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**Manoj Kumar Sinha**

Department of Veterinary  
Anatomy, Bihar Animal Science  
University, Patna, Bihar, India

**Avnish Kumar Gautam**

Department of Veterinary  
Anatomy, Bihar Animal Science  
University, Patna, Bihar, India

**Deepak Kumar**

Department of Veterinary  
Anatomy, Bihar Animal Science  
University, Patna, Bihar, India

**Nayanika Ray**

Department of Veterinary  
Anatomy, Bihar Animal Science  
University, Patna, Bihar, India

## Comparative gross anatomical studies on the lungs of black Bengal goat and Garole sheep

**Manoj Kumar Sinha, Avnish Kumar Gautam, Deepak Kumar and Nayanika Ray**

### Abstract

A study was conducted on gross anatomical studies of lungs in black Bengal goat and Garole sheep. Total ten samples were collected in each species from local slaughter house. The gross appearance and relation of the lung were studied minutely, without time lapse after collection. The age, sex, body weight is not mentioned. Disposition as well as the lobation of both the lungs were found to be similar in both the animals. However minor variation in this disposition of principal bronchus, pulmonary arteries, pulmonary veins and bronchial arteries in the hiluses were detected. The dorsomedial aspect of the apical lobe of the right lung was found to be attached with the concave aspect of the trachea by connective tissue Fibers and plura in both the animals.

**Keywords:** Gross anatomy, lungs, black Bengal goat, Garole sheep

### Introduction

The respiratory system consists of organs which play an important role to carry oxygen to the circulatory system throughout body cells. Oxygen is essential for cells, which use this vital substance to liberate the energy needed for cellular activities. In addition to supplying oxygen, the respiratory system aids in removing of carbon dioxide, preventing the lethal build-up of this waste product in body tissues. The organs of the respiratory system extend from the nose to the lungs and are divided into the upper and lower respiratory tracts. The upper respiratory tract consists of nose and pharynx, or throat. The lower respiratory tract includes larynx, or voice box, trachea, or windpipe, which splits into two main branches called bronchi; tiny branches of the bronchi called bronchioles; and the lungs. The morphometrically studies of the lung and trachea are very useful due to the vital role of trachea during breathing and intubation processes during general anesthesia (AL-Zhgoul *et al.*,2013)<sup>[1]</sup>. Target of this study to be find anatomical data of lungs in black Bengal goat and garole sheep as in these species scanty information is available.

### Materials and Method

Total ten samples were collected in each species from local slaughter house. After the collection of specimens were brought to the department for preservation and subsequent processing. The external feature lung deals with the shape, weight, relationship, ligamentation and position of the lower respiratory tract and his topographic location of lungs and the shape of the organs were recorded.

### Result and Discussion

Lungs of both the species (goat and sheep) presented all most similar anatomical features other than volume. In the sheep the whole lung was more voluminous than that of goat. Out of the two lungs the right one was for bigger than that of left. However, each of the lung was composed of three lobes- Apical lobe, Cardiac lobe and Diaphragmatic lobe, like that of ox. Right apical lobe was very large, occupied the cranial aspect of the mediastinum and placed cranial to the anterior border of the heart. It was ventilated by the apical bronchus separately which originated at the level of 39<sup>th</sup> tracheal rings in case of Black Bengal Goat and 35<sup>th</sup> tracheal rings in case of sheep. The apex of the left lung extended up to 33<sup>rd</sup> tracheal ring in case of goat and 36<sup>th</sup> tracheal ring in case of sheep. The said level in case of the right lung was 29<sup>th</sup> tracheal ring in case of goat and 31<sup>st</sup> tracheal ring in case of sheep. As usual the diaphragmatic lobe of the right lung was attached with a separate small mass of lung

**Corresponding Author**

**Avnish Kumar Gautam**

Department of Veterinary  
Anatomy, Bihar Animal Science  
University, Patna, Bihar, India

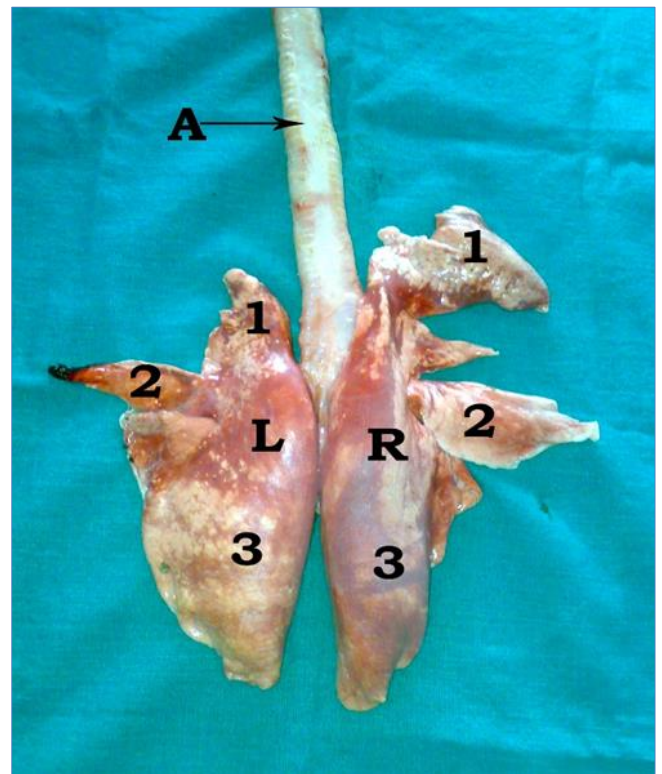
parenchyma in the form of a quadrilateral structure represented the intermediate lobe. The fissure between the apical lobe and cardiac lobe in case of left lung was indistinct in comparison to right lung. The cardiac notch of the left lung was big and formed by the union of apical lobe and cardiac lobe at a 90 degree angle. (Fig.1,2 &3).

While describing the structure of lungs of goat and sheep along with large ruminants Hare (1975) [2], Nickel and Schummer (1973) [3], Estacio *et al.* (1999) [4] and Dyce (2009) [5] have stated that left lung was composed of two lobes- Apical lobe, Diaphragmatic lobe and the right lung was composed of three main lobes - Apical lobe, cardiac lobe, diaphragmatic lobe and a small intermediate lobe. They have mentioned existence of only two lobes in case of left lung due to incomplete separation between the cardiac and diaphragmatic lobe. However Neal (1970) stated that in sheep each lung was divided into lobes known as apical lobe, cardiac lobe and diaphragmatic lobe, the right lung had an additional lobe, the intermediate lobe.

Ishaq (1980) [7] recorded that in dog the right lung was divided by deep fissures into four lobes, the apical lobe, Middle lobe and diaphragmatic lobe. There was no existence of any additional bronchus.

Hare (1975) [2] mention that the lungs of the horse unlike those of other domestic species are not clearly subdivided by deep inter lobar fissures into lobes although there were occasionally external indication of a lobar arrangement. According to him of the left lungs of horse have two lobes- Apical lobe and Diaphragmatic lobe. The right lungs had three lobes- Apical lobe, diaphragmatic and intermediate. There was no existence of apical bronchus in this species.

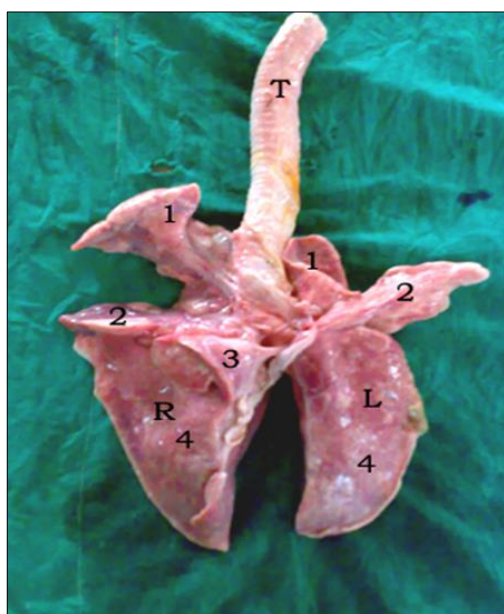
However Albert *et al.* (2009) [8] recorded that in deer the left lung was subdivided into two lobes- Cranial lobe and diaphragmatic lobe and the right lung was subdivided into four lobes- Cranial lobe, middle lobe, one extra small lobe and one accessory lobe. Presence of tracheal bronchus in deer has been mentioned by him. It was therefore observed that in most of the ruminants either domestic or wild had an additional bronchus to ventilate the right large apical lobe of the lung.



**Fig 2:** Photograph showing lung of sheep dorsal view. Trachea (A), Right lung (R), Left lung (L), Apical lobe (1), Cardiac lobe Diaphragmatic lobe (3).



**Fig 3:** Photograph showing hilus of left lung of goat. Principal bronchus (P), Pulmonary artery (A), Pulmonary vein (V).



**Fig 1:** Photograph showing lung of goat ventral view. Trachea (T), Right lung (R), Left lung (L), Apical lobe (1), Cardiac lobe (2), Intermediate lobe (3), Diaphragmatic lobe (4).



**Fig 4:** Photograph showing hilus of right lung of goat. Principal bronchus (P), Pulmonary artery (1), Pulmonary vein (2).



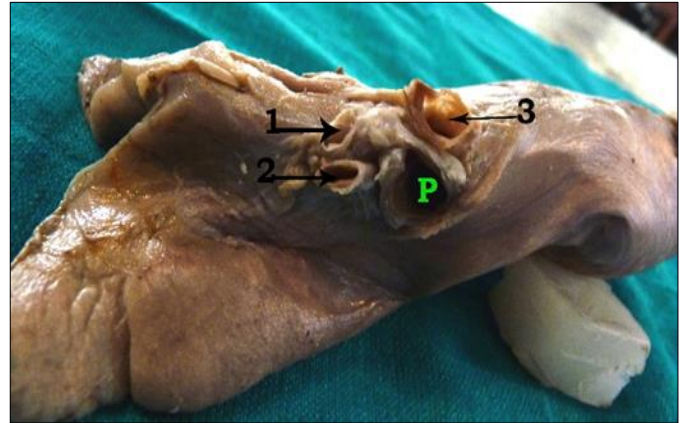
## Hilus

The hiluses of the both the lungs were situated at the junction of all the three lobes. This area was not covered by plura and placed caudodorsal aspect of the cardiac impression. It contained large opening of the principal bronchus one pulmonary artery, two pulmonary veins, along with lymphatics, nerves and bronchial artery. However due to the presence of the apical bronchus in the right lung the hilus was extended further in front. The concern branches of pulmonary artery and pulmonary veins could also be found to be in association with the apical bronchus. (Fig.4,5 & 6).

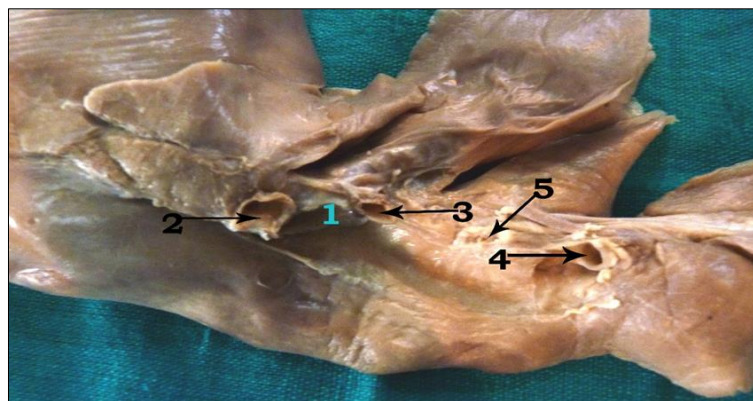
It was also observed that the placement of the pulmonary artery was closer to the principal bronchus in comparison those of pulmonary veins. Hare (1975) [2] stated that in ox the dorsal aspect to the caudal part of the cardiac impration was an area of the lung not covered by the plura which contained the bronchi, blood vessel, lymphatics and nerve entering or leaving the lungs was the hilus. He also stated that in the right lung there was a narrow area of the hilus that was intimately related to the trachea. The cranial extent of this area was the indicated by the entry in to the lung of the tracheal bronchus and its accompanying blood vessels, lymphatics, and nerves.

Neil (1970) [6] mention that in sheep the hilus was situated immediately dorsal to the cardiac impression. As per as Nickel and Schummer (1973) [3] the pulmonary vessels

accompanied the bronchi in ox. But in sheep, he stated that only the arteries accompanied the bronchi while the veins ran inter segmentally. Dyce (2009) [5] while the making a general description recorded that the pulmonary arteries normally followed the bronchi but the pulmonary veins some times ran separately alternating in position with the broncho arterial association. This pattern not only varied with the species but also with location in the one lung.



**Fig 5:** Photograph showing hilus of Left lung of sheep. Principal bronchus (P), Pulmonary artery (1), Pulmonary vein (2, 3)



**Fig 6:** Photograph showing hilus of right lung of sheep. Principal bronchus (1), Pulmonary artery (3), Pulmonary vein (2, 5), apical bronchus (4).

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