OMB Number: 4040-0001
Expiration Date: 10/31/2019

APPLICATION FOR FEDERAL ASSISTANCE
SF 424 (R&R)

3. DATE RECEIVED BY STATE	State Application Identifier

1. TYPE OF SUBMISSION*

❍ Pre-application ● Application ❍ Changed/Corrected Application

4.a. Federal Identifier
AI110964

b. Agency Routing Number

2. DATE SUBMITTED	Application Identifier	c. Previous Grants.gov Tracking Number

5. APPLICANT INFORMATION **Organizational DUNS*:** 0770900660000

Legal Name*: ECOHEALTH ALLIANCE, INC.
Department:
Division:
Street1*: ECOHEALTH ALLIANCE, INC.
Street2: 460 W 34TH ST
City*: NEW YORK
County:
State*: NY: New York
Province:
Country*: USA: UNITED STATES
ZIP / Postal Code*: 100012320

Person to be contacted on matters involving this application
Prefix: Dr. First Name*: Peter Middle Name: Last Name*: Daszak Suffix:
Position/Title: PD/PI
Street1*: 460 West 34th Street
Street2: Suite 1701
City*: New York
County:
State*: NY: New York
Province:
Country*: USA: UNITED STATES
ZIP / Postal Code*: 100012320
Phone Number*: 2123804474 Fax Number: 2123804465 Email: daszak@ecohealthalliance.org

6. EMPLOYER IDENTIFICATION NUMBER *(EIN) or (TIN)** 311726494

7. TYPE OF APPLICANT* M: Nonprofit with 501C3 IRS Status (Other than Institution of Higher Education)

Other (Specify):
Small Business Organization Type ❍ Women Owned ❍ Socially and Economically Disadvantaged

8. TYPE OF APPLICATION*
❍ New ❍ Resubmission
● Renewal ❍ Continuation ❍ Revision

If Revision, mark appropriate box(es).
❍ A. Increase Award ❍ B. Decrease Award ❍ C. Increase Duration
❍ D. Decrease Duration ❍ E. Other *(specify)* :

Is this application being submitted to other agencies?* ❍Yes ●No What other Agencies?

9. NAME OF FEDERAL AGENCY*
National Institutes of Health

10. CATALOG OF FEDERAL DOMESTIC ASSISTANCE NUMBER
TITLE:

11. DESCRIPTIVE TITLE OF APPLICANT'S PROJECT*
Understanding the Risk of Bat Coronavirus Emergence

12. PROPOSED PROJECT		13. CONGRESSIONAL DISTRICTS OF APPLICANT
Start Date*	Ending Date*	NY-010
06/01/2019	05/31/2024	

SF 424 (R&R) APPLICATION FOR FEDERAL ASSISTANCE

14. PROJECT DIRECTOR/PRINCIPAL INVESTIGATOR CONTACT INFORMATION

Prefix: Dr. First Name*: PETER Middle Name: Last Name*: DASZAK Suffix:
Position/Title: President
Organization Name*: ECOHEALTH ALLIANCE, INC.
Department:
Division:
Street1*: 460 West 34th Street
Street2: Suite 1701
City*: New York
County:
State*: NY: New York
Province:
Country*: USA: UNITED STATES
ZIP / Postal Code*: 100012317
Phone Number*: (b) (6) Fax Number: +12123804465 Email*: (b) (6)

15. ESTIMATED PROJECT FUNDING

a. Total Federal Funds Requested*	$3,586,760.00
b. Total Non-Federal Funds*	$0.00
c. Total Federal & Non-Federal Funds*	$3,586,760.00
d. Estimated Program Income*	$0.00

16.IS APPLICATION SUBJECT TO REVIEW BY STATE EXECUTIVE ORDER 12372 PROCESS?*

a. YES ○ THIS PREAPPLICATION/APPLICATION WAS MADE AVAILABLE TO THE STATE EXECUTIVE ORDER 12372 PROCESS FOR REVIEW ON:
DATE:

b. NO ● PROGRAM IS NOT COVERED BY E.O. 12372; OR
○ PROGRAM HAS NOT BEEN SELECTED BY STATE FOR REVIEW

17. By signing this application, I certify (1) to the statements contained in the list of certifications* and (2) that the statements herein are true, complete and accurate to the best of my knowledge. I also provide the required assurances * and agree to comply with any resulting terms if I accept an award. I am aware that any false, fictitious, or fraudulent statements or claims may subject me to criminal, civil, or administrative penalties. (U.S. Code, Title 18, Section 1001)

● I agree*

** The list of certifications and assurances, or an Internet site where you may obtain this list, is contained in the announcement or agency specific instructions.*

18. SFLLL or OTHER EXPLANATORY DOCUMENTATION File Name:

19. AUTHORIZED REPRESENTATIVE

Prefix: Dr. First Name*: Aleksei Middle Name: Last Name*: Chmura Suffix:
Position/Title*: Authorized Organizational Representative
Organization Name*: EcoHealth Alliance, Inc.
Department:
Division:
Street1*: 460 West 34th Street
Street2: Suite 1701
City*: New York
County:
State*: NY: New York
Province:
Country*: USA: UNITED STATES
ZIP / Postal Code*: 100012320
Phone Number*: (b) (6) Fax Number: 2123804465 Email*: (b) (6)

Signature of Authorized Representative*
Aleksei Chmura

Date Signed*
11/05/2018

20. PRE-APPLICATION File Name:

21. COVER LETTER ATTACHMENT File Name:NIAID_COV_2018_Cover_Letter_Final.pdf

424 R&R and PHS-398 Specific
Table Of Contents

OMB Number: 4040-0010
Expiration Date: 10/31/2019

Project/Performance Site Location(s)

Project/Performance Site Primary Location

❍ I am submitting an application as an individual, and not on behalf of a company, state, local or tribal government, academia, or other type of organization.

Organization Name:	ECOHEALTH ALLIANCE, INC.
Duns Number:	0770900660000
Street1*:	ECOHEALTH ALLIANCE, INC.
Street2:	460 W 34TH ST
City*:	NEW YORK
County:	
State*:	NY: New York
Province:	
Country*:	USA: UNITED STATES
Zip / Postal Code*:	100012320
Project/Performance Site Congressional District*:	NY-010

Project/Performance Site Location 1

❍ I am submitting an application as an individual, and not on behalf of a company, state, local or tribal government, academia, or other type of organization.

Organization Name:	University of North Carolina at Chapel Hill
DUNS Number:	6081952770000
Street1*:	McGavran-Greenberg Hall
Street2:	Campus Box 7435
City*:	Chapel Hill
County:	
State*:	NC: North Carolina
Province:	
Country*:	USA: UNITED STATES
Zip / Postal Code*:	275997435
Project/Performance Site Congressional District*:	NC-004

Funding Opportunity Number: PA-18-484. Received Date: 2018-11-05T16:31:22.000-05:00

Project/Performance Site Location 2

❍ I am submitting an application as an individual, and not on behalf of a company, state, local or tribal government, academia, or other type of organization.

Organization Name:	Wuhan Institute of Virology
DUNS Number:	5290274740000
Street1*:	Xiao Hong SHan, No. 44
Street2:	Wuchang District
City*:	Wuhan
County:	
State*:	
Province:	
Country*:	CHN: CHINA
Zip / Postal Code*:	430071
Project/Performance Site Congressional District*:	00-000

Project/Performance Site Location 3

❍ I am submitting an application as an individual, and not on behalf of a company, state, local or tribal government, academia, or other type of organization.

Organization Name:	Institute of Pathogen Biology
DUNS Number:	5281563570000
Street1*:	Dong Dan San Tiao, No. 9
Street2:	Dongcheng District
City*:	Beijing
County:	
State*:	
Province:	
Country*:	CHN: CHINA
Zip / Postal Code*:	100730
Project/Performance Site Congressional District*:	00-000

Additional Location(s) File Name:

OMB Number: 4040-0001
Expiration Date: 10/31/2019

RESEARCH & RELATED Other Project Information

1. Are Human Subjects Involved?* ● **Yes** ○ **No**

1.a. If YES to Human Subjects

Is the Project Exempt from Federal regulations? ○ Yes ● No

If YES, check appropriate exemption number: _ 1 _ 2 _ 3 _ 4 _ 5 _ 6 _ 7 _ 8

If NO, is the IRB review Pending? ● **Yes** ○ **No**

IRB Approval Date: 03-15-2019

Human Subject Assurance Number None

2. Are Vertebrate Animals Used?* ● **Yes** ○ **No**

2.a. If YES to Vertebrate Animals

Is the IACUC review Pending? ● Yes ○ No

IACUC Approval Date: 03-15-2019

Animal Welfare Assurance Number None

3. Is proprietary/privileged information included in the application?* ○ **Yes** ● **No**

4.a. Does this project have an actual or potential impact - positive or negative - on the environment?* ○ **Yes** ● **No**

4.b. If yes, please explain:

4.c. If this project has an actual or potential impact on the environment, has an exemption been authorized or an environmental assessment (EA) or environmental impact statement (EIS) been performed? ○ Yes ○ No

4.d. If yes, please explain:

5. Is the research performance site designated, or eligible to be designated, as a historic place?* ○ **Yes** ● **No**

5.a. If yes, please explain:

6. Does this project involve activities outside the United States or partnership with international collaborators?* ● **Yes** ○ **No**

6.a. If yes, identify countries: China

6.b. Optional Explanation:

	Filename
7. Project Summary/Abstract*	NIAID_COV_2019_PROJECT_SUMMARY_final.pdf
8. Project Narrative*	NIAID_COV_2019_NARRATIVE_Final.pdf
9. Bibliography & References Cited	NIAID_COV_2019_REFERENCES.pdf
10.Facilities & Other Resources	NIAID_COV_2019_FACILITIES_v01_PD.pdf
11.Equipment	NIAID_COV_2019_EQUIPMENT_v01.pdf

Funding Opportunity Number: PA-18-484. Received Date: 2018-11-05T16:31:22.000-05:00

Project Summary: Understanding the Risk of Bat Coronavirus Emergence

Novel zoonotic, bat-origin CoVs are a significant threat to global health and food security, as the cause of SARS in China in 2002, the ongoing outbreak of MERS, and of a newly emerged Swine Acute Diarrhea Syndrome in China. In a previous R01 we found that bats in southern China harbor an extraordinary diversity of SARSr-CoVs, some of which can use human ACE2 to enter cells, infect humanized mouse models causing SARS-like illness, and evade available therapies or vaccines. We found that people living close to bat habitats are the primary risk groups for spillover, that at one site diverse SARSr-CoVs exist that contain every genetic element of the SARS-CoV genome, and identified serological evidence of human exposure among people living nearby. These findings have led to **18 published peer-reviewed papers, including two papers in *Nature*, and a review in *Cell*.** Yet salient questions remain on the origin, diversity, capacity to cause illness, and risk of spillover of these viruses. In this R01 renewal we will address these issues through 3 specific aims:

Aim 1. Characterize the diversity and distribution of high spillover-risk SARSr-CoVs in bats in southern China. We will use phylogeographic and viral discovery curve analyses to target additional bat sample collection and molecular CoV screening to fill in gaps in our previous sampling and fully characterize natural SARSr-CoV diversity in southern China. We will sequence receptor binding domains (spike proteins) to identify viruses with the highest potential for spillover which we will include in our experimental investigations (Aim 3).

Aim 2. Community, and clinic-based syndromic, surveillance to capture SARSr-CoV spillover, routes of exposure and potential public health consequences. We will conduct biological-behavioral surveillance in high-risk populations, with known bat contact, in community and clinical settings to 1) identify risk factors for serological and PCR evidence of bat SARSr-CoVs; & 2) assess possible health effects of SARSr-CoVs infection in people. We will analyze bat-CoV serology against human-wildlife contact and exposure data to quantify risk factors and health impacts of SARSr-CoV spillover.

Aim 3. *In vitro* and *in vivo* characterization of SARSr-CoV spillover risk, coupled with spatial and phylogenetic analyses to identify the regions and viruses of public health concern. We will use S protein sequence data, infectious clone technology, *in vitro* and *in vivo* infection experiments and analysis of receptor binding to test the hypothesis that % divergence thresholds in S protein sequences predict spillover potential. We will combine these data with bat host distribution, viral diversity and phylogeny, human survey of risk behaviors and illness, and serology to identify SARSr-CoV spillover risk hotspots across southern China. Together these data and analyses will be critical for the future development of public health interventions and enhanced surveillance to prevent the re-emergence of SARS or the emergence of a novel SARSr-CoV.

Renewal: Understanding the Risk of Bat Coronavirus Emergence

Project Narrative

Most emerging human viruses come from wildlife, and these represent a significant threat to public health and biosecurity in the US and globally, as was demonstrated by the SARS coronavirus pandemic of 2002-03. This project seeks to understand what factors allow coronaviruses, including close relatives to SARS, to evolve and jump into the human population by studying viral diversity in their animal reservoirs (bats), surveying people that live in high-risk communities in China for evidence of bat-coronavirus infection, and conducting laboratory experiments to analyze and predict which newly-discovered viruses pose the greatest threat to human health.

Facilities, Equipment, and Other Resources

EcoHealth Alliance, New York, USA (Drs. Daszak, Olival, Francisco, Ross)

EcoHealth Alliance is a New York-based 501(c) 3 non-profit institution that conducts scientific research on emerging zoonoses and global health capacity building. EcoHealth Alliance New York headquarters has (b) (4) square feet of office space including a meeting room and basic laboratory – freezer storage and light microscopy. The scientific staff (34 core scientists, 100+ field staff) is supported by a core admin staff of 18 who are available for work on this project and funded through private donor and federal support. EcoHealth Alliance does not support diagnostic facilities at its core headquarters and works in partnership with a network of leading diagnostic labs both in the USA and around the world.

EcoHealth Alliance is equipped with fiber optic Internet access and video conferencing facilities to facilitate easy communication between collaborators. EcoHealth Alliance employees have around-the-clock access to servers, VPNs, encryption software, IT support, and all necessary software including Git and Github (Hosted software revision/audit service), Sublime and Vim text editors, Vagrant and Oracle Virtualbox virtual machines, Google Apps (Hosted email and collaboration web based software), Ansible (Server provisioning software framework), Python, NodeJS, and R programming languages, Meteor (Javascript framework), Bash shell scripts, Jenkins (Continuous Integration server), Microsoft Office and Adobe CS6 running on both Apple Mac OS X, Ubuntu linux, and Windows Operating Systems. EcoHealth Alliance has a dedicated quad-core Linux server and another dedicated dual quad-core Mac Pro Server - each with 4TB hard drives. Either server individually or in combination may be used for intensive computational modeling and/or database processing by all the grantees. Access to the cloud and supercomputing services (Amazon) is provided by core funding to EcoHealth Alliance.

EcoHealth Alliance is the headquarters of a global network of over 70 partners that provides exceptional leverage for the core scientists. This network includes staff from: academic institutions at leading national universities; intergovernmental agencies (WHO, OIE, FAO, DIVERSITAS, IUCN); infectious disease surveillance laboratories including BSL-3 and -4 laboratories; national government agency offices and labs; locally-based wildlife conservation organizations in Asia, Africa and Latin America. EcoHealth Alliance is the headquarters of: The Consortium for Conservation Medicine (CCM); the journal *EcoHealth*; an NSF Research Coordination Network (EcoHealthNET); the IUCN Wildlife Health Specialist Group; and the OIE Wildlife Health Network. EcoHealth Alliance is a voting member of the IUCN and a partner in Columbia University's Earth Institute Center for Environmental Sustainability (EICES) and all senior scientific staff members are Adjunct Faculty at Columbia University's Department of Ecology, Evolution, and Environmental Biology or at the Mailman School of Public Health.

Institute of Pathogen Biology, Chinese Academy of Medical Sciences and Peking Union Medical College, Beijing, China (Drs. Ren, Guo)

The Institute of Pathogen Biology (IPB) is a key (flagship) institute within the Chinese Academy of Medical Sciences & Peking Union Medical College. IPB's mission is to conduct high quality research in basic and applied biology of critically important human pathogens. The ultimate goal is to conduct research and develop technology for better diagnosis, treatment, and prevention of infectious diseases. IPB specializes in multi-disciplinary approaches to pathogen research and technological development focused on improving China's capability to diagnose, treat and prevent infectious diseases.

Human Resources. The department involved in this project consists of 30 staff members: 10 with a clinical medicine background, 12 biological research scientists, 3 bioinformaticists, 3 animal technicians, and 2 biochemists working on protein expression and purification.

Lab Facilities. The IPB includes the Ministry of Health Key Laboratory of Systems Biology of Pathogens, Christophe Merieux Laboratory, the AIDS Research Center, laboratories focused on Bacteriology, Virology, Mycology, Parasitology, and the Epidemiological Information Analysis Department. The institute has established platforms in metagenomics, transcriptome, morphology, molecular biology, and immunology. All of these are funded centrally and available to conduct the research proposed in the current R01.

BSL2 Facility. The institute has three laboratories of (b) (4) equipped as BSL2 space for virology, immunology and clinical sample preparation. Equipment includes an Illumina Hiseq 2500, Miseq and BGI 500, gel electrophoresis, power supplies, thermal cyclers, a programmable heat block, heat blocks, water baths, CO_2 incubators (2), several -70°C freezers, one -140°C freezer, refrigerators, DNA documentation system, DNA sequencing and computer assisted sequence analysis programs, several microfuges, Nikon and Zeiss microscopes with photographic and fluorescent capabilities, several class 2 environmental hoods, refrigerated water baths, real time thermocyclers, and spectrophotometers. The laboratory has an ELISA plate reader, an illuminometer, ELISA plate washer, spectrophotometers, and other equipment that is routinely used in characterizing antibody-protein interactions.
BSL 3 Facility. The institute shares an additional (b) (4) of BSL3 facilities equipped with sterile hoods (BSCIIA), CO_2 incubators, -70C freezer, an inverted Nikon fluorescent microscope, and equipment for virus isolation and culture, and molecular genetics research.

University of North Carolina at Chapel Hill, USA (Baric and Sims)
The Department of Epidemiology is an internationally recognized leader in epidemiologic research and training. The department offers research training in most specialized areas including cancer, cardiovascular diseases, environmental and occupational health, health services/clinical epidemiology, reproductive health and infectious diseases. The department's current faculty consists of 51 regular full-time faculty and 151 adjunct faculty members. The department has 218 graduate students enrolled, including 20 in the MPH program, 5 in the MSPH program, 20 in the MSCR program and 173 in the Ph.D. program. The Department of Epidemiology is headquartered in the four-story McGavran-Greenberg Building. The epidemiology administrative and office space occupies (b) (4) square feet and provides additional classroom space. Most of the department's research staff occupies a research annex consisting of approximately (b) (4) square feet of contiguous rental space in a commercial office building.

Dr. Baric has three laboratories of (b) (4) square feet each equipped as BL2 space for molecular biology, virology, immunology and recombinant DNA techniques, as laid out in the current R01 proposal. Equipment is available for gel electrophoresis, PCR, and BSL2 sample storage and handling facilities. It includes a DNA documentation system, DNA sequencing and computer assisted sequence analysis programs, several microfuges, a microscopy suite, 10+ IBM and Apple Pentium II/III computers with accompanying software, three thermocyclers, a fume hood, Nuclisens reader, hybridization oven, real time thermocyclers, three fluorescent inverted scopes with computer software (Olympus IX51), and a spectrophotometer. A Roche Light Cycler 480II is available for real time measurements. The laboratory has an ELISA plate reader, an illuminometer, 200 cages for animal maintenance and breeding in Seal-Safe housing, Bio Rad low pressure chromatography system, ELISA plate washer, spectrophotometers, and other equipment that is routinely used in characterizing antibody-protein interactions.

The Baric laboratory contains an additional (b) (4) square feet of newly renovated BSL3 facilities with enhanced features including shower in/shower out facility; dual anteroom access; Hepa filtered exhaust; redundant exhaust fans; card key access; an alarm system to Public Health/Campus Police; laboratory controlled combination lock; and Techniplast Sealsafe™ Hepa filtered animal housing for 300+ rodents. PAPR and tyvek suits are worn at all times in the BSL3 facility. The BL3 facilities are in an adjacent and attached building (b) (4) or in (b) (4), the latter space is directly adjacent to Dr. Baric's BSL2 laboratory resources. Each facility is equipped with sterile hoods (BSCIIA), four CO_2 incubators, gel electrophoresis equipment, thermal cyclers and power supplies, and related equipment necessary for virus cultivation and molecular genetic research. The facilities each house a -70°C freezer, an inverted Nikon fluorescent microscope with a digital camera, an ELISA plate reader and illuminometer. Both facilities contain rodent-sized Seal-Safe systems (~192 cages) for maintaining animals in a Hepa-filtered Air in/out environment, exhausted into the BSL3 Hepa-filtered exhaust system. An 8 chamber Buxco plethysmography system that allows for repetitive, noninvasive measures of the number of breaths, tidal volume, airway responsiveness, enhanced pause, and respiratory gases from live control and infected mice in a contained system is housed in the main BSL3 laboratory in (b) (4).

The Department of Epidemiology provides cold-room, autoclave, centralized dishwashing and a darkroom with an automated developer. The campus has central facilities for DNA oligonucleotide synthesis, histopathology, DNA sequencing, EM, light and confocal microscopy, automated PCR genotyping and Taqman facilities, and Fluorescent activated cell sorter facilities (FAC). As a member of the Department of Microbiology and Immunology and UNC Cancer center, Dr. Baric and his team have access to these facilities at a discounted cost. The University provides a variety of core services including: sequencing and deep sequencing cores, genomics cores, oligonucleotide synthesis cores, hybridoma cores, transgenic cores, structural biology cores, etc. typical of any world class research institution. Campus wide core facilities are available for oligonucleotide synthesis, Sanger and 454 sequencing, RNAseq, pathology and histology services, and Flow Cytometry. Approximately, 40,000 cages are available for CC RIX production in the (b) (4) on UNC Campus.

Wuhan Institute of Virology, Chinese Academy of Sciences, Hubei, China (Shi, Zhou, and Hu)

The Wuhan Institute of Virology (WIV), Chinese Academy of Sciences (CAS) is the only institute specializing in virology, viral pathology and virus technology among 19 other biological and biomedical research institutes in CAS. WIV is China's premier institute for virologic research. It consists of three research departments and one center: the Departments of Molecular Virology, of Bio-control, of Analytical Biochemistry and Biotechnology, and the Virus Resource and Bioinformation Center. It contains the Key Laboratory of Molecular Virology of CAS, the Joint-laboratory of Invertebrate Virology, an HIV Pre-screening Lab and the Hubei Engineering and Technology Research Center for Viral Diseases. The institute is further divided into 14 research groups, one of which (the Emerging Virus Laboratory) is headed by Dr. Zhengli Shi. The supporting system of the institute consists of an analytical equipment center, an experimental animal center, the editorial office of *Virologica Sinica* and a computer network center. The virus resource and bio-information center of China contains the largest virus bank in Asia, curating around 800 viral strains.

The Wuhan Institute of Virology is a World Health Organization collaborating center. It also has partnerships, research collaborations and contracts with universities and research institutes in more than 30 counties and regions including a long-time (>15 years) partnership with EcoHealth Alliance. There are 14 professors, 36 associated professors, and 47 assistant professors conducting research on virology and five of these have been awarded honors in the “Hundred Talents Project”. In 2013, the first BSL-4 lab in China was opened at this Institute in a bespoke facility which was designed with the assistance of the US CDC and L’Institut Pasteur of France.

The WIV Emerging Virus Laboratory, headed by Dr. Shi, was set up to carry out exactly the sort of experimental activities on emerging viruses listed in the current R01 proposal. This lab possesses all necessary facilities for molecular biology and virology including a bank of -80˚C freezers, PCR machines, gel electrophoresis and imaging systems, biosafety cabinets, super-clean benches, and cell culture rooms. A Core Facility Center was established at WIV to provide technological services to faculty, students, and visiting researchers. Core Facility Center equipment includes: a transmission electron microscope, ultracentrifugation machines, small animal *in vivo* imaging systems, confocal laser scanning microscopes, flow cytometry, a real-time qPCR system, and a high-throughput sequencing and analyzing system. In addition, WIV owns a complete biosafety research platform, which consists of the first national BSL-4 laboratory in China, and a cluster of BSL-3 and BSL-2 labs.

Equipment

EcoHealth Alliance (Daszak, Francisco, Olival, Ross)
EcoHealth Alliance is equipped with fiber optic Internet access and video conferencing facilities to facilitate easy communication between collaborators. EcoHealth Alliance employees have around the clock access to servers, VPNs, encryption software, IT support, and all necessary software including Git and Github (Hosted software revision/audit service), Sublime and Vim text editors, Vagrant and Oracle Virtualbox virtual machines, Google Apps (Hosted email and collaboration web based software), Ansible (Server provisioning software framework), Python, NodeJS, and R programming languages, Meteor (Javascript framework), Bash shell scripts, Jenkins (Continuous Integration server), Microsoft Office and Adobe CS6 running on both Apple Mac OS X, Ubuntu linux, and Windows Operating Systems. Additionally, EcoHealth Alliance has a dedicated quad-core Linux server and another dedicated dual quad-core Mac Pro Server - each with 4TB hard drives. Either server individually or in combination may be used for intensive computational modeling and/or database processing by all the grantees. Access to the cloud and supercomputing services (Amazon) is provided by core funding to EcoHealth Alliance.

Institute of Pathogen Biology (Ren, Guo)
The Institute of Pathogen Biology laboratories have equipment required for general microbiological, molecular, and biochemical work including microcentrifuges, agarose and polyacrylamide electrophoresis equipment, spectrophotometer, rocking and shaking platforms, bead-beater cell disruptor, and incubators (shaking and static). Major equipment relevant to this proposal which are available include:

BSL2 Facility. The institute has three laboratories of (b) (4) equipped as BSL2 space for the virology, immunology and clinical samples pretreatment. Equipment includes Illumina Hiseq 2500, Miseq and BGI 500, gel electrophoresis equipment, power supplies, thermal cyclers, a programmable heat block, heat blocks, water baths, CO_2 incubators (2), several -70°C freezers, one -140°C freezer, refrigerators, DNA documentation system, DNA sequencing and computer assisted sequence analysis programs, several microfuges, Nikon and Zeiss microscopes with photographic and fluorescent capabilities, several class 2 environmental hoods, refrigerated water baths, real time thermocyclers, and spectrophotometer. The laboratory has an ELISA plate reader, an illuminometer, ELISA plate washer, spectrophotometers, and other equipment that is routinely used in characterizing antibody-protein interactions.

BSL 3 Facility. The institute shares an additional (b) (4) of BSL3 facilities equipped with sterile hoods (BSCIIA), CO_2 incubators, -70°C freezer, an inverted Nikon fluorescent microscope with an assortment of filters, magnifications and digital camera, and related equipment necessary for virus cultivation and molecular genetic research.

Wuhan Institute of Virology (Shi, Zhou, Hu)
Institute of Virology's Emerging Virus Laboratory has equipment required for general microbiological, molecular, and biochemical work including microcentrifuges, agarose and polyacrylamide electrophoresis equipment, spectrophotometer, rocking and shaking platforms, bead-beater cell disruptor, and incubators (shaking and static). Major equipment relevant to this proposal which are available include: -80°C freezers, PCR machines, gel electrophoresis and imaging system, biosafety cabinets, super-clean benches, and cell culture rooms.

A Core Facility Center was established at Wuhan Institute of Virology to provide technological services to faculty, students, and visiting researchers. The equipment installed in the Core Facility Center include: transmission electron microscope, ultracentrifugation machines, small animal *in vivo* imaging systems, confocal laser scanning microscopes, flow cytometry, a real-time qPCR system, and a high-throughput sequencing and analyzing system.

In addition, the Wuhan Institute of Virology owns a complete biosafety research platform, which consists of the first national BSL-4 laboratory in China, and a cluster of BSL-3 and BSL-2 labs. These labs contain gel electrophoresis equipment, power supplies, thermal cyclers, programmable heat blocks, heat blocks, water

baths, CO_2 incubators, -70°C freezers, -140°C freezers, refrigerators, DNA documentation system, DNA sequencing and computer assisted sequence analysis programs, microfuges, Nikon and Zeiss microscopes with photographic and fluorescent capabilities, several class 2 environmental hoods, refrigerated water baths, real time thermocyclers, and spectrophotometers. The laboratory also has an ELISA plate reader, an illuminometer, ELISA plate washer, spectrophotometers, and other equipment that is routinely used in characterizing antibody-protein interactions.

University of North Carolina at Chapel Hill Baric Laboratory (Baric, Sims)
The three laboratories of the Baric Lab in the Department of Epidemiology have equipment required for general microbiological, molecular, and biochemical work including microcentrifuges, agarose and polyacrylamide electrophoresis equipment, spectrophotometer, rocking and shaking platforms, bead-beater cell disruptor, and incubators (shaking and static). Major equipment relevant to this proposal which are available include: gel electrophoresis equipment, power supplies, thermal cyclers, a programmable heat block, heat blocks, water baths, CO_2 incubators (2), several -70°C freezers, one -140°C freezer, refrigerators, DNA documentation system, DNA sequencing and computer assisted sequence analysis programs, several microfuges, two Nikon microscopes with photographic and fluorescent capabilities, several class 2 environmental hoods, refrigerated water baths, 10+ IBM and Apple Pentium II/III computers with accompanying software, three thermocyclers, a fume hood, Nuclisens reader, hybridization oven, real time thermocyclers, three fluorescent inverted scopes with computer software (Olympus IX51), and a spectrophotometer. A Roche Light Cycler 480II is available for real time measurements. The laboratory has an ELISA plate reader, an illuminometer, 200 cages for animal maintenance and breeding in Seal-Safe housing, Bio Rad low pressure chromatography system, ELISA plate washer, spectrophotometers, and other equipment that is routinely used in characterizing antibody-protein interactions.

BSL3 Facility features include: shower in/shower out facility; dual anteroom access; Hepa filtered exhaust; redundant exhaust fans; card key access; an alarm system to Public Health/Campus Police; laboratory controlled combination lock; and Techniplast Sealsafe™ Hepa filtered animal housing for 300+ rodents. PAPR and tyvek suits are worn at all times in the BSL3 facility. The BL3 facilities are in an adjacent and attached building (b) (4) or in (b) (4), the latter space is directly adjacent to Dr. Baric's BSL2 laboratory resources. Each facility is equipped with sterile hoods (BSCIIA), four CO_2 incubators, gel electrophoresis equipment, thermal cyclers and power supplies, and related equipment necessary for virus cultivation and molecular genetic research. The facilities each house a -70°C freezer, an inverted Nikon fluorescent microscope with an assortment of filters, magnifications and digital camera, an ELISA plate reader and illuminometer. Both facilities contain rodent-sized Seal-Safe systems (~192 cages) for maintaining animals in a Hepa-filtered Air in/out environment, exhausted into the BSL3 Hepa-filtered exhaust system. An 8 chamber Buxco plethysmography system that allows for repetitive, noninvasive measures of the number of breaths, tidal volume, airway responsiveness, enhanced pause, and respiratory gases from live control and infected mice in a contained system is housed in the main BSL3 laboratory in (b) (4)

OMB Number: 4040-0001
Expiration Date: 10/31/2019

RESEARCH & RELATED Senior/Key Person Profile (Expanded)

PROFILE - Project Director/Principal Investigator

Prefix: Dr. First Name*: PETER Middle Name Last Name*: DASZAK Suffix:

Position/Title*:	President
Organization Name*:	ECOHEALTH ALLIANCE, INC.
Department:	
Division:	
Street1*:	460 West 34th Street
Street2:	Suite 1701
City*:	New York
County:	
State*:	NY: New York
Province:	
Country*:	USA: UNITED STATES
Zip / Postal Code*:	100012317

Phone Number*: (b) (6) Fax Number: +12123804465

E-Mail*: (b) (6)

Credential, e.g., agency login: (b) (6)

Project Role*: PD/PI Other Project Role Category:

Degree Type: PHD Degree Year: 1993

Attach Biographical Sketch*: File Name: DASZAK_Peter_Biosketch_Final.pdf

Attach Current & Pending Support: File Name:

Funding Opportunity Number: PA-18-484 . Received Date: 2018-11-05T16:31:22.000-05:00

PROFILE - Senior/Key Person

Prefix: Dr. First Name*: Zheng Li Middle Name Last Name*: Shi Suffix:

Position/Title*: Senior Scientist
Organization Name*: Wuhan Institute of Virology
Department:
Division:
Street1*: Xiao Hong Shan, no. 44
Street2:
City*: Wuhan
County:
State*:
Province:
Country*: CHN: CHINA
Zip / Postal Code*: 430071

Phone Number*: (b) (6) Fax Number:

E-Mail*: (b) (6)

Credential, e.g., agency login: (b) (6)

Project Role*: Co-Investigator Other Project Role Category:

Degree Type: PHD Degree Year: 2000

Attach Biographical Sketch*: File Name: SHI_Zhengli_Biosketch_Final.pdf

Attach Current & Pending Support: File Name:

PROFILE - Senior/Key Person

Prefix: Dr. First Name*: Kevin Middle Name J. Last Name*: Olival Suffix:

Position/Title*: Senior Research Scientist
Organization Name*: EcoHealth Alliance
Department:
Division:
Street1*: 460 West 34th Street
Street2: Suite 1701
City*: New York
County:
State*: NY: New York
Province:
Country*: USA: UNITED STATES
Zip / Postal Code*: 100012317

Phone Number*: (b) (6) Fax Number:

E-Mail*: (b) (6)

Credential, e.g., agency login: (b) (6)

Project Role*: Co-Investigator Other Project Role Category:

Degree Type: PHD Degree Year: 2008

Attach Biographical Sketch*: File Name: OLIVAL_Kevin_Biosketch_Final.pdf

Attach Current & Pending Support: File Name:

PROFILE - Senior/Key Person

Prefix: Dr. First Name*: Ralph Middle Name S Last Name*: Baric Suffix:

Position/Title*: Professor
Organization Name*: University of North Carolina
Department:
Division:
Street1*: UNIVERSITY OF NORTH CAROLINA
Street2: DEPT EPIDEMIOLOGY
City*: CHAPEL HILL
County:
State*: NC: North Carolina
Province:
Country*: USA: UNITED STATES
Zip / Postal Code*: 275997435

Phone Number*: (b) (6) Fax Number: +19199662089

E-Mail*: (b) (6)

Credential, e.g., agency login: (b) (6)

Project Role*: Co-Investigator Other Project Role Category:

Degree Type: PHD Degree Year: 1977

Attach Biographical Sketch*: File Name: BARIC_Ralph_Biosketch_Final.pdf

Attach Current & Pending Support: File Name:

PROFILE - Senior/Key Person

Prefix: Dr. First Name*: Noam Middle Name Last Name*: Ross Suffix:

Position/Title*: Disease Ecologist
Organization Name*: EcoHealth Alliance
Department:
Division:
Street1*: 460 West 34th Street
Street2: Suite 1701
City*: New York
County:
State*: NY: New York
Province:
Country*: USA: UNITED STATES
Zip / Postal Code*: 100012317

Phone Number*: (b) (6) Fax Number: +12123804465

E-Mail*: (b) (6)

Credential, e.g., agency login: (b) (6)

Project Role*: Co-Investigator Other Project Role Category:

Degree Type: PHD Degree Year: 2015

Attach Biographical Sketch*: File Name: ROSS_Noam_Biosketch_Final.pdf

Attach Current & Pending Support: File Name:

PROFILE - Senior/Key Person

Prefix: Dr. First Name*: Alice Middle Name Last Name*: Latinne Suffix:

Position/Title*: Research Scientist
Organization Name*: EcoHealth Alliance
Department:
Division:
Street1*: 460 West 34th Street
Street2: Suite 1701
City*: New York
County:
State*: NY: New York
Province:
Country*: USA: UNITED STATES
Zip / Postal Code*: 100012317

Phone Number*: (b) (6) Fax Number: +12123804465

E-Mail*: (b) (6)

Credential, e.g., agency login: (b) (6)

Project Role*: Other (Specify) Other Project Role Category: Research Scientist

Degree Type: PHD Degree Year: 2012

Attach Biographical Sketch*: File Name: LATINNE_Alice_Biosketch_Final.pdf

Attach Current & Pending Support: File Name:

PROFILE - Senior/Key Person

Prefix: Ms. First Name*: HongYing Middle Name Last Name*: Li Suffix:

Position/Title*: Research Scientist & China Programs Coord.
Organization Name*: EcoHealth Alliance
Department:
Division:
Street1*: 460 West 34th Street
Street2: Suite 1701
City*: New York
County:
State*: NY: New York
Province:
Country*: USA: UNITED STATES
Zip / Postal Code*: 100012317

Phone Number*: (b) (6) Fax Number: +12123804465

E-Mail*: (b) (6)

Credential, e.g., agency login: (b) (6)

Project Role*: Other (Specify) Other Project Role Category: Research Scientist

Degree Type: MPH Degree Year: 2015

Attach Biographical Sketch*: File Name: LI_Hongying_Biosketch_Final.pdf

Attach Current & Pending Support: File Name:

PROFILE - Senior/Key Person

Prefix: Dr. First Name*: Leilani Middle Name Last Name*: Francisco Suffix:

Position/Title*: Senior Behavioral Risk Surveillance Coord.
Organization Name*: EcoHealth Alliance
Department:
Division:
Street1*: 460 West 34th Street
Street2: Suite 1701
City*: New York
County:
State*: NY: New York
Province:
Country*: USA: UNITED STATES
Zip / Postal Code*: 100012317

Phone Number*: (b) (6) Fax Number: +12123804465

E-Mail*: (b) (6)

Credential, e.g., agency login: (b) (6)

Project Role*: Co-Investigator Other Project Role Category:

Degree Type: PHD Degree Year: 2010

Attach Biographical Sketch*: File Name: FRANCESCO_Leilani_Biosketch_Final.pdf

Attach Current & Pending Support: File Name:

PROFILE - Senior/Key Person

Prefix: Dr. First Name*: Amy Middle Name C Last Name*: Sims Suffix:

Position/Title*: Associate Professor
Organization Name*: University of North Carolina at Chapel Hill
Department:
Division:
Street1*: University of North Carolina
Street2: 3304 MHRC, School of Public Health
City*: Chapel Hill
County:
State*: NC: North Carolina
Province:
Country*: USA: UNITED STATES
Zip / Postal Code*: 275997290

Phone Number*: (b) (6) Fax Number: (919) 966-0584

E-Mail*: S (b) (6)

Credential, e.g., agency login: (b) (6)

Project Role*: Co-Investigator Other Project Role Category:

Degree Type: PHD Degree Year: 2001

Attach Biographical Sketch*: File Name: SIMS_Biosketch_Final.pdf

Attach Current & Pending Support: File Name:

PROFILE - Senior/Key Person

Prefix: Ms. First Name*: Emily Middle Name E Last Name*: Hagan Suffix:

Position/Title*: Behavioral Research Scientist
Organization Name*: EcoHealth Alliance
Department:
Division:
Street1*: 460 West 34th Street
Street2: Suite 1701
City*: New York
County:
State*: NY: New York
Province:
Country*: USA: UNITED STATES
Zip / Postal Code*: 100012317

Phone Number*: (b) (6) Fax Number: +12123804465

E-Mail*: (b) (6)

Credential, e.g., agency login: (b) (6)

Project Role*: Other (Specify) Other Project Role Category: Research Scientist

Degree Type: MPH Degree Year: 2013

Attach Biographical Sketch*: File Name: HAGAN_Emily_Biosketch_Final.pdf

Attach Current & Pending Support: File Name:

PROFILE - Senior/Key Person

Prefix: Dr. First Name*: Guangjian Middle Name Last Name*: Zhu Suffix:

Position/Title*: Research Scientist & China Field Coordinator
Organization Name*: East China Normal University
Department:
Division:
Street1*: School of Life Science, B327
Street2: Science building, 3663 Zhongshan Beilu
City*: Shanghai
County:
State*:
Province:
Country*: CHN: CHINA
Zip / Postal Code*: 200062

Phone Number*: (b) (6) Fax Number:

E-Mail*: (b) (6)

Credential, e.g., agency login: (b) (6)

Project Role*: Co-Investigator Other Project Role Category:

Degree Type: PHD Degree Year: 2012

Attach Biographical Sketch*: File Name: ZHU_GuangJian_Biosketch_Final.pdf

Attach Current & Pending Support: File Name:

PROFILE - Senior/Key Person

Prefix: Dr. First Name*: Linfa Middle Name Last Name*: Wang Suffix:

Position/Title*: Professor & Director
Organization Name*: Duke-NUS Medical School
Department:
Division:
Street1*: 8 College Road
Street2:
City*: Singapore
County:
State*:
Province:
Country*: SGP: SINGAPORE
Zip / Postal Code*: 169857

Phone Number*: (b) (6) Fax Number:

E-Mail*: (b) (6)

Credential, e.g., agency login: (b) (6)

Project Role*: Co-Investigator Other Project Role Category:

Degree Type: PHD Degree Year: 1986

Attach Biographical Sketch*: File Name: WANG_Linfa_Final.pdf

Attach Current & Pending Support: File Name:

PROFILE - Senior/Key Person

Prefix: Dr. First Name*: Lili Middle Name Last Name*: Ren Suffix:

Position/Title*: Research Scientist
Organization Name*: Institute of Pathogen Biology
Department:
Division:
Street1*: No. 9 Dong Dan San Tiao
Street2: Dongcheng District
City*: Beijing
County:
State*:
Province:
Country*: CHN: CHINA
Zip / Postal Code*: 100730

Phone Number*: (b) (6) Fax Number:

E-Mail*: (b) (6)

Credential, e.g., agency login: (b) (6)

Project Role*: Co-Investigator Other Project Role Category:

Degree Type: PHD Degree Year: 2005

Attach Biographical Sketch*: File Name: REN_Lili_Biosketch_Final.pdf

Attach Current & Pending Support: File Name:

PROFILE - Senior/Key Person

Prefix: Dr. First Name*: Li Middle Name Last Name*: Guo Suffix:

Position/Title*: Professor
Organization Name*: Institute of Pathogen Biology
Department:
Division:
Street1*: No. 9 Dong Dan San Tiao
Street2: Dongcheng District
City*: Beijing
County:
State*:
Province:
Country*: CHN: CHINA
Zip / Postal Code*: 100730

Phone Number*: (b) (6) Fax Number:

E-Mail*: (b) (6)

Credential, e.g., agency login: (b) (6)

Project Role*: Co-Investigator Other Project Role Category:

Degree Type: MD Degree Year: 2006

Attach Biographical Sketch*: File Name: GUO_Li_Biosketch_Final.pdf

Attach Current & Pending Support: File Name:

PROFILE - Senior/Key Person

Prefix: Dr. First Name*: Peng Middle Name Last Name*: Zhou Suffix:

Position/Title*: Principal Investigator
Organization Name*: Wuhan Institute of Virology
Department:
Division:
Street1*: Xiao Hong Shan, No. 44
Street2:
City*: Wuhan
County:
State*:
Province:
Country*: CHN: CHINA
Zip / Postal Code*: 430071

Phone Number*: (b) (6) Fax Number:

E-Mail*: (b) (6)

Credential, e.g., agency login: (b) (6)

Project Role*: Co-Investigator Other Project Role Category:

Degree Type: PHD Degree Year: 2011

Attach Biographical Sketch*: File Name: ZHOU_Peng_Biosketch_Final.pdf

Attach Current & Pending Support: File Name:

PROFILE - Senior/Key Person

Prefix: Dr. First Name*: Ben Middle Name Last Name*: Hu Suffix:

Position/Title*: Research Scientist
Organization Name*: Wuhan Institute of Virology
Department:
Division:
Street1*: Xiao Hong Shan, No. 44
Street2:
City*: Wuhan
County:
State*:
Province:
Country*: CHN: CHINA
Zip / Postal Code*: 430071

Phone Number*: (b) (6) Fax Number:

E-Mail*: (b) (6)

Credential, e.g., agency login: (b) (6)

Project Role*: Co-Investigator Other Project Role Category:

Degree Type: PHD Degree Year: 2015

Attach Biographical Sketch*: File Name: HU_Ben_Biosketch_final.pdf

Attach Current & Pending Support: File Name:

PROFILE - Senior/Key Person

Prefix: Dr. First Name*: Aleksei Middle Name Last Name*: Chmura Suffix:

Position/Title*: Research Scientist
Organization Name*: EcoHealth Alliance
Department:
Division:
Street1*: 460 West 34th Street
Street2: Suite 1701
City*: New York
County:
State*: NY: New York
Province:
Country*: USA: UNITED STATES
Zip / Postal Code*: 100012317

Phone Number*: (b) (6) Fax Number: +12123804465

E-Mail*: (b) (6)

Credential, e.g., agency login: (b) (6)

Project Role*: Other (Specify) Other Project Role Category: Research Scientist

Degree Type: PHD Degree Year: 2018

Attach Biographical Sketch*: File Name: CHMURA_Aleksei_Biosketch_Final.pdf

Attach Current & Pending Support: File Name: