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Participatory epidemiology of endemic diseases in West African cattle – Ethnoveterinary and bioveterinary knowledge in Fulani disease control

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ABSTRACT

Fulani pastoralists in Nigeria lack adequate access to good quality veterinary services and often resort to treating their animals themselves. There are several negative aspects to this, including poor treatment outcomes, misuse of veterinary drugs and subsequent resistance, and further barriers to good relations between pastoralists and veterinary services. A participatory epidemiology survey was undertaken in Fulani communities, to examine their ability to diagnose and treat bovine diseases. Qualitative participatory epidemiology techniques including semi-structured interviews, ranking and participant and non-participant observations were used for data collection. Quantitative analysis to match Fulani disease descriptions to veterinary diseases was done by hierarchical clustering and multi-dimensional scaling. A concurrent parasitological survey for soil-transmitted parasites, trypanosomiasis and tick-borne diseases was undertaken to validate results.

Fulani pastoralists displayed high levels of ethnoveterinary knowledge and good clinical diagnostic abilities. Diseases considered important by pastoralists included: *hanta* (CBPP); *sammore* (trypanosomiasis); *boro* (foot and mouth disease), *gortowel (liver fluke)*, *dauda* (parasitic gastro-enteritis with bloody diarrhoea) and *susa* (parasitic gastro-enteritis). The parasitology survey supported the participatory epidemiology results but also showed a high prevalence of tick-borne diseases that were not mentioned by pastoralists in this study. The use of "*hanta*" to describe CBPP is important as the accepted translation is liver-fluke (*hanta* is the Hausa word for liver). *Gortowel* and *dauda*, two previously undescribed Fulfulde disease names have now been matched to liver fluke and PGE with bloody diarrhoea. Fulani showed low levels of bovine veterinary knowledge with mostly incorrect veterinary drugs chosen for treatment. Levels of ethno- and bio-veterinary knowledge and their application within pastoralist livestock healthcare practices are discussed.

1. Introduction

The livelihoods of Fulani pastoralists in Nigeria are heavily dependent on the health and productivity of their livestock. The livestock sector is important to the national economy, contributing to both financial and nutritional needs of the country through meat, milk and hides (6–8% of GDP) [1]. Veterinary services in Nigeria fail to meet the animal health needs of Fulani who have poor access to veterinary products and services [2–9]. Disease surveillance, extension practice and veterinary service delivery are affected by a range of structural issues in Nigeria ranging, from failings in logistics to a lack of engagement with end users. The high cost of delivering veterinary services to rural and mobile communities is prohibitively expensive. Most veterinarians have high career expectations and are based in towns and cities offering fixed-point veterinary services Cultural and professional biases also impact on service provision to pastoralist communities as veterinarians with poor understanding of ethnoveterinary knowledge (EVK) and pastoral production systems are unable to engage effectively with pastoralists to deliver animal healthcare. Pastoralist communities have had bad experiences with fake or substandard drugs in the marketplace and poor-quality animal health services resulting in low trust and limited demand for services from outside of the community [2,4,7–9]. For pastoral systems in Nigeria, the biggest issues are with engagement because even if unlimited resources were available, they

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would not yield good results unless these problems were dealt with.

Endemic diseases of livestock are a major constraint to animal health, livestock production and rural economies. Control and surveillance has been progressively scaled back in many developing countries in favour of emerging, transboundary and zoonotic diseases [9]. While surveillance is a public sector responsibility, this is mostly done passively, especially in resource-poor pastoral settings where livelihoods depend heavily on livestock [8,10]. Endemic disease management is left to livestock owners and private sector service providers.

Participatory epidemiology (PE) emerged in the 1980s, offering a new method to rapidly survey for diseases and enable disease prioritization against a background of poor to non-existent veterinary services and disease surveillance [11–13]. Participatory epidemiology has also been successfully applied at the One Health interface for wildlife, biodiversity and natural resource management [14–16]. It is based on indigenous knowledge (IK), specifically ethnoveterinary knowledge (EVK) and the need to incorporate it with scientific knowledge (SK), specifically bioveterinary knowledge (BVK) for added benefits in disease surveillance, control and community based animal health (CBAH) systems [17,18]. This should result in a complementary, synergistic relationship between both knowledge systems which is acceptable to pastoralists, professionals and researchers.

Much of the literature focuses on the differences between the two knowledge systems, setting up a dichotomy in which IK is perceived as qualitative, subjective and contextual while SK is quantitative, objective and global [19,20]. However, scientists and researchers must take into account the wealth of evidence for the social and contextual dimensions of SK – it is just one of several available and competing knowledge systems and like all knowledge is socially constructed and situated in specific contexts [21–26].

There are different approaches to working with these different knowledge systems. The “integration” approach focuses on “translating” IK into terms compatible with SK so that it can be integrated *into* SK. However, in this process, IK is distilled, compartmentalised and taken out of context, losing much of its value along the way. The “bridging” discourse recognizes these shortcomings and starting from a position of equality between knowledge systems, seeks to build bridges between the two epistemologies through a better understanding of how they differ. Focusing on their differences and similarities. The “dialogues” discourse is concerned with mutual exchange between the different knowledge spaces and focuses more methodologies and direct comparisons. However, this requires a good understanding of the underlying world view of each knowledge system [19,20,27–30].

PE has expanded rapidly in Asia and Africa [12,31] especially within community based animal health (CBAH) systems in Eastern Africa [17,32,33]. Much of the work on PE and its use in CBAH systems has been done in East Africa with pastoral groups such as Maasai, Afar, Samburu, Turkana, Karamojong, etc. [16–18,32,34–39]. The Fulbe or Fulani are the largest pastoral group in Africa, numbering over 25 million, with ~40% of them living in Nigeria. Yet, relatively little has been written about participatory epidemiology with this group. In Nigeria, treatment of endemic livestock disease is mostly undertaken by Fulani themselves, drawing on both EVK and BVK [40,41]. This “pluralist” veterinary knowledge, which may be complementary and/or competitive, is framed by individual and socio-cultural factors that interact to shape health outcomes and knowledge transmission. Consensus and competence of livestock owners needs to be assessed in any study of pluralist veterinary knowledge and practices [37]. Most studies on EVK have focused on ethnobotany/ethnopharmacology rather than integrative animal health management which is the primary concern for pastoralists [42–44, 37]. The few studies on pluralism in veterinary healthcare have identified high levels of EVK (including surgery, pharmacology and toxicology) amongst pastoralists across Africa, indicating a higher competence and consensus in EVK than in BVK amongst pastoralist [37,38,44].

There are clear gaps in our knowledge of current EVK methods used by Fulani pastoralists, how this interacts with BVK and how both knowledge systems influence Fulani ability to diagnose and treat endemic diseases in their livestock and their interactions with the veterinary services. This study has employed PE to try to answer these questions amongst Fulani in Nigeria. An epidemiological survey of endemic parasitic diseases of cattle was also conducted for confirmation/triangulation.

2. Materials and methods

2.1. Study area

This study was conducted in Bokkos Local Government Area (LGA) on the Jos Plateau, Nigeria. There over a million cattle in the area, ~70% managed by settled Fulani pastoralists who practice seasonal transhumance in both dry and wet seasons [45]. Village selection was purposive as a result of persistent insecurity and violence between members of different tribes and religions on the Jos Plateau since January 2010 [46,47]. Bokkos LGA was chosen as the study area for this project as it was relatively peaceful and secure. Despite the absence of ethnic/religious violence, armed robberies and cattle thefts affecting both indigenes and Fulani were common in Bokkos LGA.

2.2. Study design

The participatory epidemiology survey was carried out six villages (Bokkos, Daffo, Maiyanga, Mangar, Hurti, and Tambes) alongside an epidemiological survey on endemic disease control in cattle [48]. Within each study village, six household herds were selected for screening. Study site selection was purposive, based on security, previous prevalence of AAT [45], similar environmental conditions and husbandry practices. Household selection within villages was also purposive, based on willingness to participate and even geographical coverage of the village area. Enrolled animals were ear tagged and their identification data (i.e., ear tag number, breed, sex, coat colour, and age as given by owner at enrolment time) were recorded in individual files. Sampling began in April–May 2013, and was repeated at 3-month intervals thereafter until March 2013 to give 5 sampling periods.

Between April 2012 and March 2013, six herds of 80 animals each were selected in each of the study villages, a total of 480 animals per village and a total of 2880 animals across the study area. Enrolled animals were ear tagged and their identification data (i.e., ear tag number, breed, sex, coat colour, and age as given by owner at enrolment time) were recorded individually.

2.3. Participatory epidemiology methods

Longitudinal study design Between April 2012 and March 2013 data on endemic diseases of pastoral cattle was collected using participatory diagnosis and epidemiology methods. This included ranking, case histories, in-depth semi-structured interviews and key informant interviews. Interviews were conducted with herders in selected households and key informants amongst local vets and para-veterinarians. During the interviews, respondents were asked to list and rank the six most important diseases of local cattle and describe the clinical signs of these diseases. In addition, pastoralists were asked to list the number of cases, deaths and treatments used for each disease over the past 12 months. Interviews were conducted in Hausa.

2.4. Epidemiological survey

2.4.1. Blood sample collection and DNA extraction

At each sampling point, 5 ml of blood was taken from the jugular vein of each animal. 1 ml of the collected blood was immediately dispensed into a Hemocue microcuvette to determine haemoglobin (Hb) concentration. 1 ml of the remaining collected blood was spotted onto