



UW College of Agriculture and Natural Resources
Global Perspectives Grant Program
Project Report

COVER PAGE

Award Period: Fall 2017 – Fall 2018

Principle Investigator: Brant Schumaker

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Project title: Implementing a Novel Molecular Assay in Uganda for Brucellosis Control

Amount spent: \$5,000 (airfare, lodging, in-country travel, laboratory supplies/consumables)

Non-technical summary: Following international collaboration, our laboratory trained a Ugandan diagnostician in molecular diagnostic techniques to enhance her skills and understanding of Wyoming's brucellosis surveillance and control strategies for the purpose of accurately identifying *Brucella* positive animals and reducing zoonosis in Uganda. A reciprocal visit aimed to follow-up and assist in implementation of molecular diagnostic techniques, and to disseminate warranted disease surveillance strategies to applicable stakeholders. Recent disease outbreak in the district of interest posed an adverse risk to our laboratory personnel, and the inability to identify another infected district ultimately prevented us from assisting in implementing novel molecular diagnostic techniques. However, we were highly successful in disseminating warranted surveillance strategies for brucellosis. It was recognized that the University of Wyoming has significant and broad expertise in infectious disease research, diagnosis, epidemiology, and control strategies. Thus, our team left having established collaborations with individuals from the Ugandan Ministry of Health, Ministry of Agriculture, and veterinary students from Makerere University, all of whom uphold interest in receiving training in the excellent laboratory facilities at the University of Wyoming to help improve human and animal health in Uganda by reducing the prevalence of brucellosis.

REPORT

From January to March, 2018 the Infectious Disease Epidemiology of Animals (I.D.E.A.) research laboratory in the Department of Veterinary Sciences hosted a diagnostician from Uganda as a Borlaug International Agricultural Science and Technology Fellow. The goal was to train the Ugandan fellow on diagnostic techniques and enhance her understanding of Wyoming's surveillance, control strategies, pathogenesis, and epidemiology of brucellosis for the purpose of implementing similar methodologies in Uganda. It was agreed that a reciprocal visit post-fellowship would be warranted for I.D.E.A. laboratory personnel to assist the fellow in implementing these novel molecular techniques in Ugandan veterinary and public health laboratories, and regional educational institutions (Makerere University).



Dr. Brant Schumaker supervises senior technician Ashley Smith, Borlaug Fellow Stella Atim, and undergraduate student researcher Sierra Amundson in the processing of field tissues for brucellosis diagnostic test development.

Using a novel diagnostic assay developed and validated by the I.D.E.A. lab, our personnel thoroughly trained the fellow on everything required to successfully diagnose bovine brucellosis. This included identification of specific diagnostic targets in sequences for the bacterium and optimization of assay reagents. Optimization was followed by hands-on training involving sample preparation, diagnostic procedures, interpretation of results, and proper clean-up/decontamination of the laboratory. The diagnostician also participated in the epidemiology course taught by Dr. Brant Schumaker.



Dr. Stella Atim, extracts DNA from field-collected *Brucella* tissues.

The reciprocal visit (8/13/18 – 8/23/18) was made possible due to this award as well as the Borlaug International Agricultural Science and Technology Fellowship. The main objective of the reciprocal visit was to provide training to the diagnosticians' colleagues which would parallel the training the diagnostician received at the University of Wyoming. This training would involve a two day oral conference, animal field work involving collection of tissues from brucellosis positive animals, and running the novel qPCR assay. Further, the I.D.E.A. lab aimed to initiate an extension program for local farmers, veterinarians, and veterinary students to educate zoonotic awareness and address disease diagnosis, surveillance, and control. Lastly, the I.D.E.A lab foreshadowed establishing collaborations with additional Ugandan institutions.



I.D.E.A. lab personnel discuss a National control strategy for brucellosis for Uganda.

The two day conference co-hosted by the National Animal Disease Diagnostics and Epidemiology Centre, Ministry of Agriculture Animal Industries and Fisheries (NADDEC) and the I.D.E.A. lab was successful. Personnel from the I.D.E.A. lab acquired knowledge on techniques for animal sample collection and human disease diagnosis in Uganda. Attendees were receptive and intrigued by the following topics presented by I.D.E.A. lab personnel: history of brucellosis eradication in the United States, bioinformatics, DNA extraction, and novel molecular diagnostics for the detection of bovine brucellosis. The conference concluded with an in-depth open platform that addressed farmer disease awareness, promoted the materialization of incentive programs for farmers, discussed progress made in diagnostics as a result of training acquired from University of Wyoming personnel, and surfaced the steps necessary to move forward with surveillance and control strategies for brucellosis in Uganda.



Brant Schumaker makes a presentation on strategies for brucellosis control.

Blood samples were collected from a farm with previous history of brucellosis infection in cattle from 12 animals with a history of repeat breeding and abortions were selected for sampling. Samples were screened using the Rose Bengal Plate Test and ELISA at NADDEC as part of our training conference. One animal tested positive for brucellosis and one was in the suspect range. Due to a local outbreak of Rift Valley Fever (RVF) in the area, we requested that the samples also be tested for RVF antibodies. Unfortunately, all of the animals tested positive for RVF, a BSL-4 zoonotic agent. As our team did not have the appropriate PPE to protect us from this agent, Dr. Schumaker made the decision to cancel this portion of our work. We sought to sample animals from another area of the country but the local personnel were unable to provide the logistics to identify another infected farm during our short time frame in-country. Despite this, many collaborative efforts with colleagues in Uganda were still achieved to work towards better control strategies for brucellosis.



Laboratory diagnostic practical session during NADDEC conference.

In place of field work, I.D.E.A. lab personnel were cordially invited to attend a one day training co-hosted by Rakuno Gakuen University and the Ugandan Ministry of Agriculture. This was an educational training for dairy farmers and veterinarians to bring awareness of transmission, clinical signs, economic loss, control, and prevention of bovine brucellosis. The I.D.E.A. lab was asked to provide input on brucellosis surveillance and control strategies, as well as to answer questions farmers and veterinarians had about the disease. Farmers were receptive and appreciative of information the I.D.E.A. lab proposed, which helped to promote farmer dedication to eliminating brucellosis from their cattle herds.



Discussion of brucellosis diagnosis and control with district representatives in Mbarara.

While in-country, the I.D.E.A. lab was successful in developing promising collaborations with the following Ugandan institutions: the School of Veterinary Medicine at Makerere University, the Ministry of Agriculture Animal Industries and Fisheries, the National Disease Control Department at the Ministry of Health, the Ugandan National Task Force, Uganda National Health Laboratory Services, the Research Center for Tropical Diseases and Vector Control, and the Uganda Virus Research Institute. Further, the I.D.E.A. lab connected with individuals from the Center for Disease Control and Prevention and Johns Hopkins School of Public Health, both of which resulted in collaborative efforts to make national and global advancements for the One Health initiative.

Long and short-term future plans include fostering a connection with the Veterinary Department at Makerere University to target recruitment of international students to the College of Agriculture and Natural Resources. Further, the I.D.E.A. lab met with the senior epidemiologist from the Ministry of Health which resulted in a solid collaboration to recruit this epidemiologist and his expertise to the University of Wyoming for ongoing research when future opportunities arise. This collaboration between the Ugandan Ministry of Health and the University of Wyoming could trend set Wyoming in making global advancements in the One Health initiative. While in-country, I.D.E.A. lab personnel noted a consistent wildlife-livestock-man interface. Thus, the I.D.E.A. lab aims to work with the Ugandan Ministry of Agriculture to

implement Wyoming's brucellosis control strategies in Uganda to minimize spillover rates of brucellosis between these interfaces which could reduce both economic and human health effects of brucellosis. Although field work and diagnostic training were unable to materialize, the I.D.E.A. lab left supplies/consumables in-country. Thus, we will follow-up with the trained diagnostician in hopes she can implement the novel molecular techniques into her laboratory in our absence.



Participants of NADDEC conference on brucellosis.

Contacts the I.D.E.A. lab made in Uganda aided in recruiting international students, bringing expertise and valuable research to the University of Wyoming, and constituted advancements in the One Health initiative. These factors will help to accrue research funding, promote reputation, and stimulate collaboration with international stakeholders, all of which will positively impact the College of Agriculture and Natural Resources, the University of Wyoming, and the state of Wyoming.