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Investigating seasonal drivers of viral zoonoses from Madagascar fruit bats

Project Number
5R01AI129822-03

Contact PI/Project Leader
HERAUD, JEAN-MICHEL

Awardee Organization
PASTEUR INSTITUTE FROM MADAGASCAR

Description

Abstract Text

Zoonotic pathogens derived from an animal reservoir account for some 60-75% of emerging infectious diseases in humans, a disproportionate number of which take place in resource poor countries where the economic and social burden of corresponding health crises is greatest. **Bats** have received much attention in recent years for their role as the putative reservoir hosts for a number of high profile, virulent zoonoses, including Ebola and Marbug filoviruses, Hendra and Nipah henipaviruses, and SARS coronavirus, all of which demonstrate peaks in transmission—both between **bats** and from **bats** to spillover hosts (including humans)—during the resource-poor dry season for the system in question. Seasonal forcings are known to play an important role in driving epidemic cycles in infectious diseases for both humans and wildlife, though the mechanistic drivers of seasonality can sometimes be difficult to identify. In bat systems, researchers have posited that dynamical patterns could result from pulsed additions of annual, synchronous births to the pool susceptible to immunizing viruses, while others have suggested that **bats** might instead maintain these viruses as persistent infections across the duration of their lifespans and undergo periodic bouts of viral shedding. A true understanding of these dynamics will be essential to predicting and preventing the next bat zoonosis, a critical public health aim for developing world countries, like Madagascar, where we base our work. To date, longitudinal data of a fine enough scale do not exist to distinguish among the proposed hypotheses. Our project brings together a diverse team of molecular biologists from Institut Pasteur de Madagascar and Duke-NUS, epidemiological modelers from Princeton, and field ecologists from Harvard to address these challenges. In Aim 1 of our research, we introduce novel Luminex assays to identify henipa/filo/corona/lyssavirus antibodies in both bat and human serum samples in Madagascar. In Aim 2, we build mechanistic transmission models exploring the proposed hypotheses of seasonal drivers of infection dynamics in bat systems, and in Aim 3, we unite these goals in a longitudinal model- guided field study, with corresponding serological and molecular analyses, which will generate the data needed to enable effective model comparison and evaluation. Our work addresses questions of critical interest to both evolutionary biology and public health, while simultaneously building scientific capacities in the developing world.

Public Health Relevance Statement

Bats have received increasing attention in recent years for their roles as the putative reservoir hosts for several highly virulent, emerging viral diseases in humans, including Ebola, Nipah, and SARS, for which the majority of transmission, both between bats and from bats to other species, peaks in resource-poor dry seasons. In spite of the widely acknowledged importance of seasonal drivers of epidemic cycles for human infections, no longitudinal mechanistic studies have yet investigated seasonality, and consequences for zoonosis, in a bat virus system. Our work combines novel serological and molecular surveillance tools with ecological field studies and quantitative epidemiological models to enlighten understanding of the seasonal drivers of bat-borne zoonotic viruses in Madagascar.

NIH Spending Category

Biodefense | Emerging Infectious Diseases | Infectious Diseases | Rare Diseases

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Ebola Virus | Economics | Educational Workshop | Emerging Communicable Diseases | Epidemic | Epidemiology | Evaluation | Event | Excretory function | Expression Profiling | Family | Filovirus | Frankfurt-Marburg Syndrome Virus | Fruit | Future | Genes | Goals | Head | Health | Hendra Virus

Read More

Details

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Country
MADAGASCAR (MA)

Department Type
Unavailable

Organization Type
Unavailable

State Code

Congressional District

Other Information

FOA
PAR-14-080

Study Section
Special Emphasis Panel[ZRG1-IDM-N(50)R]

Fiscal Year
2019

Award Notice Date
23-April-2019

Administering Institutes or Centers
NATIONAL INSTITUTE OF ALLERGY AND INFECTIOUS DISEASES

DUNS Number
499221216

CFDA Code
855

Project Start Date
02-May-2017

Project End Date
30-April-2022

Budget Start Date
01-May-2019

Budget End Date
30-April-2020

Project Funding Information for 2019

Total Funding
$134,653

Direct Costs
$124,679

Indirect Costs
$9,974

Year	Funding IC	
2019	NATIONAL INSTITUTE OF ALLERGY AND INFECTIOUS DISEASES	$134,653

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Funding IC

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Diseases; Rare Diseases;

Sub Projects

No Sub Projects information available for 5R01AI129822-03

Publications

No Publications available for 5R01AI129822-03

Patents

No Patents information available for 5R01AI129822-03

Outcomes

The Project Outcomes shown here are displayed verbatim as submitted by the Principal Investigator (PI) for this award. Any opinions, findings, and conclusions or recommendations expressed are those of the PI and do not necessarily reflect the views of the National Institutes of Health. NIH has not endorsed the content below.

No Outcomes available for 5R01AI129822-03

Clinical Studies

No Clinical Studies information available for 5R01AI129822-03

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Related News Releases

No news release information available for 5R01AI129822-03

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No Historical information available for 5R01AI129822-03

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