

**SULSA Postdoctoral and Early Career Research Exchange (PECRE) Award:****End-of-project report for: “*Developing capacity for source attribution studies of Leptospira infection in East Africa*”****Dr. Kathryn Allan, University of Glasgow**Scientific summary:

This research exchange built upon a pre-existing collaboration established between researchers at the University of Glasgow (UG) and the OIE/National Collaborating Leptospirosis Reference Laboratory at the Academic Medical Centre (AMC), University of Amsterdam (formerly part of the Royal Tropical Institute (KIT)). The three main objectives were:

- 1) To consolidate research partnerships with the partner laboratory following a recent institutional move by the Leptospirosis Reference laboratory from KIT to AMC;**
- 2) To enable collaborative data generation and facilitate specialist laboratory training;**
- 3) To develop laboratory capacity in *Leptospira* diagnosis and microbiology for UG research projects**

**Objective 1:** The flexibility of this award allowed me to divide my exchange into two visits: the first conducted in October 2017 (2/10 – 13/10/17) with a second trip conducted November 2018 (26/11 – 6/12/2018). This provided an ideal opportunity for sustained development of research partnerships with collaborating scientists and laboratory staff at the AMC as well as an opportunity for me to work with two cohorts of undergraduate and masters students in the laboratory. Furthermore, the timing of these visits allowed for collaborative grant proposal, manuscript and project ideas to be developed and reviewed over time.

**Objective 2:** Training and resources for specialist microscopic agglutination testing (MAT) of serum samples from people and cattle in Tanzania was provided by the AMC Leptospirosis Reference Laboratory. Techniques learned and results from activities conducted through this exchange are summarised below.

Summary of results:

Serum samples collected from 251 people and 493 cattle as part of a cross-sectional surveillance survey were available for testing. *Leptospira* serological reactivity in human and cattle sera was determined by MAT using a panel of 14 serovars representing 12 different serogroups previously detected in people and animals in East Africa. *Leptospira* serological reactivity was detected in 26.7% [95% CI 21.6 - 32.5%] of people and 49.9% [95% CI 45.5 - 54.3%] of cattle. Substantial overlap was detected in patterns of serogroup reactivity between people and cattle. Reactivity against the most prevalent serogroups detected in people (serogroups Australis (17.1%) and Mini (6.0%)) was also commonly detected in cattle (6.7% and 18.3% respectively). However, some serogroups that were commonly detected in cattle such as Tarassovi (20.1%) and Sejroe (20.1%) were rarely detected in people (1.2% and 0.4% respectively). Regression analysis demonstrated that the cattle kept in pastoral areas had significantly higher odds of *Leptospira* seroreactivity than cattle kept in smallholder settings. Mean serogroup richness was also significantly higher in cattle from pastoral areas. In contrast, neither the prevalence of seroreactivity or the mean serogroup richness showed any significant variation by agro-ecological setting in people.

This collaborative study revealed new insights about the epidemiology and ecology of *Leptospira* infection in people and cattle in northern Tanzania. Serological reactivity against multiple *Leptospira* serogroups was common including against several of these serogroups have previously been implicated in acute human disease in local hospital studies. Overall patterns of *Leptospira* reactivity and serogroup trends differed between human and cattle populations, which indicates that extra-household

factors may be relatively more important for human infection risk than for cattle infection risk. Whilst livestock are likely to be an important source of human *Leptospira* infection in northern Tanzania, differences in the patterns of human and cattle seroreactivity suggest that other potential animal or environmental sources may also be important for human infection and supports the case for further investigation.

**Objective 3:** A major goal of this exchange was to develop laboratory expertise and gain an detailed understanding of capacity required to establish and support the use of gold standard *Leptospira* serological diagnostics at UG or Tanzania to support long term data generation from our research projects. To meet this objective, new techniques learned included:

- Microscopic agglutination testing including performance of ‘gold standard’ indirect microscopy and adapted direct microscopy to facilitate rapid screening of large sample sets.
- *Leptospira* culture and maintenance of diagnostic strains for MAT.
- Interpretation of serological test results and cross-reaction patterns for clinical and asymptomatic cases in humans and animals

During this exchange, I gained confidence and expertise in performing this analysis and am exploring options to implement this testing in UG laboratories (e.g. IBAHCM One Health Research in Bacterial Infectious Disease lab).

New links made:

- Collaborative relationship with the University of Amsterdam has now been consolidated following the institutional move of this reference laboratory.
- Through this exchange, I have been invited to participate in an expert group for leptospirosis for the EU FP7 DISCONTTOOLS programme in order to build and update an animal disease prioritisation model identifying key research needs by disease. The expert group is led by Dr Marga Goris at the AMC Leptospirosis Reference Laboratory and my involvement in this project was the direct result of this research collaboration.

Joint outputs from this award: (NB: Collaborators from this exchange are underlined in author lists)

**Grant applications:**

Wellcome Trust Clinical Career Development Fellowship application: “Towards One Health interventions for leptospirosis in Tanzania”. Invited to full application (Jan 2018); final decision – unsuccessful.

**Manuscripts:**

Allan KJ, Goris MGA, Carter RA et al. Prevalence and diversity of *Leptospira* infection in cattle shows marked variation by agro-ecological setting in northern Tanzania. *In preparation*

Allan KJ, Goris MGA, Carter RA et al. Investigating the ecology of human and cattle *Leptospira* infection in northern Tanzania. *In preparation*.

**Conference presentations & abstracts:**

Allan KJ, Goris MGA, Carter RA et al. A One Health approach to leptospirosis – investigating the ecology of human and cattle *Leptospira* infection in northern Tanzania. International Leptospirosis Society Conference, Vancouver, July 2019