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Full Length Research Paper

Camel pneumonia in Nigeria: Epidemiology and bacterial flora in normal and diseased lung

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Respiratory disease is an emerging problem in camels, although information of the normal bacterial flora and bacterial agents implicated in pneumonia is rare in Nigeria. Five hundred lung samples were collected at random from two randomly selected camel slaughter house in Nigeria. Swabs samples were cultured and identified. *Arcanobacterium pyogenes*, *Mannheimia haemolytica* and *Pasteurella multocida* were recovered from pulmonary lesions, however *Staphylococcus aureus* and other *Staphylococcus* spp. were the most commonly isolated. Others agents isolated includes: *Corynebacterium* spp., *Streptococcus* spp., *Klebsiella pneumonia, Micrococcus* spp., *Bacillus* spp. and *Proteus* spp. It was concluded that, camels harbour in their lower respiratory tract potentially pathogenic agents, that may pose threat to other camels, domestic animals and/or livestock or even human populations. Therefore we suggest transboundary movements of animals be instituted and the camel herd health programme in Nigeria be maintained.

Key words: Bacterial flora, camel, epidemiology, Nigeria, pneumonia.

INTRODUCTION

Respiratory tract infections are of a common occurrence in various species of domestic and farm animals (Mohamed and Abdelsalam, 2008). Viruses, bacteria, fungi and parasites have been incriminated as the main causative agents of pneumonia in mammals (Jubb et al., 1993; Cotran et al., 1999). These agents may represents risk to camels, other livestock and even human population (Abou, 2000; Ogunsan et al., 2000; Bardonnet et al., 2002; Teshome et al., 2003). Although camels are well adapted to their environment and seem to be spared from devastating epidemic infections which threaten other livestock species in the same region, there are however a number of economically important diseases that affect camels (Kane et al., 2003; Dia, 2006). Pulmonary diseases are among the emerging problems of camels that are causing considerable loss in production and death (Bekele, 1999; Zubair et al., 2004; Kane et al., 2005). However, there is little or no information on pulmonary pathology and possible bacterial aetiology or normal lung bacterial flora in camels, especially in Nigeria. Thus there is a need to determine the pulmonary pathologies and associated bacterial agents and possibly normal lung bacterial flora of camels in Nigeria; thus the likely involvement of camels in the spread of infections as they migrate across national and international boundaries.

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MATERIALS AND METHODS

Study area

The study was carried out in Kano and Sokoto main abattoirs in northwestern, Nigeria between May and October, 2008. Kano is located between latitudes 12°40 and 10°30 N and longitude 7°40 and 9°30 E, while Sokoto covers latitude 12° and 13°58 N and longitude 4°8 and 6°54 E. The annual rain fall in the study areas is estimated to be between 500 – 550 mm by FAO in 2006. The

season in this zone is categorized into hot and dry (February - May), warm and wet (June - October) and cool and dry (November - January).

Study design

The study was conducted on camels presented for slaughter at the study areas between May and October, 2008. An initial pilot study was carried out to determined the minimum sample size [Using the formula $N = Z^2P(1-P)/D^2$ as described by Thrusfield (2007), Z = 1.96 (Normal distribution from table), P= 35% (Prevalence from pilot study), and D (Desired absolute precision of ±5% with 95% confidence)], a minimum of 349.6 350 camels were calculated as the sample size for the study. However, a total of five hundred camels were examined and sampled during the period of the study.

Sampling and data collection

Samples were collected from a total of five hundred (500) one-humped adult camels of both sexes that were presented for slaughter at Kano and Sokoto main abattoirs, between May and October, 2008. Ante-mortem examination for evidence of diseases and postmortem examinations were carried out using the routine visual, palpate and incise method (Taiwo, 2005). Lungs were examined and samples collected from normal and abnormal lungs.

Tissue samples for bacteriological and histopathological examination

The lungs were examined by visual examination and palpation for the presence of lesions; after which samples for bacteriological and histopathology investigations were collected from both normal and abnormal lungs. Samples for bacteriology were placed in polythene bags and kept in flask containing ice and taken to the laboratory. (Barrow and Feltham, 1993; Cheesbrough, 2000) . Tissue specimens for histopathological examinations were fixed in 10% neutral, buffered formalin for at least 48 h prior to processing. The tissues were processed by routine paraffin embedding technique for microscopy (Luna, 1968; Humason, 1972)

Isolation and identification of bacteria

Swabs from the lungs were streaked on plates containing blood agar enriched with 5 - 6% sheep blood and incubated at 37°C for 24 h with further re-incubation for 36 - 72 h, if no growth was observed after 24 h. Single colonies of different colony types were picked on plates containing blood and on MacConkey agar. The pure cultures were Gram-stained. Identification of bacterial agents was through cultural, morphological and in some cases biochemical characteristics (Barrow and Feltham, 1993; Cheesbrough, 2000).

Data presentation

Data obtained were summarized as gross lesions and bacteriologic agents observed were presented as tables showing frequencies of isolation.

RESULTS AND DISCUSSION

Out of the five hundred (500) camels sampled, 387 (77.4%) were from Kano, while 113 (22.6%) from Sokoto main abattoirs. Of these, 345 (69.0%) were females and 155 (31.0%) were males. Normal lungs were found in 180 (36.0%), while 320 (64.0%) had evidence of one or more lesions. The main lesions encountered include: 232 pneumonia (46.4%), 14 with hydatid cysts (2.8%), 13 with pulmonary abscesses (2.6%), 3 with pulmonary haemorrhage (0.6%), 46 with atelectasis (9.8 %), and 12 with emphysema (2.4%). One hundred and ninety six 196 (39.2%) of swab samples showed no microbial growth on culture, while 304 (60.8%) yielded bacteria. With the exception of *Arcanobacterium pyogenes, Pasteurella multocida* and *Mannheimia haemolytica,* the bacterial agents isolated from the camel with both normal and diseased lungs were similar although to a different degree (Table 1). *Staphylococcus* spp. was the most frequently isolated bacterium, which occured in virtually all the lesions encountered, except focal haemorrhage where *Mannhemia hemolytica* was isolated (Table 2).

Table 1. Bacterial isolates from normal and camel lungs with lesions at Kano and Sokoto states of Nigeria (n = 500).

Bacterial agent(s)	Prevalence (Percentage)	
	Normal lung tissue	Lesions
	(n = 180 %)	(n = 320%)
Staphylococcus spp.	41(22.8)	53(16.6)
Staphylococcus aureus	0	7(2.2)
Corynebacterium spp.	4(2.2)	35(10.9)
Arcanobacterium pyogenes	0	5(1.6)
Streptococcus spp.	12(6.7)	35(10.9)
Micrococcus spp.	4(2.2)	6(1.9)
Klebsiella pneumonia	11(6.1)	20(6.3)
Bacillus spp.	17(9.4)	16(5.0)
Proteus spp.	20(11.1)	26(8.1)
Pasteurella multocida	0	14(4.4)
Mannhemia haemolytica	0	1(0.3)
Total	109(60.6)	218(68.1)

n = Total camels sampled.

DISCUSSION

Various bacterial agents were associated with the pulmonary lesions. *Corynebacterium* spp., *Staphylococcus aureus, Streptococcus* spp., *Pasteurella* spp. were frequently isolated from severe and moderate cases of acute pneumonia, while *Micrococcus* spp., *Staphylococcus* spp., *Klebsiella pneumonia, Bacillus* spp., and *Proteus* spp. were mostly isolated from milder cases. This finding was in agreement with previous

Table 2. Frequency of bacterial isolates from lung lesions of *Camelus dromedarius* in Kano and Sokoto states of Nigeria (n = 320).

Type of lesion	Bacterial isolates	Frequency (%)
Congestion(pneumonia)	*Streptococcus* spp.	33(15.8)
	Staphylococcus spp.	28(13.4)
	Corynebacterium spp.	28(13.4)
	Proteus spp.	22(10.5)
	Klebsiella pneumonia	17(8.1)
	Pasteurella multocida	13(6.2)
	Bacillus spp.	11(5.2)
	Micrococcus spp.	5(2.4)
Pulmonary emphysema	*Staphylococcus* spp.	6(2.9)
	Corynebacterium spp.	4(1.9)
	Pasteurella spp.	2(0.9)
	Klebsiella pneumonia	1(0.5)
	Bacillus spp.	1(0.5)
	Streptococcus spp.	1(0.5)
Hydatid cyst	*Staphylococcus aureus*	4(1.9)
	Corynebacterium spp.	3(1.4)
	Bacillus spp.	1(0.5)
	Klebsiella pneumonia	1(0.5)
Pulmonary abscess	*Arcanobacterium pyogenes*	5(2.4)
	Staphylococcus aureus	3(1.4)
	Streptococcus spp.	1(0.5)
Atelectasis	*Staphylococcus* spp.	9(4.3)
	Proteus spp.	4(1.9)
	Bacillus spp.	3(1.4)
	Micrococcus spp.	1(0.5)
	Klebsiella pneumonia	1(0.5)
Focal haemorrhage	*Mannhemia haemolytica*	1(0.5)

reports that *Corynebacterium* spp., *Staphylococcus* spp., *Streptococcus* spp. and *Klebsiella pneumonia* were microorganisms commonly isolated from pneumonic lesions in camels (Zubair et al., 2004; El-Tigani et al., 2004; Kane et al., 2005). However, the isolation of that latter group from normal lung tissue suggest they represent the normal flora. However, under conditions of stress, poor sanitation, and immunosuppression, they may be involved in pneumonia in camels.

Arcanobacterium pyogenes and/or *Staphylococcus aureus* were isolated from the abscesses observed in this study. This is contrary to the isolation of *Mycobacterium* spp. (Garba and Maigandi, 1995), *Klebsiella* spp. and *Pseudomonas aerogenosa* (Zubair et al., 2004) in nodular-like supurative pneumonia. (Question: Were the plates incubated sufficiently to see the appearance of *Mycobacterium* colonies (14-28 days at 37°C No, but we ran Acid fast staining on impression smears which were negative and the isolations of *A. pyogenes* strongly suggested it's likely involvement in the abscesses. The histological appearance of abscesses were not typical of Tuberculosis and thus concluded on that basis). From the available literature, *A. pyogenes* has not been previously reported in camels as a respira-tory pathogen in this environment. The organism enters the blood stream and causes septic arthritis, suppurative lesions and abscesses in various organs and tissues, mainly in the lungs (Tolle et al., 1983). *A. pyogenes* is often isolated from the abscesses in the lungs of ruminants, pigs and sometimes people (Hinto, 1972; Hommez et al., 1991).

Pasteurella multocida and *Mannheimia haemolytica* are

commensals, residing in the nasopharyngeal microflora and are all capable of causing infection when the body defense mechanisms are impaired (Reference et al., 2006; Zamri et al., 2006). Their presence is mainly confined to ruminants with most adequately characterized strains originating from cattle, sheep and goats (Biberstein and Hirsh, 1999). However, *Pasteurella* spp. and *Mannheimia haemolytica* were observed in this study to caused severe haemorrhagic pneumonia, which had not previously been observed in this environment. Examples of the most commonly recognized diseases associated with *M. haemolytica* include shipping fever in cattle, primary and secondary pneumonia in cattle, sheep and goats, septicaemia and mastitis in sheep and a number of non-specific inflammatory lesions in various species of domestic animals (Quinn et al., 2002).

Some lung tissue with observable lesions failed to yield microorganisms on culture even though there was evidence of long standing inflammatory response. This is quite suggestive of mycobacterial infection and the incubation period for primary isolation was too short to see growth of mycobacteria and in addition this may be suggestive of probably viral implication as the causation of the lesions. However, most normal lung tissue yielded one or more bacterial types even though, Lopéz (2001) reported that normal lungs were ideally suppose to be sterile as the pulmonary macrophages continue to scavenge for bacterial agents in the lungs thereby making the lung free from pathogens as a defensive mechanism.

CONCLUSION AND RECOMMENDATION

Camels harbour pontentially pathogenic agents in their lower respiratory tract that can pose threat to camels, other domestic animals and livestock or even human population. Therefore there may exist a need to control transborder movements of camel to ensure camel health in Nigeria.

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REFERENCES

Abou EAM (2000). Brucellosis in Camels and Its relation to Public health. Assiut Vet. Med. J., 44(86): 86-105.

Bardonnet K, Piarroux R, Dia L, Schneegans F, Beurdele A, Godot V and Vuitton DA (2002). Combined Ecoepidemiological and Molecular biology approaches to assess *Echinococcus granulosus* transmission to human in Mauritania: Occurrence of Camel strain and human cystic echinococcosis. Royal Soc. Trop. Med. Hyg., 96(4): 383-386.

Barrow GI, Feltham RKA (1993). Cowan and Steel's Manual for the Identification of Medical Bacteria, 3rd Ed., Cambrige University Press, pp. 128-238.

Bekele T (1999). Studies on respiratory disease 'sonbobe' in camels in the eastern lowlands of Ethiopia. Trop. Anim. Hlth. Prod., 31(6): 333-345.

Biberstein EL, Hirsh DC (1999). *Pasteurella.* In: Veterinary Microbiology, eds D.C. Hirsh and Y.C. Zee. Blackwell Science Inc. p. 135.

Cotran RS, Kumar V, Collins T (1999). Robbins Pathologic Basis of Disease. 6th Edition. W.B. Saunders, Philadelphia, pp. 697-775.

Dia ML (2006). Parasites of the Camel in Burkina Faso. Trop. Anim. Hlth, Prod., 38: 17-21.

El Tigani A, Abdulkhalig B, Adam A (2004). Studies on Pathological changes of condemned lungs of One-humped camels (*Camelus dromedarius*). Rural Poverty Reduction Through Research for Development, Deutscher Tropentag, October 5-7, Berlin.

Food and Agriculture Organization (FAO) (2006). Improvement in rainfall conditions in July and start of the 2006-2007 growing season in widespred areas of the sahel. Monthly Report on Food Security Update for the Sahel and west Africa.http://www.reliefweb.int/rw/RWFile2006.nsf/filesByRWDocUnidfilename/RMOI-6ZPMMR-full-report.pdf/ Retrieved April 3, 2009.

Garba HS, Maigandi S (1995). Diseases of Camels (*Camelus dromedarius*) encountered at slaughter at the Abattoir in Sokoto, Nigeria. Trop. Vet., 13(3-4): 95-102.

Hinto M (1972). Bovine abortion associated with *Corynebacterium pyogenes.* Vet. Bull., 42: 753.

Hommez J, Deuriese LA, Miry C, Castrycy F (1991). Characterization of 2 groups of Actinomyces like-bacteria isolated from purullent lesions in Pigs. J. Vet. Med. Series B., 38: 575-580.

Humason LG (1972). Animal Tissue Technique, 3rd Ed. W.H. Preeman Company, San Francisco, pp. 153-186.

Jubb KVF, Kennedy PC, Palmer N (1993). Pathology of Domestic Animal. 3rd Ed. Academic Press, New York. p. 2.

Kane Y, Diop A, Isselmon E, Kaboret Y, Ould Mekkhalle M, Diallo BC (2003). Contraintes Majeures de Eélevage Canelin en Mauritaure. Revue Africaine de Sante et de Prod. Animales, 1(1): 31-37.

Kane Y, Kadja MC, Bada-Alambedji R, Bezeid OE, Akakpo JA, Kaboret Y (2005). Lung lesions and bacteria of the One-Humped Camel (*Camelus dromedarius*) at Nouakchott Slaughterhouse in Mauritania. Revue d Élevage et de Médecine Véterinaire de. Pays Tropicaux, 58(3): 145-150.

Lopéz A (2001). Respiratory system, Thoracic cavity, and pleura. In: McGavin, M.D.,Carlton, W.W. and Zachary, J.F. (Ed.) Thomson's Special Veterinary pathology 3rd Ed. Mosby, A harcourt health sciences company, London, pp. 125-191.

Luna LG (1968). Manual of histologic staining Methods of the armed forces Institute of pathology. 3rd Edition, Mcgraw-Hill, New york , USA. pp. 1-47.

Mohamed RA, Abdelsalam EB (2008). A Review on Pneumonic Pasteurellosis (Respiratory Mannheimiosis) with Emphasis on Pathogenesis, Virulence Mechanisms and Predisposing Factors. Bulgarian J. Vet. Med., 11(3): 139-160.

Ogunsan A, Umari O, Bannor TT, Majiyagbe KA (2000). Hydatidosis in Slaughtered camels in Sokoto State, Nigeria. Nig. Vet. J., 21: 1-9.

Quinn PJ, Markey BK, Carter ME, Donnelly WJ, Leonard FC (2002). Veterinary Microbiology and Microbial Disease. Blackwell Science, pp. 137-143.

Taiwo VO (2005). A Manual for Necropsy Procedure for Veterinary Students and Clinician. Dabfol Print and pack Limited, Dugbe, Ibadan, Nigeria, pp. 2-21.

Teshome H, Molla B, Tibbo M (2003). A seroprevalence Study of Camel brucellosis in three Camel-rearing regions of Ethiopia. Trop. Anim. Hlth. Prod., 35(5): 381-390.

Thrusfield M (2007). Veterinary Epidemiology (3rd Edition), Vet. Epidemiol., pp. 434-440.

Tolle A, Franke V, Reichmuth J (1983). *Corynebacterium pyogenes* mastitis-Bacteriological aspects. Deut. Tierarztl. Woch., 90: 256-260.
Zamri-Saad M, Ernie A, Sabri MY (2006). Protective effect following Intranasal exposure of goats to live *Pasteurella multocida* B:2. Trop. Anim. Hlth. Prod., 38: 541-548.
Zubair R, Khan AMZ, Sabri MA (2004). Pathology of Camel Lungs. J. Camel Sci., 1:103-106.