2018 Thomas C. Alber Science & Engineering Fellow

Cara Brook

UC Berkeley Post-Doctoral Fellow with Miller Institute for Basic Research

Cara Brook is a first year postdoctoral fellow with the Miller Institute of Basic Research at UC Berkeley, hosted jointly in the labs of Professor Britt Glaunsinger in Plant and Microbial Biology and Professor Mike Boots in Integrative Biology. Her research bridges field ecology, cellular immunology, and quantitative epidemiology to examine the role of bats as reservoirs for emerging human diseases, including Hendra and Nipah henipaviruses, Ebola and Marburg filoviruses, and SARS coronavirus. Cara received her PhD at Princeton University's Department of Ecology and Evolutionary Biology in 2017, where she spearheaded an ongoing field study documenting longitudinal viral and immunodynamics in several fruit bat species in Madagascar. Cara speaks both French and Malagasy and conducts all research in collaboration with Institut Pasteur of Madagascar (IPM) and the University of Antananarivo. As an Alber Science & Engineering Fellow, she is expanding her work examining seasonal changes in the within-host transcriptional response of viral tolerant bats to infection.

Fellowship Proposal

Some 60-75% of emerging diseases in humans are zoonotic in nature, or derived from an animal reservoir. In recent years, several of the highest profile zoonotic diseases, including Nipah henipavirus, SARS coronavirus, and Ebola filovirus, have emerged from bat reservoirs. Though no known human spillover events have yet taken place in Madagascar, the island was recently classed within the zoonotic 'niche' for both Ebola and Marburg and filoviruses and henipaviruses are known to circulate in three endemic fruit bat species. Bat-human contact rates are substantial in Madagascar, where fruit bats are hunted and consumed widely for food.

Previous research documents seasonal variation in both intra-species reservoir dynamics and cross-species spillover of bat-borne viruses, with transmission concentrated in the resource-poor dry season. Seasonal cycles are ubiquitous in disease ecology, and much research has focused on identifying mechanistic interactions, such as annual variations in host aggregation, that drive cyclical epidemics. Within-host seasonal variation in nutritional, immunological, or reproductive status can also drive epidemics. In wildlife populations, especially, seasonal booms and busts in resource availability mediate dynamic differences in host susceptibility and infectiousness across a year, influencing population-level patterns of disease by altering probability that contact results in transmission.

Cara's project investigates contrasting hypotheses of the drivers underpinning seasonal patterns in zoonotic fruit bats infections in Madagascar. One of the aims of the project is to conduct a longitudinal field study examining: (a) population-level henipa/filovirus infection dynamics and (b) elucidate within-host mechanisms of viral tolerance and resistance in Malagasy fruit bats. The proposed work advances practical understanding of bat-borne zoonotic risks in Madagascar, one of the ten poorest countries in the world, while also providing opportunities for significant capacity building for Malagasy scientists.