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Biology and infection of bats with novel bat influenza viruses

Project Number
5R01AI134768-02

Contact PI/Project Leader
MA, WENJUN

Awardee Organization
KANSAS STATE UNIVERSITY

Description

Abstract Text

Project Summary Influenza pandemics are caused by emergent novel influenza A viruses (IAVs) that transmit efficiently within human populations lacking preexisting immunity against the specific virus. After the significantly divergent genome sequences of novel HL17NL10 and HL18NL11 bat influenza A-like viruses (BIALVs) were identified, concerns have been raised that they may pose significant spillover threats to humans because antibodies to IAVs and influenza B viruses have no cross-reactivity to novel BIALVs. To understand these novel viruses, reverse genetics was established for both viruses. It was demonstrated that internal genes of these viruses are functional through generation of chimeric bat viruses that contain six internal genes from the bat virus and the ORF of both HA and NA from canonical IAVs. It was also shown that reassortant viruses that carry the classical IAV M gene by replacing the bat M gene in the genetic background of chimeric bat virus can be rescued. Bats have been shown to be seropositive to IAVs, frequently to the H9N2 viruses. Furthermore, bat cells from different species have been demonstrated to support human, swine and avian IAV replication. The bats could have been exposed to both BIALVs and IAVs, and reassortment might occur to generate novel viruses that can infect other species including humans. Recent studies showed that rescued BIALVs can infect canine and human cells. All facts suggest a zoonotic potential of novel bat viruses. However, little is known about the receptors of these novel viruses, infection and immunological responses in their natural hosts (bats), or how they are maintained and transmitted among their natural hosts. Whether bats can be infected by IAVs, and if they are infected, what role in the ecology of IAVs do these infections play? Significant knowledge is needed to understand these novel viruses and their potential threats to other species including humans. Jamaican fruit bats (Artibeus jamaicensis) were shown to be experimentally susceptible to the rescued wild type HL18NL11 virus. Therefore, it is hypothesized that Jamaican fruit bats can be used as a model organism for understanding novel BIALVs and their potential threats to other species including humans. This proposal includes three specific aims: 1) To determine BIALV infection kinetics and tropisms in bats, as well as identify cellular receptors; 2) To determine reassortment potential and mechanisms between BIALVs and classical IAVs; 3) To determine which bat adaptive immune responses are critical to controlling BIALV infection. The results from this proposal will provide novel insights into the biology and virology of novel BIALVs, reveal the association of identified viral sequences with bats, identify roles that bats may play in virus ecology, and address concerns regarding their potential threats to other species including humans, which are important for the both influenza and bat immunity research communities.

Public Health Relevance Statement

Project Narrative Understanding biology and infection of bats with novel bat influenza A-like viruses will provide novel insights into the role of the bats in virus ecology, and offer new knowledge on molecular mechanisms of bat influenza A-like virus replication and potential reassortment with other canonical influenza A viruses, and on their potential threats to public and animal health.

NIH Spending Category

Biodefense Emerging Infectious Diseases Infectious Diseases Influenza Pneumonia & Influenza

Project Terms

Address Animal Model Animals Antibodies Avian Influenza A Virus B-Lymphocytes Biological Assay Biology Canis familiaris Cells Cellular Immunity Chiroptera Communities Data Disease Dose Ecology Evolution Exposure to Flow Cytometry Fruit Future Generations Genes Genetic Genome Health Hong Kong Human Immune response Immunity Individual Infection Influenza Influenza A Virus, H9N2 Subtype Influenza A virus Influenza B Virus Interferon Type II Jamaican Kinetics Knowledge Laboratories Maintenance Mediating Molecular Open Reading Frames Play Population Predisposition Public Health Publishing Quail Reassortant Viruses Research Research Personnel

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Contact PI/Project Leader
MA, WENJUN

Awardee Organization
KANSAS STATE UNIVERSITY

wma@missouri.edu

Organization

Name
KANSAS STATE UNIVERSITY

City
MANHATTAN

Country
UNITED STATES (US)

Department Type
VETERINARY SCIENCES

Organization Type
SCHOOLS OF VETERINARY MEDICINE

State Code
KS

Congressional District
01

Other Information

FOA
PA-16-160

Study Section
Virology - B Study Section[VIRB]

Fiscal Year
2019

Award Notice Date
21-December-2018

Administering Institutes or Centers
NATIONAL INSTITUTE OF ALLERGY AND INFECTIOUS DISEASES

DUNS Number
929773554

CFDA Code
855

Project Start Date
10-January-2018

Project End Date
31-December-2022

Budget Start Date
01-January-2019

Budget End Date
31-December-2019

Project Funding Information for 2019

Total Funding
$409,517

Direct Costs
$339,334

Indirect Costs
$70,183

Year	Funding IC	FY Total Cost by IC
2019	NATIONAL INSTITUTE OF ALLERGY AND INFECTIOUS DISEASES	$409,517

NIH Categorical Spending

Click here for more information on NIH Categorical Spending

Funding IC	FY Total Cost by IC	NIH Spending Category
NATIONAL INSTITUTE OF ALLERGY AND INFECTIOUS DISEASES	$409,517	Biodefense; Emerging Infectious Diseases; Infectious Diseases; Influenza; Pneumonia & Influenza;

Sub Projects

No Sub Projects information available for 5R01AI134768-02

Publications

No Publications available for 5R01AI134768-02

Patents

No Patents information available for 5R01AI134768-02

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.

Thank you for your feedback!

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No Clinical Studies information available for 5R01AI134768-02

News and More

Related News Releases

No news release information available for 5R01AI134768-02

History

No Historical information available for 5R01AI134768-02

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No Similar Projects information available for 5R01AI134768-02

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