USAID Avian and Pandemic Influenza and Zoonotic Disease Program

PREDICT

Request for Information (RFI)

Posting Date: April 15, 2009

RFI Number: USAID/M/OAA/GH/HSR-09-877

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FY- 2009 USAID Avian and Pandemic Influenza and Zoonotic Disease Program PREDICT

The United States Agency for International Development (USAID) Bureau for Global Health, Office of Health, Infectious Disease and Nutrition (GH/HIDN) anticipates awarding two (2) cooperative agreements, PREDICT and RESPOND, under its Avian and Pandemic Influenza and Zoonotic Disease Program. The goal of PREDICT is to establish a global early warning system for disease emergence that is capable of detecting, tracking and predicting the emergence of new infectious diseases in high-risk wildlife (e.g. bats, rodents, and non-human primates) that could pose a major threat to human health. At this time the Agency is requesting information/comments regarding the attached draft program description from potential bidders. Please note that the Request for Information (RFI) for Respond is posted independently. After receipt of comments and prior to posting the Request for Applications (RFA), USAID anticipates hosting a **bidders conference**. This conference is tentatively scheduled for **April 29, 2009**. Potential bidders should be U.S. based institutions of higher education, research institutions, for profit, non-profit, or private voluntary organizations with capacity and experience in wildlife surveillance, epidemiology, data analysis and reporting, modeling, threat detection and forecasting, and other related activities.

Request for Information Guidelines
Respondents are encouraged to comment on the general concept, potential benefits or obstacles, the overall merits and relative priority of the ideas described in this scope of work. USAID will evaluate the responses and modify, as appropriate, the final scope to be included in the RFA.

Questions

<u>Expanded Wild Animal Surveillance</u>

1. Can advances in wildlife biology, microbiology, diseases ecology and anthropology lead to better models for predicting the emergence of new zoonotic disease threats to humans?
2. To what extent can the identification of geographic “hotspots” for emergence of new infectious diseases provide a rationale for focusing resources?

3. Are some wildlife species more likely candidates for harboring emergent pathogens than others? And if so, would there be greater effectiveness in developing a "risk-based" surveillance strategy that targets specific species?
4. Can the combination of "forecasting" and "hotspot" focusing be the basis for a strategic allocation of resources to pre-empt or combat the first stages of disease emergence?

For the purposes of this RFI, the term "Grant" is synonymous with "Cooperative Agreement"; "Grantee" is synonymous with "Recipient"; and "Grant Officer" is synonymous with "Agreement Officer".

The authority for the RFI is found in the Foreign Assistance Act of 1961, as amended.

Disclaimers:

This RFI is issued solely for information and planning purposes and does not constitute a solicitation. In accordance with FAR 15.201(e), responses to this notice are not offers and cannot be accepted by the Government to form a binding contract. Respondents are solely responsible for all expenses associated with responding to this RFI. Responses to this RFI will not be returned. Respondents will **not** be notified of the result of the review.

In accordance with FAR 52.215-3 Request for Information or Solicitation for Planning Purposes:

(a) The Government does not intend to award a contract on the basis of this solicitation or to otherwise pay for the information solicited except as an allowable cost under other contracts as provided in subsection 31.205-18, Bid and proposal costs, of the Federal Acquisition Regulation.

(b) Although "proposal" and "offeror" are used in this Request for Information, your response will be treated as information only. It shall not be used as a proposal.

(c) This solicitation is issued for the purpose of information gathering for planning purposes only.

The preferred method of distribution of USAID RFI information is via the Internet. This RFI and any future amendments can be downloaded from http://www.grants.gov.

Responses for the information requested should be approximately 10 pages in length. Responses shall be submitted electronically by no later than **10 AM EST** on **April 27, 2009**, to **Patricia Bradley at pbradley@usaid.gov** and **Kate Bryant at kbryant@usaid.gov.**

Thank you for your interest in USAID programs.

Sincerely,

Bruce Baltas
Agreement Officer
USAID

ABBREVIATIONS AND ACRONYMS

AFENET	African Field Epidemiology Network
AIMEBA	Avian Influenza Monitoring, Evaluation, and Budget Analysis
AOTR	Agreement Officer's Technical Representative
API	Avian and Pandemic Influenza
CDC	Centers for Disease Control and Prevention
CA	Cooperating Agency
DOD	US Department of Defense
DOS	US Department of State
FAO	The Food and Agriculture Organization
GH/HIDN	Global Health, Office of Health, Infectious Disease, and Nutrition
HHS	US Department of Health and Human Services
HIV	Human Immunodeficiency Virus
HPAI	Highly Pathogenic Avian Influenza
NGO	Non-Governmental Organization
OIE	Organization for Animal Health
OWOH	One World One Health
RFA	Request for Application
RFI	Request for Information
TIGER	The International Group for Epidemiology and Response
UNICEF	The United Nations Children's Fund
USAID	United States Agency for International Development
USDA	United States Department of Agriculture
WHO	The World Health Organization

Program Description PREDICT

I. USAID Avian and Pandemic Influenza and Zoonotic Disease Program

A. INTRODUCTION

The U.S. Agency for International Development (USAID) has been a major leader in the global response to the emergence and spread of highly pathogenic avian influenza (HPAI). Since mid-2005, USAID has programmed $543 million to build capacities in more than 50 countries for monitoring the spread of HPAI among wild bird populations, domestic poultry, and humans, and to mount a rapid and effective containment of the virus when it is found. Recent analyses indicate that these efforts have contributed to significant downturns in reported poultry outbreaks and human infections, and a dramatic reduction in the number of countries affected. At the peak of its spread in 2006, HPAI had been reported in 53 countries across three continents[1]. By the end of 2008, however, the number of countries affected had shrunk to 20; five of these countries, four of which were in Asia, accounted for more than 80% of all reported outbreaks[2]. Although these apparent successes are significant, HPAI remains a serious threat: it continues to spread in poultry, the mortality rate among infected humans remains above 60%[3], new genetic variants continue to emerge[4], and the potential for it to again spread rapidly across the globe remains.

Considering these factors, it is critical that USAID and its global partners maintain vigilance in the fight against HPAI. At the same time, the successes in Africa, Europe and Eurasia, and large parts of Asia in containing the spread of HPAI suggest an opportunity for USAID to begin rethinking its current “emergency” focus on the H5N1 virus in favor of a transitional strategy that addresses the broader threats posed by other emergent diseases of animal origin (also known as “zoonotic” diseases). The emergence of the HPAI H5N1 virus in the mid-1990s was part of a broader dynamic that has given rise to a stream of new and increasingly deadly zoonotic diseases. Of these new zoonotic diseases, nearly three-quarters have been caused by pathogens originating in wildlife[5], for example, SARS, which emerged in Guangdong Province, China; Nipah virus in Perak State, Malaysia; and HIV in Central Africa. Domestic animals, which are the other major source of zoonotic pathogens, account for approximately 20% of all new zoonotic diseases. RNA viruses like the highly pathogenic H5N1 influenza virus are the most common pathogens, owing to their high rates of mutation and their higher capacity to adapt to new hosts.

The convergence of people, animals and our environment has led to a growing consensus among the scientific and public health communities that the emergence of new, deadly zoonotic disease threats will increase steadily in the coming decades As evidenced by HPAI and SARS before it, the speed with which these diseases can spread across the increasingly interconnected globe puts a premium on identification and launch of rapid containment and response as early as possible when new diseases emerge. Driven by these growing concerns public- and animal-health professionals, conservationists and ecologists have

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[1] OIE: Avian Influenza: Facts and Figures 2003-2009

[2] Andrew Clements, (2009): Unpublished analysis of OIE reports

[3] Andrew Clements, (2009): Unpublished analysis of WHO data

[4] Tien Dung Nguyen et al (2008): *Multiple Sublineages of Influenza A Virus (H5N1), Vietnam, 2005–2007*: Emerging Infectious Diseases**:** Vol 14:4

[5] Kate Jones et al (2008): *Global trends in emerging infectious diseases*: Nature, Vol 451.21

recently formulated a new global health paradigm, called “One World One Health” (OWOH)[6], which identifies the future well-being of humans, animals and the environment as inextricably linked.

USAID has adopted a strategic approach that, while consistent with the OWOH concept, specifically draws on the current USAID package of cross-sectoral investments to combat HPAI to address the broader threats of other emergent zoonotic diseases. The explicit **objective of this approach is to pre-empt or combat, at their source, the first stages of the emergence of zoonotic diseases that pose a significant threat to public health**. To be successful, this approach will require a significant improvement in the capacity of countries to identify candidate pathogens while they are still limited to circulating among non-human hosts. In addition, the countries most likely affected must have the capacity to mount rapid containment at the point of emergence. Ultimately, the success of these efforts will be measured by the ability to detect and respond early to not only acute diseases like Ebola Hemorrhagic Fever and influenzas, where the time lag between infection and illness is measured in days, but also to the emergent diseases where this gap can span decades, as is the case for HIV.

To build upon investments made in response to HPAI threat, five lines of work surface: (1) Expansion of current surveillance of wild birds to more broadly address the role played by wildlife in facilitating the emergence and spread of new pathogens; (2) enhancement of field epidemiological training for relevant animal- and human-health teams to address the threat posed by other newly emergent zoonotic diseases in addition to HPAI; (3) strengthened support for animal- and public-health diagnostic laboratories to more fully address a broader array of infectious disease threats; (4) broaden ongoing behavior change and communications efforts to prevent H5N1 transmission from poultry to humans to include potential transmission of other emergent wildlife pathogens; and, (5) expand our support for simulations and field tests of national, regional and local pandemic preparedness plans to include threats posed by other zoonotic disease threats. USAID will use a “risk-based” strategy discussed in this paper to target its package of interventions towards those places, populations, times or situations where the risk of zoonotic disease emergence is greatest and the likelihood of impacting on it is highest.

B. BACKGROUND

Over the past several decades, many previously unknown human infectious diseases have emerged from animal reservoirs, including agents such as human immunodeficiency virus (HIV), Ebola Hemorrhagic Fever virus, Nipah virus, and Hanta virus. In fact, more than three-quarters of new, emerging, or re-emerging human diseases at the beginning of the 21st century have been caused by pathogens originating from animals or animal products[5]. These newly emergent threats, such as the Ebola and Marburg outbreaks in Central Africa[7] or the 2003 outbreak of SARS in East Asia[8], frequently appear suddenly and spread quickly, and after a brief time they often disappear almost as quickly as they appeared. Other newly emergent diseases, such as the HIV virus, have emerged less dramatically and have proven far more robust in their ability to survive and infect over long periods of time.

[6] *Contributing to One World, One Health: A Strategic Framework for Reducing Risk of Infectious Diseases at the Animal-Human-Ecosystem Interface,* FAO/OIE/WHO/UNICEF/UNSIC/World Bank, October 14, 2008

[5] Kate Jones et al (2008): *Global trends in emerging infectious diseases*: Nature, Vol 451.21

[7] *Ebola and Marbug Hemorrhagic Fevers: African Hemorrhagic Fever* (2008): The Center for Food Security and Public Health, Iowa State University: Update December 19, 2008

[8] David D. Bell (2004): *Public Health Interventions and SARS spread, 2003*: Emerging Infectious Diseases 2004:10(11):1900-6

Multiple factors contribute to the emergence of new zoonotic infectious diseases, particularly the increased interaction between human and animal populations driven by growth in human population, new trends in animal production practices, changing patterns of wildlife populations, human intrusion on new ecosystems, and transborder mobility of humans, animals, food and feed products. A wide variety of animal species, both wild and domesticated, can serve as reservoirs for these pathogens.

While new global markets have created unprecedented economic opportunities and growth, the health risks of our increasingly interconnected world continue to grow. Over the past century, notable reminders of just how vulnerable the world is to the growing risk of emerging zoonotic diseases include the 1918 influenza pandemic, which was caused by an influenza virus that initially jumped from birds to humans and killed over 50 million people[9] globally; HIV, which originated as a simian virus and now infects more than 33 million individuals[10]; and the more recent threats posed by SARS and the HPAI H5N1 virus. Increasingly, all populations are vulnerable to new diseases emerging in other countries; it is in our collective interest to strengthen the capacity of all high-risk countries to prevent the emergence and spread of these new disease threats.

Recent studies suggest that in a global pandemic caused by a virus similar to the one that caused the 1918 pandemic, a quarter of the world's population would be infected and between 51-81 million people would die, with the toll in the United States exceeding 400,000 casualties[11]. Related studies also forecast that the toll on the world's economy would exceed $4 trillion and result in a five percent loss of GDP in the United States[12]. Even short-lived outbreaks of recent zoonotic diseases have been devastating; SARS in 2003, for example, cost the economies of East Asia an estimated $50 billion[13]. While no one can predict with any certainty when the next global pandemic will occur, historical records spanning the past 300 years show a cycle of a global pandemics every 30-40 years[14]. Mindful of this threat, having in place capacities for early detection of and rapid response to new emergent disease threats will be central to minimizing their potential impact on our social and economic well-being.

Emerging Infectious Diseases and the Threat Posed by "Zoonotics"

Among the 1,461 pathogens recognized to cause of diseases in humans, nearly 60% are of animal origin[15]. An analysis of the more than 300 infectious diseases that have emerged

[9] Jeffery K. Taubenberger and David M. Morens (2006): *1918 Influenza: the Mother of All Pandemics:* Emerging Infectious Diseases: 12(1)

[10] UNAIDS/WHO Global HIV/AIDS on-line database (2009)

[11] Christopher J. Murray et al (2006): *Estimation of Potential Global Pandemic Influenza Mortality on the Basis of Vital Registry Data from the 1918-1920 Pandemic: A Quantitative Analysis*: The Lancet: 368:2211-18

[12] Congressional Business Office (2006): *A Potential Influenza Pandemic: Possible Macroeconomic Effects and Policy Issues*

[13] Asia Development Bank (2003): *Assessing the Impact and Cost of SARS in Developing Asia:* Asia Development Outlook 2003 Update, Hong Kong, China, Oxford University Press for the Asia Development Bank

[14] David M. Morens and Anthony S. Fauci (2007): *The 1918 Influenza Pandemic: Insights for the 21st Century:* Journal of Infectious Diseases: 195:1018-1028

[15] E.F. Torrey and R.H. Yolkan (2005): *Beasts on the Earth*: New Brunswick, J.J., Rutgers University Press

since 1940[5], shows that more than 65% were caused by zoonotic pathogens. Of these new infectious diseases, nearly three-quarters have emerged from a limited number of agents of wildlife origin, with bats (the Corona virus, responsible for SARS, and the Nipah virus), rodents (Hanta virus) and non-human primates (HIV) serving as the most frequently implicated hosts for spread of new infectious agents to humans.

The other major source of zoonotic pathogens, domestic animals, has been shown to account for approximately 20% of all new zoonotic diseases[5]. Viral pathogens, especially avian RNA viruses like HPAI H5N1, were the principal pathogens identified. Due to their often high rates of nucleotide substitution, poor mutation error-correction ability, and their higher capacity to adapt to new hosts, including humans, they have proven particularly deadly.

While the emergences of new zoonotic infectious diseases are difficult to forecast, a strong enough pattern has been established to instill confidence that the regular appearance of new infectious diseases or syndromes is virtually inevitable. Recent studies have indicated that number of new zoonotic diseases has been steadily increasing over the past several decades[16]. As such, unless measures are put in place for more effective detection and control of new emerging disease threats, their economic and human toll over the coming decades could prove unprecedented.

<u>"Drivers" of Emergence</u>

Until recently our understanding of the process of diseases emergence has been poor. Advances in understanding the risk factors for their emergence and the environmental factors that drive them, however, has led to the following observations[17]: the risk for emergence of new zoonotic agents from wildlife depends largely on three factors, (1) the diversity of wildlife microbes in a region (the "zoonotic pool"); (2) the effects of environmental change on the prevalence of pathogens in wild populations; and (3) the frequency of human and domestic animal contact with wildlife reservoirs of potential zoonoses.

The emergence of a successful zoonotic pathogen such as SARS or HIV requires three steps[17]. First the pathogen must be successfully transmitted between a wild reservoir and humans or their domestic animals. Several recently emerging zoonoses have achieved this stage without further transmission, e.g. Hendra virus. Second, the pathogen must be directly transmitted between humans. Finally, the pathogen must move from a local epidemic into the global population. Understanding and predicting the global emergence of pathogens require knowledge of the drivers of each of these steps.

Evidence suggests that many pathogens are transmitted between their animal reservoirs and humans but fail to be transmitted efficiently from human-to-human. However, there is some concern that repeated transmission of nonhuman viruses to humans, such as the H5N1 virus, most of which results in no human-to-human transmission, will increase the diversity of viruses

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[5] Kate Jones et al (2008): *Global trends in emerging infectious diseases*: <u>Nature</u>, Vol 451.21

[16] Woolhouse MEJ, Dye C, eds. (2001*): Population biology of emerging and re-emerging pathogens*: <u>Philosophical Transactions of the Royal Society for Biological Sciences</u> , 2001, 356:981--982

[17] Nathan D. Wolfe et al (2005): *Bushmeat Hunting: Deforestation, and Pediction of Zoonotic Disease Emergence*: <u>Emerging Infectious Diseases</u>: Vol 11: 12:18221827

and sequence variants moving into humans[17]. This situation, could in turn, increase the probability of transmission of a pathogen that can successfully replicate, and ultimately increase the ability of a human-adapted virus to emerge. Minimizing the opportunity for repeated transmission of nonhuman viruses to humans will be critical to pre-empting the emergence of new zoonotic pathogens.

One example of how wildlife is increasingly a source of new infections comes from the consumption of "bush meat" in sub-Saharan Africa[18]. In this region, people are increasingly turning to wild animals to meet their nutritional needs, particularly in the face of growing food insecurity. In the Congo Basin, this trend has fueled an increase in outbreaks of zoonotic diseases such as Ebola Hemorrhagic Fever. Ebola, like the HIV virus that causes AIDS, passes into the human population through contact with blood from infected primates, such as gorillas and chimpanzees, as well as other primates like monkeys, which regularly form part of the bush-meat trade. The consumption of bush meat is particularly acute across west and central Africa where there are still large equatorial forests with up to five million tones of bush meat consumed annually. The multi-billion dollar bush meat industry is a key contributor to local economies throughout the developing world. It is also among the most immediate threats to tropical wildlife.

In contrast, the emergence of zoonotic diseases from domesticated animals is predicted by a combination of animal population density, farming practices, human population density and human population growth. The explosion in poultry produced across Asia since the 1970s has been a key factor in the rapid spread of HPAI virus among domesticated animals in recent years. China typifies the dramatic changes in poultry production. In 1969, an estimated 500 million poultry were being raised in China to feed a population of 750 million. To meet the growing human population, increased household wealth, and a corresponding rise in demand for animal protein, the number of poultry had risen to 15 billion[19] by 2000. In China, this dramatic increase in poultry farming has taken place largely on non-industrial farms following traditional animal husbandry practices, particularly those involving the informal animal-production sector of "backyard farmers". This sector is largely unregulated and biosecurity is low. High human and poultry population densities, coupled with the employment of poor farming practices, have proven a lethal combination in facilitating the rapid spread of poultry diseases such as HPAI over the past few years, not only in China but also in other countries and regions with similar profiles. As a consequence, new zoonotic threats of domestic animal origin, such as HPAI and the more recent H9N2 avian influenza virus, have arisen with increasing frequency. Given that the demand for animal-based protein is expected to increase by 50% by 2020[20], there is a greater risk for past trends to continue, further fueling conditions for increased emergence of new disease threats.

<u>Using Risk-based Forecasting for Early Detection of Rare Events</u>

Even as the risk of new zoonotic diseases is increasing, their emergences remain relatively rare whose occurrences have proven difficult to predict. One of the biggest obstacles to early detection of these diseases is the lack of sufficient, sensitive surveillance capacity

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[18] H.E. Eves et al. (2002) : The Bushmeat Crises Taskforce Collaboration Across Sectors and Continents to Address the Bushmeat Crisis: *Communique,* November 2002

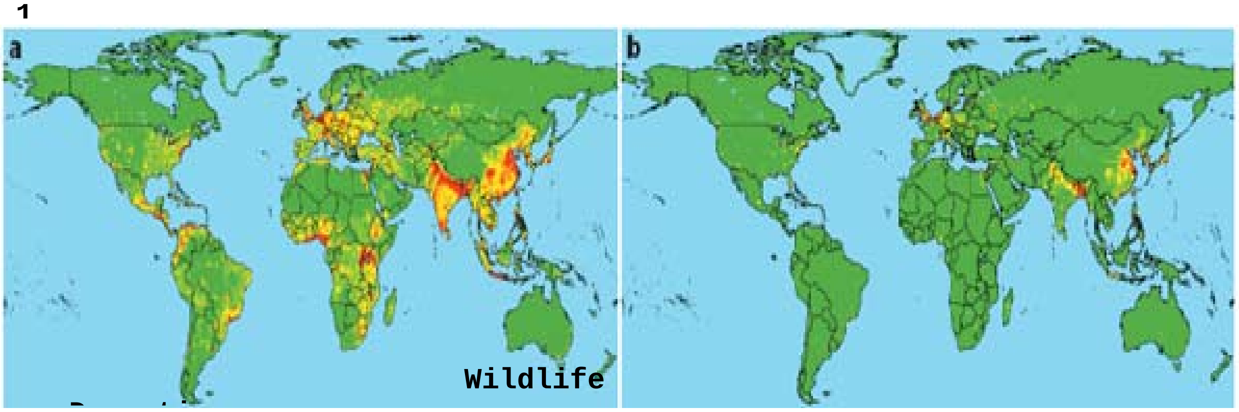
[19] Food and Agricultural Organization – Livestock production

[20] C. Delgado et al: *Livestock to 2020: the next food revolution*: Food, Agriculture, and Environment Discussion paper 28, Washington D.C.

geared toward rapid and reliable detection of highly unusual pathogens. Traditional disease-surveillance approaches tend to assume disease risks are relatively homogenous across populations or geographic areas; applying traditional disease surveillance to monitoring for rare events, such as emergent diseases, however, would be exceedingly cost- and infrastructure prohibitive. However, recent advances in the understanding of factors that drive the emergence of zoonotic diseases have led to the development of new risk-based models for forecasting new zoonotic diseases, therefore opening opportunities to bring greater focus to emergent-disease surveillance. The origins of newly emergent diseases have been found to strongly correlate with specific geographic areas, animal hosts, microbial agents, and people.

Geographic "Hot Spots": In a retrospective analysis of outbreaks of new diseases over the past 50 years, zoonotic pathogens[5] from wildlife were found to be most concentrated in lower-latitude regions of tropical Africa, Asia and Latin America, with high risk foci in eastern China, the Gangetic and Indus River plains of the India sub-continent, Congo Basin, and the neighboring Rift Valley regions of East Africa, the Niger delta of West Africa, and the northwest region of South America (Figure 1a). Wildlife host-species richness was shown to be a significant predictor for the emergence of zoonotic diseases. Significantly, this study showed a substantial risk of wildlife zoonotics originating at lower geographical latitudes where there are very limited surveillance and response capacities.

Figure 1



In this same study, zoonotic pathogens from domestic animals were found to be highly concentrated in eastern China, the Gangetic plain of the India sub-continent, and along the Nile River in Egypt. Not surprisingly, these are the same areas where the HPAI virus is principally concentrated (Figure 1b).

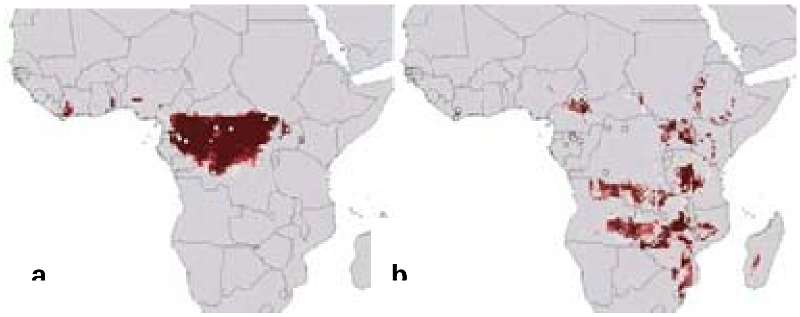
While retrospective studies can provide important insight into the general distribution of past zoonotic "hot spots", the maps illustrated in figure 1, do not necessarily serve as predictors for where future diseases might emerge. Another study (Figure 2)[21], which used ecologic niche modeling of outbreaks and sporadic cases of filovirus-associated hemorrhagic fever, provides the first large-scale "predictive map" on the most likely geographic and ecologic distributions of Ebola (2a) and Marburg virus (2b). The significance of predictive modeling is that it provides greater insight into where emergent pathogens may be circulating but are undetected; they also highlight geographic areas that may currently be free of a particular pathogen but possess the requisite ecological risk factors to make them highly vulnerable to its introduction. Most

[5] Kate Jones et al (2008): *Global trends in emerging infectious diseases*: Nature, Vol 451.21

[21] A. Townsend Peterson et al (2004): *Ecological and Geographic Distribution of Filovirus Disease*: Emerging Infectious Diseases" 10 (1)

importantly, predictive models allow for more strategic focusing of resources for monitoring for the emergence and spread of zoonotic threats.

Figure 2



High-risk host species: There are an estimated 50,000 vertebrate species that are potential reservoirs for viruses, bacteria, and other pathogens that could potentially infect humans[22]. Very few of these species, however, will ever have the kind of direct or even indirect contact with people or domestic animals that allow for the transfer of animal pathogens to humans, with the “hot spots” representing some of the most remote and least-accessed regions of the earth. Yet, over the past several decades, there has been an almost exponential growth in the frequency of these contacts as new human settlements and roadways increasingly infringe on once-pristine wildlife domains.

The frequency of interaction, therefore, is the critical factor in weighing the risk specific animal hosts pose to transferring potentially dangerous new microbial agents to humans. Animal host-to-human and animal host-to-domestic animal interactions provide ideal circumstances for pathogens that initially affect only animals to evolve first into agents that can cause primary infections in humans through direct animal-to-human contact to agents that can cause limited outbreaks through both human-to-human contact and animal-human contact[23]. The numbers of species that account for the majority of these transfers, however, appear limited; rodents have proved highly adaptive in their ability to spread pathogens to humans, such as Hanta virus through their feces and urine. Conversely, bats have infected people with Nipah virus directly through contaminated fecal droppings and indirectly by infecting pigs who are later consumed by humans. In the case of the Ebola and Marburg viruses, infected non-human primates (which were most likely infected by bats) have been the source of human infections when consumed as bush meat[24].

While other species of wild animals have undoubtedly been involved in either the direct or indirect infection of humans with novel animal pathogens, there is an emerging consensus that it is a limited sub-set of infected wildlife that has frequent interactions with humans that poses the greatest risk for enabling the infection of humans with potentially new and deadly

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[22] W. Ian Lipkin (2009): *Microbe Hunting in the 21st Century*: PNAS: Vol 106/1

[23] Nathan D. Wolfe et al (2004): *Naturally Acquired Simian Retrovirus Infections n Central African Hunters*: The Lancet: 363:932-937

[24] M.C. Georges-Courbot et al (1997): *Isolation and Phylogenetic Characterization of Ebola Viruses Causing Different Outbreaks in Gabon*: Emerging Infectious Diseases: 1997:3:59-63

pathogens. This suggests that these “high-risk host species” should be prioritized for monitoring for the emergence and spread of potential microbial threats.

High-Risk microbial agents: Wildlife is a reservoir of an extraordinarily deep and diverse pool of microbial agents. There are an estimated 1 million different viruses, alone, circulating among wildlife of which 99% have yet to be recorded[25]. Even considering such overwhelming diversity, the actual numbers of microbial agents that have been reported to infect humans and cause disease are limited. RNA viruses, such as retro-viruses (AIDS) and influenza A viruses (influenza), Corona viruses (SARS), and Filoviruses (Ebola and Marburg) are examples of families of pathogens that have proven capable of human-to-human transmission. As such, families of viruses with demonstrated capacities to infect humans provide a first, but not exclusive, line for focused monitoring and surveillance. By tracking their movement within and among animal species, including domestic animals and humans, and monitoring for key genetic changes can prove a critical tool for an early identification of emergent threats. As illustrated less than ten years ago by the Corona virus, however, new disease threats can emerge from families of viruses that previously have not been know for posing threats to humans. It will be important to monitor other microbes circulating within the “high-risk” animal hosts for their ability to diversify their host range or for changes in their epidemiologic profile.

High-Risk populations: Ultimately, the key event in the transfer of a novel animal pathogen is either direct or indirect exposure of an individual to an infected animal host. Individuals and populations with frequent exposure to wild animals or their products, such as hunters and related butchers of wild game, bush meat traders and consumers, as well as those whose economic activities lead to incursions in wild life areas, such as loggers, miners and road builders are at particular risk of infection of new microbial threats[26]. In addition, domestic animals that live in close proximity to wildlife habitats can act as an intermediary source of infection; for example, the infection of domesticated pigs by bats or the hunting/scavenging of wild game by domesticated dogs. It is likely that monitoring of population settlements where human and domestic animals have high levels of exposure to wild animals will provide the earliest insight into events involving the transfer of a new microbial threat from a wild animal host.

Together, these observations about the relationship between “risk” and geographic “hot spots”, animal hosts, microbial agents, and vulnerable populations demonstrate that the emergence of new zoonotic diseases strongly correlates with socio-economic, environmental, genetic, biological, and ecological factors. Importantly “risk-based” intervention strategies can be used to provide the basis for a highly cost-effective and strategic allocation of resources to pre-empt or combat the first stages of disease emergence. In effect, risk-based interventions allow the use of knowledge about the heterogeneity of risk to target disease detection to those places, populations, times or situations where risk of disease is greatest and the likelihood of finding it is highest. The result is more efficient use of limited resources in detecting a rare “emergent” event.

C. STRATEGIC FRAMEWORK

USAID efforts to control the HPAI virus have been focused on improving developing-country capacities to contain the virus and limit its opportunities to develop the properties that

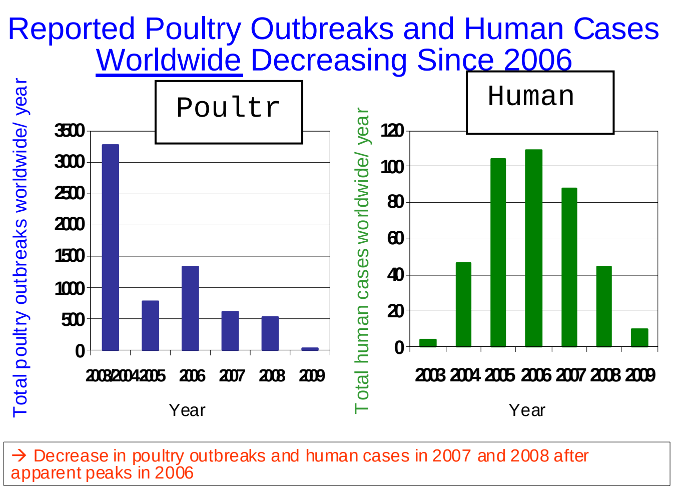
[25] W. Ian Lipkin (2009): *Microbe Hunting in the 21st Century*: PNAS: Vol 106/1

[26] Nathan D. Wolfe et al (2007): *Origins of Major Human Infectious Diseases*: Nature: Vol 447/17

would allow it to move efficiently and continuously among humans. USAID recently conducted a series of strategic reviews to determine whether the goals and strategies of its Avian and Pandemic Influenza (API) program needed to be modulated or significantly changed in light of lessons learned in efforts to fight HPAI over the past three years. The reviews strongly concluded that significant progress has been achieved in controlling the HPAI threat in many parts of the world, but that the virus still remains a serious threat: It continues to spread in poultry, new genetic variants continue to emerge, the mortality rate among infected humans remains above 60%, and possibility remains that the virus could once again spread around the globe as it did in 2006. As such, maintaining vigilance in the fight against the HPAI virus is critical.

The exercise highlighted the important contribution made by improving disease surveillance and response capacities, particularly in those areas in Africa and Asia most vulnerable to the emergence of other zoonotic threats. Specifically, it was concluded:

(1) The overall magnitude of the H5N1 avian pandemic has diminished, with reported numbers of poultry outbreaks and human cases having decreased since their peak in 2006.



Sources: OIE, FAO, and WHO

Over the past three years, the total numbers of reported poultry outbreaks and human cases have decreased. In 2006, nearly 1,500 H5N1 outbreaks in poultry were reported, compared to 600 in 2007 and 500 in 2008; with 2009 on pace for even further reductions.

Similarly, while more human cases were reported between November 2005 and October 2007 than in the previous three-year period, the number of human cases has been on the decline these past two years. There were fewer cases reported in 2007 than 2006, and 50% fewer cases in 2008. In addition, there has been an 81% reduction in human cases during the peak influenza period of November 2008 to February 2009 compared to November 2007 to February 2008[27].

Progress has been particularly significant in Thailand and Vietnam, two of the most affected countries. Between December 2003 and December 2005, both countries accounted for a total of 3,447 reported H5N1 outbreaks in poultry, or 86% of the global total. After an aggressive package of control measures was introduced in both countries in 2005, total poultry outbreaks between January 2006 and June 2008 fell to 182. On the human-health side, results have been equally remarkable. During the same 2003-2005 period, both countries reported 115 human cases, or 78% of the global total. Since 2006, there have been 16 human cases in both countries (through February 2009)[24].

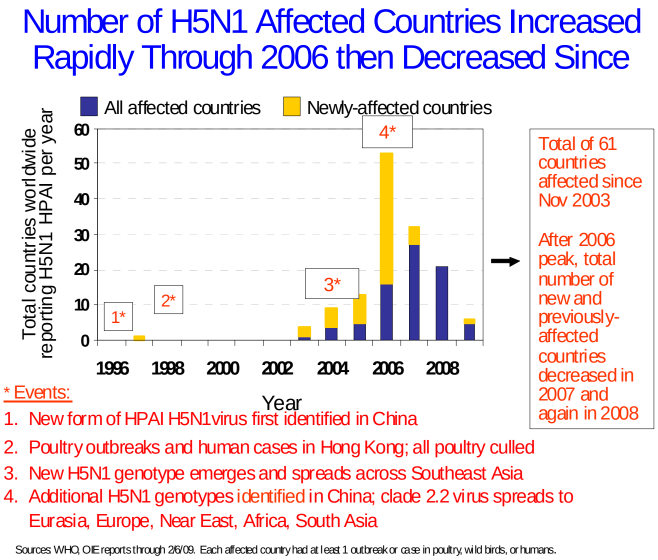
(2) H5N1 appears to have not only stopped spreading to new countries, but there has also been a dramatic contraction of its geographic range.

[27] Andrew Clements (2009): Unpublished analysis of WHO/FAO/OIE data

[24] Andrew Clements (2009): Unpublished analysis of WHO/FAO/OIE data

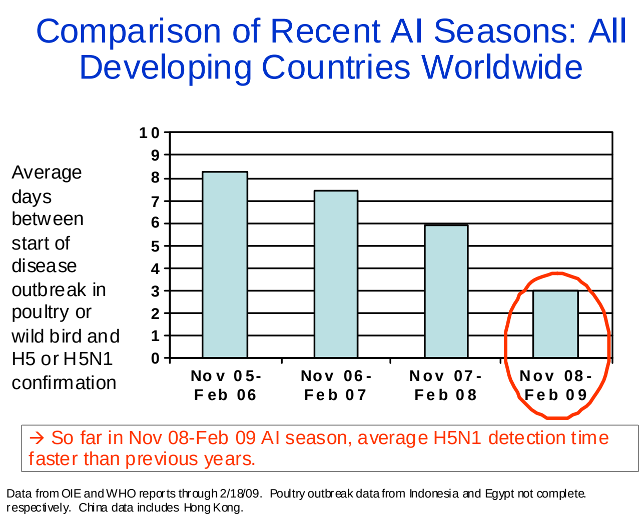
With the exception of Nepal which had its first limited (and quickly contained) outbreaks this past December, H5N1 appears largely to have stopped spreading to new countries, at least for now. Between 2003 and mid-2005, nine countries in Southeast Asia reported H5N1 outbreaks. Beginning in late 2005, there was an explosive movement of the virus outside of Southeast Asia to Europe, the Middle East, South Asia, and Africa. At the height of the poultry pandemic in 2006, a total of 53 countries had reported outbreaks. By the end of 2008, the number of countries affected shrank to 20, with five of these countries (Bangladesh, China, Egypt, India, and Vietnam) accounting for more than 80% of all reported outbreaks[24].

Figure



(3) Affected countries have strengthened their capacities to identify and respond to future poultry outbreaks.

Figure



USAID has focused on strengthening the capacity of affected countries in three key areas: early identification of H5N1 outbreaks involving the H5N1 virus in both poultry and people, promotion of timely and effective response in containment and elimination of the virus, and education of the general population on the risks associated with avian influenza and steps they can take to protect themselves. These investments have led to improved capacities in early-warning surveillance for HPAI outbreaks in domestic poultry, wild birds, and humans, have strengthened capacities of veterinary and human health laboratory diagnosis of the H5N1 virus, and have established rapid response teams involving veterinary and public health professionals trained in core principals of field epidemiology. All of these are key capacities that could prove the backbone of any effort to address the larger threats posed by emerging zoonotic diseases. Per the adjacent figure, a comparison of recent AI seasons (November through February) indicates that the average number of days between the start of disease outbreak in poultry or wild birds and H5 or H5N1 confirmation has fallen from in excess of eight days (in November 2005-February2006) to three days (during the current 2008-2009 season)[24]. This is a strong indicator that the worldwide response to HPAI outbreaks has dramatically improved.

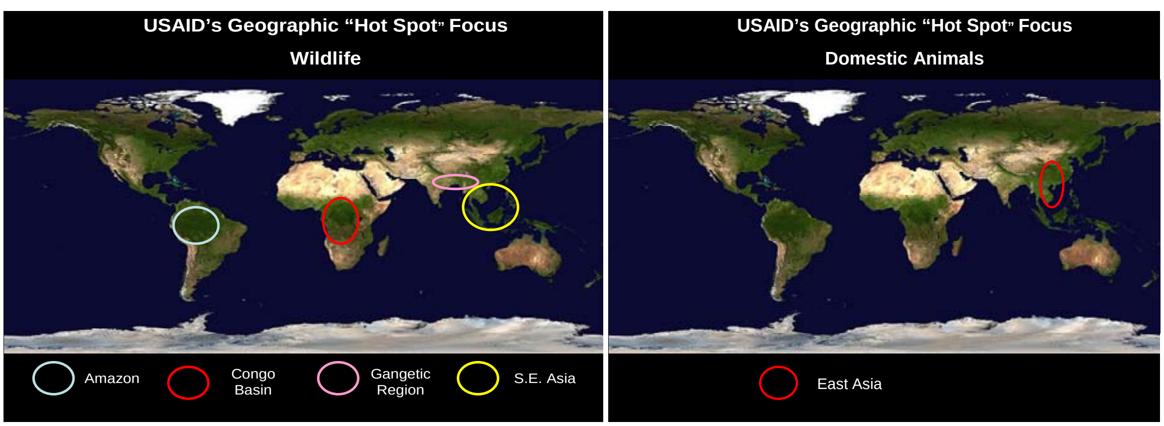
[24] Andrew Clements (2009): Unpublished analysis of WHO/FAO/OIE data

A “Package” for Control of Emergent Zoonotic Threats: Building on HPAI Control Platforms

Over the past three years, USAID’s HPAI program has focused on building capacities for monitoring the spread of the H5N1 virus among wild bird populations, domestic poultry and humans, and to mount rapid and effective containment of the virus when found. The successes in Africa, Europe and Eurasia and large parts of Asia in containing the spread of the HPAI virus have begun to signal the opportunity to begin rethinking our current exclusive “emergency” focus on the HPAI virus in favor of a transitional strategy to address the broader threats of other emergent diseases of animal origin. Specifically, **we describe a multi-year effort that will use risk-based modeling to target a package of highly cost-effective surveillance and response interventions. Importantly, this effort builds on the HPAI control platforms to establish a global early warning system for disease emergence to address the broader threats posed by other emergent diseases of animal origin as the urgency for an exclusive HPAI effort subsides**.

To address the rising threat posed by new emergent diseases, USAID will build on its current HPAI portfolio to develop an intervention package that includes five main lines of work: (1) expand our current monitoring of wild birds to more broadly address the role played by wildlife in facilitating the emergence and spread of new pathogens; (2) enhance support for field epidemiological training of relevant animal and human health teams beyond HPAI to more broadly address the threat posed by other newly emergent zoonotic diseases; (3) enhance our support for animal- and public-health diagnostic laboratories to more fully address a broader array of infectious disease threats; (4) broaden ongoing behavior change and communications efforts to prevent H5N1 transmission from poultry to humans to include potential transmission of other emergent wildlife pathogens; and, (5) expand our support for simulations and field tests of national, regional and local pandemic preparedness plans to include threats posed by other zoonotic disease threats Using risk-based modeling, our focus will be on delivering this package in geographic “hotspots” for the emergence of new infectious disease threats originating from both wild animals (the Amazon region, the Congo Basin, the Gangetic Plain, and Southeast Asia) and domestic animals (East and Southeast Asia) (Figure 6)).

Figure



The USAID strategy envisions five primary mechanisms. These mechanisms will, together, form a comprehensive program. However, due to the fact they each mechanism requires specific skills they will be implemented through different existing grants or new separate procurements. A brief description of the five is presented in the table below.

USAID Emergent Zoonotic Disease Program

Area of focus	Project name	Implementing group	Description
Planning	PREPARE	CA	A cooperative agreement that will support technical assistance for simulations and field tests of national, regional and local pandemic preparedness plans. The intent will be to ensure that countries have the ability to actually implement national response plans in an effective and efficient manner.
Surveillance	PREDICT	CA	A cooperative agreement to monitor for the emergence of new infectious diseases in high-risk wildlife (e.g. bats, rodents and non-human primates) that could pose a major threat to human health. Particular focus would be placed on establishing an enhanced wildlife monitoring capacity in those geographic “hotspots” that pose a particular risk for the emergence of new infectious disease threats. The monitoring would include wildlife in their natural habitats, market trade of wildlife, wildlife products and foods, including characterizing the risks associated with “bush meat”.
Laboratory	IDENTIFY	WHO, FAO, and OIE	The intent of this area of work is to support the development of a laboratory network and strengthening of diagnostic capacity that can facilitate the identification of newly emergent pathogens of animal origin. This work will be undertaken through grants that USAID has with the World Health Organization (WHO) and the Food and Agriculture Organization (FAO). Also included in this activity as a sub-grant from FAO to the World Organization for Animal Health (OIE).
Response	RESPOND	CA	A cooperative agreement that will strengthen the human capacity of countries to respond to outbreaks of newly emergent diseases of animal origin in a timely and sustainable manner. The agreement will focus on the development of field epidemiology training in long term settings as well as short term in-service training

			programs. That training will emphasize the merging of animal and human health dynamics into a comprehensive capacity for disease detection and outbreak response.
Communications & Behavior Change	PREVENT	CA	A cooperative agreement that will address other disease threats of animal origin, including supporting efforts to characterize "high risk" practices that increase the potential for new disease threats from wildlife or wildlife products to spread and infect people; identify high-risk groups that need to be targeted for communication / behavior change messages; and formulate behavior change / communication strategies and interventions that are consistent with meeting the challenges posed by "rare" events, such as the emergence of a new infectious disease.

II. Program Description of PREDICT

A. GOALS AND OBJECTIVES

USAID is issuing this cooperative agreement with the goal of establishing a global early warning system for disease emergence that is capable of detecting, tracking and predicting the emergence of new infectious diseases in high-risk wildlife (e.g. bats, rodents and non-human primates) that could pose a major threat to human health. Particular focus will be placed on establishing an enhanced wildlife monitoring capacity in those geographic "hotspots" that pose a particular risk for the emergence of new infectious disease threats. Surveillance will focus on specific priority pathogens. Agents such as retroviruses, influenza, corona viruses, filoviruses are examples of agents that would be tracked by this agreement. The final list will be identified by USAID and the cooperating agency. The monitoring will include wildlife in their natural habitats, market trade of wildlife, wildlife products and foods, including characterizing the risks associated with "bush meat".

The following five objectives and illustrative activities will form the core of this project.

1. **Objective I: Assess existing capacity and develop plans for the implementation of wildlife surveillance support.**

The PREDICT project will assess the capability of each country/region to conduct wildlife surveillance and develop a plan of action that identifies the inputs needed from this project to achieve the other objectives described in this RFA.

A wide range of laboratory and data surveillance platforms, systems and capabilities of various levels exist across the geographic areas of interest and these assets may be important parts of the overall effort to develop systems for the surveillance of disease in wild animals. For example, WHO, FAO, OIE, and the U.S. Government (to include CDC, DOD, and USAID) have provided resources and technical assistance within key countries and regions to develop analytical (laboratory) capacity and to implement surveillance systems. Many of these labs and systems are primarily focused on specific diseases, however, these assets may be available and useful to include. Also, these assets may currently be used to varying levels of capacity, and the utility may change predictably (e.g., seasonally) or unpredictably (e.g., outbreaks, changes in organizational priority). Utilizing these existing assets and capabilities will require close coordination and a clear understanding of organizations, workloads and priorities.

This objective should result in a comprehensive understanding of the existing capacity in the countries and regions targeted through this project. It will describe the existing capabilities, their current utility, and any opportunities to use those capabilities for broader surveillance of diseases in wild animals that are of potential public health impact. Close coordination with the organizations that own, support, and/or operate these assets will help to understand the true potential for use in this wild animal surveillance project. Gaps in systems will be identified and options for solutions will be developed and presented. Barriers to implementation of a wild animal surveillance system will be identified and addressed.

Illustrative Activities:

- Development of an assessment tool to capture information on key capabilities and systems.
- Development of a report that describes capabilities and their potential use for broader wild animal disease surveillance.
- Analyses of gaps in systems and barriers to implementation.
- Meetings with key partners in the target countries and regions that increase the understanding of capabilities and the practical opportunities for expanding their use for broader wild animal disease surveillance.

2. Objective II: Develop models of disease occurrence and spread as well as determining specific areas at high risk.

Zoonotic disease emergence and spread is difficult to predict because there are several dynamic factors and relationships that affect the occurrence and spread of disease. Relationships among humans, domestic animals and wild animals are varied, and they are changing rapidly in some areas of the world. Therefore, it is necessary to focus efforts based on the risks of host animals that carry pathogens of known public health impact having close and frequent contact with people or their domestic animals. These conditions most often occur in what can be described as geographic “hot zones” for emerging infectious disease. They are areas of high biodiversity and high human population density which may be changing the human-animal-ecosystem interface with increasingly frequent and complex contact.

Some human-driven factors affecting increased and complex human-animal interaction include genetic and biological factors, social, political and economic factors, human health, behavior and attitudes, and activities such as transport and trade of animals and animal products. For example, the world’s human population has nearly doubled since 1950, and this growth has increased the demand for animal protein. Larger numbers of farmers in resource-poor countries are raising food animals in concentrated animal feed operations, and there is a lack of consistent, safe animal husbandry practices such as vaccination. These conditions greatly increase the risk of zoonotic disease spread to humans. Also, the increased demand for animal protein has led to an increased demand for “bushmeat” – the meat of terrestrial wild animals such as elephants, non-human primates, rodents and birds. Hunting, trading, handling and consuming wild animals may expose people to emerging infectious diseases such as Ebola.

Environmental-driven factors such as changes in weather patterns and climate may affect the spread of emerging zoonotic diseases. Also, the great expansion of human habitat into areas that were previously dominated or even exclusively inhabited by wild animals adds to the frequency and complexity of interaction among humans, their domestic animals, and wild animals. Animal habitats, feeding habits, reproductive patterns and other characteristics may change as their environment changes.

This objective should produce computational models of disease occurrence and spread that will aid in the development of wild animal surveillance systems and risk-based forecasting for early disease events. Using existing data sets, historical information, scientific publications and other credible, relevant information, these models will identify geographic areas and animal species to target for surveillance activities, identify the factors and conditions most likely to influence the spread of disease from wild animals to domestic animals and/or humans, describe the strengths and weaknesses of differing levels of detection and reporting, and assess the potential impacts (e.g, health, economic) of disease and disease control measures. Efforts should focus pathogens that have known public health impact (e.g., RNA viruses, such as retro-viruses (AIDS) and influenza A viruses (influenza), Corona viruses (SARS), and Filoviruses (Ebola and Marburg), and Nipah virus, are examples of pathogens that have proven capable of acquiring human-to-human transmission, and therefore pose special risks to humans.). The pathogens listed previously are relevant examples; however, USAID may expand on this list of pathogens and may require the recipient of this cooperative agreement to work on disease surveillance activities for any pathogen that may have significant public health impact.

Illustrative Activities:

- Identify and mine data sets and other information useful for modeling disease occurrence and spread
- Identify key factors affecting the occurrence and spread of emerging zoonotic disease in geographic focus areas and/or target species
- Identify key factors affecting the spread of disease from specific species of wild life
- Produce mathematical models that illustrate the occurrence and spread of disease from wild life based on key factors

3. Objective III: Establish a wildlife surveillance capacity in selected countries and regions that targets specific microbial agents

There are several strategies to consider for developing surveillance capacity to detect disease among wild animals. These include analysis of pathogens, surveillance of markets, trade of wild animals, movement of animal products, behavior of people handling animals and animal products, and indicators or "triggers" for disease outbreaks. It is critical that selected strategies provide timely information on the greatest threats to domestic animal populations and ultimately public health. Strategies must also be supportable in the environments in which they are established. For example, surveillance of pathogens may require the development and sustaining of analytical capacity in resource-restrained countries. Laboratories with adequate bio-safety levels are too expensive to maintain in many low-resource countries, and it is difficult to assure ongoing adherence to bio-safety practices that protect workers and prevent spread of disease. Furthermore, laboratory analyses alone do not provide adequate information on disease threats or their prevention. Surveillance of behaviors, practices, and indicators or triggers must be carefully planned so that they produce useful information on risk of disease spread. Such surveillance strategies must also provide useful feedback to participants so that the work is valued and sustainable.

This objective will improve policy development capabilities for conducting routine and other non-routine surveillance of targeted diseases in wild animals. Disease occurrence and spread among wild animals and channeling to domestic animals and humans may have tremendous economic and public health impacts. However, surveillance systems can fail or become ineffective if they are not adequately supported by thoughtful policy. Sampling and testing may be inadequate, inconsistent, or sometimes overwhelming. Surveillance systems that do not provide useful feedback may appear meaningless and a waste of scarce resources. Therefore, the design of the system must be very thoughtful and supportive of stakeholder interests, and the system must be supported by strategic policy.

This objective will also support the strengthening of country capacity to become aware of disease outbreaks, forecast early disease events and to implement enhanced surveillance during un-forecasted outbreaks. As countries improve routine surveillance of disease occurrence and spread in wild animals, they will understand the changes in routine surveillance data that indicate that an outbreak may occur or is beginning to occur. Also, through modeling and other strategies, countries will also be able to prepare for events (e.g., drought, flood, changes in livestock production, changes in trade, movement of high-density human populations into new areas) that increase the risk for outbreaks. Countries will improve their capacity to respond to such events by increasing the intensity of routine surveillance and/or broadening surveillance strategies to detect outbreaks of one or more disease threats.

This objective will improve the ability of countries and regions to monitor key risk factors for disease spread. Ministries of Health, Agriculture and others will be able to use surveillance information to communicate risk and prevention information to key groups and to inform policy decisions that protect human health and economic well-being.

This objective will also improve the ability of countries to safely collect samples at field sites and ensure that samples reach appropriate laboratories in suitable condition for analysis. The collection and transport of specimens in resource-restrained countries is one of the greatest challenges for laboratory surveillance. Collectors must be well trained and equipped to safely collect proper samples. Virus isolation is laborious, expensive and slow – results are generally not available for one to two weeks after submission. Therefore, the proper collection and transport of useable specimens is critical to timely feedback of results. In most cases, specimens require strict environmental conditions and timeframes for transport from collection to an appropriate laboratory environment. Conditions such as “cold chain” (a series of storage and transport links through a network of refrigerators, freezers and cold boxes that keep specimens at a safe temperature throughout their journey) require delicate logistical support, and a break in that system effectively destroys samples.

This objective will also improve capacity within target countries to conduct analysis of data from the wild animal surveillance system and interpret the results. Ongoing review and analysis of surveillance data will be necessary to understand emerging disease issues in wild animal populations, to provide input to models that predict occurrence and spread of disease, and to predict and track any spillover from wild animal populations to domestic animals or humans. As this project matures, there will be large amounts of data and multiple sets of data, depending on the types of surveillance strategies employed. The project must ensure that analysts are identified, properly trained, and equipped to conduct data analysis and provide clear interpretations of the data.

<u>Illustrative Activities:</u>

- Identify existing surveillance systems that could be broadened to include the monitoring of disease in wildlife.
- Identify gaps in systems and resources that are necessary for a functioning surveillance system.
- Develop and improve protocols that results in more efficient and effective sampling
- Provide training and technical assistance to countries in developing, expanding, and maintaining surveillance systems.
- Increase the number of trained animal and human health workers that can participate in surveillance activities at different levels and localities.
- Develop evaluation methodologies to assess and improve surveillance systems.
- Use modeling results to forecast events and plan surveillance strategies
- Increase capacity to “bank” samples and data during periods of routine surveillance and retrieve them for use during outbreak occurrences.
- Provide training and technical assistance in specialized epidemiology techniques such as aberration detection.
- Training and equipping of local-level workers for safe and proper specimen collection in the field
- Coordination with USAID for equipment and supplies needed for safe specimen collection
- Development and implementation of systems to track sample transports
- Assessment of cold chain and other transport capabilities in-country and plans and activities to improve and extend those capabilities
- Work with field epidemiology training programs on disease investigations, data collection, analysis and interpretation
- Provide material support for training in data analysis and interpretation
- Provide technical support for training in data analysis and interpretation
- Ongoing engagement of stakeholders in developing policy that supports the surveillance system
- Developing communication loops that inform stakeholders of results and gather stakeholder feedback on the system
- Monitoring and evaluation of the impact of policy decision on surveillance activities

4. <u>Objective IV:</u> Introduce new technologies where they are appropriate and sustainable.

Technological advances have extended the ability to conduct disease surveillance in developing countries. For example, disease reporting can occur through text messaging or SMS. Also, field diagnostic technology can help reduce logistical issues for specimen transport and laboratory backlogs. This project will capitalize on the practical, sustainable application of technology to support and streamline surveillance of targeted microbial agents among wild animals. It will focus on technologies that are proven effective, adaptable to low-resource countries, sustainable and promising for long-term use. Appropriate surveillance staff in focus countries will receive training and support for the integration of selected technologies into wild animal surveillance and they will provide feedback and suggestions for improvement to these applications.

Illustrative Activities:

- Reporting of wild animal illnesses and/or die offs through phone technology, digital photo/video, or email.
- Working with USAID on validating field test kits and integration of test kits for use in national surveillance systems.
- Surveillance of wild animal illnesses and/or die offs through review of local/regional media (to include informal sources such as blogs).
- Tracking of lab samples and ordering of consumables (lab and field).

5. Objective V: Improve the flow and handling of information, specimens and samples resulting from the surveillance activities.

The flow of information from surveillance systems through appropriate channels to decision makers who can then take action to reduce and prevent the spread of disease is critical to success. One of the great challenges in monitoring zoonotic diseases of potential public health impact is that success requires close coordination and sharing of information among animal and public health sectors. Emerging zoonotic diseases among domestic animal populations have tremendous and often immediate economic consequences (e.g., domestic consumption, imports and exports) while the public health impacts are not always as immediate or clear. These challenges also vary among countries. This objective will develop the policy considerations around notification of emerging diseases and ensure timely, parallel flows of communication through animal and public health sectors so that timely decisions and actions can occur. It will also develop communication and feedback channels to support and strengthen wild animal surveillance systems. Key partners and participants will be engaged to understand how surveillance information can be used at different levels. Communication methods and formats will be designed to provide participants with timely and useful feedback. Barriers to communication among key participants will be identified and addressed according to the specific context.

Specimen samples (disease-positive, disease-negative, and untested) can be valuable resources for future surveillance and epidemiological studies. For example, when an unusual disease event occurs, retrieval and analysis of stored samples may aid in aberration detection – defining an observed value (such as appearance of disease) as being greater than an historical value for that same period. Proper storing and maintenance of samples provides the necessary background information for such studies. Likewise, surveillance data must be managed for quality and completeness and maintained for future use. This objective will improve countries' capacity to maintain data and specimen samples for continued retrieval and use.

Finally, this objective will ensure that findings from the wild animal surveillance project will be promptly shared with the public health community so that timely responses can be formed and implemented.

Illustrative Activities:

- Engage key participants and partners to understand how surveillance information can be used.
- Assisting countries in formulating policy and protocols for disease notification.
- Provide technical assistance to key participants in translating surveillance information to inform animal and human health activities and policy decisions.

- Provide forums for partners to discuss and exercise the notification of surveillance findings.
- Provide material support (e.g., equipment, systems, supplies) for storage and long-term maintenance of samples and data
- Institute quality control systems for processing, tracking, storage, maintenance and retrieval of samples and data
- Provide training and technical assistance for processing, tracking, storage and maintenance of samples and data

B. MONITORING AND EVALUATION

The evaluation plan should: (1) address the overall program goal; (2) have measurable, achievable and time-phased objectives; (3) focus on programmatic outcome/impact; (4) include the name and qualifications of the person(s) responsible for conducting the evaluation; (5) specify how often evaluation will be conducted; and (6) discuss how the results of the evaluation and lessons learned will be used on an on-going basis during project implementation. Evaluation should be designed and implemented at the beginning of the project and occur throughout the project. The applicant will use an external advisory panel to assist with and guide the evaluation.

The applicant should also provide a plan for evaluating the wild animal surveillance system. This evaluation should be compatible with existing standards for the evaluation of surveillance systems located at http://www.cdc.gov/mmwr/preview/mmwrhtml/rr5013a1.htm

Throughout the program as required, the applicant will input programmatic information into USAID monitoring and evaluation systems such as the Avian Influenza Monitoring, Evaluation and Budget Analysis (AIMEBA) system or other system as directed by the Agreement Officer's Technical Representative (AOTR).

C. STAFFING

Applicants are expected to develop a comprehensive staffing plan that will enable achievement of the PREDICT results and demonstrates an appropriate balance of skills. The staffing pattern should include highly experienced individuals that are renowned in their fields.

Key Personnel. The Applicant shall designate three key personnel for the following positions. The proposed Key Personnel must have the demonstrated ability to address the objectives of the PREDICT Project and implement state-of-the-art of wildlife surveillance.

Director. The Director must have:

- A minimum of a PhD or DrPH (preferred) in science, public health or an equivalent field;
- A minimum of 10 years experience working on international projects;
- At least 5 years experience as Chief of Party or Director for international projects with similar scale and complexity;
- Demonstrated ability to work with multiple partners on collaborative projects;
- Demonstrated ability to create and maintain effective working relations with senior Government personnel, international organizations, NGO partners, host country governments, and U.S. Government Agencies.

Deputy Director. The Deputy Director must have:

- A minimum of 10 years experience working on international projects;
- A PhD or DrPH in science, public health or an equivalent field is preferred;
- At least 2 years experience as Deputy Chief of Party or Deputy Director for international projects with similar scale and complexity;
- Demonstrated ability to work with multiple partners on collaborative projects;
- Demonstrated ability to manage staff and decentralized branch/field offices.
- Demonstrated ability to create and maintain effective working relations with senior Government personnel, international organizations, NGO partners, host country governments, and U.S. Government Agencies.

Senior Technical Officer (Wildlife Veterinarian/Ornithologist/Conservation Biologist). The Senior Technical Officer must have:

- A minimum of a doctoral degree in veterinary medicine, related science or an equivalent field;
- A minimum of 5 years of experience working on international projects; demonstrated ability to work with multiple partners on collaborative projects;
- A demonstrated ability to create and maintain effective working relations with senior Government personnel, international organizations, NGO partners, host country governments, and U.S. Government Agencies.

Other Staff. In addition to the Key Personnel, the Applicant must design a staffing pattern to include core team members and individuals available for short-, medium-, and long-term technical assistance assignments. These individuals should bring technical expertise, innovation, and the capacity to build and maintain successful partnerships. Staff should have extensive experience in the area of wildlife surveillance as well as working in a developing country context.

D. CROSS-CUTTING THEMES

USAID expects that the implementer of PREDICT will embrace the following critical themes when designing and implementing activities in this Program.

1. Technical Leadership

This project should provide technical expertise, innovation, and the capacity to build and maintain successful partnerships. State-of-the-art approaches using cutting-edge technologies and methodologies will be employed to achieve the objectives. The applicant should propose individuals who bring the highest level of technical leadership and expertise possible. Extensive experience among proposed staff in the area of wildlife surveillance as well as working within the developing world is highly valued. Special attention will be given to the substantial involvement of developing country staff. Their involvement leads to more sustainable results and this is an area where USAID is particularly concerned.

2. Coordination

The work that USAID is proposing under this RFA requires extensive coordination and collaboration with other partners. As is noted in section II of the RFA, USAID will be managing this agreement as an integral part of an overall program. Coordination within that program is critical. In addition, USAID works closely with other USAID programs, other U.S. Government agencies (e.g., DOS, HHS, USDA, and DOD), national governments, key international organizations including the World Health Organization (WHO), UNICEF, the U.N. Food and Agriculture Organization (FAO), the World Organization for Animal Health (OIE), and other U.N. agencies, and many private sector and non-governmental organizations. It is anticipated that coordination among these partners will be a critical factor for successful implementation of this project.

3. Capacity Building

All efforts under this cooperative agreement are geared towards building technical and operational knowledge, resources, leadership, and systems within the country of operation. It is expected that this project will lead to significant, sustainable improvements in the country's ability to conduct surveillance in wild animals and reduce and prevent the spread of dangerous pathogens to domestic animals and humans. These improvements will require investments in human capital and infrastructure. USAID anticipates that the applicant will demonstrate how they will meet the objectives of this RFA while they are building sustainable capacity.

4. Build on existing platforms

USAID has made significant investments in various national and international platforms over the last three years to reduce the threat posed by H5N1. It is the expectation of USAID that the PREDICT project will build on those control platforms to address the broader threats posed by other emergent diseases of animal origin as the urgency for an exclusive HPAI effort subsides. It is, therefore, expected that a successful applicant will demonstrate their ability to build on current API investments as much as possible and to also utilize existing platforms that may not have been incorporated into the USAID API program but which offer constructive platforms from which to implement activities.

Relevant to the scope of work for this project is the work of several important field epidemiology training regional networks that would be valuable partners in implementing activities such as those outlined in this RFA. The African Field Epidemiology Network (**AFENET**) is a non-profit organization based in Kampala, Uganda that works in partnership with Ministries of Health, non-governmental organizations, international agencies, private sector, and other public health agencies to help African nations enhance and develop their own applied epidemiology capacity. The International Group for Epidemiology and Response (**TIGER**) is a recently established network designed to strengthen disease surveillance and response systems to provide timely and effective interventions for health emergencies in Southeast Asia. Central and South American countries have formed a similar organization called **REDSUR** to facilitate the development and use of field epidemiology training programs in that region. These networks could provide unique partnership opportunities to enhance implementation.

5. Programmatic Focus

This project will have three critical programmatic foci: 1) a risk-based approach for the early detection of emerging zoonotic diseases that have significant public health impact; 2) geographic focus on areas where these diseases are most likely to emerge (e.g. the Amazon Region, the Congo Basin, the Gangetic Plain, and Southeast Asia) and where host species are likely to have significant interaction with domestic animals and high density human populations within these geographic areas; 3) a focus on pathogens that are likely to be of significant public health impact- for example RNA viruses such as retro-viruses (AIDS) and influenza A viruses (influenza), Corona viruses (SARS), Filoviruses (Ebola and Marburg), and Nipah virus.