Understanding Risk of Zoonotic Virus Emergence in EID Hotspots of Southeast Asia

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Abstract

Southeast Asia is one of the world?s highest-risk EID hotspots, the origin of the SARS pandemic, Nipah virus, and repeated outbreaks of influenza. This is driven by high diversity of wildlife and rapidly expanding demography that brings human and wildlife populations closer. This proposal will launch the Emerging Infectious Diseases - South East Asia Research Collaboration Hub (EID-SEARCH), a collaboration among leaders in emerging disease research in the USA, Thailand, Singapore and the 3 major Malaysian administrative regions. These researchers have networks that span >50 clinics, laboratories and research institutions across almost all SE Asian countries and will use the EID-SEARCH as an early warning system for outbreaks involving exchange of information, reagents, samples and technology, and a collaborative power- house for fundamental and translational research. The EID-SEARCH will also act as a significant asset to scale-up and deploy resources in the case of an outbreak in the region. This EIDRC will conduct research to: 1) Identify, characterize and rank spillover risk of high zoonotic potential viruses from wildlife, by analyzing previously-archived wildlife samples, conducting targeted wildlife surveillance, and using serology & PCR assays to identify novel viruses. These will be characterized to assess risk of spillover to people, and a series of in vitro (receptor binding, cell culture) and in vivo (humanized mouse and collaborative cross models) assays used to assess their potential to infect people and cause disease; 2) Collect samples and questionnaire data from human communities that live in EID hotspots and have high cultural and behavioral risk of animal exposure (e.g. wildlife hunting, bat guano collection). These will be tested with serological assays to identify evidence of novel virus spillover, and analyzed against metadata to identify key risk pathways for transmission; 3) Identify and characterize viral etiology of ?cryptic? outbreaks in clinical cohorts. We will conduct syndromic surveillance at clinics serving the populations in Aim 2, enroll patients with undiagnosed illness and symptoms consistent with emerging viral pathogens, and test samples with molecular and follow-up serological assays to identify causal links between these syndromes and novel viruses. This research will advance our understanding of the risk of novel viral emergence in a uniquely important region. It will also strengthen in-country research capacity by linking local infectious disease scientists with an international collaborative network that has

proven capacity to conduct this work and produce significant findings. The large body of high impact collaborative research from this EIDRC leadership team provides proof-of-concept that EID-SEARCH has the background, collaborative network, experience, and skillset to act as a unique early warning system for novel EIDs of any etiology threatening to emerge in this hottest of the EID hotspots.

Public Health Relevance

This proposed EID Research Center (EID-SEARCH) brings leaders in emerging disease research from the US, Thailand, Singapore and the 3 major Malaysian administrative regions together to build an early warning system to safeguard against pandemic disease threats. This team will identify novel viruses from Southeast Asian wildlife, characterize their capacity to infect and cause illness in people, and use serological assays of samples from people in rural communities with high wildlife contact to identify the background rate of exposure, and risk factors that drive this. They will conduct in-depth surveillance of clinical cohorts at hospitals serving these communities to examine if ?cryptic? outbreaks are caused by these novel agents, and to build significant capacity to rapidly detect and respond should there be a major outbreak of a virus in the region.

Funding Agency

Agency	National Institute of Health (NIH)
Institute	National Institute of Allergy and Infectious Diseases (NIAID)
Type	Research Project--Cooperative Agreements (U01)
Project #	1U01AI151797-01
Application #	9968924
Study Section	Special Emphasis Panel (ZAI1)
Program Officer	Patterson, Jean Lois
Project Start	2020-06-17
Project End	2025-05-31
Budget Start	2020-06-17
Budget End	2021-05-31
Support Year	1
Fiscal Year	2020
Total Cost	
Indirect Cost	

Institution

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Department	

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Comments