Research in Veterinary Science 94 (2013) 573–578

Contents lists available at SciVerse ScienceDirect

Research in Veterinary Science

journal homepage: www.elsevier.com/locate/rvsc

Baseline survey of animal trypanosomosis in the region of the *Boucle du Mouhoun*, Burkina Faso

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ARTICLE INFO

Article history:
Received 20 August 2012
Accepted 23 December 2012

Keywords:
Boucle du Mouhoun
Burkina Faso
PATTEC
Trypanosomosis
Cattle
Small ruminants
Donkeys

ABSTRACT

In view of gathering baseline information about the prevalence of animal trypanosomosis, the Pan African Tsetse and Trypanosomiasis Eradication Campaign (PATTEC) funded a cross sectional survey in the region of the *Boucle du Mouhoun* which constitutes the Northern limit of the tsetse distribution in Burkina. This cross sectional study was carried out in 53 villages located in the six provinces of the region. A total of 2002 cattle, 1466 small ruminants and 481 donkeys were sampled. This survey showed that about 25% of the cattle had been treated with trypanocidal drugs within 3 months before the survey compared to 3% and 0.42% for the small ruminants and donkeys, respectively. Parasitological prevalence in cattle was low: 0.77% (95% C.I. 0.30–1.95%). No goats and three donkeys were found infected with trypanosomes. Infections were mainly due to *Trypanosoma vivax* (75.0%) with cases of *Trypanosoma congolense* (25.0%). In cattle, the serological prevalence of trypanosomosis, for the entire region of the *Boucle du Mouhoun*, was 34.2% (95% C.I. 26.1–43.4%). For sheep, goats and donkeys, the prevalence were of 20.9% (95% C.I. 12.2–33.5%), 8.5% (95% C.I. 5.7–12.5%) and 5.8% (95% C.I. 3.9–8.6%), respectively. The age and distance to the river were the two main risk factors associated with seropositivity.

1. Introduction

The economy of Burkina Faso is largely dependent on pastoral agriculture. The contribution of the national herds to the gross domestic product ranges from 10% to 14% (MEDEV, 2002, 2004). The livestock includes cattle (8 million), small ruminants (18 million), pigs (2 million) and equids (1 million) (Ministère des Ressources Animales, 2010). Ruminants are either raised in sedentary or transhumant animal husbandry systems mostly on communal natural pastures and with limited access to adequate veterinary health care delivery. This system of livestock management highly exposes animals to the risk of disease outbreaks which are indeed often reported by the veterinary services (Ministère des Ressources Animales, 2006, 2010). Among all the diseases, trypanosomosis being the most frequent one greatly hampers livestock productivity in Burkina Faso (Ministère des Ressources Animales, 2006). One third of the total surface of the country is at risk of the disease. More than 63% of the country's cattle population is raised in zones with high trypanosomosis risk (Kamuanga et al., 2001). Those zones are partially preserved from human activities offering good grazing capacities for the cattle but, at the same time, providing suitable refuges for the tsetse flies.

In Burkina Faso, the financial costs of trypanocidal compounds have been estimated to be 3.9 million US$ per annum (Sow et al., 2010). Treatments with trypanocidal drugs constitute the most frequently used method for controlling trypanosomosis and maintaining susceptible breeds in tsetse infested areas. However, extended use of these drugs led to the development of chemoresistance in all trypanosomosis enzootic areas of Burkina Faso (Clausen et al., 1992; McDermott et al., 2003; Talaki et al., 2007; Sow et al., 2012).

The Government of Burkina Faso tried to mitigate the impact of human and animal trypanosomosis with the support of international partners. All previous efforts to eliminate tsetse and trypanosomosis in the country failed because of the interconnections

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http://dx.doi.org/10.1016/j.rvsc.2012.12.011

between the different river systems within and outside the country and the lack of a concerted approach in dealing with this transboundary animal disease (Adam et al., 2012).

The Pan-African Tsetse and Trypanosomosis Eradication Campaign (PATTEC) is the most recent programme that was launched to eliminate tsetse and trypanosomosis. Thirty-seven African countries endemic for human and animal trypanosomosis are participating to the campaign. In Burkina Faso, the region of the *Boucle du Mouhoun* was selected as one of the initial locations for the implementation of the PATTEC initiative. Indeed, this region is located at the Northern limit of the tsetse distribution (Laveissière,1976; Hendrickx et al., 1999) and the subsequent elimination campaign will be carried out following the "rolling carpet" strategy from North to South. Preventing reinvasion of flies living in the adjacent river basins i.e. the Comoé, the Niger and the Sissili river basins would be indicated since the population of flies originating from the different water basins are genetically interconnected (Solano et al., 2010; Kone et al., 2011). The present survey was conducted before implementing the eradication campaign with the aim of determining the prevalence of trypanosome infections and the health status of farm animals by using the packed cell volume (PCV) and Body Condition Score (BCS) as indicators. A cross-sectional survey was conducted from September to December 2007, during the transition rainy to dry season (i) to identify hot spots (high prevalence of the disease) to conduct block treatment for trypanocidal drug resistance testing, (ii) to get an estimate of the disease prevalence, (iii) to assess the impact of the disease on the health status of the animals and indirectly and (iv) to evaluate the efficiency of the treatments with trypanocidal drugs in the area.

2. Material and methods

2.1. Study area

The region of the *Boucle du Mouhoun*, is located at the North-West of Burkina Faso between 2°4′–4.6° W and 11°23′–13°7′ N, and its surface is about 34,000 km^2 (12.6% of the national territory). The region is subdivided in six provinces namely Balé, Banwa, Kossi, Mouhoun, Nayala and Sourou. These provinces are divided in a total of 47 departments, themselves composed of 1061 villages (Ministère de l'Administration Territoriale et de la Décentralisation – Burkina Faso (MATD), 2007). The climate of the region is of soudano-sahelian type with the annual rainfall ranging between 500 and 1400 mm (MEDEV, 2005). The region is drained by the Mouhoun river which is 280 km long. A dense hydrographic network made by permanent and temporary tributaries is woven around the Mouhoun river (Fig. 1).

2.2. Parasitological survey

2.2.1. Sampling

Among the 1061 villages of the 47 departments, one village was randomly selected from each department. To increase the chances to get a suitable environment for the block treatments for drug resistance testing i.e. where the risk of trypanosome infection is high enough, six additional villages were randomly selected from a list of 41 being located less than 5 km from the river or its main tributaries. Further random sampling of 50 cattle, 30 small ruminants and 10 donkeys was there organised. In total 2650 cattle, 1590 small ruminants and 530 donkeys were selected as theoretical sampling frame. For each sampled animal, information related to species, sex, age, breed, body condition score (BCS), livestock management system and history of trypanocidal treatments were recorded. The sampling took place in September and November 2007, i.e. during the transition rainy to dry season.

2.2.2. Parasitological and serological analysis

A blood sample was collected in heparinised Vacutainer® tubes from each animal by vein puncture of the jugular vein for the determination of the PCV and the detection of trypanosomes using the buffy-coat technique (Murray et al., 1977). The serum collected on dry Vacutainer® tubes was used for the detection of the anti-trypanosome antibodies. The dry tubes containing the blood of each animal were centrifuged (430*g*, 10 min) and sera were collected into Eppendorf® tubes that were kept at cool temperature on ice during the field operations and then at −20 °C before ELISA processing. The serological analyses were carried out using an indirect ELISA according to the protocol described by (Desquesnes et al., 1999). Briefly, microplates were sensitised with soluble antigens (5 μg/ml) of *Trypanosoma vivax* (IL1392), *T. brucei* (ILTat1.2), *T. congolense* savannah type (IL1180) or *T. evansi*. The results of the ELISA analyses were expressed as relative percentage positivity (RPP) compared to positive and negative reference samples. The positivity thresholds (PT) were fixed at 20% (Desquesnes et al., 1999).

2.3. Statistical analysis

Data from the different animal species were analysed separately in robust generalised linear models, using the villages as primary sampling units. Overall parasitological and serological prevalences were estimated from the 47 randomly selected villages (excluding the six additional villages closer to rivers) using logistic regressions without explanatory variables. All other analyses were performed on data originating from all 53 villages (including the six additional villages closer to rivers), considering the distance to main rivers ($\geqslant$ or $\leqslant$5 km) as strata. Prevalences less than 5 km from main rivers and beyond were estimated using the distance to the rivers ($\geqslant$ or $\leqslant$5 km) as only binary explanatory variable. The significance of the distance to rivers and the animals' age on their serological status was evaluated in a multivariate model using these two parameters as continuous explanatory variables. Finally, the effect of trypanosome infections (observation of trypanosomes and seropositivity; explanatory variables) on the PCV and the BCS (responses) was evaluated in ordered multinomial logistic regressions. Body condition was classified as good, medium and bad whereas three PCV classes were created using <20 and <26 as cut-offs for the four animal species considered in this study. The proportion of animals and confidence interval were calculated for each class using a non-linear combination of estimators. A significance threshold of 5% was used in all statistical tests.

3. Results

3.1. Sampled animals

A total of 2002 cattle, 1466 small ruminants, 481 donkeys were sampled from the 53 selected villages participating to the survey (Table 1). The sampled animals were mainly sedentary (98.6%), with 64.3% of males, because of the presence of draught oxen. In the herds, 72.4% were Zebus (*Bos indicus*), 3.9% were taurines (*Bos taurus*) and 23.7% were crossbred. In sheep, the breed repartition was 80.2%, 5.4% and 14.4% for Djallonke, Bali–Bali and crossbreds, respectively. Similarly, in goats, the proportion of Djallonke, Sahel and crossbred was 77.6%, 6.9% and 15.5%, respectively.

The study showed that 11.7% and 12.9% of the cattle, for diminazene aceturate (DA) and isometamidium chloride (ISM), respectively, had received a treatment less than three months before the sampling; for sheep, those proportions were 5.25% and 0.2% for DA and ISM, respectively. When considering goats and donkeys, the proportion of animals treated with DA was of 1.5% and 0%, respectively, none was treated with ISM.