Histological Study of Lung Parenchyma of the One-humped Camel (Camelus dromedarius)

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(Received July 26, 2005; accepted April 28, 2006)

Abstract


Histology of lung parenchyma of camel (Camelus dromedarius) was studied by using light microscopy. Intrapulmonary bronchi in lung of camel were lined by a respiratory epithelium. The tela submucosa of bronchi of camel was loose connective tissue with many elastic fibers, smooth muscle and cartilage. No cartilage and gland were present in bronchioles of camel. Respiratory bronchioles were absent in camel. Pores of kohn were found in alveolar wall in camel. The visceral pleura completely covered both lungs. It consisted of squamous mesothelial cells with varying amounts of elastic fibers and dense irregular connective tissue.

Key words: Histology, camel, lung parenchyma.

Introduction

The lung’s only known essential function is to provide sufficient gas-exchange surface to satisfy the organism’s need for oxygen and elimination of carbon dioxide. The histological description of the lung parenchyma of the mammals has been documented (Dellman, 1998), however, the lung parenchyma of the one-humped camel does not appear to have been investigated, hence this present study.

Materials and Methods

Lung of 7 adult camels (Camelus dromedarius) mixed sexes were used for this study. The camels were checked for health, slaughtered, then the bronchi, bronchioles and lung parenchyma were dissected free and flushed with normal saline. Samples were fixed in 10% formalin for 72 h. Tissue samples were dehydrated, cleared and embedded in paraffin. Paraffin embedded sections were cut at 6 μm with a Leica Rotary Microtome, mounted on a glass slide and stained with haematoxylin and eosin, Masson’s trichrom (MT) and Vangiesson (VG) stains for collagen fibers, Verhof for elastic fiber, Alcian blue and periodic acid shift (PAS), PAS+VG and PAS+MT. Then all samples were studied under light microscope (Olympus).

Results and Discussion

Intrapulmonary bronchi of camel were lined by a respiratory epithelium composed primarily of ciliated, secretary cells (goblet...
cell), and basal cells. The tela submucosa of bronchi of camel was loose connective tissue containing many elastic fibers and mixed submucosal glands (Fig. 1; 2) similar to that of carnivores and ruminants (cow, sheep), the horse and the pig (Dellman, 1998). The hyaline cartilage of the bronchi of camel was in the form of irregular plates.

Tunica mucosa of bronchioles of camel was simple cuboidal or columnar and devoid of goblet cell, its epithelium composed of ciliated and bronchiolar exocrine cells (Clara cell). No cartilage and gland were present in bronchioles of camels that it is similar to other mammals (Fig.3). Respiratory bronchioles were absent in camels, respiratory bronchioles were infrequently observed in ruminant and swine, poorly developed in horses and humans (William, 1990). The propria submucosa of bronchioles was loose connective tissue with elastic fibers. The epithelium of terminal bronchioles of guinea pig was comprised of two cell types, ciliated cells were cuboidal and contained long thin microvilli, ellipsoid mitochondria, both rough and smooth endoplasmic reticulum and conciliated (Clara) cell were dome-shaped and usually protruded into the bronchioles lumen (Davies, 1984).

As in other mammalian species (Plopper, 1989) submucosal glands were not observed in the bronchiolar tree of the camel. The absence of mucus-producing cells distal to the terminal bronchioles has previously been observed in other mammalian species.

![Fig. 1. Microphotograph of the bronchi in the lung of camels showing epithelium (E), goblet cell (arrow head), muscular layer (M), cartilage (C), lamina propria (LP), (Alcian blue staining, x320).](image1)

![Fig. 2. Microphotograph of the bronchioles in the lung of camels showing epithelium (E), elastic fiber (arrow head), lamina propria (LP), (Verhoeff staining, x320).](image2)

![Fig. 3. Microphotograph of the terminal bronchioles (arrow head) in the lung of camels showing epithelium (E), muscular layer (M), alveolar sac (AS), (H&E staining, x 320).](image3)
including ox (Loveannitti, 1985) and horse (Pirie, 1990), but these cells have been seen in the Rhesus monkey (Plopper, 1989) where individual mucus-producing cells, producing acidic to neutral mucosubstances have been observed within the epithelial lining of the distal airway.

The alveolar membrane was thin and attenuated. At the level of the light microscope two cell types were identified, the cuboidal alveolar type II and the alveolar type I cell with its long cytoplasmic processes (Fig. 4). At this level no mucosubstances were detected by the AB and PAS staining procedure. Mucosubstances were absent in the lining epithelium in the alveolar membrane of the goat (Kahwa, 1996), sheep and buffalo (Atwal, 1979).

Pore of kohn were found in alveolar walls in camel that was similar to other mammalian species. In bovine lung alveolar pores of kohn were small and extremely rare (Mariassy, 1975). The quantification of the pores of kohn in various species shows great variation according to the fixation technique, animal age and site to alveoli in the lung and lobules, the size of these apertures also depends on species, varying from 0.8 to 15 micron (Desplechien, 1983). During early lung development in Wister rats, the pores of kohn seem to serve as passageways for alveolar macrophages (Van Meir, 1991).

The visceral pleura of camel was a serous membrane that completely covers both lungs, except at the hilum and pulmonary ligament, it consisted of squamous mesothelium cells with varying amount of elastic fiber and dense irregular connective tissue (Fig. 5). The visceral pleura was thinnest in the dog and cat but it was thick in large domestic mammals (Dellman, 1998).

![Microphotograph of the visceral pleura in the lung of camels showing collagen fiber (CF), elastic fiber (arrow head), alveolar sac (AS), (H&E staining, x640).](image)

**Fig. 5.** Microphotograph of the visceral pleura in the lung of camels showing collagen fiber (CF), elastic fiber (arrow head), alveolar sac (AS), (H&E staining, x640).

**Acknowledgement**

The author wishes to express his appreciation to the Research Council of the Ferdowsi University of Mashhad for the financial support. I also wish to thank Mr. Poradybi for his technical assistance.

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