INTRODUCTION

Yellow fever (YF) is a zoonotic, mosquito-borne viral hemorrhagic disease endemic to tropical areas of South America and Africa, which has once again become a major public health concern over the last three decades1,2. In South America the number of YF cases has increased five-fold, affecting primarily rural communities and nonhuman primates (NHPs)3,4. This increase is associated with several factors including: 1) low vaccine coverage in some endemic areas, and 2) exposure of susceptible humans and NHPs to mosquito vectors in endemic regions2. Illegal hunting, capture and/or trade of NHPs is another factor that may increase the number of YF cases among humans and NHPs, but this has not yet been carefully evaluated. Infected NHPs captured for the illegal animal trade could serve as sources of infection for humans and other NHPs in the presence of competent mosquito vectors.

Illegal trade and other threats to NHPs resulting from human activities have proven to have an impact on disease epidemiology and the emergence and re-emergence of infectious diseases worldwide1.

RESEARCH OBJECTIVES

1. Evaluate the presence of antibodies to YF in a sample of howler monkeys confiscated from the illegal wildlife trade at EcoSanfte Rehabilitation center located in Jerico, Antioquia, Colombia. 
2. Develop participatory epidemiology focus group studies to identify the community demographics and needs, as well as their knowledge of howler monkey identification, the type of contact between the community and the monkeys, the knowledge of disease transmission and risk of YF, and possibly identify any hunting or wildlife trade occurring in the area.
3. Propose a nonhuman primate (epizootic) yellow fever surveillance protocol for Colombia, based on Brazil’s surveillance protocol and guidance provided by collaborating researchers in Brazil.

METHODOLOGY

COLOMBIA: (pending)

Seroprevalence of yellow fever (YF) antibodies
- Biological sampling and physical examination of 30 confiscated howler monkeys located at EcoSanfate rehabilitation center.
- Serology test: Capture ELISA for IgM antibodies and neutralization assay.
- Protocols follow the American Society of Primatologist approved guidelines for handling of nonhuman primates and have been approved by Tufts-IAUC; currently awaiting approval from the Colombian Ministry of Environment.

Human activities and illegal nonhuman primate trade (pilot survey – one community)
- Development of semi-structured interviews of the community and individual questionnaires.
- Data analysis: qualitative and quantitative (linear regression, odds ratios, and chi-squared test).
- Interviews and questionnaires are currently awaiting Tufts-IRB approval.

Propose an epizootic surveillance program
- Gather information on the current Colombian YF surveillance system and (if available) of epidemiological data (incidence and prevalence) to identify opportunities to enhance YF epizootic surveillance in Colombia.

EXPECTED OUTCOMES AND RESULTS ...

Seroprevalence of yellow fever (YF) antibodies
- Answer whether the EcoSanfte rehabilitation center howler monkeys have been exposed to YF virus.
- Establish baseline data to assess possible causal relationship of illegal NHP trade with changes in incidence and prevalence of YF infection in monkeys and humans.

Human activities and illegal nonhuman primate trade (participatory epidemiology focus groups)
- Identify the community at most risk and their necessities to propose a more intensive epizootic surveillance protocol to use in Colombia.
- Develop a community education program (including wildlife rehabilitators and any personal involved in the control of illegal wildlife trade) to address YF risk factors and the importance of support conservation efforts to protect the howler monkeys and other NHP.

BRAZIL:

Training in YF epizootic surveillance and howler monkey trapping
- Spent 3 weeks with collaborators at the Centro Estadual de Vigilância em Saúde (CEVS), Rio Grande do Sul, Brazil to learn about their intensive, active YF epizootic surveillance program implemented in 2001.
- Observe and assisted with the capture of howler monkeys during a field expedition to understand the best methods of capture for the species to later implement those into future research.

SUMMARY

- This is the first pilot study looking to evaluate the seroprevalence of YF in howler monkeys confiscated from the illegal wildlife trade in Colombia.
- In general the pilot has been successful, however several problems have been encountered including:
  - Delayed on agreements of collaboration
  - Delayed and misinformation on approval of scientific permits by the Colombian Ministry of Environment.
- The results of this study will provide a basis for further investigation of the possible causal relationship of illegal NHP trade and other human activities with changes in the epidemiology of YF in Colombia.

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REFERENCES