

PREVALENCE OF TUBERCULOSIS IN SLAUGHTERED CAMELS (*Camelus dromedarius*) BASED ON POST-MORTEM MEAT INSPECTION AND ZEIH-NEELSEN STAIN IN NIGERIA

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ABSTRACT

This study aimed at determining the prevalence of tuberculosis, based on post-mortem meat inspection and Zeihl-Neelsen Stain in slaughtered camels. A total of 500 camels, consisting of 188 males and 312 females, slaughtered at Kano (Sahel part of northern Nigeria) abattoir were subjected to detailed meat inspection, out of which 83 were suspected to have lesions that were compatible with tuberculosis, with a prevalence rate of 16.6%. Thirty six were males with a prevalence rate of 19.1% and 47 were females with a prevalence rate of 15.1%. Samples were obtained from suspected gross tuberculous lesions and subjected to acid-fast stain, out of which 9 were positive with a prevalence rate of 10.8%. Three were males with a prevalence rate of 8.3% and 6 were females with a prevalence rate of 12.8%. The chi-square (χ^2) test of significance based on sex was not statistically significant ($P>0.05$). This study highlights the importance of meat inspection in camels and its public health implications. Measures for control are also suggested. Hence, more emphasis should be directed at the improvement of meat inspection services in Nigeria since there are no available laboratory facilities for confirmatory diagnosis of tuberculosis in the abattoirs.

Key words: Camel, meat inspection, Zeihl-Neelsen stain

Tuberculosis (TB) in camels has been documented since the 19th century (Lingard, 1905; Leese, 1908 and Littlewood, 1989). Leese (1969) reported high frequency in Egyptian camels while Mason (1917) indicated that in one Cairo abattoir the incidence of tuberculous carcasses was 2.9%. Tuberculosis is widely distributed throughout the world with serious effect on animals and is also of significant public health importance (O'Raeilly and Dabon, 1995). The TB-like lesions were found mostly in the liver and lungs but sometime generalised throughout the viscera. He concluded that camel tuberculosis was caused by the same bacilli as the bovine type (*M. bovis*). Wernery *et al* (2007) reported a recent outbreak of tuberculosis in a camels racing herd of 58 camels in which 3 camels were involved. The disease was confirmed at necropsy by finding gross lesions from which *Mycobacterium bovis* was isolated. Diagnosis of TB in camels faces many difficulties (Wernery and Kaaden, 1995), with none of the standard available tests being able to detect the disease. The intradermal tuberculin test, which is the traditional diagnostic tool in cattle, appears to produce too high a non-specific reaction in camels.

Schillinger (1987) reported false-positive results of the skin test in 10-20% of Australian camels.

There is virtually no documented report of the disease in camels and very little is known on the true epidemiology of the disease in the country. It is therefore imperative that simple, inexpensive and relatively non-invasive method for diagnosis of camel tuberculosis be put in place. One of the most efficient and practical way of doing this is through proper gross meat inspection to detect a gross tuberculous lesions as described by Corner (1994). Adequate palpation of lesions at PM with production of gritty sound on incisions of some of the organs and lymph nodes form the basis of tentative diagnosis of TB in camels as in other animals. This form of diagnosis, though not confirmatory, is still better than tuberculin test that has been found to be not as reliable in camels as it is in cattle (Schillinger, 1987).

The aim of this study is to determine the prevalence of TB based on post-mortem meat inspection and Zeihl-Neelson Stain in slaughtered camels. This will improve the level of epidemiological knowledge of tuberculosis in camels in Sahel part of

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Nigeria where camels are increasingly used as source of meat, milk, hide and as beast of burden.

Materials and Methods

Study Area and Animals

The study period was June - September 2008 which corresponds to a time of massive livestock movements and when camel owners from neighboring countries (Chad and Niger Republic) enter Nigeria in the course of their seasonal migration for better pastures and water. This is the critical time range when large influx of camels into Northern Nigeria is seen and hence the best times to sample as both healthy and ill camels are on the move. The ones that are old or not doing well are sold for slaughter while the apparently healthy ones are retained. More so, during this period, there is known to be scarcity of other meats hence Camel meat is used to cover the shortages. It is important to note that camels are not slaughtered in Northern Nigeria for any festivities.

A total of 1395 camels, aged at least five years and of both sex, either for slaughter (855) or draft (540) in the camel markets and abattoirs of Sokoto, Kano and Maiduguri and representative of camel draft or slaughter activity in Northern Nigeria were sampled. The age of each camel was obtained from the owner's record, otherwise it was estimated by observing the conformation of teeth (Schwartz & Dioli 1992; FAO, 1994). For proper sampling, the team was distributed into the three study areas, assisted by local field staff. The whole group assembled at the end of the period in the Ahmadu Bello University Zaria-Nigeria for data analysis and interpretation.

Sampling

A total of 500 slaughtered camels were sampled and examined at post-mortem for TB lesions. Visceral organs and lymph nodes were inspected through careful visual palpation and incision procedures for nodules and granulomatous lesions as described by (Corner *et al*, 1990). Tissue samples were collected from camels with suspected lesions of TB in sterile screw-capped containers (with normal saline solution to keep them moist) and transported on ice to the laboratory where these were processed for acid fast staining.

Acid-fast/Ziehl-Neelsen Stain

Ziehl-Neelsen staining was carried out using standard protocol as described by Kazwala *et al* (1998) to detect acid-fast bacilli from granulomatous tissue samples collected during the meat inspection.

The bacilli appeared red, straight or slightly curved rods present either singly or in groups while non-acid-fast microorganisms stained blue.

Data analysis: Chi-square was used to analyse the relationship between sex and suspected TB lesions. Prevalence was calculated using the formula:

$$\text{Prevalence} = \frac{\text{Number of sample positive} \times 100}{\text{Total sample collected}}$$

Result

Out of total of 500 slaughtered camels 83 were suspected to have gross TB lesions (Fig 1) with an overall prevalence rate of 16.6%, 36 were males with a prevalence rate of 19.1% and 47 were females with a prevalence rate of 15.1% (Table 1). The distribution of suspected gross TB lesions in different organs of affected camels shows that the lungs has the highest number of suspected gross TB lesions with 57 (62.6%), followed by lymph nodes with 24 (26.4%) while liver, intestines and spleen having 6 (6.6%), 3 (3.3%) and 1 (1.1%), respectively. Out of 83 with suspected gross TB lesions (consisting of 36 males and 47 females) 9 were positive with acid fast stain giving a prevalence rate of 10.8%. Males were 3 with a prevalence rate of 8.3% while females were 6 with a prevalence rate of 12.8%. The chi-square (χ^2) test of significance based on sex was statistically non-significant ($P > 0.05$).

Table 1. Prevalence and Chi-square test for tuberculosis based on suspected gross-TB lesions in slaughtered camels.

Sex	Camels tested	Positive	Negative	Prevalence	(P-Value)
Male	188	36 (31.2)	152 (156.8)	19.1%	(0.143)
Females	312	47 (51.8)	265 (260.2)	15.1%	
Total	500	83	417	16.6%	

$P < 0.05$) regarded as significant

Discussion

In Nigeria, tuberculosis in camels has not been extensively studied in comparison with other domesticated species of animals especially cattle. The result obtained in this study showing 16.6% and 10.8% prevalence rates for post-mortem meat inspections and acid-fast stain, respectively is of immense epidemiological and public health significance. This is important because traditional practice exist here in Sahel part of northern Nigeria that could facilitate the transmission of tuberculosis between camels, cattle, sheep, goats and humans, during watering and grazing. Camels are reared and used in close proximity with their owners giving ample

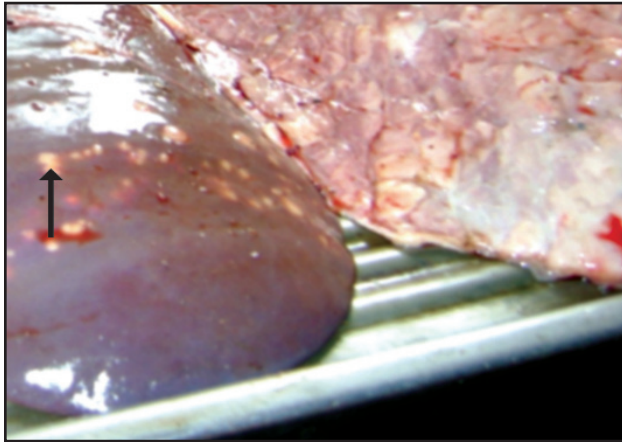


Fig 1. Suspected gross TB lesions in one of the camel slaughtered.

opportunity for zoonotic transmission. However, the zoonotic potentials of the disease in camels should not be overlooked. The dangers lies in the fact that the western way of eating undercooked meat and improperly roasted meat “suya” and “kilishi” is gaining ground in Nigeria (Bale, 1991), though no study has isolated the organism in camel meat in the country.

The prevalence rate reported in this study is very high compared with the previous report of 2.9% for camels in Cairo abattoir by Mason (1917). It could be as a result of nomadic nature of the Fulanis who own most of the Nigerian livestock and also because of the porosity of the borders and the influx of livestock from neighbouring countries (Osholi, 1990).

The detection of suspected gross TB lesions in slaughtered camels at abattoir possess great danger of contacting the disease by the public especially abattoir workers and butchers. This is because camels are usually slaughtered in abattoirs where the butchers wear minimal protective clothing and process meat with their bare hands. It further confirms that appropriate control measures are not in place or inadequately applied; because in countries where control of TB is in place, detection of gross lesions at the abattoir during meat inspection is usually very minimal. This finding also agrees with an earlier suggestion that, abattoir monitoring could be an essential element in the national TB campaign and the most effective means of detecting residual infection especially in countries that have achieved control of the disease (Corner *et al*, 1990).

Table 2 shows that 62.6% of the lesions that were found to be positive for suspected gross-TB lesions were from the lungs followed by lymph node

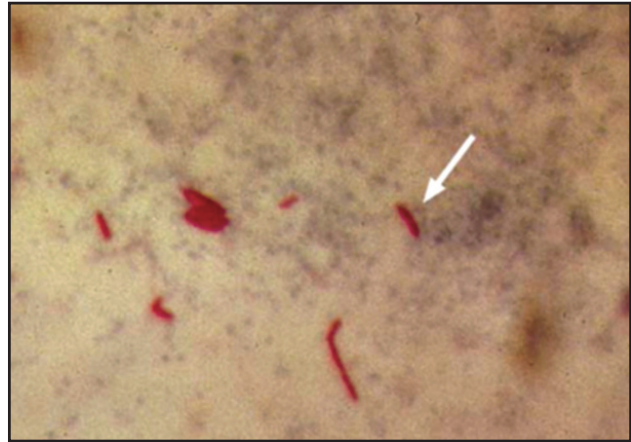


Fig 2. *Mycobacteria* spp (acid-fast positive) under the microscope.

which agrees with an earlier study where it was found that 70-90% TB lesions were found in the lungs and lymph nodes of the head or thoracic cavity (Lepper *et al*, 1973; Neill *et al*, 1994; Palmer *et al*, 2002 and Philips *et al*, 2003). It further confirmed the suggestion that the most common route of transmission is through aerosol.

Another finding in this study (Table 3) is the result of the acid-fast stain from samples suspected to have lesions compatible to TB during post-mortem meat inspections (Fig 2). Since culture is not usually done as a diagnostic tool in Nigeria as in most economically constrained countries, not many report of TB by culture are available in the country.

Table 2. Distribution of suspected gross TB lesions in different organs of slaughtered camels.

Organs	Location of TB-lesions	Percentage (%)
Lungs	57	62.6.%
Lymph node	24	26.4%
Liver	6	6.6%
Intestine	3	3.3%
Spleen	1	1.1%
Total	91	100%

Table 3. Prevalence and Chi-square test for tuberculosis, based on Acid-fast stain from suspected gross TB lesions.

Sex	Sample tested	Positive	Negative	Prevalence	(P-Value)
Male	36	3(3.9)	33(32.1)	8.3%	(0.3924)
Females	47	6(5.1)	41(41.9)	12.8%	
Total	83	9	74	10.8%	

P<0.05) regarded as significant

The chi-square test indicates that there was no significant relationship between sexes for the 2 methods. This may be attributed to the fact that TB does not discriminate between sex, terms of infection.

Although, both of 2 procedures carried out in this study were not confirmatory (Isolation and identification of the organism is the gold standard). It is to be noted that the presence of other bacteria like *Nocardia* could present similar nodular lesions and be positive to acid fast-stain. However, the procedures help to a great extent in reducing the spread of zoonotic tuberculosis found in most developing countries like Nigeria. This becomes useful since most slaughter houses and abattoir do not have facilities to confirm tuberculosis and similar bacterial disease (Cadmus *et al*, 2007). In such situations when meat inspections procedures are properly carried out, 95% of animal with visible lesions can be identified (Corner, 1994). Tuberculosis is likely to continue to be a serious zoonotic disease in Nigeria and neighbouring countries. Nomadism is common, and nomads often cross the borders from neighbouring countries into Nigeria in search of pasture and trade. At the moment these countries have not instituted any extensive TB control programme for their livestock.

Conclusion

From this study, 16.6% and 10.8% of a sample of 500 slaughtered camels in Sahel part of northern Nigeria were found to be suspected based on gross TB lesions and acid-fast stain, respectively. Transmission of this agent among other domesticated species is believed to be the most likely source of the infection since camels are traditionally herded together with other species of animals. Control could only be achieved when all susceptible domestic species are considered together and intergovernmental cooperation is initiated to prevent cross-border spreads. Proper abattoir hygiene and proper post-mortem meat inspection are necessary to prevent infection in humans. However, this study indicates that a widespread and detailed epidemiological study is needed to ascertain the true extent of TB infection in Nigerian livestock including camels before initiation of a control program.

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