

## Respiratory System Examination - An Effective Diagnostic Tool

We as Veterinarians rely a lot on physical examination, considering availability of limited diagnostic tools with field applications. Clinical examination skills are of paramount importance if early and appropriate diagnostic tests and treatment are to be instituted. Physical examination follows a sequence: inspection, palpation (feeling with the hands), percussion and auscultation (listening with a stethoscope).

### History:

Most of the times, history alone may pinpoint the diagnosis.

- Time course or duration of disease
- Number affected – Individual or group
- Age
- Recent feed changes
- Recent history of new herd additions
- Inclement weather or periods of stress (e.g. long distance transportation)
- Vaccination status

The history and physical examination is key for diagnosing the respiratory tract disease in livestock. The symptoms like cough or sneeze, history of persistent cough, nasal discharge, or abnormal breathing pattern are some of the indicatives of respiratory tract disease. Physical examination of nostrils, thorax and respiratory pattern are helpful diagnostic techniques.

### Nostrils

Examination of nostrils and nasal breath can help in diagnosing many conditions in bovine.

#### **Odour of Nasal Breath**

Odours originating from respiratory tract are usually constant with each breath and may be unilateral.

- Sweet sickly smell indicates Ketosis.
- Fetid odour suggests gangrenous pneumonia, necrosis of nasal cavities or accumulation of nasal exudates.

#### **Volume of Breath from Nostrils**

Variation in volume between nostrils, as felt on the hands, may indicate obstruction or stenosis of one nasal cavity. This can be examined further by closing off the nostrils one at a time; if obstruction is present in one nostril, closure of other causes severe respiratory embarrassment.

#### **Secretion from Nostrils**

- Secretion from one nostril- Local infection.
- Discharge from both nostrils- Systemic infection.
- Clear and colorless discharge- Early stage of inflammation.
- White to yellowish exudate- Chronic inflammation.
- Rust or prune coloured discharge indicates blood originating from lower respiratory tract like in pneumonia.
- Blood clots/blood flakes - originates from upper respiratory tract or pharynx.
- Blood from upper respiratory tract is unevenly mixed with any discharge, whereas that from the lower tract comes through as an even color.
- Bubbles or foams in nasal discharge: When the bubbles are coarse it signifies that discharge originates in pharynx or nasal cavities; fine bubbles originate in lower respiratory tract. This is observed in conditions like pulmonary oedema, haemorrhage and chronic bronchitis.
- Nasal Discharge with Saliva or Food particles: Paralysis of Pharynx.
- **Epistaxis**- blood seen near nostrils and often originates from the nasal passages, sinuses, turbinates and nasopharynx.

## Volume of Nasal Discharge

- Amount of nasal discharge increases in acute nasal catarrh, malignant head catarrh.
- Reduced amount is noted in chronic catarrh of upper respiratory tract (URT), bronchitis and pneumonia and in pulmonary tuberculosis.

## Nasal Mucous Membrane

- Hyperaemic- acute nasal catarrh (rhinitis).
- Pale mucous membranes- Anaemia, Chronic nasal catarrh.
- Cyanosis does not become apparent until 5 mg/100 mL of deoxygenated hemoglobin, about one third of the total normal hemoglobin, is present; this reflects a profound decrease in oxygen saturation of hemoglobin and is suggestive of severe hypoxemia.
- Icteric (yellowish): hepatic diseases, acute infectious anaemia and leptospirosis.
- Examine, frontal and maxillary sinuses- Identification of abnormal resonance, usually dullness, may be made easier by performing this with the mouth held open.
- Palpation of the sub-mandibular regions, larynx, pharyngeal and cervical regions should be performed to identify any abnormal lymph node enlargement, masses, or areas of muscular atrophy.
- Both jugular veins should be checked for patency and presence of any evidence of injection sites or infections that may contribute to abnormal upper airway function by interfering with normal recurrent laryngeal nerve or vagosympathetic trunk function.

## Thorax

- Respiration should be examined from a distance, preferably with the animal in standing position, because recumbency is likely to modify it considerably.
- Allowance should be made for effects of excitement, high environmental temperatures and fatness of the animal.
- Obese cattle may have respiratory rates two to three times that of normal animals.

## Form and Shape of Thorax

- Unilateral narrowing of thorax occurs in pleuritic diseases after absorption of exudate.
- Bilateral narrowing occurs in tuberculosis and rickets.
- Bilateral enlargement (barrel shape) of thorax is seen in bilateral alveolar emphysema, and bilateral exudative pleuritis.
- Unilateral enlargement of thorax maybe observed in unilateral exudative pleuritis, pneumothorax and unilateral pneumonia.

## Percussion

- Percussion determine the anatomic relationships of the normal lung to other organs and detect some abnormal states of the lung.
- Percussion is the production of sound over the chest wall created by a blow to a finger, spoon, or plexor placed against the chest wall. (Fig-1)
- Percussion over the lung field evokes a resonant or ringing sound, indicating gas or air beneath the site of percussion.
- With excess air in the lungs, the resonance, or ringing, is exaggerated.
- On percussion of thoracic wall, the area must be divided into upper, middle and lower thirds.
- The most intensive pulmonary sound is heard on percussion of the middle third where the thoracic wall is somewhat thin, curvature of the ribs is large and airwaves are deep.
- In the upper third, the heavy musculature hinders clear resonant sound of the lungs.

## Changes in Area of Percussion

- Increased area of percussion is recorded when the size of lung tissue increases, presence of large amount of air in lungs as in alveolar emphysema, in various forms of pneumonia.

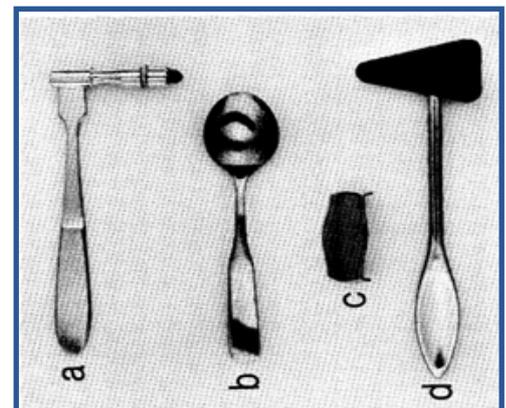


Fig – 1: Plexors (a and d) for striking and pleximeters (b and c) to be placed against the intercostal space for chest percussion. The fingers can be used in place of the plexor and the pleximeter.

- In cases of unilateral pneumonia and pneumothorax there is unilateral increase in area of lung percussion.
- Decreased area of lung percussion is seen in animals with acute gastric dilatation, tympany of intestine, ruminal tympany and in case of presence of fluids in thoracic cavity.

### **Abnormal Percussive Sounds**

- Loud resonant sound (e.g. emphysema and pneumothorax).
- Tympanic sound- When a part of lung tissue is surrounded by solidified tissue or exudate, isolating it from its environment. This occurs in following conditions
  - Early and late stages of fibrinous pneumonia.
  - Catarrhal pneumonia.
  - Pulmonary oedema and atelectasis.
  - Presence of small or large tumors surrounding lungs.
  - Prolapse of bowel into the thoracic cavity in diaphragmatic hernia.
- Dull sound is heard when lung tissue becomes dense. This occurs in
  - Pneumonic hepatization.
  - Tuberculosis and metastatic pneumonia.
  - Tumors.

### **Respiration**

The rate, rhythm, depth and type of respiration should be recorded

#### **Respiratory Rate**

In normal animals under average conditions, the rate is

- Cattle- 10 -30 per minute
- Sheep- 10 - 20 per minute
- Goats- 25 -35 per minute
- **Polypnea:** Increased respiratory rate
- **Oligopnea:** Decreased respiratory rate
- **Apnea:** Complete cessation of respiration
- The rate may be counted by observation of rib or nostril movements, by feeling the nasal air movements, or by auscultation of thorax or trachea.
- A significant rise in environmental temperature or humidity may double the normal respiratory rate. Respiratory rate may increase to six or eight times the normal in panting open-mouth breathing.
- Pathological conditions with increased respiratory rates are fever, pulmonary disease, severe cardiac disease, obstruction in upper respiratory tract and in anaemia.
- Decreased respiratory rate is rare. Occur in space occupying lesions of brain, stenosis of upper respiratory tract and in uraemia.

#### **Respiratory Rhythm**

The normal respiratory cycle consists of three phases of equal length: inspiration, expiration, and pause. Variation in length of one or all phases constitutes an abnormality of rhythm.

#### **Prolongation of Phases**

- Prolongation of inspiration is usually caused by obstruction of upper respiratory tract.
- Prolongation of expiration is often caused by failure of normal lung collapse, as in emphysema.
- In most diseases of lungs there is no pause, and rhythm consists of two beats instead of three.
- There may be variation between cycles:
  - Cheyne- Stokes Respiration- There is gradual increase followed by a gradual decrease in depth of respiration. Eg.- Advanced renal and cardiac disease intoxication.
  - Biot's Breathing- This occurs in meningitis affecting the medullary region, is characterized by alternating periods of hyperpnea and apnoea and periods often are of unequal length.
  - Periodic Breathing also occurs commonly in animals with electrolyte and acid-base imbalances. There are periods of apnoea followed by short bursts of hyperventilation.

- **Hyperventilation** is a pattern that increases alveolar ventilation and causes arterial hypocapnia.
- **Hypoventilation** alters gas exchange in such a way to cause arterial hypercapnia, or retention of carbon dioxide.

### Respiratory Depth:

- The amplitude or depth of respiratory movements may be reduced in painful conditions of the chest or diaphragm and increased in any form of anoxia.
- Moderate increase in depth is referred to as hyperpnea.
- Labored breathing is referred to as dyspnea. In dyspnea, the accessory respiratory movements become more prominent. There is extension of the head and neck, dilatation of the nostrils, abduction of the elbows, and breathing through the mouth plus increased movement of the thoracic and abdominal walls. Loud respiratory sounds, especially grunting, may also be heard.

### Type of Respiration:

- In normal respiration there is movement of the thorax and abdomen.
- In painful conditions of the thorax, e.g., acute pleurisy, and in paralysis of the intercostal muscles, there is relative fixation of the thoracic wall and a marked increase in the movements of the abdominal wall.
- There also may be an associated pleuritic ridge caused by thoracic immobility with the thorax expanded. This syndrome is usually referred to as an abdominal-type respiration.
- The reverse situation is thoracic-type respiration, in which the movements are largely confined to the thoracic wall, as in peritonitis, particularly when there is diaphragmatic involvement.

### Respiratory Noises or Stridors

These include the following:

- Coughing caused by irritation of pharynx, trachea and bronchi.
- Sneezing caused by nasal irritation.
- Wheezing caused by stenosis of nasal passages.
- Snoring when there is pharyngeal obstruction, as in tuberculous adenitis of pharyngeal lymph nodes.
- Roaring in paralysis of vocal cords.
- Grunting is forced expiration against a closed glottis, which happens in many types of painful and labored breathing.

### Respiratory Sounds on Auscultation:

The normal respiratory sound heard over the respiratory area (Fig-2) consists of vesicular sound and bronchial sound.

- **Vesicular respiratory sound/"vesicular murmur"**

The vesicular murmur resemble the sound produced when the letter "V" is whispered softly and it occurs during inspiration, but during expiration the vesicular murmur changes its character and resembles the sound of the letter "F". The vesicular murmur may be exaggerated or feeble "soft".

- **Exaggerated vesicular sound**

- Increased respiratory frequency "polypnea".
- Increased depth of respiration "hyperpnea".
- Occurs normally in young animals.

- **Feeble vesicular sound**

Thickening of thoracic wall and pleura due to any cause.

- Reduced air content of the lung as in early stages of pneumonia.
- In old animals.
- Hydrothorax, hemothorax and pulmonary neoplasms.



Fig-2: Lung Area of Auscultation

- **Bronchial respiratory sound**

- It resembles the sound produced by letter "CH". It is heard clearly in small animals and very lean old animals but in large animals it is less distinct.
- The occurrences of bronchial sound in lung are indicating of diseased condition.
- It is audible when the lung contains less air with increase in structural density of inflammatory area which acts as a good conductor of the sound as in cases of hydrothorax, hemothorax and pleurisy "Exudative stage".

- **Crepitant rales**

Occurs when the bronchial mucosa is sufficiently swollen and affection extends to involve the alveoli. So, opposing walls become adherent to one another but the stream of air still pass through small communication between them it resembles the sound produced by rubbing a tuft of hair held between fingers close to the ear. It occurs in cases of:

- Bronchiolitis.
- Early stages of pneumonia.
- Pulmonary edema.

- **Frictional sound**

- Normally the visceral and parietal pleura glide smoothly over each other, since both membranes are smooth and lubricated by clear lymph like fluid, when these surfaces are dry, frictional sound occurs.
- It resembles the sound produced by rubbing two pieces of leather against each other or by pressing the finger against the ear and stretching the finger nail of other hand. It occurs in cases of:
  - Pre-exudative stage of pleurisy.
  - Pericarditis.

- **Emphysematous sound (harch sound) or (sharp sound)**

Resembles the sound produced by collection of piece of paper between fingers and hand.

- **Girgling sound**

Resembles sound produced by gases and air bubbles, as in cases of diaphragmatic hernia (in chest) and bloat (in rumen).

- **Moist rales:**

Occurs when the bronchi and bronchioles contains thin watery mucous secretions, they are obtaining as and when air is drawn from the end of the tube under the surface of water, so it is called bubbling sound. According to the site of affection moist rales are classified into:-

- **Fine moist rales:**

Occurs when the terminal parts of respiratory tract "alveoli" are involved. They are of unfavorable prognosis.

- **Coarse moist rales:**

Occurs when the affections are confined to the bronchi and bronchioles only. It occurs in cases of:

- Bronchitis "acute"
- Bronchiolitis
- Bronchopneumonia
- Aspiration "drenching pneumonia"
- Hydrothorax
- Hemothorax
- Exudative stage of pleurisy

- **Dry rales**

Dry rales are heard when air is forced through the bronchial tube which is partially thickened by thick consistency exudate as by severe swelling of mucous membrane. It resembles the sound produced by movement of two tightly stretched papers against each other. It occurs in cases of

- Early acute stages of bronchitis
- Chronic bronchitis
- Tuberculosis

- Sometimes, heart and respiratory rate are in synchrony, confusion may arise on the source of abnormal sound; that is, whether the sound is a cardiac murmur or a harsh, abnormal breath sound?
- Blocking the nostrils for 15 seconds eliminates respiratory sounds and helps localize the abnormal sound to the cardiovascular or gastrointestinal system.
- At the same time, temporarily blocking the nostrils or using a rebreathing bag (approximately 8 L in capacity for an adult cow, 1-2 L for small ruminants or calves) to build up blood CO<sub>2</sub>, stimulates the respiratory center and causes a larger excursion of the chest for several breaths when room air is again inspired.
- Rebreathing bags are used to cause the animal to rebreathe its own expired carbon dioxide, not to necessarily deprive it of oxygen. Rebreathing expired carbon dioxide results in increased PaCO<sub>2</sub>, which stimulates deeper and more frequent breathing efforts, making recognition of abnormal lung sounds simpler. The bag used should be large enough to accommodate 2 to 3 times the normal tidal volume of the animal and should be held in such a manner as to prevent the bag from occluding the patient's nostrils. Once the bag is removed, the animal will usually take several very deep breaths and the examiner should take advantage of these very large breaths to re-examine areas where suspicious sounds were heard during re-breathing. Animals with significant lung pathology will not tolerate the bag well, may cough when the bag is removed, and may require more time to return to baseline respiratory patterns when the bag is removed.
- Sounds are normally loudest on inspiration, particularly during early to mid-inspiration.
- Expiration is a passive process and breath sounds are less intense and fade during end expiration.
- Breath sounds are louder during expiration in cases of intra-thoracic airway disease, such as bronchopneumonia, because the airway inflammation narrows the airways and forces faster flow of a similar volume of air.

Physical examination is the most important tool to diagnosis. For identifying the pathological conditions related to respiratory system also, the history and physical examination play a crucial role. In the field conditions the Veterinarians adopt some key indicators like nasal discharge, appearance of thorax, respiratory rate and sounds for identifying the route cause and select the appropriate treatment option.

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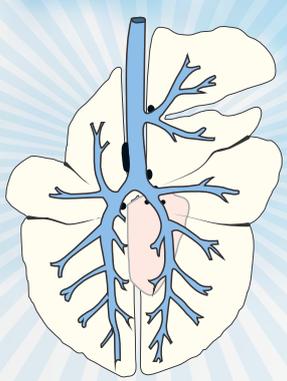


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