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Effect of agro-ecological zone and grazing system on incidence of East Coast Fever in calves in Mbale and Sironko Districts of Eastern Uganda

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Abstract

Between May 2002 and February 2003 a longitudinal survey was carried out in Mbale and Sironko Districts of Eastern Uganda to determine the influence of agro-ecological zones (AEZ) and grazing systems on tick infestation patterns and incidence of East Coast Fever (ECF) in bovine calves. The study area was stratified into AEZ (lowland, midland and upland) and grazing systems {zero grazing (ZG), restricted-outdoor grazing (ROG) and communal grazing (CG)}, whose strata had previously been shown to influence the prevalence of ECF, babesiosis and anaplasmosis. One hundred and eighty-five smallholder dairy farms with a total of 198 calves of both sexes, between the ages of 1 day and 6 weeks, were purposively selected from the AEZ–grazing system strata. Nine dynamic cohorts (11–51 calves in each) of these calves were examined and sampled monthly. Ticks infesting the calves were counted from one side of the animal body and categorized into the different species, sex and feeding status. Sera were collected at recruitment and monthly thereafter and

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antibodies against *Theileria parva*, *T. mutans*, *Babesia bigemina*, *B. bovis* and *Anaplasma marginale* were measured using ELISA. Tick challenge (total and specific) varied with AEZ and grazing system. The risk of infection with *T. parva* was higher in the lowland zone compared to the upland zone (hazard ratio (HR) = 2.59; 95% CI: 1.00–6.34). The risk of infection with *T. parva* was higher in the CG system than the ZG system (HR = 10.00; 95% CI: 3.61–27.92). The incidence risk for sero-conversion, over the 10 months study period, was 62, 16 and 9% in the lowland, midland and upland zones, respectively. Ninety-eight percent of the calves in lowland-CG stratum sero-converted by the age of 6 months, while 56 and 8% did so in the lowland-ROG and the lowland-ZG stratum, respectively. The results of this study show the need to consider farm circumstances and the variation in ECF risk, both spatially and temporally when designing control strategies for ECF.

Keywords: Infection risk; *T. parva*; Grazing system; Agro-ecological zone

1. Introduction

Mbale and Sironko Districts are located in the eastern region of Uganda and the basic characteristics of this area have been described previously (Rubaire-Akiiki et al., 2004). Briefly, three agro-ecological zones (AEZs), lowland, midland and upland, are identified. The area is densely populated and so the majority of the producers are smallholder farmers living in scattered homesteads where they keep limited number of cattle under zero grazing (ZG), restricted-outdoor grazing (ROG) and communal grazing (CG). The climatic conditions of the two districts are favourable for the tick vectors of tick-borne diseases (TBDs), namely *Rhipicephalus appendiculatus* for East Coast Fever (ECF), *Boophilus decoloratus* for babesiosis and anaplasmosis and *Amblyomma variegatum* for heartwater (Branagan, 1973). Thus, cattle in this region are under constant threat of severe tick infestations and TBDs unless tick control measures are undertaken (Perry, 1994) or there is endemic stability in the area ((Norval et al., 1992). These diseases cause serious debility, morbidity and mortality in susceptible exotic cattle, hybrids, as well as indigenous breeds of cattle raised in tick-borne disease free areas (Bram, 1982; Okello-Onen et al., 1994; Perry and Randolph, 1999; Gitau et al., 2000). Case studies have indicated that ECF is responsible for approximately half of all the cattle mortality in endemic areas (Kambarage, 1995). In Uganda the disease is estimated to kill up to 30% of the annual calf crop of the indigenous cattle and up to 100% of the untreated improved cattle (Otim, 1989).

The epidemiology of ECF is complex and the disease generally results from several causative factors acting in concert with environmental and production factors (Norval et al., 1992). These interactions are driven and modified by a wide variety of factors ranging from climate, soil and vegetation to crop/livestock production systems and measures taken to control ticks and TBDs (Perry and Randolph, 1999). In the Kenya highlands, Deem et al. (1993), Gitau et al. (1994, 1997, 1999, 2000) and O'Callaghan (1998) have demonstrated that prevalence of *Theileria parva* infections and the reported ECF morbidity, mortality and case-fatality can vary significantly by AEZ (increasing with lower elevation) and grazing system (increasing with unrestricted grazing). Recently in Uganda, Rubaire-Akiiki et al. (2004) reported that prevalence of ticks and serum antibodies to ECF, babesiosis and anaplasmosis differed across age of cattle, grazing systems and agro-ecological zones.