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Microscopic Studies Of The Foetal Lung Development In The One-Humped Camel (*Camelus dromedarius*) Obtained From Kano Abattoir

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SUMMARY

Eighty – seven foetal lung samples from camels (*Camelus dromedarius*) were collected at Kano abattoir to study lung development. Four phases of the lung development were observed as follows; pseudo-glandular phase was between 10.5 cm to 38.2 cm crown-rump length, with endodermal buds and prominent mesenchymal cells. Canalicular phase was observed between 38.7 cm to 62.2 cm crown-rump length and was characterized by thinning of the endodermal buds and invasion of capillaries. Saccular phase was noticed at 65.6 cm to 82.6 cm crown-rump length when thick intercellular septa were noticed. Alveolar phase was noticed between 85.9 cm to 121 cm crown-rump length when primitive alveolar was noticed. This study has established phases of lung development in the camel and serves as baseline information for scientific knowledge.

Keywords: Foetal lung, camel (*Camelus dromedarius*), crown-rump length, lung development and Kano abattoir.

INTRODUCTION

The one-humped camel (*Camelus dromedarius*) belongs to the family *camelidae.* This family is divided into three genera: the old world camels (genus *camelus),* the new world camels (*genus Lama* with the species *L*. glama, L. guanicoe, L. pacos) and genus Vicugna with species V. Vicugna) (Wilson and Reeder, 2005). The mean gestation period of the camel is between 315-360 days (Puschmann, 1989) and may be up to 370-375 days (Rao *et al.*, 1970; Fazil and Hofmann, 1981; Arthur, 1992). The dromedary Camel (one –humped camel) is the most important animal in the semi-arid areas of northern and eastern Africa as well as in the desert of the Arabian Peninsula (Farah, 2004). It is a multi-purpose animal, kept for its supply of milk, meat, hides and transport (Farah,

2004; Kane *et al.*, 2008). Most preterm infants (< 28 weeks gestation) born during the canalicular stage of lung development, when the lungs are surfactant-deficient, have a small surface area for gas exchange, a thick air-blood gas barrier and an under-developed pulmonary capillary bed (Alcorn *et al*., 1981). As a result, most preterm infants commonly suffer respiratory failure after birth and require respiratory support (Allison *et al.*, 2010). There is paucity of information on the developmental morphology or organs in the camels, including the foetal lung. The aim of the study was to investigate the phases of foetal lung development in the camel.

MATERIALS AND METHODS

The study was carried out in Kano abattoir, Kano state, in northwestern Nigeria, and the study was conducted in four months (between March and June). Kano state covers an area of 20,131 km^2 and is located between latitude 12° 40'w and 10° 30'N and longitude 7° 40'E and 9° 30'E. (Roger, 1999). Eighty-seven (87) foetuses were used for the study. The foetuses were collected immediately after the dams were slaughtered. Lung tissue were taken from the right cranial lobe of the eighty – seven camel foetuses after measuring the crown-rump length. Tissue specimens for histological section were fixed in 10% neutral, buffered formalin for 24 hours at room temperature prior to processing. The routine histological tissue processing for light microscopy, paraffin section method and technique were used (Mulish *et al*., 2010). Pictures of the prepared sections were taken using Amscope MT series Microscope camera (AMSCOPE^R MT 10000, Resolution 10 M pixels) mounted on a light microscope (Olympus CH23, Germany).

RESULTS

Pseudo - glandular phase was observed from 10.5-38.2cm crown-rump length. During this phase, the lungs assumed the histologic appearance of a tubulo-acinus gland (Plates I and II).

Canalicular phase was noticed at 38.7-62.2cm of crown-rump length. It showed pulmonary acini which were revealed by the thinning out of the connective tissue between them. It was also characterized by endodermal buds (Plate III). Plates III also show respiratory bronchioles.

At 65.6-82.6cm of the crown-rump length, the saccular phase was observed and characterized by thick intercellular septa surrounding the primitive saccule, and vascularization was prominent. The capillaries invaded thin layers of respiratory bronchioles (Plate IV).

At 85.9-121cm crown-rump length, the alveolar phase was observed. The respiratory bronchioles branched into the alveolar (Plate V and VI). Plate V also shows branching of bronchioles with different sizes of bronchioles (respiratory and terminal bronchioles), arterioles, venules, alveolar duct and alveolar sac. Plate VI shows the formation of alveolar ducts.

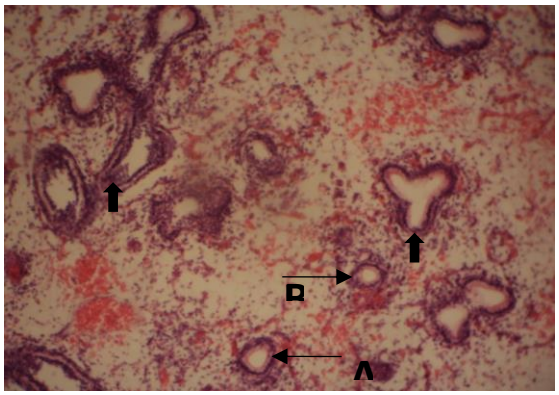

Plate 1: Photomicrograph of the Pseudoglandular phase in the camel foetal lung at 28.3 cm crown-rump length. Note the lung resembles a gland (arrow), artery (A) and capillary (B), H & E X 40

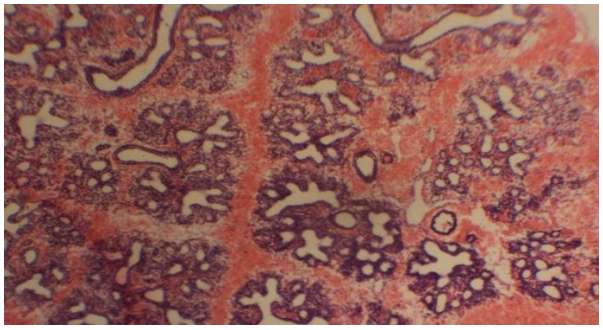

Plate II: Photomicrograph of the pseudoglandular phase in the camel foetal lung at 38.2 cm crown-rump length, note the lung resemble a gland (arrow), H & E X 40

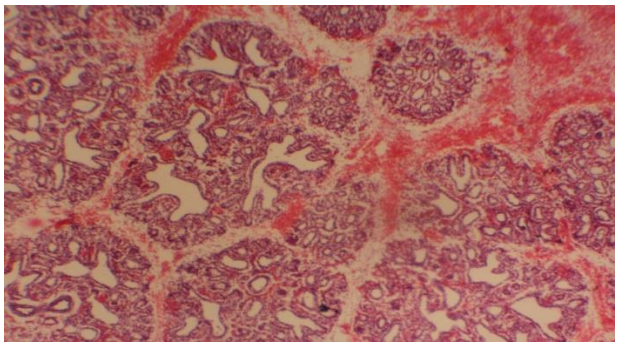

Plate III: Photomicrograph of the Canalicular phase in the camel foetal lung at 47.1 cm crown-rump length, showing the thinned endodermal buds (arrow) and respiratory bronchiole (A), H & E, X 40

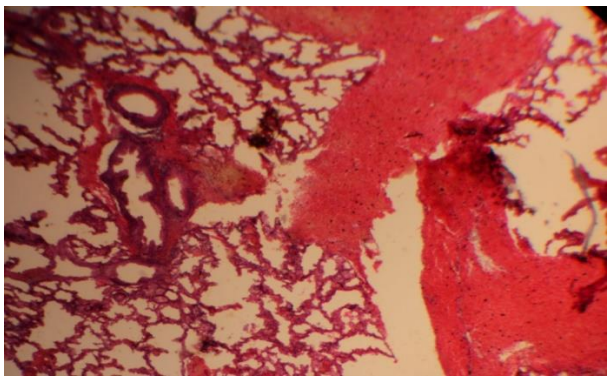

Plate IV: Photomicrograph of the Saccular phase in the camel foetal lung at 82.6 cm crown-rump length, showing the respiratory bronchiole (A), lined by capillary epithelium (arrow) and intercellular septa (B), H & E X 100

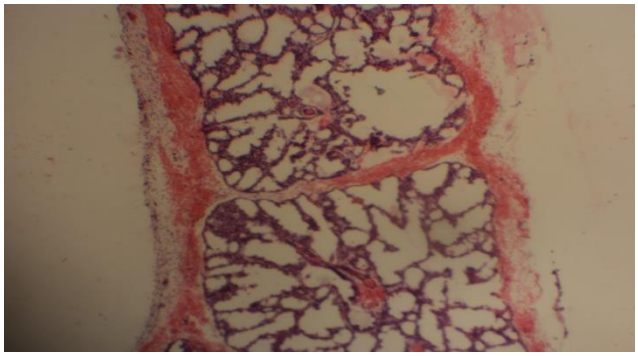

Plate V: Photomicrograph of the alveolar phase in the camel foetal lung at 85.9 cm crown-rump length, showing the formation of alveolar duct (arrow), respiratory bronchiole (A), intercellular septa (B), arteriole (C) and venule (D), H & E X 100

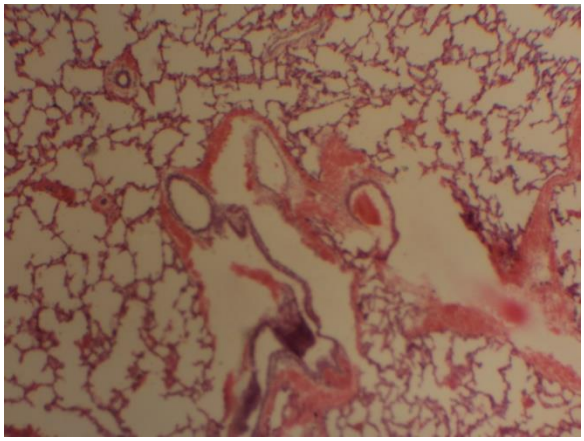

Plate VI: Photomicrograph of the alveolar phase in the camel foetal lung at 95.5 crown-rump length, showing branching of different sizes of bronchioles(1,2), arteriole (A),venule (B), alveolar duct (C) and alveolar sac (D), H & E X 100

DISCUSSION

This study has established four phases of foetal lung development in the one –humped camel (*Camelus dromedarius*). The pseudo - glandular phase, was noticed as from 13.4 – 24.3 weeks, canalicular phase was noticed as from 24.4 – 33.6 weeks, saccular phase was noticed as from 35 – 41.6 weeks and the alveolar phase was noticed as from 42.8 – 56.6 weeks. Similarly, the phases of foetal lung development in the camel reported in this study are in agreement

with the findings on white Fulani cattle in Nigeria (Mba, 2008) and the Friesian cow by de Zabala and Weinman (1984). Mba (2008) stated that the pseudo - glandular phase was noticed as from 8.4 – 15 weeks, canalicular phase was noticed between 15 - 24 weeks, saccular phase was observed between 24 - 34.5 weeks and the alveolar phase was seen at 35.5 weeks to term. This finding is in agreement with the observation in the Friesian cow, obtained by de Zabala and Weinman (1984) that the pseudo - glandular phase was from 7 – 16 weeks, canalicular phase from 16 - 24 weeks, saccular phase from 24 – 36 weeks and the alveolar phase was seen at 36 weeks to term. The differences obtained may be due to the variation in the species of the animals. The results obtained on the histology of the phase of foetal lung development of the camel showed similarity with those of the tropical and temperate breed of cattle (Mba, 2008).

CONCLUSION

This study has established four phases of foetal lung development in the one - humped camel (*Camelus dromedarius*). The pseudo - glandular phase, canalicular phase, saccular phase and the alveolar phase. Pseudo - glandular phase was between 10.5 cm to 38.2 cm crown-rump length, with endodermal buds and prominent mesenchymal cells. Canalicular phase was observed between 38.7 cm to 62.2 cm crown-rump length and was characterized by thinning of the endodermal buds and invasion of capillaries. Saccular phase was noticed at 65.6 cm to 82.6 cm crown-rump length when thick intercellular septa were noticed. Alveolar phase was noticed between 85.9 cm to 121 cm crown-rump length when primitive alveolar was noticed.

RECOMMENDATION

Further studies should be carried out as regard to other system of the body, so as to produce comprehensive information about the camel.

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