Topographical and histological study of the lung in the sheep and goats

S.E.J.Al- sadi
Colle. of Vet. Med. /Unive. of Mosul

Abstract
- The lungs are located in the thoracic cavity, protected by the thoracic cage and the lungs are covered by a serous membrane known as the pleura.
- The lung consists of paired right and left. On the medial surface there is a hilus where the primary bronchi and associated blood vessels enter and leave.
- The weight of lung in sheep are more than that of lung in goats.
- The color of lungs in sheep is rose grey but it is blue grey in goat.
- Tracheal bronchioles of the cranial lobe of right lung in sheep are branched proximal cranially than that in goats.
- The lymph nodes of the lung and cranial tracheo- bronchi in sheep are rounded and largest than lymph nodes in goats.
- The bronchial tree in all lobes of the lung in sheep distributed from secondary bronchioles. The pulmonary veins in sheep pass above the bronchial tree but in the goats their passage are between the bronchial tree.
- The elastic connective tissue in sheeps lung is more than that in goats.
- The diameters of bronchi, bronchial and alveoli in sheep are more than in goats.
- Large accumulation of lymphoid tissue near the bronchial bifurcation in lung of sheep more than in the lung of goats.

Introduction
The lungs are the major organs of the respiratory system. The respiratory system play the role of respiration. The process of gas exchange has three phases that are continuous with each other: lungs ventilation, internal respiration and cellular respiration (1,2,3,4). Also the function of the respiratory system is filtration and defense against macrophages in the air sacs(5,6). Additionally the respiratory system has extensive structural and functional connection to the cardiovascular system(7,8). The present work was done to study to topographical and histological structures of lung in sheep and goats which may serve as a guide for future physiological, pathological and surgery studies.

Materials and Methods
Lungs of five awasi sheep males and five black goat males, aged (1-2) years with an average body weight of (25-30) kilograms were collected from local slaughter house. For gross anatomy observation, weight and dimensions were recorded immediately by using single pan balance and vernier measurement (9). For histological examination, each lung was cut sagittally into five equal parts (fig.1). Sequentially numbered and fixed in (10%) neutral buffered formalin and Bouin's solution. Fixed tissues were washed in current water, dehydrated in agraded alcohol, cleared in xylol and embedded in paraffin wax. Each paraffin block was completely seially sectioned at five micrometers thickness and stained with hematoxylin and eosin and masson trichrom stian. Vasopun was used to measure the diameter and length of bronchi, bronchioles and alveoli (10,11,12).

Results
Gross observation of lung:
There are two lungs that lie with in the thoracic cavity on either side of mediastinum. This area contains the heart, trachea, esophagus and many lymph nodes. The hilus of the lung is the area on
the medial surface where the pulmonary bronchial vessels, nerves and lymph node associated with the root. Each root is aggregation the strucutres that enter and leave the lung at the hilus. The serous membrane that covers the lungs is known as pulmonary pleura, the pleura sac are free except at the roots where they are attached to the mediastinum. The two lungs are grossly a like each other in shape, although the right one is always larger, and it is a half of a cone in shape (fig.2). The weight of lung in sheep is (750-900) grams but in goats about (650-700) grams. The lungs are normally soft, spongy and kept expanded by the air pressure within the respiratory tree. The color of the lungs in sheep are fresh pink grey but the color of the lungs in goats are grey blue. The two lungs are consisted of three surfaces costal, medial and diaphragmatic, also have two borders, thick dorsal and thin ventral (fig.3). The base and apex presented toward the thoracic inlet. The costal surface is related to the ribs, the mediastinal surface has two parts a vertebral part which is related to the bodies of the thoracic vertebrae and the mediastinal part related to the mediastinum. On this part, the heart impression, which is deeper in the right lung than in the left. The diaphragmatic surface which is the convex surface in contact with the diaphragm.

**The lobes of the lung:**

In two animals the pulmonary lobes are divided by two deep fissures oblique and horizontal. The right lung has four lobes (fig.4). These lobes are: the cranial or apical, irregular middle, caudal or diaphragmatic and accessory lobes. The later one is small and lies on the medial surface of the caudal lobes of the right lung. In goat the accessoray lobe is triangular more than in sheep. The left lungs are divided into two lobes (cranial and caudal). The bulk of the lungs substance is provided by the bronchi, bronchiol, pulmonary vessels.

**The bronchi tree:**

The trachea divided into the tracheal bronchi that intering the cranial lobe of right lung in sheep proximal cranially than that the tracheal bronchi of right lung in goats (fig.5). The tracheal bronchus gives two branches, drosal and ventral ones. The trachea divided into two bronchi that supply the right and left the lungs (fig.6). Right and left principal bronch are short and have structure similar to that of the trachea(fig.7). The point of the division is marked by a ridge known as the crina or bifurcation (fig.8). The bronchi are named according to their divisions or generation. The first divisions creates the right and left primary bronchi. The diameter of tracheal bronchi, primary and secondary bronchi largest in sheep than in goats (table.1). The primary bronchi divided into secondary bronchi(fig.6,7) that enter each respective lung lobe there are two lobar bronchi in the left lung and fourth lobar bronchi in the right. Secondary bronchi divided into smaller tertiary bronchi. As the bronchi get smaller, the cartilaginous ring breaks into cartilage plates. The lymph nodes of the lung in sheep are three which found in the cranial, caudal and middle tracheal bronch. The lymph node of cranial lobe of the left lung is rounded and largest in sheep, while in goats is elongated and smallest (fig.7).

**The blood supply of lung:**

The right and left pulmonary arteries enter the lung as venous blood and they are divided in to right and left pulmonary arteries and their branches. The blood leaves the lungs throw the pulmonary veins, which also divided in to right and left pulmonary veines. The blood supply of the lung arises from the bronchoesophageal artery and follow the bronchial tree. In sheep the pulmonary veins pass above the bronchial tree but in goats their passage are between the bronchial tree (fig.8).

**Microscopic observation of lung:**

The pleura is the serous membranes covering the lung, is consist of two layers parietal and visceral that are continuous in the region of the hilus. Both membranes are composed of mesothelial cells resting on a connective tissue layer that contains collagen and elastic fibers. The elastic fibers of the visceral pleura are continuous.
with those of the pulmonary parenchyma. The lung in sheep are composed of elastic connective tissue more than in goats (fig.9,10). The respiratory bronchiolar mucosa is respiratory identical to that of the terminal bronchioles. Each terminal bronchiole subdivides into two or more respiratory bronchioles (fig.11,12). Respiratory bronchioles are lined with cuboidal epithelial cells. The alveolar duct proceeding distally along the respiratory bronchioles the number of the alveolar openings into the bronchiolar wall with the tube is called an alveolar duct. Both the alveolar ducts and the alveoli are lined with cuboidal epithelium (fig.13,14). The diameter of the bronchi, bronchiole and alveoli largest in sheep than in goats (Table.2). The lymphatic vessels and lymphatic tissue are also found in the interlobular septum. Large accumulation of lymphoid tissue near the bronchial bifurcation in lung of sheep largest than lung of goats (fig.15,16). Pulmonary blood vessels are found in the parenchyma, they are supported by connective tissue (fig.17,18).

Table(1). Diameters of tracheal bronchi extra and intrabronchi in sheep and goats in millimeter.

<table>
<thead>
<tr>
<th>Parameter</th>
<th>In sheep</th>
<th>In goats</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Diameter / SD</td>
<td>Diameter / SD</td>
</tr>
<tr>
<td>Tracheal bronchiol</td>
<td>1.70 ±0.007</td>
<td>1.30 ±0.009</td>
</tr>
<tr>
<td>Extra pulmonarybronchi</td>
<td>1.30 ±0.03</td>
<td>1.00 ±0.01</td>
</tr>
<tr>
<td>Intra pulmonarybronchi</td>
<td>0.70 ±0.003</td>
<td>0.30 ±0.005</td>
</tr>
</tbody>
</table>

Table(2) Diameters of bronchi, bronchioles and alveoli in sheep and goats in micrometer.

<table>
<thead>
<tr>
<th>Parameter</th>
<th>In sheep</th>
<th>In goats</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Diameter / S.D</td>
<td>Diameter / S.D</td>
</tr>
<tr>
<td>Bronchi</td>
<td>60×80=4800 ±0.456</td>
<td>53×80=4240 ±0.321</td>
</tr>
<tr>
<td>Bronchioles</td>
<td>15×80=1200 ±0.632</td>
<td>12×80=960 ±0.411</td>
</tr>
<tr>
<td>Alveoli</td>
<td>6×80=480 ±0.354</td>
<td>3×80=240 ±0.213</td>
</tr>
</tbody>
</table>

Dissection

Gross observation of lung:

The right and left lungs are each invaginated into the pleural sac and are free except at the roots where they are attached to the mediastinum. Anatomical descriptions are generally the lung is consist of three surface and two borders (13,14). The root of the lung situated dorsal to the cardiac impression. Is formed by the bunching together of the chief bronchus and the pulmonary artery veins, lymphatic and nerves (15). The fissures between lobes of the lung are very deep which reach almost to bronchi in carnivores while in ruminants the cranial lobes are more distinctly divided by interlobar fissure in ox than in sheep and goat especially the left cranial lobe shows on clear evidence of division but in horse the fissure is absence (16,17,18). The base of the right lung reveals the small accessory lobe, in some species the right and left chief bronchi arise at the tracheal bifurcation above the heart and after entering the lung at its root each detaches bronchus of the cranial lobe before continuing caudally (18). The number of the bronchial generations before the smaller bronchi are succeeded by bronchioles varies among species and also among parts of the one lung. In mice and other small animals only four of five generations bronchi are present, whereas more than a dozen may be necessary in large animals (19,20). In ruminant and pig

(fig:2): Show the shape of lung like to the half of a cone in sheep.

(fig:3): Show the shape of lung consist of three surface and two borders in goat and sheep.


(fig:5): 1&2 The tracheal bronchiole of the right cranial lobe of lung in sheep and goat.

(fig:6): Show the bronchiole tree in sheep and goat. 1&2 Tracheal bronchiole 3&4 Primary bronchi. 5&6 Secondary bronchi.
(Fig.7): Show the pulmonary veins in sheep and goat. 5&5 Tracheal bronchi vein. 6&6 Bifurcasion. 7&7 Primary pulmonary vein. 8&8 Secondary pulmonary vein.

(Fig.9): Section through the lung in sheep. 1. Connective tissue. 2. Alveolar duct. Stain by H&E. X320

(Fig.10): Section through the lung in goat. 1. Connective tissue. 2. Alveolar duct. Stain by Masson trichrome. X1320

(Fig.11): Section through bronchial tree in sheep. 1. Respiratory bronchi. 2. Terminal bronchi. 3. Alveolar duct. 4. Alveoli. Stain by H&E. X320

(fg.12): Section through bronchial tree in goat. 1. Respiratory bronchi. 2. Terminal bronchi. 3. Alveolar duct. 4. Alveoli. Stain by H&E. X320
(fig:13): Section through the lung in sheep. 1. Show the cuboidal epithelium in alveolar. Stain by H&E. X1320

(fig:14): Section through the lung in goat. 1. Show the cuboidal epithelium in alveolar. Stain by H&E. X1320

(fig:15): Section through the lung in sheep. 1. Show the lymph tissue. Stain by H&E. X320

(fig:16): Section through the lung in goat. 1. Show the lymph tissue. Stain by H&E. X320

(fig:17): Section through the lung in sheep. 1. Show the blood vessel. Stain by H&E. X320

(fig:18): Section through the lung in goat. 1. Show the blood vessel. Stain by H&E. X320
the tracheobronchial and mediastinal lymph nodes are lymph drains directly after passage through small pulmonary nodes (20).

**Microscopic observation of lung:**

The respiratory epithelium is pseudostratified ciliated columnar in all species (21,22). Respiratory bronchioles are not equally developed. They are not present in ruminant and swin and poorly developed in horse and man. They are well developed in monkey and carnivores (23). The terminal bronchioles open directly into several alveolar ducts in all species (24,25). The literature on previous research not dealing on large accumulation of lymphoid and connective tissue near the bronchial bifurcation in lung of sheep. Which appeared largest than in lung of goats. As well as the diameter of the bronchi, bronchioles and alveoli not detected by other research. The present results showed that the pulmonary veins in sheep pass over the bronchioles tree but in goats passage between the bronchial tree.

**References**

دراسة طوبغرافية ونسجية للرئة في الأغنام والماعز المحلية

سمية عميسي جعفر الساعدي
كلية الطب البيطري/جامعة الموصل

الخلاصة

- تقع الرئة في التجويف الصدري محتلة بالقصة الصدري وتغطي الرئة بواسطة غشاء مصلين يسمى البلورا.
- تتكون الرئة من زوجين (رئة علوي ورئة سفلي) وفي وسط كل رئة سرة بمثابة القصبة الأولية مرتبطة مع الأوعية الدموية الداخلية والخارجية.
- وزن الرئة في الأغنام أكثر من وزن الرئة في الماعز.
- لون الرئة في الأغنام حيوي ومافي الماعز مزرق.
- القصبة الرغامية لفص اللسانين للرئة الامامي تتفرع اماما اماميا في الأغنام أكثر مما هو في الماعز.
- العقدة اللمفاوية الرئوية والقصبة الرغامية في الأغنام مرتبطة وانكساخ والاوردة الرئوية تفرع عند رئة هما في الماعز.
- الشجرة القصبية في جميع فصوص الرئة تفرع إلى قصبات ثانوية وفصبيات وانكساخ والاوردة الرئوية تفرع عند رئة هما في الماعز.
- الرئة في الأغنام تحتوي على نسيج رابط أكثر مما هو في الماعز.
- أقصر القصبات والفصبيات والاوعية الدموية في الأغنام مما هو في الماعز.
- توجد تجمعات من النسيج اللمفاوي في الانقسام القصبي للرئة في الأغنام أكثر مما هو في الماعز.