capillary plexus .The interalveolar **interstitial connective tissue** contains collagen and elastic fibers and fibrocytes; pericytes, macrophages, lymphocytes, and plasma cells may also be present.

The capillary bed of the interalveolar septa is an intermeshed network of short, branching vessels numerous endocytotic vesicles. The intercellular junctions tend to be loose or leaky; the tight junctions have few anastomosing ridges. The surface area of the gas exchange capillary

The alveoli contain a small amount of fluid, consisting of a biphasic layer of plasma filtrates overlaid by a thin layer of phospholipids.

This phospholipid layer or **pulmonary surfactant** reduces the intra alveolar surface tension, preventing alveolar collapse.