**Advertisement for a PhD Public Defense**

**Date :** 3rd February, 2022

**Time :** 14:00 Hrs – 17:00 Hrs

**Venue :** Conference Room 1, Level 3, CoVAB, Makerere University

**Thesis Title :** TICKS AND TICK-BORNE DISEASES OF CATTLE IN SELECTED

DISTRICTS OF UGANDA: ZOONOTIC POTENTIAL AND PUBLIC

HEALTH IMPLICATIONS

**Course: :** PhD

**Candidate’s Name :** STEPHEN KARABYO BALINANDI

**Reg. No.** : 2017/HD17/19177U

**Supervisors**: (1) Dr. Lawrence Mugisha, (PhD)

Associate Professor, College of Veterinary Medicine, Animal Resources and Biosecurity, Makerere University

(2) Dr. Maja Malmberg, (PhD)

Associate Professor, Department of Biomedical Sciences and Veterinary Public Health, Swedish University of Agricultural Sciences

(3) Dr. Julius J. Lutwama, (PhD)

Assistant Director of Research

Uganda Virus Research Institute

# ABSTRACT

**Background**

According to the World Health Organization and other international health monitoring bodies, ticks have emerged as a major player in propagating human diseases, yet their involvement in zoonotic disease epidemiology in Uganda is not well described.

**Objectives**

This study investigated the diversity of tick species infesting cattle and characterized the associated pathogens in their host (human and cattle) populations.

**Methods**

Five exploratory studies were conducted. Study I, II, III and V, were cross-sectional studies in which ticks and blood samples were collected from 500 cattle in 5 purposively selected districts of Kasese, Hoima, Gulu, Soroti and Moroto. Ticks were then identified using both morphological and molecular methods, while blood samples were investigated for Crimean-Congo Hemorrhagic fever (CCHF) seroprevalence, and molecularly for other potential zoonotic pathogens. Study III was a case series study design in which CCHF case-based surveillance data and samples were reviewed and investigated to understand the CCHF clinical and molecular epidemiology in Uganda.

**Findings**

Study 1 identified 15 different tick species infesting cattle in the study areas, including *Rhipicephalus afranicus*, a recently described species in South Africa. Specimens of this tick were found in Moroto district. In addition, *Rhipicephalus microplus*, a recently identified tick species in Uganda was found to have expanded its range into Soroti and Gulu districts. Whereas species diversity was highest in Moroto district (p=0.004), geographical predominance by specific tick species was also noted in this study (p=0.001). Study II identified various morphological anomalies in 3 ticks including, for the first time, gynandromorphous *Amblyomma lepidum*. Another *A. lepidum* female showed slight asymmetry and lacked a genital aperture. Both *A. lepidum* ticks were collected in Moroto. One *Rhipicephalus decoloratus* from Kasese district, displayed multiple anomalies including body asymmetry, ectromely, chitinous formations and constrictions. Study III identified 10 viruses belonging to 5 families and 8 genera among 175 studied cattle, including Bovine hepacivirus, Lammi virus, Schmallenberg virus, Aedes pseudoscutellaris reovirus, Equine infectious anemia virus, Obodhiang virus and 4 potential novel viruses that were related to Tarumizu tick virus, Bat pestivirus, Puchong ephemerovirus and Kotonkan ephemerovirus. Study IV found that a total of 32 CCHF cases (75% males; CFR, 31.2%), aged between 9 to 68 years, were detected in Uganda between 2013-2019. Fever was the most common presenting symptom (93.8%), followed by hemorrhage (81.3%), headache (78.1%), fatigue (68.8%), vomiting (68.8%) and myalgia (65.6%). Thrombocytopenia was common among investigated cases. While using unbiased metagenomics, it was found that the S- and L- segments of CCHF virus in Uganda, have remained conserved in Africa 2 clade since the 1950s. In contrast, the M segment split into two geographically interspersed clades; one that belongs to Africa 2 and another that is ancestral to Africa 1 and 2. Lastly, study V found a 12.6% and 75.0% CCHFV seropositivity among the studied animals using inhouse and commercial ELISA (IDVet), respectively. Further testing of 37 samples using an Immunofluorescent assay (IFA) showed a 64.8% seropositivity and none by RT-PCR. Interassay comparisons showed that IFA results were more comparable to IDVet (κcoefficient = 0.88, p = <0.01) than to IH (κcoefficient = 0.32, p = 0.02). In all assays, CCHFV seropositivity was associated with geographical location, increasing age, being female and a higher tick burden.

**Conclusions and Recommendations**

This study showed that the species diversity of ticks infesting cattle in Uganda is high. CCHF virus, one of the most medically important tick-borne zoonoses globally, is also highly prevalent in Uganda, including in areas where, historically, no human cases have been detected. In addition, there are other viruses circulating in cattle populations in Uganda, for which their medical relevance needs further investigations.

Limitations of this present study emanate from its cross-sectional design, sample collection and analysis strategies; thus, there is a need to perform further research for stronger evidence-based decision making and advocacy. Despite these limitations, data from this study are useful for strengthening the existing infrastructure for public health surveillance and outbreak investigations, as well as for tick control and improving safety in the food production chain in Uganda.