Short Communication

Transmission of Zoonotic Mycobacterium Africanum between Human and Cattle in Gujuba, Yobe State, Nigeria

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ABSTRACT

Background: Tuberculosis is one of the most important infectious diseases of humans and cattle in Africa. This study aimed at reporting a transmission of zoonotic Mycobacterium africanum between human and cattle.

Methods: A bull was tested positive for Mycobacterium infection based on single caudal fold intradermal tuberculin test, but showed no gross TB pathological lesions after post-mortem meat inspection. The cattle rearer was also diagnosed with active pulmonary TB in a hospital. The cattle rearer 's sputum and the bull 's bronchial, retropharyngeal and mediasternal lymph nodes were obtained, processed and cultured, where tubercle bacilli was isolated. The isolates were subjected to SD Bioline TB Ag MPT64 as well as Genotype MTBC.

Results: Both the rearer's sputum as well as the bull's lymph nodes yielded Mycobacterium africanum which is primarily a human pathogen and has rarely been isolated from cattle. Based on our knowledge, this is a first case of possible human to cattle transmission of Mycobacterium africanum in the study area.

Conclusions: The isolation and identification of M. africanum species from both human and cattle is of epidemiological and public health importance especially to abattoir workers and cattle rearers. An animal attendant with active pulmonary TB may represent an important source of the disease for animals, spreading the bacilli via sputum, urine or faeces. The report highlights the importance of M. africanum and it zoonotic public health implications between humans and cattle transmission. Measures for control should be instituted.

INTRODUCTION

Tuberculosis (TB) is among the diseases that have threatened the health and lives of people and animals in the past century [1]. It is caused by pathogenic members of the genus Mycobacterium which are commonly known as members of Mycobacterium tuberculosis complex (M. tuberculosis, M. bovis, M. africanum, M. microti, M. cannetti and M. pennipedii)[6,8,11]. Tuberculosis is widely distributed throughout the world with serious effect on animals and is also of significant public health importance[7].

The Nigerian government formally launched its National TB and Leprosy Control Program (NTBLCP) in 1991 and adopted the World Health Organization (WHO) - recommended 'Directly Observed Therapy-Short Course Strategy' (DOTS) in 1993. The DOTS program was established as the control method for TB in humans and is integrated into the Primary Health Care of the country through the Federal Ministry of Health [9].

Despite this expression of political will to control human TB in Nigeria , and a clearly articulated national TB policy , it has not resulted in allocation of sufficient financial support necessary for the effective implementation of this policy [3]. Effective control is also affected by inadequate trained personnel and political instability , poor health infrastructure and facilities , poor referral system , poor procurement and supply management system and poor donor coordination /management locally and internationally . Most importantly , diagnosis of TB stops at the smear level , hence the species involved in causing the disease are not known thereby making it difficult to study outbreaks , trace the routes of transmission and also identify the species and strains of Mycobacterium involved[2].

Another major setback is the inability of the national TB control program to recognize the significance of *M. bovis* , which is a major public health problem and the general lack of collaboration between human and veterinary medical personnel in this regard . Generally , there has been total lack of synergy and harmony of laws regulating the control of human and bovine tuberculosis in the country[5].

The control of animal TB in Nigeria is regulated by the Federal Ministry of Agriculture . However , this control policy as stated in the Animal Diseases Control Decree of 1988 is poorly or inadequately implemented in recent years . This is largely due to politico - economic reasons , such as the high cost of sustainable testing and slaughter of infected animals and the subsequent compensation to farmers . Added to this is the problem of social unrest due to political instability and ethnic wars especially between the Fulani herders and local farmers , resulting in the displacement of large numbers of human and animal populations [10]. Also , socially , the test and slaughter method of controlling bovine TB is not accepted by the Fulani nomads who own most of the cattle population in Nigeria . There is also the lack of adequate veterinary personnel to implement control measures such as rigorous meat inspection at abattoirs . Poor communication networks , insufficient collaboration with neighboring countries and the lack of quarantine , and smuggling of live animals across state boundaries have also been identified to cause problem in controlling the disease in cattle[10].

From the public health point of view and based on the reports of the prevalence of both human and bovine TB in Nigeria , it can be concluded that Mycobacterium is prevalent in Nigeria and indeed , some percentage of the public stand the risk of getting infected . Also , the information on specie of Mycobacterium involved in causing the disease in both humans and animals in Nigeria is scanty . All these needs further investigation and are to be made a research priority if effective control of TB is to be achieved [11].

In this article , we describe a transmission of *M. africanum* infection from human to cattle , confirmed by the molecular method SD - Bioline TB Ag MPT 64 technique that identify and differentiate the genus into *M. tuberculosis* complex and non - tuberculous Mycobacteria while the Genotype MTBC differentiate the complex into various species.

METHODS

In March , 2011 , during tuberculin skin testing in cattle which was part of the National Bovine TB Epidemiological Survey , a bull reacted strongly to bovine tuberculin test in Gujuba , Yobe State , Nigeria . The bull was purchased and slaughtered but there were no gross pathological changes visible in tissues and organs inspected . The retropharyngeal , bronchial , mediasternal and mesenteric lymph nodes were obtained for Mycobacteriological investigations . Following decontamination , homogenization , neutralization and inoculation on Lowenstein Jensen slant (with pyruvate and the other with glycerol) the materials were incubated at 37oC. After eight weeks of incubation , colonies were observed on Lowenstein Jensen slant , Ziehl - Neelsen stained and acid - fast cultured isolates were obtained . Similarly , sputum from the cattle herd attendant who had been coughing for a while and reported to the hospital was also obtained. Sputum samples were Ziehl - Neelsen stained before being processed for culture . All the mycobacteriological investigations of the lymph nodes as well as the sputum were performed according to the protocol described by [17]. The isolates were subjected to SD - Bioline TB Ag MPT 64 which differentiates them into *Mycobacterium tuberculosis complex* species and other environmental Mycobacteria.

Following the DNA extraction, the genomes were subjected to Genotype MTBC for molecular genetic assay for differentiation of the Mycobacterium tuberculosis complex species after amplification, hybridization and interpretation of results according to the Manufacturer's manual (Figure 1).

RESULTS AND DISCUSSIONS

It was observed that, samples from both a bull and a cattle herd attendant harbored Mycobacterium africanum species (Figure 1). The isolation and identification of M. africanum species from both humans and cattle is of epidemiological and public health importance especially to abattoir workers and Fulani herdsmen. It is a human pathogen which is also pathogenic for cattle, but it has only rarely been isolated from this host [13,12].

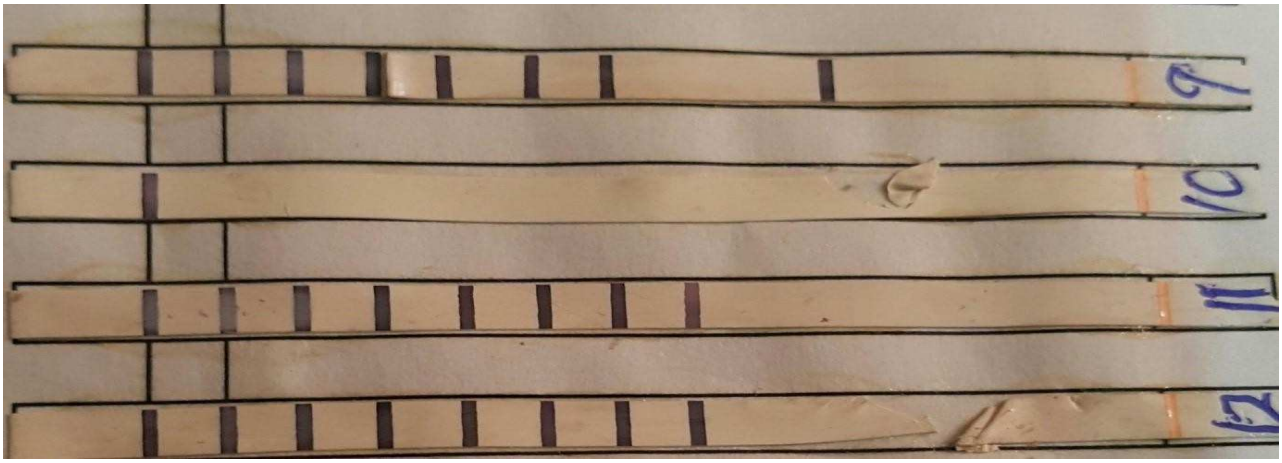

Fig. 1: Genotype MTBC Strips indicating M. africanum

Although, this is the first case of human to cattle transmission of Mycobacterium africanum in the study area, the possibility of cross-infection cannot be ruled out. However, Cadmus et al., reported a similar finding in a study in Ibadan, Nigeria.[3,15],[16], hypothesized that, when a tuberculin positive animal is recognized during routing tuberculin testing for the first time in a herd and particularly, when the tuberculin positive animal is adult, the possibility of human TB infection among farm workers should be considered.

In this reported case, a bull was affected, but no TB - like pathological changes were detected although it reacted to skin tuberculin test. The fact that the cattle herd attendant was infected with TB, strongly suggested the possibility of an anthropozoonotic transmission of M. africanum infection. Available literature suggests that, when humans are suffering from active TB, they tend to be the most probable source of the disease. Osepek et al, also reported that, an animal attendant with active pulmonary TB may represent an important source of the disease for animals, spreading the bacilli via sputum, urine or faeces [17,16,18,14].

In conclusion, we consider this report as the first possible evidence of human to cattle transmission of M. africanum in the study area. Also, it is suggested that, in areas where bovine TB and human TB coexist, a detailed microbiological investigation of the specimens from slaughtered tuberculin positive animals should always be performed in order to differentiate between species of Mycobacterium tuberculosis complex infections.

DECLARATIONS

Competing interests: None.

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Authors contributions: AUB designed the study. UAA, SM and MH collected the samples. UAA, SM, MH, LL and AIA supported sample analysis. AUB and HAG drafted the manuscript. All authors reviewed and approved the final manuscript.

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Ethical approval: Approval was obtained from the Ethics Committee of the Yobe State Hospital Management Board prior to the study.

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