Introduction

Study Site

- Peradeniya (population: 50,000, elevation 510 m) is a town in the Kandy district in central Sri Lanka.
- Located on the banks of the Mahaweli River, the longest river in Sri Lanka.
- The University of Peradeniya has over 14,000 students and staff.
- Due to continued habitat destruction, there is increasing human-monkey conflict in Sri Lanka. Toque Macaques (Macaca sinica) are the non-human primate (NHP) in closest contact with Peradeniya residents.

Tuberculosis

- Tuberculosis, caused by the Mycobacterium tuberculosis complex, affects over 9 million people globally.
- Children and immunocompromised individuals are most often affected.
- Highly zoonotic. Most mammals are susceptible, with old world primates being especially at risk.

Enteroparasites

- Macaques were captured using a cage baited with garbage and fruit.
- After an individual was captured and the troop left, the monkey was sedated with ketamine (15-20 mg/kg) and xylazine (0.5-2 mg/kg) IM.
- 2 mL blood (from the femoral vein), nasal/oral swabs and fecal samples were collected.

Methods

Monkey Capture

- Serum was tested for IgG presence with Dengue IgG Elisa Kit (Abnova) using anti-monkey IgG (Santa Cruz Biotechnology). An additional 10 samples from 2014 were tested for anti-dengue IgG.

Tuberculosis

- PCR was performed on DNA extracted from nasal swabs and feces to detect M. tuberculosis complex specific DNA.

Enteroparasites

- Fecal floatation with centrifugation was performed on fresh feces. Diagnosis was made by size and morphology.

Challenges

The biggest challenge in this project is catching the requisite number of monkeys. In a developing country such as Sri Lanka, there is often a lack of equipment. Significant effort went into optimizing protocols and equipment for the capture of wild primates. Furthermore, the University of Peradeniya does not have a darting system suitable for small mammals. Capture was often slow, averaging 1 monkey per week. The University of Peradeniya is currently working to increase the number of cages and acquire a commercial darting system for to facilitate this and other projects.

Preliminary Results

Dengue

- 2 samples from 2015 (33.3%) and 4 samples from 2014 (40%) were positive for anti-dengue IgG.
- Overall, 44% of adults and 28.6% of juveniles were positive for anti-dengue IgG.

Standarization of anti-monkey IgG

- A dilution of 1:2500 was chosen as it yielded a range of antibody indices consistent with the human ranges provided in the kit.

Determination of Threshold

- As the binding of the anti-monkey IgG to the sample is different than the binding of the enzymes in the kit, a new threshold was needed. There are two methods for determining a threshold:
  - Using the lowest sample as the negative control, 4 times the lowest sample is taken as a positive result.
  - Testing the negative control provided in the kit with the anti-monkey IgG, 4 times the OD of the negative control is taken as a positive result. This method is preferred, as it does not require repeated use of samples as controls.

Tuberculosis

- All 6 samples were negative for tuberculosis.

Enteroparasites

- 1 sample (16.7%) was positive for giardia.
- 2 samples (33.3%) were positive for coccidia.
- 1 sample (16.7%) had suspected strongyloidiasis.
- 2 samples (33.3%) were negative for enteroparasites.

Future Studies

- As the above figure shows, the body’s response to dengue varies over time. To further characterize the prevalence of dengue in toque macaques, the serum samples will be tested for dengue NS1 antigen. Viral RNA will be extracted and PCR will be used to detect active viremia.
- The Fernando Group has developed a new set of PCR primers to detect M. tuberculosis DNA in clinical samples with higher sensitivity. Early results indicate that the primer can differentiate between M. bovis and M. tuberculosis.
- Future studies may be expanded to include other native NHP species, especially those in close contact with humans.

References


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