University of Mosul
Lecture No.: 2
College of Veterinary Medicine
Date: 3/3/2025
Unit of Scientific Affairs
Website: https://uomosul.edu.iq/veterinarymedicine/

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Summary:

The respiratory system

Is a complex biological system comprised of several organs that conduct, control (purification of inspired air and registration of the presence of harmful substances), and modify (warming or cooling) air to and from lungs thus permitting gaseous exchange. In addition to conduction and gaseous exchange, respiratory organs are also involved in phonation, olfaction, control of body temperature, acid-base balance. The respiratory tract can be divided at the thoracic inlet into upper and lower respiratory parts.

Anatomical Components

The muzzle of most domesticated animals is made up of the nose and lips. It holds the nostrils.

The upper respiratory tract includes;

1- External nose: the most rostral structure extending from the face.

2- Nostrils (external nares): the two external openings of the respiratory tract that lead into the nasal cavity. The shape and size of the nostrils vary in most animals. The soft expandable nostrils and muzzle of the horse contains many oil glands as well as sweat glands. The snout of swine is much more rigid and does not contain any oil glands. The muzzle of cattle and sheep also do not contain oil glands, however, they do contain many sweat glands. If cattle have dry muzzles, they are often feverish.

3- Nasal cavity: the respiratory passages just caudal to the nose that is separated from the mouth by a hard and soft palate. The front of the nasal cavity is an extension of the nostrils while the rear portion of the nasal cavity is connected to the pharynx. It is separated into two symmetrical halves by a

central structure of cartilage. The nasal cavity is designed to conduct and filter the air before it reaches the lungs.

4- Pharynx: (most people refer to it simply as the throat) is a short, funnel-shaped tube that transports air into the larynx. The pharynx serves as a common passageway for air and food. However, air and food cannot pass through the pharynx at the same time. The epiglottis keeps this from happening. The pharynx is lined with a mucous membrane and ciliated cells that remove more impurities from the air.

5- Larynx (voice box): a short passage that connects the laryngopharynx to the trachea. It is essential for voice production and is located in the middle of the animal's neck. The larynx also controls breathing and prevents the inhalation of foreign objects into the lungs.

While the more important parts of the lower airways are

1- Trachea: a tubular passage that extends from the larynx that consisting of series of adjacent cartilage rings (they are rigid to prevent collapse of the trachea) that connected by annular ligaments and lined by a mucous membrane. The trachea enters the chest cavity as a single tube. It extends to a level above the base of the heart where it divides into two branches called primary bronchi. Each of the bronchi passes into one of the lungs. Inside the lungs, the bronchi bifurcated further and further into branches that are called bronchioles. The trachea, bronchi, and the first few bronchioles contribute to the cleansing function of the respiratory system, as they are lined with mucous membranes and ciliated cells. The bronchioles also divide many more times into smaller and smaller bronchioles

2- Lungs: The lungs in mammals located inside the thorax and consist of an elastic, spongy material that greatly expands when filled with air. When the lungs are expanded to total capacity, they completely fill the thoracic or chest cavity. The lungs are cone-shaped and may be incompletely divided into several lobes by deep fissures on the bottom side. In cattle, sheep, and

swine, the left lung is divided into two-three lobes. While the right lung has an additional lobe called the intermediate lobe.

Some other important structures associated with respiratory system

Air sacs

Birds differ from mammals in that their lungs are relatively nonexpendable. Furthermore, birds have accessory air sacs that aid in respiration and add to their ability to float on water. Chickens have nine accessory air sacs and perforations in their long bones (forearms).

Paranasal sinuses

They are air-filled bony cavities within the skull of various animals. They are connected to the nasal cavities and lined by respiratory mucosa and thus usually affected by respiratory tract diseases. The sinuses in domestic animals include the maxillary, frontal, sphenoidal, ethemoid, and palatine sinuses. Cattle and sheep have an additional pair of sinuses (called lacrimal sinuses) located in the lacrimal bones. In mature cattle the frontal sinuses cavities extend into the horn cores so it could be opened to the atmosphere following dehorning. While horse has six pairs of paranasal sinuses, some of them have a strong relation with some of the maxillary premolar and molar tooth roots. The maxillary sinus is the largest one and is divided into two parts (rostral and caudal) by a thin septum. Many of the sinuses also communicate with one another: In healthy horses, mucus produced by the lining of the sinuses flows freely through the sinuses and into the nasal passages. The bone overlying the sinuses is very thin, and can be easily distorted by disease.

Guttural pouches

They are paired extensions or diverticulum of Eustachian tubes that connect the pharynx to the middle ear occupying the area posterior to the mandible. They are found in many species especially non-ruminant ungulates: horses, tapirs, and

rhinoceros. The pouches are lined with a thin mucous membrane and are separated from each on the midline by median septum and muscles. Each guttural pouch is divided ventrally into a medial and a lateral compartment by the stylohyoid bone, and it communicates with the pharynx through the pharyngeal orifice of the Eustachian tube.

Function: unclear, but it has been suggested that it provides a mechanism to cool the brain during periods of hyperthermia via cooling the blood within the internal carotid artery. As well as, it equalizes pressure between pharynx and middle air.

Most common affections of external nares (nostril)

Alteration in function or obstruction to air flow through nares could cause dyspnea and respiratory distress.

Trauma to nares

a- Laceration of external nares has little impact on function but may require attention from cosmetic view.

b- When trauma cause full-thickness wounds, a three layers closure is required using interrupted absorbable sutures in subcutaneous tissue and non-absorbable apposition closure for both inner and outer layers.

c- Sever blunt trauma to rostral bridge of nose: usually occurs when animal runs into an objects (e.g. fences) leading to depressive injury to the soft tissue supporting structures of nostril and may involve rostral aspect of nasal bone causing destruction of nasal septum.

Clinical signs: stenosis of nares if extensive due to fibrous tissue contraction.

Treatment: the extent of the injury will determine the suitable

1-immediate mid-cervical tracheostomy if animal is dyspenic.

2-a stent on either side of nasal septum is anchored together by through and through sutures of the damaged septum extending from floor to the normal height of the nasal cavity.

3-elevation, support, and fixation of the depressive nasal bones by open reduction.

4-cicular stents are placed via external nares beyond stenotic area.

5-placing of drain to decrease soft tissue distension.

6- using of antibiotic and non-steroidal anti-inflammatory agents.

Tumors

Neoplasms are uncommon but the most common one are equine sarcoids, carcinomas, papilomas, and warts on the skin of external nares. Prognosis depends on regional metastasis to lymph nodes

Treatment: surgical excision.