DOI : 10.5958/2277-8934.2023.00008.5 *Vol 30 No 1, p 63-67*

AN ABATTOIR STUDY OF PULMONARY LESIONS IN ADULT CAMELS (*Camelus dromedarius*) FROM EASTERN REGION OF SAUDI ARABIA

S.E.M. Barakat and F.M. ALkhoofi
Department of Pathology, College of Veterinary Medicine King Faisal University Al-Ahsa, Saudi Arabia

ABSTRACT

This study describes the gross and microscopic findings in the lungs of 450 adult camels at the AL-Ahsa abattoir (352 male and 98 female). The study showed that 14.7% of the examined lungs had one or more lesions. The most common lesions were pneumoconiosis with dilation of the alveoli 12 (17.91%), pulmonary fibrosis 9 (13.43%) and hydatid cysts 33 (49.25%). In addition various inflammatory lesions including acute mucous bronchopneumonia 2, (2.98%), chronic bronchial pneumonia 1 (1.49%), lung nodules 1 (1.49%), and lung oedema 3 (4.47%) were observed. Moreover secondary cancers, represented by malignant lymphoma 3 (4.47%) , malignant epithelial cell tumour 2 (2.98) %, and Malignant fibroblastoma 1 (1.49%) were seen. Possible explanations for the occurrence of the pulmonary lesions are discussed and the necessary recommendations are made.

Key words: Camel, fibroblastoma, pneumoconiosis, pneumonia, Saudi Arabia

Studies on the pathogenesis of camel respiratory diseases are limited. Although early reports were recorded on the incidence of tuberculosis, in Egypt (Refai, 1992), United Arab Emirates (Wernery and Kaaden, 2002; Kinne *et al,* 2006), Pakistan (Zubair *et al,* 2004), Australia (Manefield and Tinson, 1997), Ethiopia (Bekele, 2008; Mamo *et al,* 2011). Influence of camel pulmonary lesions on some hematological and clinicopathological parameters were previously reported by Nourani *et al* (2009), Abubakar *et al* (2011), Jenberie *et al* (2012), Bani (2017) and Hamid *et al* (2021). Many authors have observed the association of bacterial pneumonia with the high levels of condemnation of lungs of camels in abattoirs, AL-Tarazi (2001), Tigani *et al* (2007), Nasar Eldien (2010), Awol *et al* (2011) and Muna *et al* (2017). Isolation and characterisation of Mycobacterium species from camels with pneumonia were reported, (Elfaki *et al*, 2002; Mederos-Iriarte *et al,* 2014). However, recent studies on MERS Coronavirus in dromedary camel were carried out in Jordon (Reusken *et al,* 2013), Saudi Arabia, (Alagaili *et al,* 2014; Hemida *et al,* 2013), and Egypt (Chu *et al,* 2014). The respiratory diseases of camels have received little attention, even though they are emerging diseases in several countries causing considerable loss of production and deaths (Bekele, 1999; Rufael, 1996; Tafesse, 1996). In Ethiopia, the relevant clinical, etio-epidemiological and pathological data regarding gross and microscopic pulmonary lesions of dromedary camels and their causative agents were reviewed and summarised (Tolossa, 2022). The aim of the present study was to determine the incidence of gross and microscopic pulmonary lesions in adult camels brought for slaughter to several abattoirs in the Eastern Region of Saudi Arabia.

Materials and Methods

A total of 450 apparently healthy adult camels (*Camelus dromedarius*) of both sexes (352 males and 98 females) brought for slaughter at Al Ahsa Central Abattoir and Alomran Abattoir were included in this study. The lungs of camels were collected and grossly examined immediately after the slaughter and lesions were recorded. Samples were collected from the affected parts of each lung in 10% neutral formalin solution, which were prepared for histopathological examination using the wax paraffin method. Sections were cut 4-5 µm and stained with H&E according to the method of Bancroft and Gamble (2008).

Results and Discussion

The prevalence rate of hydatidosis between infected cases in camels under this study was 7.33% (Fig 1). This percentage was lower than previous abattoir survey reports from Egypt (Haridy *et al,* 1998), and from Ethiopia (Bekeke, 2008; Muskin, 2011 and Etana *et al,* 2015). This could be attributed to the

SEND REPRINT REQUEST TO S.E.M. BARAKAT email: seifbrkt@gmail.com

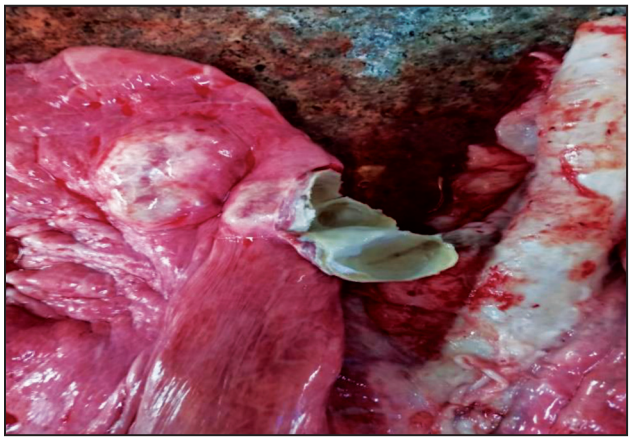

Fig 1. Hydatid cyst. The vesicles are protruding on the surface or within the parenchyma of the lung.

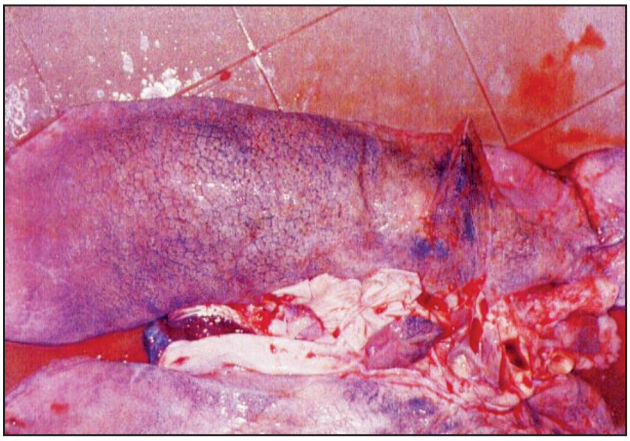

Fig 2. Pneumoconiosis. Dark deposits in the lung tissue, accompanied by the appearance of prominent lung lobules, and dilation of the alveoli.

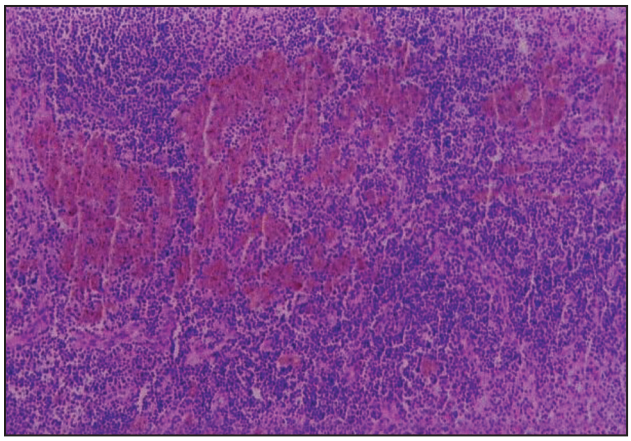

Fig 3. The bronchial lymph nodes were obliterated with aggregations of macrophages containing carbon or silicon granules. H&E × 100.

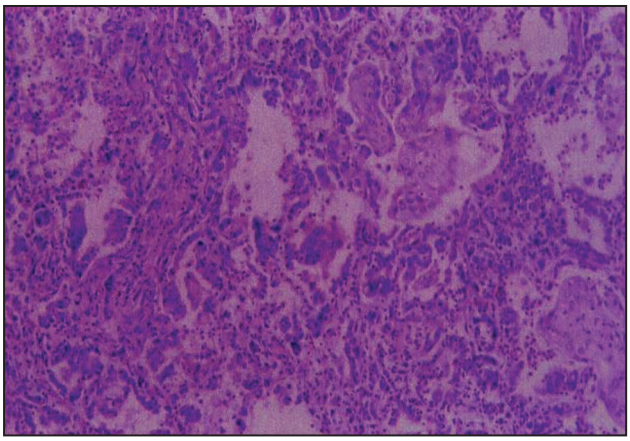

Fig 4. Chronic bronchial pneumonia-destruction of the bronchioles with fibrosis and proliferation of inflammatory cells. H&E × 100.

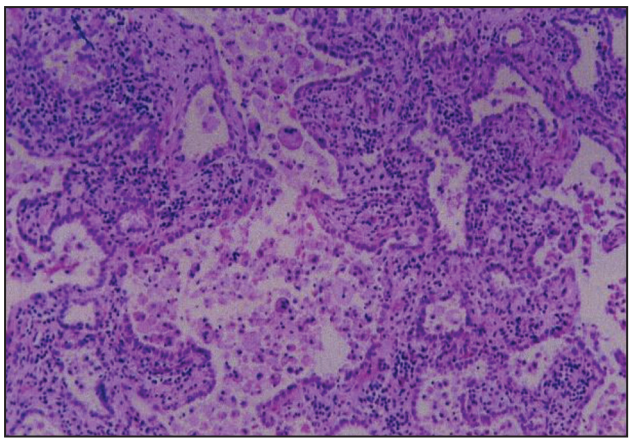

Fig 5. Pulmonary adenomatosis Presence of chronic pneumonia with hyperplasia of type 2 pneumocytes and multinucleated cells and alveolar adenomatosis. H&E × 100.

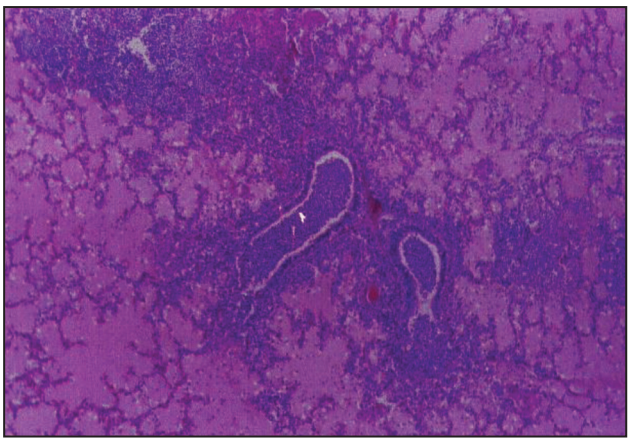

Fig 6. Acute mucous bronchopneumonia. Neutrophil infiltration inside and between the respiratory bronchioles (thin arrow) and presence of pink staining serous exudate and fibrin in the alveoli. H&E × 100.

proper condemnation procedures of carcasses after slaughter adopted in all abattoirs of the eastern region of Saudi Arabia. In this study lung infections, were few and comparable with that previously reported by Farah *et al* (1984) in Egypt and Al Darraji and Wajid (1990) in Iraq. The recorded pulmonary lesions

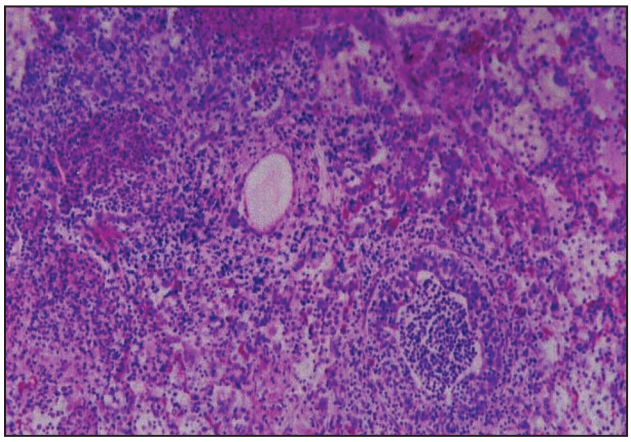

Fig 7. Chronic bronchial pneumonia obliteration of bronchioles and alveoli with inflammatory cells mainly lymphocytes and presence of serofibrinous exudate in some alveoli. H&E × 100

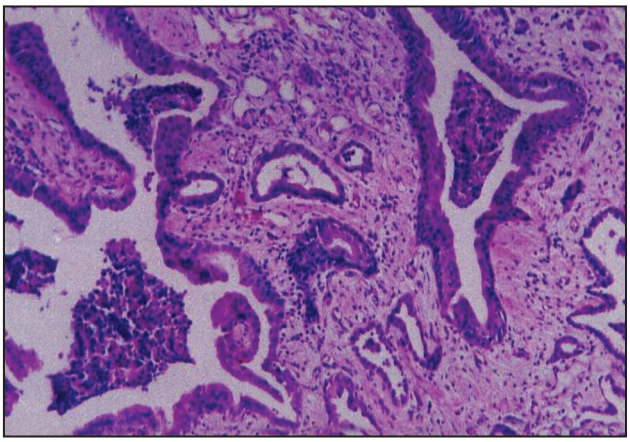

Fig 8. Pulmonary Fibrosis : Alveoli were replaced by spreading fibrous tissue, with the transformation of the mucous membrane lining the bronchi to layered epithelial cells. H&E ×200.

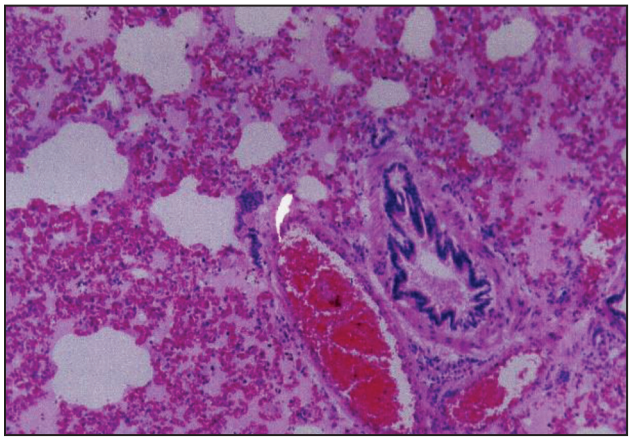

Fig 9. Pulmonary oedema: Presence of clear fluid in the alveoli with capillary congestion. H&E × 100.

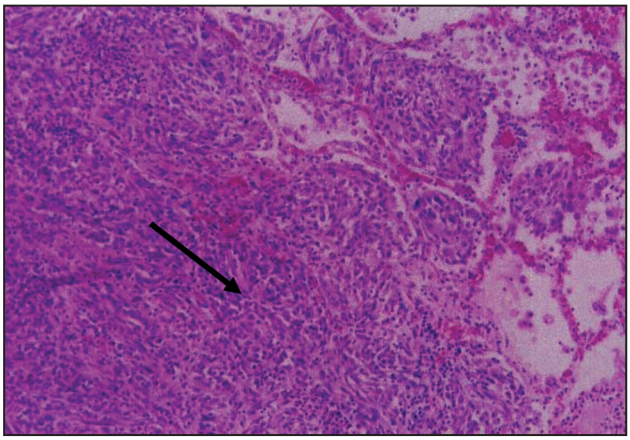

Fig 10. Malignant lung fibroblastic carcinoma. Note the presence of groups of malignant fibroblasts in the lung tissue. H&E × 100.

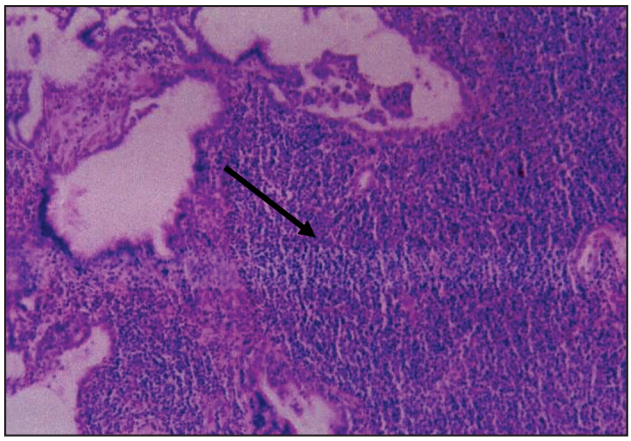

Fig 11. Malignant lung lymphoma. Note the presence of malignant small and medium lymphocytes in the lung tissue. H&E × 100.

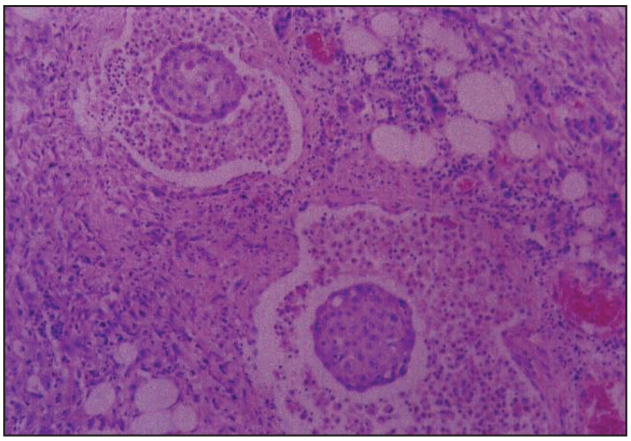

Fig 12. Malignant lung epithelial cell carcinoma. Note the presence of groups of cells in the lymphatic vessels. H&E × 200.

of acute mucous bronchopneumonia (1.49%) and chronic bronchial pneumonia (2.98%) (Figs 6, 7) may indicate previous exposure to bacterial or viral infections (Carlton and McGavin, 1995; Dungworth, 1993; Jones *et al,* 1997). However, the occurrence of respiratory infections in animals could be due

Table 1. Prevalence of naturally occurring pulmonary lesions in camel lungs (n=450).

Lesion Type	Number 450	Percentage between infected cases	Percentage between the total number of cases
Hydatid cyst	33	49.25	0.22
Pneumoconiosis	12	17.91	2.66
Pulmonary Fibrosis	9	13.43	2.0
Acute mucous bronchopneumonia	2	2.98	0.44
Chronic bronchial pneumonia	1	1.49	0.22
Pulmonary adenomatosis	1	1.49	0.22
Lung oedema	3	4.47	0.67
Malignant lymphoma	3	4.47	0.67
Malignant epithelial cell tumour	2	2.98	0.44
Malignant Fibroblastoma	1	1.49	0.22
Total	67	%	14.87

to stress and compromised immunity created by adverse environmental conditions (Mohamed, 2002; Shewen *et al,* 1993). The percentage of pneumoconiosis between infected cases in present study was 17.91%. Pneumoconiosis was demonstrated grossly as dark deposits in the lung tissue, accompanied by the appearance of prominent lung lobules, and dilation of the alveoli (Fig 2). Microscopically focal aggregates of dust laden macrophages were observed (Fig 3). This could be attributed to the dusty environment where camels are reared in the eastern region of Saudi Arabia. The diagnosed cancers, malignant epithelial cell carcinoma (Fig 12), malignant fibroblastoma (Fig 10) and malignant lymphoma (Fig 11) demonstrated in present study were possibly secondary cancers and were not reported previously. The rare occurrence of neoplasms in camelids could be due to a low prevalence of neoplasia within the population or a lack of presentation for clinical and histopathological examination (Al-Ani *et al,* 2004; Singh *et al,* 1991). In conclusion, the present study has demonstrated the common naturally occurring pulmonary lesions in camels, but the detailed epidemiological information and identification of the primary causative agents of respiratory diseases in camels need further investigation.

References

Abubakar MS, Fatihu MY, Ibrahim NDG and Oladele SB. Influence of pulmonary lesions on some haematological parameters of camels (*Camelus dromedarius*) in Northwestern Nigeria. Sokoto Journal of Veterinary Science. 2011; 9(1):1-6.

Al-Ani F, El-Qaderi S, Hailat N, Razziq R and Al-Darraji A. Human and animal brucellosis in Jordan between 1996 and 1998: a study. Revue Scientifique et Technique. 2004; 23(3):831-840.

Al Darraji A and Wajid S. Etiological and pathological study of camel's lung lesions in Iraq. Camel Newsletter. 1990; 7(12):77.

Alagaili AN, Briese T, Mishra N, Kapoor V, Sameroff SC, Burbelo PD, de Wit E, Munster VJ, Hensley LE, Zalmout IS, Kapoor A, Epstein JH, Karesh WB, Daszak P, Mohammed OB and Lipkin WI. Middle East respiratory syndrome coronavirus infection in dromedary camels in Saudi Arabia. MBio. 2014; 5(2):e00884-00814.

Al-Tarazi YH. The bacteriological and pathological study of pneumonia in the one-humped camel (*Camelus dromedarius*) in Jordan. Revue D Élevage Et De Médicine Véterinary Des Pays Tropicaux. 2001; 54(2):93-97.

Awol N, Ayelet G, Jenberie S, Gelaye E, Sisay T, Nigussie and H. Bacteriological studies on pulmonary lesions of camel (*Camelus dromedarius*) slaughtered at Addis Ababa abattoir, Ethiopia. African Journal of Microbiology Research. 2011; 5(5):522-527.

Bani Ismail Zuhair. Pneumonia in dromedary camels (*Camelus dromedarius*): a review of clinico-pathological and etiological characteristics. Journal of Camel Practice and Research. 2017; 24:49-54.

Bekele ST. Gross and microscopic pulmonary lesions of camels from Eastern Ethiopia. Tropical Animal Health and Production. 2008; 40(1):25-28.

Bekele T. Studies on the respiratory disease 'sonbobe'in camels in the eastern lowlands of Ethiopia. Tropical Animal Health and Production. 1999; 31(6):333-345.

Carlton W and McGavin M. Thomson's Special Veterinary Pathology, Mosby-Year Book. Inc. London, Tokyo, Toronto. 1995; pp 99-100.

Chu DK, Poon LL, Gomaa MM, Shehata MM, Perera RA, Zeid DA, El Rifay AS, Siu LY, Guan Y, Webby RJ, Ali MA and Peiris M. MERS coronaviruses in dromedary camels, Egypt. Emerging Infectious Diseases. 2014; 20(6):1049.

Dungworth D. The respiratory system. Pathology of Domestic Animals. 1993; pp 413-556.

Elfaki M, Abbas B, Mahmoud O and Kleven S. Isolation and characterisation of Mycoplasma arginini from camels (*Camelus dromedarius*) with pneumonia. Comparative Immunology, Microbiology and Infectious Diseases. 2002; 25(1):49-57.

Etana Debela, Buckhary Abdulahi, Bekele Megersa, Bersissa Kumsa, Fufa Abunna, Desie Sheferaw and Alemayehu Regassa. Hydatidosis of camel (*Camelus dromedarius*) at Jijiga municipal abattoir, Eastern Ethiopia: prevalence, associated risk factors and financial implication. Journal of Parasitic Diseases. 2015; 39(4):730-735.

Farah M, Shuaib M and Ibrahim I. The prevalence of some helminthic parasites and hepatic disorders in sheep,

cattle and camels in Bureida. Proceedings of the Saudi Biological Association. 1984; 1:337-339.

Hamid MEI, Omer OH and Haroun EM. Lung lesions on camels (*Camelus dromedarius*) slaughtered in Tamboul abattoir, Sudan: pathological and haematological study. Journal of Camel Practice and Research. 2020; 27(3):333-337.

Haridy FM, Ibrahim BB and Morsy TA. Studies on hydatidosis in slaughtered camels in Egypt. Journal of the Egyptian Society of Parasitology. 1998; 28(3):673-681.

Hemida M, Perera R, Wang P, Alhammadi M, Siu L, Li M, Poon LL, Saif L, A Alnaeem and Peiris M. Middle East Respiratory Syndrome (MERS) coronavirus seroprevalence in domestic livestock in Saudi Arabia, 2010 to 2013. Eurosurveillance. 2013; 18(50):20659.

Jenberie S, Awol N, Ayelet G, Gelaye E, Negussie H andAbie G. Gross and histopathological studieson pulmonary lesions of camel (*Camelus dromedarius*)slaughtered at Addis Ababa abattoir, Ethiopia. Tropical Animal Health and Production. 2012; 44(4):849-854.

Jones T, Hunt R and King N. Respiratory system In: Jones TC *et al*. Veterinary Pathology. 6th edn. Williams and Wilkinson, Baltimore. 1997; pp 965-967.

Kinne J, Johnson B, Jahans K, Smith N, Ul-Haq A and Wernery U. Camel tuberculosis–a case report. Tropical Animal Health and Production. 2006; 38(3):207-213.

Mamo G, Bayleyegn G, Sisay Tessema T, Legesse M, Medhin G, Bjune G, Abebe F and Ameni G. Pathology of camel tuberculosis and molecular characterisation of its causative agents in pastoral regions of Ethiopia. 2011; PLoS One. 6(1):e15862.

Manefield G and Tinson A. Camels: a compendium Sydney post graduate foundation vade mecum series C no. 22. Sydney: Post Graduate Foundation, Sydney University. 1997.

Mederos-Iriarte LE, Poveda JB, Poveda CG, Vega-Orellana OM, Gutiérrez C, Corbera JA and Ramírez AS. Mycoplasma detection and isolation from one-humped camels (*Camelus dromedarius*). Tropical Animal Health and Production. 2014; 46(7):1317-1320.

Mohamed R. The effect of iron compounds and other factors on the pathogenesis of pneumonic pasteurellosis in Nubian goats. Ph. D. Thesis, Faculty of Veterinary Science, University of Khartoum, Sudan. 2002.

Muna E Ahmed, Zakia AM, Abeer AM, Manal H Salih,Halima MO, Ishraga G Ibrahim and Hala AM Ibrahim. Bacteriological and histopathological studies on pulmonary lesions of camels (*Camelus dromedarius*)in Sudan. Journal of Advanced Microbiology. 2017; 5(1):1-8.

Muskin SH and Moti Y. Infection rates, cyst fertility and larval viability of hydatid disease in camels (*Camelus dromedarius*) from Borena, Kereyu and Harar Areas of Ethiopia. Global Veterinaria. 2011; 7(6):518-522.

Nasar Eldien AHK. Pathological and bacteriological studies on condemned lungs of camels at Tamboul Abattoir, Sudan. M.Sc. Thesis, University of Khartoum. 2010.

Nourani H and Rohani F. Pathological study on lungs of dromedary camels slaughtered in the central part of Iran. Journal of Camel Practice and Research. 2009; 16:51-54.

Refai M. Bacterial and mycotic diseases of camels in Egypt. Paper presented at the Proceedings of the First International Camel Conference, Feb. 1992.

Reusken CB, Ababneh M, Raj VS, Meyer B, Eljarah A, Abutarbush S, Godeke GJ, Bestebroer TM, Zutt I, Muller MA, Bosch BJ, Rottier PJ, Osterhaus AD, Drosten C, Haagmans BL, and Koopmans MP. Middle East respiratory syndrome coronavirus (MERS-CoV) serology in major livestock species in an affected region in Jordan, June to September 2013. Eurosurveillance. 2013; 18(50):20662.

Rufael T. Report on the new camel disease (Furroo) in Southern rangeland development project (SORDU): Borena. Proceedings of Ethiopian Veterinary Association 10th Conference, Addis Ababa, Ethiopia. 1996.

Sheik-Mohamed A and Velema JP. Where health care has no access: the nomadic populations of sub-Saharan Africa. Tropical Medicine and International Health. 1999; 4(10):695-707.

Shewen P, Conlon JR and Ames I. Pasteurella. Pathogenesis of Bacterial Infections in Animals, 2nd ed. Iowa State University Press, Ames. 1993; pp 216-225.

Singh P, Singh K, Sharma D, Behl S and Chandna I. A survey of tumours in domestic-animals. Indian Veterinary Journal. 1991; 68(8):721-725.

Tafesse B. Survey on the distribution of ticks of domestic animals in the eastern zone of Ethiopia. Tropical Animal Health and Production. 1996; 28(2):145-146.

Tigani TA, Hassan AB and Abaker AD. Bacteriological and Pathological studies on condemned lungs of camels (*Camelus dromedarius*) slaughtered in Tamboul and Nyala Abattoirs, Sudan. Sudan Journal of Science and Technology. 2007; 8(2):3-12.

Tolossa Yacob Hailu. Major pulmonary lesions and their etiology in dromedary camel (*Camelus dromedarius*) with particular emphasis to Ethiopian situation. International Journal of Advanced Research in Biological Sciences. 2022; 9(12):34-50.

Wernery U and Kaaden O. Infectious Diseases of Camelids. Blackwell Science, Berlin and Vienna. 2002.

Zubair R, Khan A and Sabri M. Pathology in camel lungs. Journal of Camelid Science. 2004; 1:103-106.