Department of Veterinary Physiology

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B.V.Sc. & A.H.
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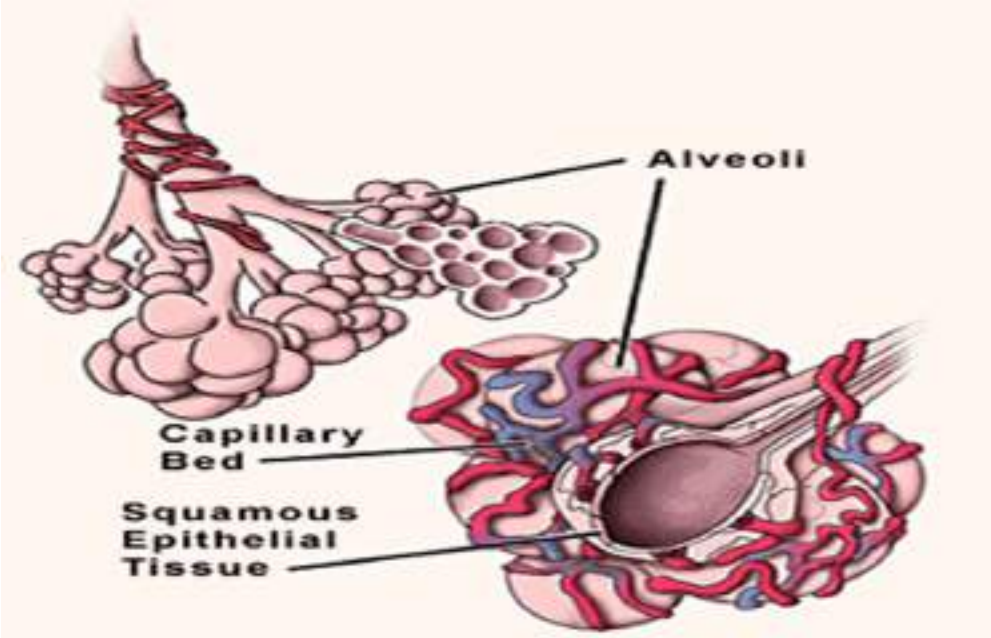
Respiratory System-I



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Physiology of Respiratory System of Domestic Animals

What is Respiration ?

- **Respiration** includes all those chemical and physical processes by which an organisms exchange gases with its environment

- **Internal Respiration** is the exchange, which takes place at the tissue level.

- **Ventilation** The act of bringing air in and expelling air from the lungs.

Mammalian Respiratory System

- ☑ *Nasal passage*
- ☑ *Larynx*
- ☑ *Trachea*
- ☑ *Lungs*
- ☑ *Thoracic cavity*
- ☑ *Pleural Sac*

TRACHEA

- Bronchi Bronchi
- Bronchioles
- Alveolar duct
- Atria
- Alveolar Sac
- Alveoli ------- single cells Structure

Important terms to remember

- Tidal volume
- Complemental Volume--- air inspired by deepest possible inspiration
- Supplemental volume
- Vital Capacity
- Residual Volume
- Respiratory /Minute Volume
- Alveolar minute Volume - air which directly comes in contact with circulation at the level of alveoli.
- **Total lung capacity** --Volume of air including vital capacity and residual volume

Dead space

- Area of respiratory tract that does not come in contact with circulation.
- Anatomical - area from external naris to the alveolus.

- Physiological

Intra alveolar/ Intrapulmonary pressure

- During inspiration its reduced due to the expansion of the lungs, as compared to the atmospheric pressure.

- Inspiration - 2 to - 3 mm Hg

Intra - thoracic pressure / Intra pleural pressure

- Intra thoracic pressure always remains negative during inspiration as well as during expiration.
- At Inspiration - 19 mm Hg
- At Expiration - 04 mm Hg
- Physiological significance Venous return
  Regurgition
  Vomition ,Defecation & Parturition

Surfactant

- Mixture of lipoprotein and is secreted by alveolar epithelium into alveoli and respiratory passage.

- This fluid contains phospholipid and lecithin.

Common Terms

- Eupnea is normal quiet type of breathing.
- Apnea is transient cessation in the respiration
- Hyperpnea is the increase in rate and depth of respiration.
- Polypnea is rapid shallow type of respiration.
- Dysnea is difficult (labored) respiration.
- Pnemothorax is collapse of thoracic cavity due to the entry of air.

RESPIRATORY MEMBRANE

- Thickness - > 1 μ
- Surface area - 70 Sq. meters
- Diameter - 7 μ
- Carbondioxide diffuses 20 times faster than oxygen.
- Thickness - Fibrosis
- Surface area

Mechanism of Respiration

- **Contraction of Diaphram**

  Inspiration longitudinal diameter is increased

- **Movement of ribs** anterio-posterior diameter of chest cage greater by 20 % during inspiration as compared to expiration
- **Abdominal Muscles**

  Sternum Muscle : lifting of sternum
  Anterior Serratins : Helps to lift ribs
  Scaleni Muscle : lifting first two ribs.

DIFFUSION OF GASES

Oxygen

Transport of Oxygen

97% is transported by chemical combination with hemoglobin and

only 3% through dissolved state

Transport of Carbondioxide

- **Dissolved state: At an average Pco_2 of 45 mm Hg, 100 ml of blood contains 2.7 ml of Co2 in various blood. In arterial blood 100 ml contains 2.4. ml of Co_2 at 40 mm Hg, so 0.3 ml Co_2 is transported in dissolved state. It accounts for 7% of Co2 transport.**
- **Transport in form of Hco3 ions: In blood Co_2 reacts with water and forms Carbonic acid in presence of enzyme Carbonic anhydrase**

REGULATION OF RESPIRATION

Nervous **Chemical**

- Recticular substance of medulla and pons.

1. Medullary rhythmicity area
2. Apneustic area
3. Pnenmooxic area

Chemical Regulation

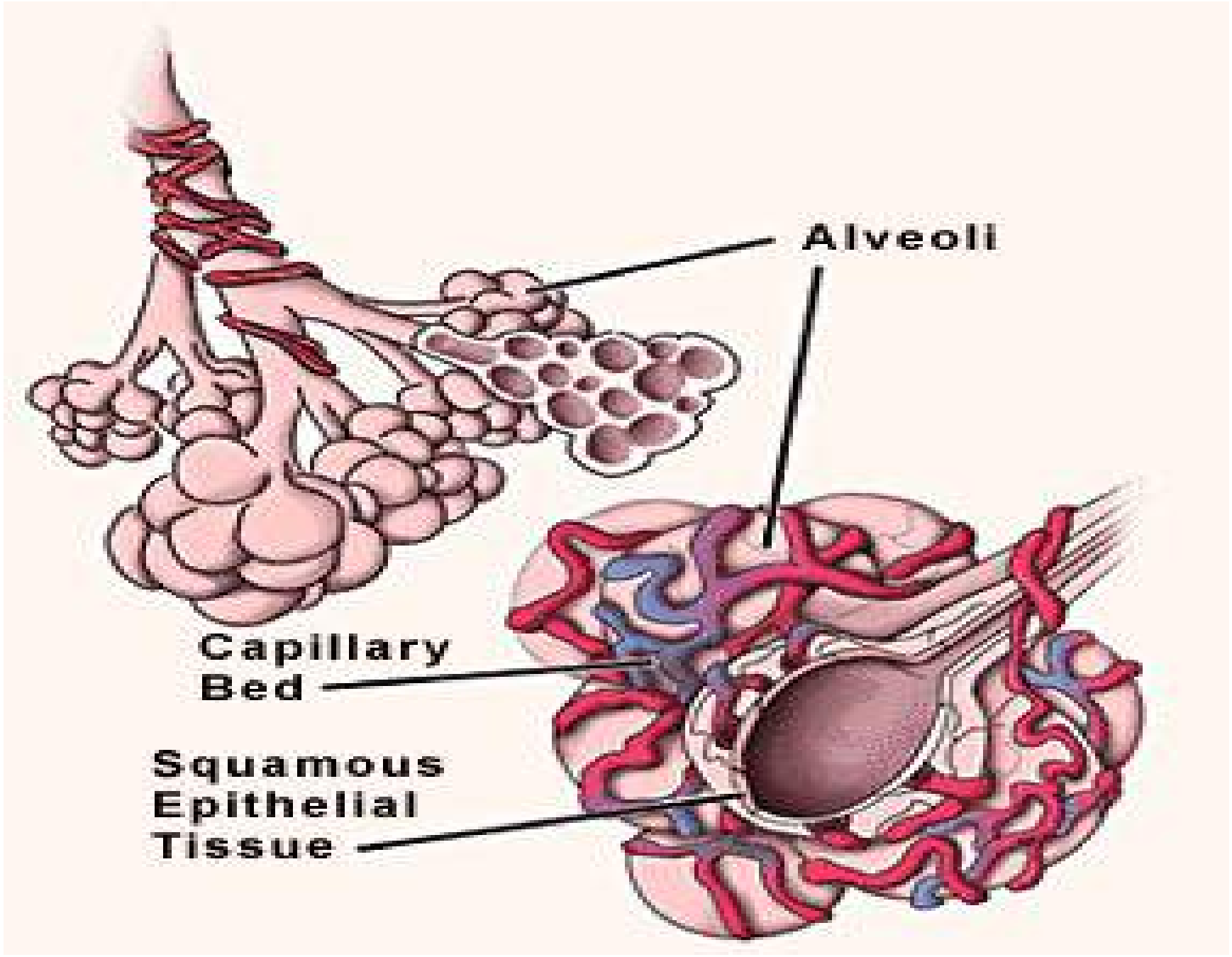
- Co_2 Respiration rate increases
- H^+ Respiration rate increases
- H^+ Respiration rate decreases.
- In case of increased Co_2 concentration in blood it diffuses into CSF but not H^+

Factors affecting respiratory center

- Walking
- Talking
- Sudden entry to shower
- Excitation by prick
- Some thing happening suddenly

Hering-Bruer Reflex

Stretch receptors are located in the walls of bronchi and alveoli, which transmits the signals through vagus into dorsal respiratory group of neurons when lungs becomes over stretched, thus inspiration is stopped, this is called as hering – breuer inflation reflex.


Alveoli
Capillary
Bed
Squamous
Epithelial
Tissue

Non- Respiratory functions

- Olfaction
- Vocalization
- Prevention from dust particles
- Defence mechanism
- Water balance
- Body temp regulation
- Acid base balance

- Anticoaulat function
- Activation of angiotension – I
- Synthesis of hormones

Thanks