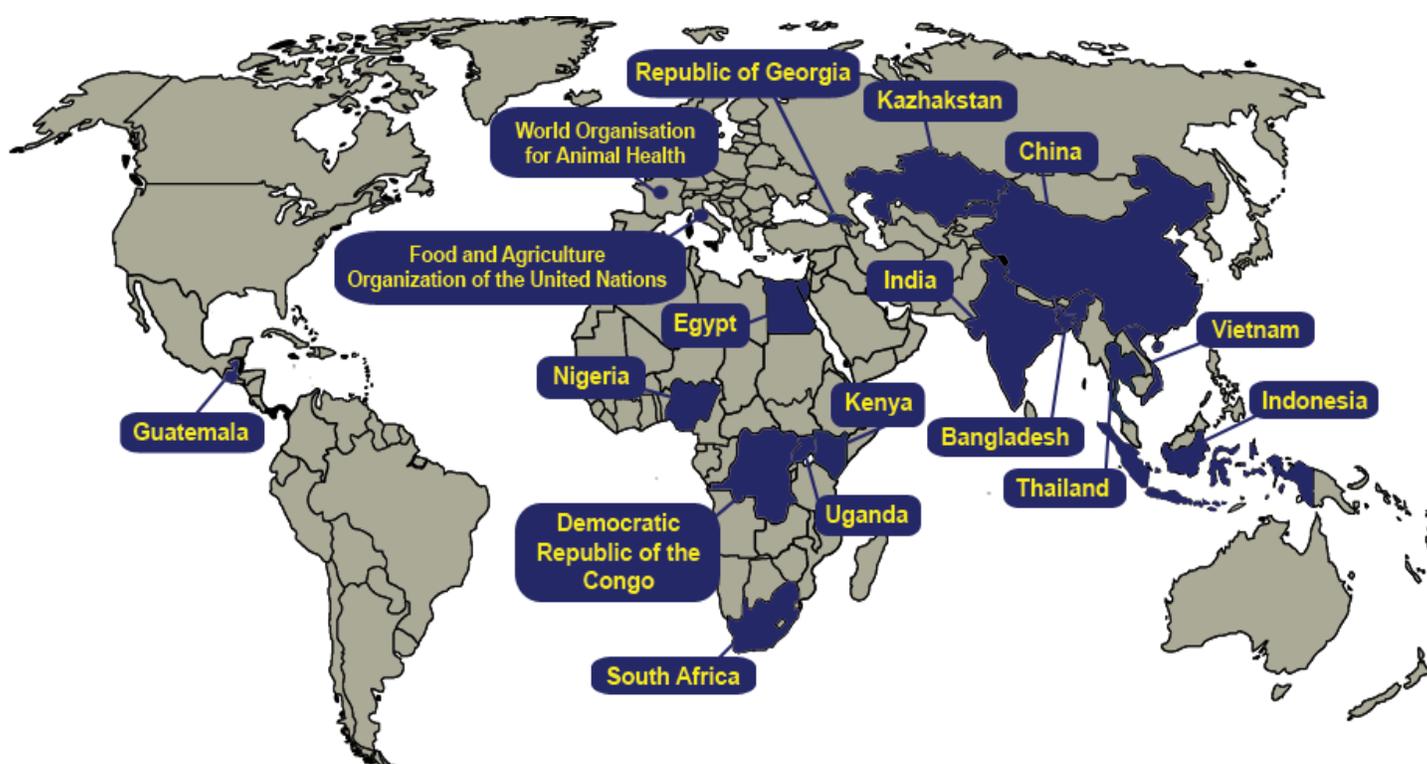


National Center for Emerging and Zoonotic Infectious Diseases

One Health and Zoonoses Activities at 17 Select International Locations

April 2012-May 2013



Compiled by the One Health Office
Division of High-Consequence Pathogens and Pathology
National Center for Emerging and Zoonotic Infectious Diseases
Centers for Disease Control and Prevention

<http://www.cdc.gov/onehealth>
onehealth@cdc.gov

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Welcome to the second annual report of One Health and Zoonoses projects that the Centers for Disease Control and Prevention (CDC) is conducting at 17 international sites, including 15 countries, the World Organisation for Animal Health (OIE), and the United Nations Food and Agriculture Organization (FAO). **The purpose of this Report is to facilitate communication, collaboration, and coordination of animal-human interface activities in order to maximize the impact of CDC's global presence.** The Report is prepared by the One Health Office (OHO), National Center for Emerging and Infectious Diseases (NCEZID), CDC.

This Report describes collaboration between CDC field staff and subject matter experts stationed in Atlanta, GA and Fort Collins, CO. During the period covered by the Report, April 2012 through May 2013, support for international staff and projects came primarily from CDC core funding; the US Department of Health and Human Services, Office of Global Affairs; the CDC Global Disease Detection Program; and the CDC NCEZID Emerging Pandemic Threats program allocation. Feedback following release of the first Report included requests for greater uniformity of information among different sites and provision of in-country contact information; the current report addresses these concerns. In addition, we were asked to specifically address the issue of how a CDC country office or animal-human interface assignee can prioritize zoonotic diseases in-country. Thoughtful prioritization was seen as necessary for seeking and allocating funding, identifying diseases and locations for surveillance activities, and increasing the efficiency of program activities and public health impact. In response to this request we have developed a semi-quantitative prioritization tool that is currently being piloted at several sites. We look forward to distributing this tool more widely in the near future.

Organization of the Report

Table One includes all 15 countries and presents an overview of One Health and Zoonoses related parameters across the sites. Information for the table originates from a variety of sources, including reports from CDC Country Offices and formal reports from Ministries. The remainder of the Report is presented by country, or organization (i.e., OIE and FAO). This section contains **country profiles and country-specific tables** that provide greater detail regarding individual projects as well as general and project related contact information.

I would like to sincerely thank all of the CDC staff who contributed time and energy to this Report, and look forward to continued feedback so that the next iteration will be of even greater utility.

Carol Rubin, DVM, MPH

OHO/NCEZID/CDC
404-639-7378
crubin@cdc.gov

**Table of One Health and Zoonoses Activities at
Select International Locations**

April 2012—May 2013

Table of One Health and Zoonoses Activities at Select International Locations, April 2012-May 2013

(Definitions available on page 62)

Country	CDC One Health POC	National-level One Health Organization	FETP or FELTP ¹	Sources of Non-CDC Funds for Zoonoses Activities	Diseases Addressed by CDC Zoonoses Activities
Bangladesh	Yes	Yes	Yes	EcoHealth Alliance, Gates Foundation, Google.org, NIH, PATH, USAID, Rockefeller Foundation	Anthrax, Hepatitis E, Influenza viruses, Japanese encephalitis, Nipah virus, Rabies, Rotavirus
China	Yes	No	Yes	--	Brucellosis, Campylobacteriosis, Influenza viruses, Salmonellosis, Severe fever with thrombocytopenia syndrome
Democratic Republic of the Congo	No	No	In progress	USAID	Monkeypox, Rabies
Egypt	Yes	No	Yes	DOD/GEIS, DOD/CBEP, USAID	Brucellosis, Crimean–Congo hemorrhagic fever, Campylobacteriosis, <i>Escherichia coli</i> , Influenza viruses, Leptospirosis, Listeriosis, Q fever, Rift Valley Fever, Salmonellosis, Sandfly fever Naples virus, Sandfly fever Sicilian virus, Shigellosis, West Nile virus
Guatemala	Yes	No	Yes ¹	EcoHealth, University of Georgia, Veterinarians Without Borders	Arenaviruses, <i>Bartonella</i> spp., Campylobacteriosis, Coronaviruses, <i>Escherichia coli</i> , Flaviviruses, Giardiasis, Influenza viruses, Leptospirosis, Paramyxoviruses, Rabies, Reoviruses, Rhabdoviruses, Rickettsial disease, Salmonellosis
India	Yes	Yes	Yes	DOD/DTRA	Hepatitis E, Japanese encephalitis, Leishmaniasis, Salmonellosis
Indonesia	No	No	Yes	USAID	Arboviruses
Kazakhstan	No	No	Yes ¹	DOS/BEP, DTRA	Campylobacteriosis, Crimean–Congo hemorrhagic fever, Influenza viruses, Rabies, Rickettsial disease, Salmonellosis
Kenya	Yes	Yes	Yes ¹	DOS/BEP, DOD/DTRA, Washington State University/Paul Allen Foundation, NIH/University of Minnesota	Anthrax, Brucellosis, Influenza viruses, Rabies, Rift Valley Fever
Nigeria	Yes	No	Yes ¹	DOS/BEP	<i>Bartonella</i> spp., Coronaviruses, Flaviviruses, Influenza viruses, Lassa fever, Lead, Lyssaviruses, Orthomyxoviruses Rabies
Republic of Georgia	No	No	Yes ¹	DOD/DTRA, DOS/BEP	Anthrax, Brucellosis, Rabies
South Africa	No	No	Yes ²	--	Brucellosis, Eastern equine encephalitis, Influenza viruses, Leptospirosis, Sindbis virus, Viral hemorrhagic fever, West Nile virus
Thailand	Yes	Yes	Yes	USAID DOD/DTRA	<i>Bartonella</i> spp., Brucellosis, Influenza viruses, Leptospirosis, Lyme disease, Melioidosis, Q fever, Rabies, Scrub typhus, <i>Streptococcus suis</i> , West Nile virus
Uganda	No	No	In progress	USAID	Arboviruses, Rabies, Viral hemorrhagic fever,
Vietnam	Yes	Yes	Yes	USAID, HHS, DOD, and other country institutions	Influenza viruses

¹ Training program includes veterinarians

² Currently no veterinarians in training, but has taken veterinarians in the past

Recent Zoonotic Outbreaks (country, species)	Zoonoses Surveillance in Animals (species)	Zoonoses Surveillance in Humans
Anthrax (human, cattle, goats), Influenza viruses (poultry), Nipah virus (human)	Influenza viruses, Nipah virus (bats), Rotavirus (pigs)	Influenza viruses, Japanese encephalitis, Meningo-encephalitis, Nipah virus, Rotavirus
Anthrax (human), Brucellosis (human, bovine), Influenza virus (avian, human), Plague (human)	Anthrax, Brucellosis, Influenza viruses	Anthrax, Brucellosis, Echinococcosis, Hemorrhagic fever with renal syndrome, Influenza viruses, Japanese encephalitis, Leptospirosis, Plague, Rabies, SARI, Scrub typhus, Severe fever with thrombocytopenia syndrome, <i>Streptococcus suis</i> , West Nile virus
Ebola Hemorrhagic Fever	Monkeypox	Monkeypox
Influenza viruses (human, poultry), MERS-CoV (Jordan, Saudi Arabia, Qatar, United Arab Emirates; human)	Influenza viruses (poultry)	EMARIS SARI Sentinel Network (multiple countries), Influenza-like Illness Sentinel Network (Egypt, Jordan, West Africa), National Influenza Surveillance (Egypt), Population-based surveillance (Egypt)
Rabies (dogs, cattle), Unknown encephalitis (equine)	Bovine tuberculosis (cattle), Brucellosis (cattle), Influenza viruses (chicken)	Influenza viruses, ViCo Surveillance (selected regions/syndromic)
Anthrax (cattle, elephant, rhinoceros), Botulism (cattle), Crimean–Congo hemorrhagic fever (human), Chikungunya fever (human), Hepatitis E (human), Influenza viruses (poultry, human), Japanese encephalitis (human), Kyasanur forest disease (monkey, human), Leishmaniasis (human), Rabies (canine, human), Scrub typhus (human)	Anthrax (cattle, elephant), Brucellosis (ruminants), Influenza viruses (poultry, swine), Japanese encephalitis (multiple), Leptospirosis (multiple), Plague (multiple), Rabies (canine, wildlife), West Nile virus (migratory birds)	Brucellosis, Chandipura virus, Chikungunya fever, Hepatitis E, Influenza viruses, Japanese encephalitis, Kyasanur forest disease, Leishmaniasis, Leptospirosis, Plague, Rabies, Rickettsial disease, Salmonellosis
--	--	--
Anthrax (human, cattle), Crimean–Congo hemorrhagic fever, Salmonellosis	Anthrax, Bovine tuberculosis, Brucellosis, Crimean–Congo hemorrhagic fever, Influenza viruses, Rabies	Influenza viruses
Anthrax (bovine), Rabies (humans), Trypanosomiasis (humans)	Anthrax (cattle), Brucellosis (livestock), Influenza viruses (poultry, pigs), Rabies (canine), Rickettsial disease (livestock), Rift Valley Fever (livestock)	Anthrax, Brucellosis, Influenza viruses, Rabies, Rickettsial disease, Rift Valley Fever, Viral hemorrhagic fever
Hepatitis E (humans), Lassa fever (humans), Leishmaniasis (humans), Rabies (humans & dogs; cattle), Trypanosomiasis (humans)	Influenza viruses (poultry)	Anthrax, Influenza viruses, Lassa fever, Rabies, Yellow Fever
Anthrax (Georgia, Armenia, Azerbaijan, human, cattle), Brucellosis, Leishmaniasis	--	Anthrax
Anthrax (wildlife), Crimean–Congo hemorrhagic fever (human), Influenza viruses (ostrich), Rabies (human, canine, wildlife)	Anthrax, Brucellosis, Crimean–Congo hemorrhagic fever, Eastern Equine encephalitis, Influenza viruses, Leishmaniasis, Leptospirosis, Rabies, Rift Valley Fever, Salmonellosis, Trypanosomiasis	<i>Bartonella</i> spp., Crimean–Congo hemorrhagic fever, Cryptococcosis, Influenza viruses, Rabies, Rift Valley Fever, Sindbis virus, West Nile virus
Influenza viruses (Cambodia; poultry), Leptospirosis (human)	Brucellosis (ruminants), Influenza viruses (poultry), Leptospirosis (multiple), Melioidosis (ruminants), Q fever (ruminants), Rabies (canine, feline), Tuberculosis (ruminants)	Chikungunya fever, Encephalitis, Influenza viruses, Hepatitis E, Leptospirosis, Liver fluke, Melioidosis, Rabies, Q fever, Scrub typhus, Tuberculosis
Ebola hemorrhagic fever, Marburg hemorrhagic fever	Plague	Plague
Influenza viruses, Leptospirosis, Rabies, <i>Streptococcus suis</i> ,	Anthrax (ruminants), BSE (cattle), Influenza viruses (poultry, swine), Leptospirosis (swine), Rabies (canine), <i>Streptococcus suis</i> (swine, porcine reproductive & respiratory syndrome)	Anthrax, Influenza viruses, Leptospirosis, Plague, Rabies, SARS

Bangladesh

CDC recently designated Bangladesh as the eighth GDD site. The GDD Regional Center in Bangladesh works in conjunction with the Ministry of Health and Family Welfare to identify, control and combat priority health threats. James Heffelfinger, MD, MPH, became the CDC Country Director in 2012. In February 2013, Nord Zeidner, DVM, PhD, began working in-country as the head of Zoonotic Diseases, Centre for Communicable Diseases, International Center for Diarrhoeal Disease Research.

In-country One Health Collaborations

CDC has collaborated with the International Center for Diarrhoeal Disease Research for over 40 years. Recent joint projects have focused on bolstering in-country surveillance efforts of avian influenza viruses and other emerging pathogens. CDC also works with the Institute of Epidemiology, Disease Control, and Research within the Bangladesh Ministry of Health to conduct surveillance for severe respiratory disease and influenza-like illness in the general population and in hospitals across the country. Collaborative projects with the Institute of Epidemiology, Disease Control, and Research and other partners include efforts to improve surveillance for avian influenza in poultry markets and to improve the safety of slaughtering and de-feathering poultry in villages. In 2009, 14 national influenza surveillance sites were established at district hospitals in the country, strengthening diagnostic laboratory capacity in Bangladesh. Currently there are sites at 12 tertiary and seven district level hospitals. CDC has also set up surveillance at six hospitals in Bangladesh to detect illness caused by Nipah virus, and works alongside wildlife ecologists at the Consortium for Conservation Medicine with EcoHealth Alliance to understand the transmission of Nipah virus within bats in Bangladesh, and the conditions that lead to transmission to humans. Collaborations between CDC and Bangladesh also entail working with the Bangladesh government to train district level health officers to effectively respond to threats of Nipah virus outbreaks, influenza outbreaks, and outbreaks of unknown or emerging diseases.

National-level partnerships include research efforts with USAID, which build upon USAID/USG investments in avian and pandemic influenza preparedness and response, and expand on efforts to address emerging zoonotic infections, specifically those of wildlife origin.

Epidemiology Training Program

On March 26, 2013 officials from Bangladesh's Ministry of Health and Family Welfare and the Institute of Epidemiology, Disease Control, and Research met with CDC Director Dr. Thomas Frieden, officially recognizing the cooperation between the two countries in establishing the FETP in Bangladesh for government medical officers. The program is currently recruiting its first cohort of five residents who will begin training in the summer of 2013. In addition, an infectious disease research fellowship program, modeled after CDC's Epidemiology Intelligence Service, trains capable young Bangladeshi nationals on outbreak response and investigation.

Additional Country-Specific Information

OH-Bangladesh, a national level One Health organization, was formed in 2007 and currently has over 200 members across multiple institutions. Bangladesh has convened several scientific meetings to recruit institutional partners and advocate for a One Health approach to address emerging diseases. Most recently, the organization convened a four-day international workshop in order to develop a framework for integrating One Health into the government of Bangladesh. Representatives from the Ministry of Health, Ministry of Fisheries and Livestock, and the Ministry of the Environment attended the workshop. There are also monthly meetings of the Coordination Committee One Health Bangladesh bringing together representatives of the International Center for Diarrhoeal Disease Research, the Institute of Epidemiology, Disease Control and Research, FAO, WHO, UNICEF, and the department of livestock services to discuss issues of importance, including outbreak investigations.

Country Contacts

Country Director—James Heffelfinger, MD, izh7@cdc.gov

AHI Officer—Nord Zeidner, DVM, PhD, nord@icddrb.org, naz2@cdc.gov

Additional Information

<http://www.cdc.gov/globalhealth/countries/bangladesh/>

<http://www.icddrb.org/>

<http://www.iedcr.org/>

http://www.iedcr.org/index.php?option=com_content&view=article&id=70&Itemid=110

Bangladesh

One Health and Zoonoses Activities in Bangladesh (April 2012-May 2013)

Project Title	Pathogen	Brief Description	Sources of Funding	CDC PI	CDC Headquarters Collaborating Programs
Poultry surveillance in Bangladesh	HPAI viruses	Identify outbreaks in domestic poultry, sample dead poultry for HPAI, improve understanding of human interactions with diseased backyard poultry and live bird markets, surveillance of gallinaceous birds at markets and interview live bird vendors and suppliers.	HHS/CDC	Nord Zeidner	NCIRD/ID
National assessment of backyard poultry rearing practices in Bangladesh	Avian Influenza viruses	Describe poultry raising practices over time, assess contribution to household income/nutrition, describe epidemiology of poultry illnesses (includes sampling for avian influenza and some other diseases). Note: several backyard avian influenza outbreaks identified were not detected by FAO or government surveillance.	HHS/CDC	Nord Zeidner	NCIRD/ID
Identifying risk factors and dispersion of avian influenza in backyard poultry	Influenza A virus (H5)	Identify risk factors for susceptibility of backyard poultry farms to HPAI H5, assess dispersion of H5 around affected backyard farms, and compare phylogeny of H5 collected near case farms with those recovered from case farms and in other Asian countries.	HHS/CDC	Nord Zeidner	NCIRD/ID
Role of commercial poultry as a source of avian influenza in backyard poultry and live bird markets	H5N1 Influenza virus	Test backyard flocks within radii of H5N1 infected commercial poultry farms, test live bird markets within same radii, identify dispersion among backyard flocks of H5N1 from commercial poultry farms, and conduct epidemiological investigations of source/spread to and from infected commercial flocks.	HHS/CDC	Nord Zeidner	NCIRD/ID

Project Title	Pathogen	Brief Description	Sources of Funding	CDC PI	CDC Headquarters Collaborating Programs
Surveillance for avian influenza at the wildlife-poultry interface	H5N1 Influenza virus	To establish dead wild bird surveillance for HP H5N1, to establish active surveillance of crow roosts for HPAI H5N1, and to establish ongoing active surveillance for avian influenza in domestic nomadic ducks in regions frequented by large numbers of wild migratory waterfowl.	HHS/CDC	Nord Zeidner	NCIRD/ID
Japanese encephalitis immunogenicity vaccine trial	Japanese encephalitis virus	Evaluation of Chinese Japanese encephalitis virus vaccine.	Bill & Melinda Gates Foundation, PATH, K Zaman	Emily Gurley	NCEZID/DVBD
PREDICT-USAID	Emerging viruses	Surveillance of bats, rodents, primates, small carnivores, and ungulates for emerging infectious diseases.	USAID – EcoHealth Alliance	Nord Zeidner	--
Surveillance of domestic animals	Emerging viruses, Nipah virus	Surveillance of domestic cattle, goats and sheep for emerging infectious diseases; Nipah virus surveillance; Fruit bat feeding behavior.	NIH/PEER grant	Nord Zeidner	--
Improving biosecurity of Nipah virus in Bangladesh	Nipah virus	Assessment of sample collection practices, storage of biological specimens as part of routine surveillance and outbreak investigations.	DOS/BEP	--	NCEZID/DHCPP/VSPB
Anthrax surveillance and prevention measures in endemic areas	<i>Bacillus anthracis</i>	Refining, standardizing, and strengthening outbreak responses – both human and animal investigations; build laboratory capacity to enhance laboratory confirmation of cases.	HHS/CDC	Nord Zeidner, Emily Gurley	NCEZID/DHCPP/BSPB

Contact Information for CDC PIs

Emily Gurley: egurley@icddrb.org

Nord Zeidner: nord@icddrb.org

Publications

- Brooks WA, Goswami D, Rahman M, Nahar K, Fry AM, Balish A, Iftekharuddin N, Azim T, Xu X, Klimov A, et al. Influenza is a major contributor to childhood pneumonia in a tropical developing country. *Pediatr Infect Dis J* 2010;29(3):216-21.
- Chakraborty A, Khan SU, Hasnat MA, Parveen S, Islam MS, Mikolon A, Chakraborty RK, Ahmed BN, Ara K, Haider N, et al. Anthrax outbreaks in Bangladesh, 2009-2010. *Am J Trop Med Hyg* 2012;86(4):703-10.
- Haider N, Khan SU, Sarkar S, Poh M, Wilson A, Beckwith N, Azad AK, Paul SK, Rahman MZ, Balish A, et al. Unusual waterfowl mortality due to highly pathogenic avian influenza A/H5N1 in Bangladesh. *Health and Science Bulletin (icddr,b)* 2013;11(1):15-20.
- Hayman DT, Gurley ES, Pulliam JR, Field HE. The application of One Health approaches to henipavirus research. *Curr Top Microbiol Immunol* 2012 Nov 17. [Epub ahead of print]
- Homaira N, Rahman M, Hossain MJ, Nahar N, Khan R, Rahman M, Podder G, Nahar K, Khan D, Gurley ES, et al. Cluster of Nipah virus infection, Kushtia District, Bangladesh, 2007. *PLoS One* 2010;5(10):e13570.
- Homaira N, Rahman M, Luby SP, Rahman M, Haider MS, Faruque LI, Khan D, Parveen S, Gurley ES. Multiple outbreaks of puffer fish intoxication in Bangladesh, 2008. *Am J Trop Med Hyg* 2010;83(2):440-4.
- Islam MS, Luby SP, Rahman M, Parveen S, Homaira N, Begum NH, Khan AKMD, Sultana R, Akhter S, Gurley ES. Social ecological analysis of an outbreak of pufferfish egg poisoning in a coastal area of Bangladesh. *Am J Trop Med Hyg* 2011;85(3):498-503.
- Islam A, Mikolon A, Mikoleit M, Dilruba A, Khan SA, Sharkar MA, Hossain JM, Islam A, Epstein J, Zeidner N, et al. Isolation of *Salmonella virchow* from a fruit bat (*Pteropus giganteus*). *J Ecohealth Alliance* 2013, *in press*.
- Kendall EA, LaRocque RC, Bui DM, Galloway R, Ari MD, Goswami D, Breiman RF, Luby S, Brooks WA. Leptospirosis as a cause of fever in urban Bangladesh. *Am J Trop Med Hyg* 2010;82(6):1127-30.
- Khan MS, Hossain J, Gurley ES, Nahar N, Sultana R, Luby SP. Use of infrared camera to understand bats' access to date palm sap: implications for preventing Nipah virus transmission. *EcoHealth* 2010;7(4):517-25.
- Khan SU, Berman L, Haider N, Gerloff N, Rahman MZ, Shu B, Rahman M, Dey TK, Davis TC, Chandra B, et al. Investigating a crow die-off in January-February 2011 during the introduction of a new clade of highly pathogenic avian influenza H5N1 into Bangladesh. *Intervirology* 2013, *in press*.
- Khan SU, Gurley ES, Hossain MJ, Nahar N, Sharkar MA, Luby SP. A randomized controlled trial of interventions to impede date palm sap contamination by bats to prevent nipah virus transmission in Bangladesh. *PLoS One*. 2012;7(8):e42689. doi: 10.1371/journal.pone.0042689. Epub 2012 Aug 8.
- Lo MK, Lowe L, Sazzad HMS, Gurley ES, Hossain MJ, Luby SP, Miller DM, Comer JA, Rollin PE, Bellini WJ, et al. Characterization of Nipah virus from outbreaks in Bangladesh, 2008-2010. *Emerg Infect Dis* 2012;18(2):248-55.
- Luby SP, Gurley ES. Epidemiology of henipavirus disease in humans. *Curr Top Microbiol Immunol* 2012;359:25-40
- Nahar N, Sultana R, Gurley ES, Hossain MJ, Luby SP. Date palm sap collection: exploring opportunities to prevent Nipah transmission. *EcoHealth* 2010;7(2):196-203.

Nahar N, Uddin M, Sarkar RA, Gurley ES, Uddin Khan MS, Hossain MJ, Sultana R, Luby SP. Exploring pig raising in Bangladesh: implications for public health interventions. *Vet Ital* 2013;49(1):7-17.

Nahar N, Uddin M, Gurley ES, Khan MS, Hossain MJ, Sultana R, Luby SP. Pig illnesses and epidemics: a qualitative study on perceptions and practices of pig raisers in Bangladesh. *Vet Ital* 2012;48(2):157-65.

Nahar N, Mondal UK, Sultana R, Hossain MJ, Khan MS, Gurley ES, Oliveras E, Luby SP. Piloting the use of indigenous methods to prevent Nipah virus infection by interrupting bats' access to date palm sap in Bangladesh. *Health Promot Int*. 2012 Jun 4. [Epub ahead of print]

Olival KJ, Islam A, Yu M, Anthony SJ, Epstein JH, Khan SA, Khan SU, Cramer G, Wang LF, Lipkin WI et al. Ebola virus antibodies in fruit bats, Bangladesh. *Emerg Infect Dis* 2012; 19(2):270-3.

Ozaki M, Islam S, Rahman KM, Rahman A, Luby SP, Bern C. Economic consequences of post-kala-azar dermal leishmaniasis in a rural Bangladeshi community. *Am J Trop Med Hyg* 2011;85(3):528-34.

Paul RC, Rahman M, Gurley ES, Hossain MJ, Diorditsa S, Hasan ASMM, Banu SS, Alamgir ASM, Rahman MA, Sandhu H, et al. A novel low-cost approach to estimate the incidence of Japanese encephalitis in the catchment area of three hospitals in Bangladesh. *Am J Trop Med Hyg* 2011;85(2):379-85.

Rahman MA, Hossain MJ, Sultana S, Homaira N, Khan SU, Rahman M, Gurley ES, Rollin PE, Lo MK, Comer JA, et al. Date palm sap linked to Nipah virus outbreak in Bangladesh, 2008. *Vector Borne Zoonotic Dis* 2012;12(1):65-72.

Sazzad HM, Hossain MJ, Gurley ES, Ameen KM, Parveen S, Islam MS, Faruque LI, Podder G, Banu SS, Lo MK, et al. Nipah virus infection outbreak with nosocomial and corpse-to-human transmission, Bangladesh. *Emerg Infect Dis* 2013;19(2):210-7.

Sultana R, Nahar N, Rimi NA, Azad S, Islam MS, Gurley ES, Luby SP. Backyard poultry raising in Bangladesh: a valued resource for the villagers and a setting for zoonotic transmission of avian influenza. A qualitative study. *Rural Remote Health* 2012;12:1927. Epub 2012 Sep 4.

Sultana R, Rimi NA, Azad S, Islam MS, Khan MS, Gurley ES, Nahar N, Luby SP. Bangladeshi backyard poultry raisers' perceptions and practices related to zoonotic transmission of avian influenza. *J Infect Dev Ctries* 2012;6(2):156-65.

China

CDC has collaborated with public health institutions in China since the 1980s, and the China GDD Regional Center has been in existence in Beijing since 2006. The current office director is Jeffrey McFarland, MD, who also serves as the One Health POC.

In-country One Health Collaborations

CDC's principal partners in China are the Chinese Center for Disease Control and Prevention, the Ministry of Health, and WHO China. The China Ministry of Health and the U.S. Department of Health and Human Services signed a new Memorandum of Understanding to extend the collaboration on the prevention, detection, response and control of infectious diseases through 2015. CDC has also supported the Chinese National Influenza Center for more than 20 years.

Epidemiology Training Program

The Chinese FETP was established in 2001, and is headquartered in Beijing. The program's primary objective is to strengthen China's disease surveillance, field epidemiology and response capacity. Health professionals trained through the Chinese FETP work in 27 of the 31 provinces and at the national level. In 2012, Chinese FETP epidemiologists supported the national realignment of food-borne disease investigation for all of China by developing national guidelines for investigating foodborne outbreaks. Chinese FETP epidemiologists also trained 186 provincial level staff in the foodborne outbreak methodology. Partner institutions include U.S. CDC, WHO, UNICEF, Chinese Center for Disease Control and Prevention, and the Chinese Medical Association. There is also a China FETPV.

Country Contacts

George Conway, MD, MPH, goc1@cdc.gov

John Klena, PhD, irc4@cn.cdc.gov

Country Officer Director—Jeffrey McFarland, MD, jwm5@cdc.gov

Additional information

<http://www.cdc.gov/globalhealth/gdder/GDD/china.htm>

<http://www.cdc.gov/globalhealth/countries/china/>

http://www.cdc.gov/globalhealth/fetp/pdf/DPHSWD_china.pdf

http://www.cdc.gov/globalhealth/FETP/pdf/China_factsheet.pdf

<http://www.china-fetpv.org/>

One Health and Zoonoses Activities in China (April 2012-May 2013)

Project Title	Pathogen	Brief Description	Sources of Funding	CDC PI	CDC Headquarters Collaborating Programs
Public health impact of new arbovirus isolates causing encephalitis and fever in China	Arboviruses: Japanese encephalitis virus, Getah virus, Tahyna virus, etc	Identify arboviruses in China to determine the presence and distribution of potential disease agents; identify the mosquito species associated with transmission of these arboviruses, and determine if the viruses are infecting people and causing disease.	HHS/CDC (portion of 2012)	--	--
PulseNet China: Eight province <i>Salmonella</i> surveillance network	<i>Salmonella</i>	Modeled on U.S. CDC's PulseNet System. Support surveillance in four current provinces (Guangxi, Fujian, Chongquig, Sichuan). Enhance surveillance in Guangdong, Shanghai, Henan, and Beijing. Support for National Reference Laboratory for <i>Salmonella</i> . Efforts may be scaled back due to budget constraints.	HHS/CDC	John Klena	CGH/GGDER/GDD-IEIP
Surveillance for zoonotic viruses	--	CDC Ft. Collins has been collaborating with China CDC on building surveillance for zoonotic viruses.	HHS/CDC (portion of 2012)	--	NCEZID/DVBD
Survey of workers with high risk for <i>Brucella</i> exposure in Guangdong	<i>Brucella</i>	Serosurvey of high risk workers in Guangdong for <i>Brucella</i> exposure and to explore control strategies in place currently in Guangdong province.	HHS/CDC	John Klena	CGH/GGDER/GDD-IEIP
Investigation into the biology and pathogenesis of severe fever with thrombocytopenia syndrome in Hubei Province	Severe fever with thrombocytopenia syndrome virus	Identifying all pathogens that are present in cases meeting the definition for severe fever with thrombocytopenia syndrome and the ecological and geographical distribution of severe fever with thrombocytopenia syndrome virus in Hubei.	HHS/CDC	John Klena	CGH/GGDER/GDD-IEIP

Contact Information for CDC PIs

John Klena: irc4@cn.cdc.gov

Publications

Shu Y, Li CK, Li Z, Gao R, Liang Q, Zhang Y, Dong L, Zhou J, Dong J, Wang D, et al. Avian influenza A(H5N1) viruses can directly infect and replicate in human gut tissues. *J Infect Dis* 2010 Apr 15;201(8):1173-7.

Yin Z, Wang H, Yang J, Luo H, Li Y, Hadler SC, Sandhu HS, Fischer M, Jiang Y, Zhang Z, et al. Japanese encephalitis disease burden and clinical features of Japanese encephalitis in four cities in the People's Republic of China. *Am J Trop Med Hyg* 2010 Oct;83(4):766-73.

Zeng G, Xie SY, Li Q, Ou JM. Infectivity of severe acute respiratory syndrome during its incubation period. *Biomed Environ Sci* 2009 Dec;22(6):502-10.

Zhou L, Liao Q, Dong L, Huai Y, Bai T, Xiang N, Shu Y, Liu W, Wang S, Qin P, et al. Risk factors for human illness with avian influenza A (H5N1) virus infection in China. *J Infect Dis* 2009 Jun 15; 199(12):1726-34.

Democratic Republic of the Congo

CDC established an office in the Democratic Republic of the Congo in 2001 to give HIV/AIDS support to the Ministry of Health by providing laboratory services, strategic information, capacity building, and surveillance. CDC also provides support for influenza, rabies, monkeypox, polio, and malaria.

In-country One Health Collaborations

CDC supports the Ministry of Health in strengthening the surveillance system in Equator province for monkeypox, a viral disease that occurs primarily in central and western Africa. The primary focus is to gain understanding of the risks associated with human monkeypox infection and the dynamics of transmission of the monkeypox virus from animals to humans. CDC is also working on community outreach methods, as well as tools and approaches that promote early identification of human monkeypox illnesses, to minimize the spread of the disease among people during outbreaks.

As a part of the continuing effort to prevent and control rabies in the Democratic Republic of the Congo, CDC collaborates with the Ministry of Health, the Ministry of Agriculture, and universities to improve laboratory capacity and to expand epidemiological monitoring of rabies. CDC transferred technology and provided training for local staff from both ministries to implement a CDC-developed field laboratory test to detect rabies virus antigens. CDC also developed predictive models of disease occurrence, surveyed community members about their knowledge, attitudes, and practices related to animal bites and medical care availability, and conducted pathogen discovery at the animal-human interface including wildlife and bats.

Epidemiology Training Programs

In coordination with the African Field Epidemiology Network, an FETP is currently under development in the Democratic Republic of the Congo with USAID EPT funding and a Resident Advisor has been placed in Kinshasa to mentor residents, cover outbreak investigations and evaluate public health systems. The program focuses on training Ministry of Health professionals to: 1) lead rapid response teams at the Central, provincial, and district level to more rapidly detect, investigate and respond to epidemic-prone IHR diseases; 2) routinely analyze and report on disease surveillance systems and recommend how to strengthen them; and 3) establish stronger interface between clinicians, epidemiologists and laboratory scientists to promote rapid detection, capture and containment of extremely dangerous pathogens.

Country Contact

Country Director—Kassim Sidibe, MD, MPH, KSidibe@cdc.gov

Additional information

<http://www.cdc.gov/globalhealth/countries/drc/pdf/drc.pdf>

One Health and Zoonoses Activities in the Democratic Republic of the Congo* (April 2012-May 2013)

Project Title	Pathogen	Brief Description	Sources of Funding	CDC PI	CDC Headquarters Collaborating Programs
Activities to support the EPT Program: Detection and surveillance of orthopoxviruses in wildlife and characterization of potential human risk	Orthopoxvirus	Identification of potential modes of transmission between animals and humans, identification of potential host species, and determination of the baseline prevalence of orthopoxviruses in native mammals in the region.	USAID	Darin Carroll	NCEZID/DHCPP/PRB
Activities to support the EPT Program: Detection and surveillance of lyssaviruses in wildlife and characterization of potential human risk	Lyssaviruses	Determination of environmental, socio-economical, and medical factors that may be significantly associated with zoonotic disease transmission, outbreaks, and human fatalities; development of community-appropriate strategies for reducing human/domestic animal/ wildlife exposure risks from zoonotic agents. Enhancement of laboratory diagnostic capacity.	USAID	Richard Franka	NCEZID/DHCPP/PRB

*For the purpose of this report, activities listed in the table are those supported in part by the USAID EPT Program.

Contact information for CDC PIs

Darin Carroll: zuz4@cdc.gov

Richard Franka: rpf5@cdc.gov

Publications

Ellis CK, Carroll DS, Lash RR, Peterson AT, Damon IK, Malekani JM, Formenty P. Ecology and geography of human monkeypox case occurrences across Africa. *J Wildl Dis* 2012;48(22):335-47.

Lash RR, Carroll DS, Hughes CM, Nakazawa Y, Karem K, Damon IK, Peterson AT. Effects of quality control in georeferencing primary disease data used in monkeypox transmission risk maps. *Int J Health Geogr* 2012;11:23. doi:10.1186/1476-1072X-1111-1123.

Nakazawa, Y, Lash RR, Carroll DS, Damon IK, Karem KL, Reynolds MG, Osorio JE, Rocke TE, Malekani JM, Muyembe J-J, et al. Mapping monkeypox transmission risk in the Congo Basin. *PLoS One*; *submitted*.

Quan PL, Firth C, Conte JM, Williams SH, Zambrana-Torrel CM, Anthony SJ, Ellison JA, Gilbert AT, Kuzmin IV, Niezgoda M, et al. Bats are a major natural reservoir for hepaciviruses and pegiviruses. *Proc Natl Acad Sci U S A*. 2013 Apr 22. [Epub ahead of print]

Reynolds MG, Carroll DS, Karem KL. Factors affecting the likelihood of monkeypox's emergence and spread in the post-smallpox era. *Curr Opin Virol* 2012;2(3):335-43.

Egypt

CDC has worked with public health institutions in Egypt in collaboration with NAMRU-3 for over 20 years. The CDC office is located in Cairo, within NAMRU-3, and has a regional scope of over 40 countries in North and West Africa, the Middle East, and Central Asia. The GDD Regional Center was established in 2006 and is currently headed by Erica Dueger, DVM, PhD; the Animal-Human Interface Officer position was filled in 2012 by Noha Farag, MD, PhD.

In-country One Health Collaborations

CDC's long-term collaborators include NAMRU-3 and the Egyptian Ministry of Health. Many ongoing projects are focused on syndromic surveillance, including the use of a multi-national SARI surveillance network to identify seasonal influenza viruses as well as human cases of H5N1. Integrated human-animal-vector studies are ongoing in Ghana in collaboration with the University of Ghana, Noguchi Memorial Institute for Medical Research; and are planned for Iraq in collaboration with the Ministries of Agriculture and Health of the Kurdistan Regional Government. With the addition of the Animal-Human Interface Officer position, new collaborations are developing between CDC and the Animal Health Research Institute, which houses Egypt's reference laboratory for "Safety Analysis of Food of Animal Origin."

Epidemiology Training Program

Egypt's FETP was established in 1993. In the 20 year history of the program, the majority of the 96 graduates have been physicians; however the program has graduated one dentist, one pharmacist and one veterinarian. Plans are in place for actively recruiting veterinarians for incoming cohorts. On average, the FETP conducts 3-5 disease investigations per year, including recent investigations of zoonoses such as *Escherichia coli*, Rift Valley Fever, and human rabies. The FETP is also actively involved in prevention and control efforts for avian influenza A (H5N1).

Additional Country-Specific Information

In September 2012, a novel beta coronavirus was first detected in Saudi Arabia in a 60 year-old male patient presenting with pneumonia and renal failure. As of May 8, 2013, 31 laboratory-confirmed cases have been reported to WHO: 22 from Saudi Arabia, two from Qatar, two from Jordan, three from the United Kingdom, one from the United Arab Emirates, and one from France. The GDD Regional Center is involved in the investigation of a cluster of novel coronavirus in Jordan. The cluster involved 13 cases (2 confirmed and 11 probable). The possibility of an animal source of infections is also being investigated.

Country Contacts

Office Director—Erica Dueger, DVM, PhD, Erica.dueger@med.navy.mil

AHI Officer—Noha Farag, MD, PhD, iym0@cdc.gov

Additional Information

<http://www.cdc.gov/globalhealth/gdder/gdd/egypt.htm>

http://www.cdc.gov/globalhealth/fetp/pdf/DPHSWD_Egypt.pdf

One Health and Zoonoses Activities in Egypt (April 2012-May 2013)

Project Title	Pathogen	Brief Description	Sources of Funding	CDC PI	CDC Headquarters Collaborating Programs
Damanhour integrated population-based surveillance (Egypt)	Syndromic surveillance: acute respiratory infections, acute febrile illness, acute infectious neurological disease, and influenza-like illness	Collaborative project (NAMRU-3, Ministry of Health's International Emerging Infections Program, and CDC) implemented at public and private hospitals and outpatient clinics to determine etiology and epidemiology of infectious disease.	DOD/GEIS HHS/CDC	Erica Dueger	NCIRD/DBD/RDB CGH/GDD
Integrated hospital-based surveillance (Ghana)	Influenza virus (H5), Crimean-Congo hemorrhagic fever virus, Dengue virus, <i>Brucella</i> spp., <i>Leptospira</i> spp., <i>Coxiella burnetii</i> , Rift Valley Fever virus, West Nile virus, Sandfly fever Naples virus, Sandfly fever Sicilian virus	An integrated hospital-based infectious disease surveillance system, ongoing at three sentinel sites- two in Accra and one in the northern Tamale region.	DOD/GEIS HHS/CDC	Erica Dueger	CGH/GDD
Epidemiology and etiology of flaccid paralysis of infectious origin (Republic of Georgia)	Influenza viruses, <i>Campylobacter jejuni</i> , Cytomegalovirus, West Nile virus, Enteroviruses	A prospective hospital-based surveillance to identify cases of acute flaccid paralysis in adults and children, and characterize the clinical, laboratory, and electrodiagnostic features of the syndrome. Clinical and demographic data will be collected in a prospective case-control study to identify potential etiologies of and risk factors for acute flaccid paralysis. This project will be transferred to GDD-Georgia and the United States Army Medical Research Institute for Infectious Diseases in 2013.	DOD/DTRA DOD/GEIS HHS/CDC	Erica Dueger	NCEZID/DHCPP/PPHO
PulseNet Middle East (Multiple countries)	<i>Salmonella</i> spp., <i>Shigella</i> spp., <i>Escherichia coli</i> , <i>Campylobacter</i> spp., <i>Listeria monocytogenes</i> , <i>Vibrio cholera</i>	PulseNet Middle East is participating in the PulseNet international network and includes: Oman, Jordan, Palestine, Kuwait, Saudi Arabia, Qatar, Libya, Bahrain, and Iran. Coordination is achieved by a collaboration of NAMRU-3, CDC, and WHO.	HHS/CDC	Myriam Morcos	NCEZID/DFWED/GFN

Egypt

Project Title	Pathogen	Brief Description	Sources of Funding	CDC PI	CDC Headquarters Collaborating Programs
Integrated human-animal-vector surveillance* (Iraq)	Rift Valley Fever virus, West Nile virus, Dengue fever virus, Crimean-Congo hemorrhagic fever virus, <i>Coxiella burnetti</i> , <i>Leptospira</i> spp., <i>Brucella</i> spp., Sandfly fever Naples virus, Sandfly fever Sicilian virus	Pilot study for integrated surveillance of endemic and emerging vector-borne and zoonotic pathogens in high risk populations. Samples collected from animals at time of slaughter, abattoir workers and trapped vectors.	DOD/GEIS DOD/CBEP HHS/CDC	Erica Dueger	-
Integrated human-animal-vector surveillance (Ghana)	Rift Valley Fever virus, West Nile virus, Dengue fever virus, Crimean-Congo hemorrhagic fever virus, <i>Coxiella burnetti</i> , <i>Leptospira</i> spp., <i>Brucella</i> spp., Sandfly fever Naples virus, Sandfly fever Sicilian virus	Pilot study for integrated surveillance of endemic and emerging vector-borne and zoonotic pathogens in high risk populations. Samples collected from animals at time of slaughter, abattoir workers and trapped vectors.	DOS HHS/CDC	Erica Dueger	-
Circulation of Crimean-Congo hemorrhagic fever virus among humans, animals, and vectors at a camel market (Egypt)	Crimean-Congo hemorrhagic fever virus	Pilot study to assess the prevalence of Crimean-Congo hemorrhagic fever virus among high-risk camel owners, domestic and imported camels, and specific variants of Crimean-Congo hemorrhagic fever virus among ticks collected from domestic and imported camels.	DOD/GEIS HHS/CDC	Erica Dueger	NCEZID/DHCPP/VSPB
Poultry practice survey to optimize surveillance at the AH1* (Egypt)	Influenza A (H5N1)	Collaboration (Ministry of Health, Ministry of Agriculture, CDC) to determine surveillance locations for HPAI in poultry in high-risk areas including live bird markets and households. Survey to be conducted in same area covered by human population-based surveillance system (Damanhour).	DOD/GEIS HHS/CDC	Erica Dueger	-
Environmental surveillance for HPAI in Damanhour* (Egypt)	Influenza A (HPAI)	Pilot study to evaluate surveillance locations and methods for detection of HPAI in poultry environments in locations where there is an increased risk of transmission to humans. Locations will be selected from results of poultry practice survey.	HHS/CDC	Erica Dueger	NCIRD/ID CGH/GDD

* Approved but not started

Project Title	Pathogen	Brief Description	Sources of Funding	CDC PI	CDC Headquarters Collaborating Programs
EMARIS Network: SARI Surveillance (Multiple countries)	Influenza A viruses (including H5N1)	EMARIS was established in 2007. Currently 22 active SARI sentinel surveillance sites located in Egypt, Jordan, Oman, Yemen, Qatar, Djibouti, Iraq, and Pakistan.	DOD/GEIS DOS/USAID HHS/CDC	Maha Talaat	NCIRD/ID CGH/GDD
Influenza-like illness surveillance (Egypt, Jordan)	Influenza viruses (including H5)	Eight sentinel sites in Egypt, three in Jordan. Influenza surveillance only.	DOD/GEIS	NAMRU-3	NCIRD/ID
Seasonal influenza surveillance (West Africa)	Influenza viruses (including H5)	Enhance seasonal Influenza surveillance and provide epidemiological support to FELTP's in Cote d'Ivoire, Burkina Faso, Mali, Mauritania, Togo, Niger	HHS/CDC	NAMRU-3	NCIRD/ID
Population-based influenza surveillance (Ghana)	Influenza viruses (including H5)	Population-based surveillance to determine epidemiology and burden of influenza in Ghana	HHS/CDC	-	NCIRD/ID

Contact Information for CDC PIs

Erica Dueger: Erica.Dueger@med.navy.mil

Myriam Morcos: Myriam.Morcos.eg@med.navy.mil

Publications

Abdel-Maksoud M, House B, Wasfy M, Abdel-Rahman B, Pimentel G, Roushdy G, Dueger E. In vitro antibiotic susceptibility testing of *Brucella* isolates from Egypt between 1999 and 2007 and evidence of probable rifampin resistance. *Ann Clin Microbiol Antimicrob* 2012; Aug 28:11:24

Burke RL, Kronmann KC, Daniels CC, Meyers M, Byarugaba DK, Dueger E, Klein TA, Evans BP, Vest KG. A review of zoonotic disease surveillance supported by the Armed Forces Health Surveillance Center. *Zoonoses Public Health* 2012 May;59(3):164-75. doi: 10.1111/j.1863-2378.2011.01440.x. Epub 2011 Nov 30.

Chisholm K, Dueger E, Fahmy NT, Samaha HA, Zayed A, Abdel-Dayem M, Villinski JT. Crimean-Congo hemorrhagic fever virus in ticks from imported livestock, Egypt. *Emerg Infect Dis* 2012;18(1):181-2.

Earhart K, Carter B. Addressing global health security in Eastern Mediterranean countries by increasing regional cooperation on zoonotic diseases. *Int J Antimicrob Agents* 2010;36(Suppl 1):S3-4.

Lohiniva A, Dueger E, Talaat M, Refaey S, Zaki A, Chisholm Horton K, Kandeel A. Poultry rearing and slaughter practices in rural Egypt: an exploration of risk factors for H5N1 virus human transmission. *Influenza Other Respi Viruses* 2012 Nov 12. doi: 10.1111/irv.12023. [Epub ahead of print]

Kandeel A, Deming M, Elkreem EA, El-Refay S, Afifi S, Abukela M, Earhart K, El-Sayed N, El-Gabay H. Pandemic (H1N1) 2009 and Hajj pilgrims who received predeparture vaccination, Egypt. *Emerg Infect Dis* 2011;17(7):1266-8.

Malik A, Earhart K, Mohareb E, Saad M, Saeed M, Ageep A, Soliman A. Dengue hemorrhagic fever outbreak in children in Port Sudan. *J Infect Public Health* 2011;4(1):1-6.

Nair H, Brooks WA, Katz M, Roca A, Berkley JA, Madhi SA, Simmerman JM, Gordon A, Sato M, Howie S, et al. Global burden of respiratory infections due to seasonal influenza in young children: a systematic review and meta-analysis. *Lancet* 2011;378(9807):1917-30.

Soliman A, Mohareb E, Salman D, Saad M, Salama S, Fayez C, Hanafi H, Medhat I, Labib E, Rakha M, et al. Studies on West Nile virus infection in Egypt. *J Infect Public Health* 2010;3(2):54-9.

Talaat M, Afifi S, Dueger E, El-Ashry N, Marfin A, Kandeel A, Mahareb E, El-Sayed N. Effects of hand hygiene campaigns on incidence of laboratory-confirmed influenza and absenteeism in schoolchildren, Cairo, Egypt. *Emerg Infect Dis* 2011;17(4):619-25.

Witt CJ, Richards AL, Masuoka PM, Foley DH, Buczak AL, Musila LA, Richardson JH, Colacicco-Mayhugh MG, Rueda LM, Klein TA, et al. The AFHSC-Division of GEIS Operations Predictive Surveillance Program: a multidisciplinary approach for the early detection and response to disease outbreaks. *BMC Public Health* 2011;11(Suppl 2):S10.

Guatemala

CDC first established its presence in Central America via a field office for medical entomology and parasitology in the 1960s in El Salvador, which later transferred to Guatemala in 1978. CDC's official office opened in Guatemala City, Guatemala in October 2005. The GDD Regional Center for Central America was established in 2006 and covers the countries of Guatemala, Panama, El Salvador, Belize, Costa Rica, Honduras, Nicaragua, and the Dominican Republic. Daniel Garcia, PhD, MPH, began working in country as the Animal-Human Interface Officer in 2012.

In-country One Health Collaborations

CDC partners with USDA/APHIS, PAHO, EcoHealth Alliance, Veterinarians Without Borders, University of Maryland, the University of Georgia, and programs within the GDD Regional Center for Guatemala including the International Emerging Infections Program, the Influenza Program, and the FETP.

CDC partners with the Ministry of Public Health, the Ministry of Agriculture and Livestock, the University del Valle de Guatemala, the School of Veterinary Medicine at the University of San Carlos de Guatemala, the non-governmental organization "Comunidad Gatuna," the Guatemala-Association of Veterinarians, and RECETA, a Central American network of epidemiologists and microbiologists aimed at enhancing the region's ability to control food borne disease outbreaks by training local staff and sponsoring national studies.

Epidemiology Training Program

The Central American Regional FETP was established in 2000. The program accepts both medical doctors and veterinarians. Currently, there are 6 veterinarian enrolled in the intermediate level out of seventeen FETP students. Multiple outbreak investigations occur each year throughout the region. Recent activities include surveillance for acute respiratory infections, diarrheal diseases, and leptospirosis in Costa Rica during severe flooding and landslides throughout the Central Pacific region.

Additional Country-Specific Information

In February 2012, Guatemala experienced seven deaths in children with neurological symptoms within the region of Zacapa. During the investigation, it was noted that the same region had experienced numerous deaths in horses, also with neurological symptoms. The etiology was not determined for the children or horses, although numerous samples were sent to CDC and USDA laboratories. There is currently an Encephalitis Working Group, active in Guatemala, with members of the Ministry of Public Health, the Ministry of Agriculture and Livestock, the GDD Regional Center for Central America, la Universidad del Valle de Guatemala, USDA, and PAHO, working to develop a plan for improved surveillance and outbreak investigation if further cases should occur.

Country Contacts

Office Director—Nelson Arboleda, MD, MPH, nfa8@cdc.gov

GDD Center Coordinator—Leonard Peruski, PhD, czn1@cdc.gov

AHI Officer—Daniel Garcia, PhD, MPH, int7@cdc.gov

Additional Information

http://www.cdc.gov/globalhealth/fetp/pdf/DPHSWD_Central-America.pdf

<http://www.cdc.gov/globalhealth/gdder/gdd/guatemala.htm>

<http://www.uvg.edu.gt/investigacion/ces/miembros.html>

http://acervosalud.net/index.php?option=com_content&view=category&id=38&lang=en

http://visar.maga.gob.gt/?page_id=919

http://visar.maga.gob.gt/?page_id=683

One Health and Zoonoses Activities in Guatemala (April 2012-May 2013)

Project Title	Pathogen	Brief Description	Sources of Funding	CDC PI	CDC Headquarters Collaborating Programs
Animal-Human interface of influenza transmission in rural backyards within tropical wetlands* (Guatemala)	Influenza A virus	Study to analyze the influence of backyard animal systems (poultry and swine) in rural areas within the tropical wetland system on the prevalence of influenza A. The study hopes to contribute to the knowledge surrounding transmission of zoonotic influenza viruses and the emergence of new pathogenic strains.	HHS/CDC	Will Clara	NCIRD/ID
Characterizing viral diversity and spillover risk in the common vampire bat, <i>Desmodus rotundus</i> (Guatemala)	Flavi-, Corona-, Orthomyxo-Paramyxo-, Rhabdo-, Arena-, Filo- and Reo-viridae	Study to characterize the viral diversity in <i>D. rotundus</i> populations, using clinical bat samples relevant to the bat-human-domestic animal interface. Telemetry will also be included as part of this study to study bat movement.	HHS/CDC EcoHealth Alliance	Dan Garcia	OID/NCIRD
Training: Rabies dRIT and DFA laboratory diagnostics	Lyssavirus (rabies)	Participants from the ministries of health, animal health and private universities (University del Valle de Guatemala and Universidad de San Carlos de Guatemala, Facultad de Medicina Veterinaria y Zootecnia) were provided hands-on experience in DRIT and DFA testing techniques. Jan 28 th -Feb 1 st , 2013.	HHS/CDC	Dan Garcia	NCEZID/DHCPP/PRB
Workshop: Interagency coordination for rabies surveillance outbreak support	Lyssavirus (rabies)	A follow-up to CDC/ University del Valle de Guatemala initial training in outbreak response over a year previous. In collaboration with Vets Without Borders. Feb 18-20	HHS/CDC, Veterinarians Without Borders	Dan Garcia	NCEZID/DHCPP/PRB
Hospital-based surveillance of zoonotic pathogens using the International Emerging Infections Program ViCo platform	<i>Campylobacter</i> , <i>Salmonella</i> , <i>Escherichia coli</i> , <i>Giardia</i> , <i>Bartonella</i> , <i>Leptospira</i> , <i>Rickettsia</i>	Hospital-based surveillance of diarrheal, respiratory, and febrile syndromes with identification of underlying etiologies. There are a total of 2 hospitals, 3 health centers and 3 health posts that cover two separate regions of Guatemala and which participate in this study.	HHS/CDC	Joe Bryan	CGH/GDD

* Approved but not started

Project Title	Pathogen	Brief Description	Sources of Funding	CDC PI	CDC Headquarters Collaborating Programs
Survey of <i>Salmonella</i> in raw poultry	<i>Salmonella</i> spp.	Study of retail raw poultry samples for <i>Salmonella</i> spp. and evaluation of serotypes and antibiotic profiles. Reports will be incorporated into model of risk assessment under development by the WHO-Global Food Safety Initiative	CDC/ University del Valle de Guatemala, University of Georgia	Dan Garcia	CGH/GDD
Integrated antimicrobial resistance surveillance for foodborne diseases in Central America	<i>Salmonella</i> spp.	Study of <i>Salmonella</i> spp. isolates in human and raw poultry samples collected in Guatemala during 2011-2012; evaluation of serotypes, PFGE patterns and antibiotic profiles. Provide information of appropriate risk management strategies for public health, veterinarian, and food safety authorities in the region.	HHS/CDC	Joe Bryan	CGH/GDD
Prevalence of pathogenic <i>Escherichia coli</i> CFA antigen and <i>C. jejuni</i> CPS antigen in strains isolated from Guatemalan population	<i>E. coli</i> , <i>Campylobacter jejuni</i>	Study to determine the prevalence of enterotoxigenic <i>E. coli</i> and <i>C. jejuni</i> (CFA or CPS antigens) in the Central America and Caribbean regions using either serological or molecular methods, starting with a retrospective study in Guatemala.	HHS/CDC NAMRU-6	Dan Garcia	CGH/GDD
Influenza surveillance in bats	Influenza A virus	Surveillance study in bats in Guatemala for characterization of novel influenza strains and to increase knowledge of the ecology and disease transmission between and within bat species.	CDC/ University del Valle de Guatemala	Dan Garcia	NCIRD/ID
<i>Bartonella</i> prevalence in cats and humans	<i>Bartonella</i> spp.	Study to determine the prevalence of <i>Bartonella</i> spp. circulating in cats and persons at risk (veterinarians, vet technicians, caretakers, etc.) in Guatemala.	CDC/ University del Valle de Guatemala	Dan Garcia	NCEZID/DVBD/BDB
Technical assistance for rabies outbreaks	Rabies virus	Technical assistance to strengthen national laboratory capacity for Rabies surveillance and outbreak investigation.	CDC/ University del Valle de Guatemala	Joe Bryan, Dan Garcia	NCEZID/DHCPP/PRB

Contact Information for CDC PIsJoe Bryan: zbg5@cdc.govWill Clara: aclara@gt.cdc.govDan Garcia: int7@cdc.gov

Publications

- Bai Y, Álvarez D, Moran D, Kosoy M, Garcia DL. The prevalence of diverse and novel *Bartonella* genogroups in bats, rodents, cattle, dogs and cats from Guatemala. 2012; *in preparation*.
- Bai Y, Kosoy M, Recuenco S, Álvarez D, Moran D, Turmelle A, Ellison J, Garcia D, Estévez A, Lindblade K, et al. *Bartonella* spp. in bats, Guatemala. *Emerg Infect Dis* Jul 2011;17(7):1269-72.
- Conrardy C, Recuenco S, Ellison J, Moran D, Alvarez D, Lindblade K, Anderson LJ, Rupprecht CE, Tong S. Coronavirus detection from bat in rural area of Guatemala: implications for emerging infectious disease. 2012; *submitted*.
- Ellison JA, Turmelle AS, Recuenco S, Moran D, Álvarez –Castillo DA, Lindblade K, Rupprecht CE. Rabies virus neutralizing antibodies in bats from Guatemala. 2012; *in preparation*.
- Escobar LE, Álvarez D, Villatoro FJ, Moran D, Estévez A. Two new flea records from Guatemala: *Pulex simulans* and *Echidnophaga gallinacea* (*Siphonaptera: Pulicidae*), and their host-parasite relationship. *Parasit Vect Bio* 2011 Sept;3(3): 40-3.
- Garcia DL, Oneida OE, Lopez MR, Lopez B, Gomez G, Parsons MB, Arvelo W. Prevalence of pathogenic *Escherichia coli* from population-based surveillance studies in Guatemala. 2012; *in preparation*.
- Kent R, Reiche A, Morales-Betoulle M, Komar N. Comparison of engorged *Culex quinquefasciatus* collection and blood-feeding pattern among four mosquito collection methods in Puerto Barrios, Guatemala, 2007. *J Am Mosq Control Assoc* 2010;26(3):332-6.
- Morales-Betoulle ME, Komar N, Panella, NA, Alvarez D, López MR, Betoulle JL, Sosa SM, Müller ML, Kilpatrick AM, Lanciotti RS, et al. West Nile virus ecology in a tropical ecosystem in Guatemala. *Am J Trop Med Hyg* 2013; 88(1):116-26.
- Moran D, Juliao P, Álvarez D, Lindblade K, Ellison J, Turmelle A, Peterson B, Rupprecht C, Recuenco S. Knowledge attitudes and health practices of people at risk of exposure to bats in Guatemala 2012; *in preparation*.
- Quan PL, Firth C, Conte JM, Williams SH, Zambrana-Torrel CM, Anthony SJ, Ellison JA, Gilbert AT, Kuzmin IV, Niezgod M, et al. Bats are a major natural reservoir for hepaciviruses and pegiviruses. *Proc Natl Acad Sci USA* 2013 Apr 22 [Epub ahead of print, doi:10.1073/pnas.1303037110].
- Tao Y, Shi M, Conrardy C, Kuzmin IV, Recuenco S, Agwanda B, Alvarez DA, Ellison JA, Gilbert AT, Moran D, et al. Discovery of diverse polyomaviruses in bats and the evolutionary history of the Polyomaviridae. *J Gen Virol* 2013 Apr; 94(Pt 4):738-48.
- Tong S, Li Y, Rivallier P, Conrardy C, Castillo DAA, Chen LM, Ellison JA, Davis CT, York I, Shi M, et al. A distinct lineage of influenza A virus from bats. *PNAS Early Edition* 2012 Feb 27; doi 10.1073.
- Troyo A, Álvarez D, Taylor L, Abdalla G, Calderón-Arguedas O, Zambrano ML, Dasch GA, Lindblade K, Hun L, Eremeeva ME, et al. *Rickettsia felis* in *Ctenocephalides felis* from Guatemala and Costa Rica; *submitted to the Amer J of Trop. Med. & Hyg.*
- Turmelle D, Moran D, Álvarez A, Ibarra A, Medellín R, Rupprecht C. Foraging fidelity of vampire bats in agricultural landscapes: implications for rabies prevention and control 2012; *in preparation*.

India

In November 2010, the CDC and India National Centre for Disease Control signed a Memorandum of Understanding to establish the GDD India Centre. The GDD India Centre is located in Delhi, with headquarters at the National Centre for Disease Control. The current CDC Country Director is Capt. Ken Earhart, MD who also serves as GDD India Center Director. Dr. Shaikh Shah Hossain, MD, MPH, recently joined in March 2013 as the Animal-Human Interface Officer and serves as the One Health POC for India.

In-country One Health Collaborations

The GDD India Centre supports National Centre for Disease Control activities through involvement in the National Standing Committee on Zoonoses, and consulting on the reduction of antibiotic residues in food animals, which is spearheaded by the Council of Scientific and Industrial Research. Additionally, the GDD India Centre provides informal technical and expert advice to the Public Health Foundation of India, a non-governmental network of academic institutions that has become an important proponent of a One Health approach to zoonotic disease control with the development of its “Roadmap to Combat Zoonosis in India.”

The Joint Monitoring Group at the Central Government level in Delhi meets monthly and is comprised of the Director General of Health Services and the Animal Health Commissioner, as well as other high-ranking officials and technical experts. The Joint Monitoring Group was initially established in the wake of the pandemic H5N1 threat but continues to cover all matters of mutual concern. Additionally, the National Institute of Virology at Pune has established a high-level biosecurity laboratory that will process both human and animal samples.

Epidemiology Training Program

The GDD India Centre, in partnership with the National Centre for Disease Control, launched an Epidemic Intelligence Service-like Program in India in October 2012. The Program is modeled after the U.S. Epidemic Intelligence Service Program and has started with twelve candidates from State/District Health Departments. Currently, all candidates hold a medical degree; however, in the future, the program expects to extend recruitment to other One Health professionals.

Country Contacts

Country Director—Ken Earhart, MD, jkq8@cdc.gov

AHI Officer—Shaikh Shah Hossain, MD, MPH, vpk4@cdc.gov

Additional Information

<http://www.cdc.gov/globalhealth/countries/india/>

<http://www.ncdc.gov.in/index3.asp?sslid=524&subsublinkid=307>

http://www.nicd.nic.in/EIS_FAQ.pdf

One Health and Zoonoses Activities in India (April 2012-May 2013)

Project Title	Pathogen	Brief Description	Sources of Funding	CDC PI	CDC Headquarters Collaborating Programs
GFN in collaboration with WHO	<i>Salmonella</i>	Enhancing foodborne illness surveillance and outbreak response.	HHS/CDC	Padmini Srikantiah	NCEZID/DFWED
Surveillance and outbreak response	Japanese encephalitis virus	Improve capacity for Acute Encephalitis Syndrome surveillance and outbreak response. Developing a burden of disease protocol.	HHS/CDC	Padmini Srikantiah	NCEZID/DVBD, CGH/DGHP
Surveillance and outbreak response*	To be determined	Developing a burden of disease protocol for acute febrile illness syndromic surveillance.	HHS/CDC DOS/BEP	Shah Hossain	NCEZID/DHCPP
Surveillance and outbreak response*	To be determined	Developing a burden of disease protocol for acute encephalitis syndromic surveillance.	HHS/CDC DOS/BEP	Ken Earhart	NCEZID/DVBD, CGH/DGHP
One Health Strategy- GDD India Centre	To be determined	Establishing a one health component and strategy to the GDD India platform.	HHS/CDC DOD/DTRA	Shah Hossain	NCEZID/OHO, CGH/DGHP

* Approved but not started

Contact Information for CDC PIs

Ken Earhart: jkq8@cdc.gov

Shah Hossain: vpk4@cdc.gov

Padmini Srikantiah: pks6@cdc.gov

Publications

None

Indonesia

CDC has provided technical assistance to Indonesia for more than fifty years. Short and long-term technical assistance from CDC staff has helped the Indonesian Ministry of Health address a wide range of high-priority public health needs including communicable diseases, noncommunicable diseases, injuries, and strengthening surveillance. CDC has funded cooperative agreements with the Ministry of Health since 2004. Of particular importance has been CDC support for avian influenza surveillance.

In-country One Health Collaborations

Zoonotic vector-borne viruses, including Japanese encephalitis and dengue, are especially important causes of morbidity and mortality in Indonesia although accurate figures on incidence are lacking. CDC has provided technical consultation for evaluating control of dengue in Yogyakarta, Java. This study was the best controlled, longest, and most extensive test of vector control as the sole means of reducing dengue infection conducted in Asia. Although vector abundance indices were reduced by more than 90%, there was no significant reduction in disease incidence, highlighting the need for more investigation of transmission.

In 2012, in cooperation with USAID, CDC instituted a cooperative agreement to establish at the Eijkman Institute of Molecular Biology at Jakarta as the first national arbovirus laboratory using state of the art techniques. During the first year, a laboratory was renovated and equipped; staff hired and trained; archived human specimens identified; and the first human cases of West Nile virus identified and sequenced. New collaborations and funding were initiated at Hasanuddin University on Sulawesi to identify and sequence novel vector-borne viruses and to study dengue transmission. Future activities will emphasize establishing sites to accurately identify arboviral etiologies of acute febrile illness, including those with hemorrhagic and neurological symptoms, at select sites throughout the archipelago. CDC is also collaborating with PREDICT, the Ministry of Agriculture, and others to train personnel to collect and analyze specimens from wildlife and livestock.

Epidemiology Training Program

In 1982, CDC helped establish an FETP in Indonesia to build sustainable capacity for detecting and responding to health threats. More than 600 residents have graduated from the program and are now assuming public health leadership positions in Indonesia and other countries in the region. In 1990, the FETP evolved into a Master's Program at the University of Indonesia and the University of Gadjah Mada. CDC has re-engaged with the Ministry of Health to continue recent efforts supported by the Asian Development Bank to help the FETP become more field-based. CDC will place a resident advisor in-country to strengthen field assignments and to provide mentorship and instruction on special topics such as disaster epidemiology, spatial analysis, scientific writing, and communications.

Country Contact

Country Director—William Hawley, PhD, MPH, WHawley@cdc.gov

Additional information

<http://www.cdc.gov/globalhealth/countries/indonesia/pdf/indonesia.pdf>

One Health and Zoonoses Activities in Indonesia* (April 2012-May 2013)

Project Title	Pathogen	Brief Description	Sources of Funding	CDC PI	CDC Headquarters Collaborating Programs
Activities to support the EPT Program: Strengthening capacity to detect emerging vector-borne zoonotic diseases	Vector-borne pathogens	Establish a national reference lab for the identification of endemic and novel vector-borne viruses	USAID	Ann Powers	NCEZID/DVBD/OD

*For the purpose of this report, activities listed in the table are those supported in part by the USAID EPT Program.

Contact Information for CDC PIs

Ann Powers: akp7@cdc.gov

Indonesia

Publications

None

Kazakhstan/Central Asia

CDC opened a Central Asia Regional Office in Almaty, Kazakhstan in 1995 to assist countries in the Region in modernizing their health care systems; subsequently, satellite country offices opened in Tashkent, Uzbekistan; Dushanbe, Tajikistan; and Bishkek, Kyrgyzstan. A GDD Regional Center is in development. While the Central Asia Regional program is listed as a country program in Kazakhstan, it functions regionally by working in five Central Asian countries: Kazakhstan, Kyrgyzstan, Tajikistan, Turkmenistan and Uzbekistan. The current CDC Country Director is George Schmid, MD, MSc.

In-country One Health Collaborations

The Central Asia Regional program's international collaborations include the World Bank, the WHO/Global Food Safety Network, the International Science and Technology Center, and the US Department of Defense's Defense Threat Reduction Agency. In-country collaborations include the Kazakhstan Ministry of Health, Kazakhstan Ministry of Agriculture, Kyrgyz Republic Ministry of Health, Kyrgyz Republic Ministry of Agriculture, Tajikistan Ministry of Health, Tajikistan Ministry of Agriculture, Turkmenistan Ministry of Health, and the Uzbekistan Ministry of Health.

Epidemiology Training Program

The Central Asia Regional FELTP was established in 2003. Central Asia Regional FELTP trainees include professionals from the human health and veterinary health sectors. Currently, the Program trains four veterinarians out of 23 participants. Partner institutions include: Kazakhstan Ministry of Health, Kazakhstan Ministry of Agriculture, Kyrgyz Republic Ministry of Health, Kyrgyz Republic Ministry of Agriculture, Turkmenistan Ministry of Health, Uzbekistan Ministry of Health, UK Ministry of Defense, US Department of Defense's Defense Threat Reduction Agency, NCEIZD, CDC DPEI, CDC HIV/AIDS, and CDC GDDER. The Central Asia Regional FELTP covers four countries (Kazakhstan, Kyrgyzstan, Turkmenistan, Uzbekistan). A second FELTP is under development in Tajikistan and will train Tajik and Afghan trainees. Recent investigations include an anthrax outbreak investigation led by a Central Asia Regional FELTP resident in Faizabad district of Tajikistan in 2012.

Country Contact

Country Director—George Schmid, MD, MSc gps1@cdc.gov

Additional Information

<http://www.cdc.gov/globalhealth/countries/kazakhstan/>

http://www.cdc.gov/globalhealth/fetp/pdf/DPHSWD_Central%20Asia.pdf

Kazakhstan

One Health and Zoonoses Activities in Kazakhstan (April 2012-May 2013)

Project Title	Pathogen	Brief Description	Sources of Funding	CDC PI	CDC Headquarters Collaborating Programs
Support influenza sentinel surveillance	Influenza virus	Support the seven sites in Kazakhstan and two in Krgyzstan, including laboratory and epidemiology support.	HHS/CDC	George Schmid	CGH/GDD, NCIRD/ID
Fellowships to support Central Asia scientists	--	Set up small grants to support at least four Central Asia scientists to work on scientific projects in partnership with the CDC Central Asia Regional Office and CDC/Atlanta	HHS/CDC	George Schmid	--
<i>Morbidity and Mortality Weekly Report</i>	--	Modeled on US CDC's publication, this will be a regional publication.	HHS/CDC	George Schmid	DNDHI/NNDS
Support to develop a Central Asia science journal indexed in <i>Index Medicus</i>	--	Work with the Kazakhstan School of Public Health to develop their journal into one with international standards.	HHS/CDC	George Schmid	CGH/GDD
Strengthen Crimean-Congo hemorrhagic fever surveillance in southern Kazakhstan	Crimean-Congo hemorrhagic fever virus	Together with the Ministry of Health of the Republic of Kazakhstan, monitor tick bites, improve data collection, revise practice guidelines, supply diagnostics for Crimean-Congo hemorrhagic fever (PCR, ELISA), and analyze data.	DTRA	George Schmid	NCEZID/DHCPP/VSPB
International conferences and training for staff of CDC and the Ministry of Health	Emerging and dangerous pathogens, Influenza virus	Provide training and conferences; support staff.	DTRA, HHS/CDC	George Schmid	CGH/GDD
Strengthen <i>rickettsiae</i> surveillance in Kazakhstan	<i>Rickettsia</i> spp.	Together with the Ministry of Health of the Republic of Kazakhstan, identify ticks, improve data collection, revise practice guidelines, supply diagnostics, and analyze data.	DTRA, HHS/CDC	George Schmid	NCEZID/DVBD/RZB
Strengthen rabies surveillance	Rabies virus	Train in diagnostics, update surveillance and management guidelines	DTRA, HHS/CDC	George Schmid	NCDEZID/DHCPP/PRB
Global Food Network training	Enteric bacteria	Educate and train individuals from Ministries of Health and Agriculture of the five countries of Central Asia in foodborne diseases	HHS/CDC, WHO	George Schmid	NCEZID/DFWED/EDEB, NCEZID/DFWED/EDLB

Contact information for CDC PI

George Schmid: gps1@cdc.gov

Publications

Parodi P, Schmid G, Ward D. One Health in central Asia: a situational analysis informing the future. *It J Trop Med* 2011;16:22-36.

Kenya

CDC has been collaborating with public health institutions in Kenya since 1979 to address the major public health problems of the country, and increasingly, East Africa. In 2004, CDC established a GDD Regional Center at the Kenya Medical Research Institute in Nairobi, with a satellite campus in Kisumu. The current CDC Country Director is Dr. Kevin DeCock, PhD.

Although the GDD Regional Center in Kenya had been conducting animal-human interface studies in the region for several years, the One Health/Zoonoses capacity was formalized in November 2010 by the assignment of Dr. Kariuki Njenga, BVM, PhD, as Animal-Human Interface Officer.

In-country One Health Collaborations

Current One Health collaborations include domestic institutions such as the Kenya Medical Research Institute, Ministry of Health, Ministry of Agriculture, Fisheries, and Livestock Development, Kenya Wildlife Services, Kenyatta University of Agriculture and Technology, University of Nairobi, and among the main international collaborators are WHO, World Bank, USAID, International Livestock Research Institute, US Department of Defense, US Department of State, US Walter Reed Army Institute of Research, Washington State University, University of Minnesota/NIH, the Training Programs in Epidemiology and Public Health Interventions Network, and the African Field Epidemiology Network.

As a result of close collaboration between animal and human health sectors, the Zoonosis Disease Unit was created on August 2, 2011. The unit has representation from the two Ministries, Ministry of Health and Ministry of Agriculture, Fisheries, and Livestock Development, and works in close collaboration with partners. The Zoonosis Disease Unit's mission is to establish and maintain active collaboration at the animal, human and ecosystem interface towards better prevention and control of zoonotic diseases. The country also has a 5-year strategic plan for the implementation of One Health that was launched in 2012. The Strategic Plan emphasizes establishing sub-national structures and partnerships that promote One Health; strengthening surveillance, detection, prevention, and control of zoonoses in both humans and animals; and conducting research and training at the human-animal-ecosystem interface. The GDD Regional Center in Kenya is also collaborating with the USAID/EPT program in Tanzania to identify zoonotic etiologies in humans and animals. The GDD Regional Center also has an NIH-funded animal influenza surveillance program in collaboration with University of Minnesota, and population-based animal syndromic surveillance linked to a human population-based surveillance in Western Kenya supported by the Paul Allen Foundation through Washington State University.

Epidemiology Training Program

The GDD Regional Center in Kenya, in partnership with the Ministry of Public Health and Sanitation, established the FELTP in 2004. In the initial years, the FELTP included trainees from Kenya, South Sudan, Tanzania, Uganda, and Ghana. As part of the One Health approach in 2009, FELTP started training veterinarians alongside physicians and more recently, it has reviewed the curriculum to add One Health modules and strengthen One Health hands-on experience for trainees through the Zoonosis Disease Unit activities and studies.

Country Contacts

Country Director—Kevin DeCock, PhD, kmd2@cdc.gov

AHI Officer—Kariuki Njenga, BVM, PhD, knjenga@ke.cdc.gov, byi6@cdc.gov

Additional Information

<http://www.zdukenya.org>

<http://zdukenya.org/strategic-plan/>

http://www.cdc.gov/globalhealth/fetp/pdf/DPHSWD_Kenya.pdf

<http://www.cdc.gov/globalhealth/gdder/gdd/kenya.htm>

One Health and Zoonoses Activities in Kenya (April 2012-May 2013)

Project Title	Pathogen	Brief Description	Sources of Funding	CDC PI	CDC Headquarters Collaborating Programs
Zoonosis Technical Working Group meeting	-	Meets quarterly and provides operational guidance to the Zoonotic Disease Unit on matters of zoonotic disease surveillance, outbreak response, and prevention control.	HHS/CDC	Peninah Munyua	-
Zoonosis Disease Unit	-	Officially opened the Zoonosis Disease Unit offices and launched the Kenya One Health Strategic Plan on October 3, 2012	DOS/BEP, DOD/DTRA	Kariuki Njenga	-
USAID/EPT collaboration in Tanzania	Multiple	Working with the USAID/EPT program to test human and animal (domestic and wild) specimens in Tanzania	USAID	Joel Montgomery	None
Rabies diagnosis and control guidelines	Rabies virus	Working with the PRB in Atlanta to expand a direct Rapid Immunohistochemical Test diagnosis of rabies in Kenya. Also working with FAO to initiate a national canine rabies elimination program modeled after the progressive control program used in other livestock diseases	Government of Kenya, FAO, HHS/CDC	Barry Fields, Kariuki Njenga, James Zingeser	NCEZID/DHCPP/PRB
Rift Valley Fever mapping in Kenya	Rift Valley Fever	Identify division/location most at risk for Rift Valley Fever epidemic; useful for resource allocation for intervention (vaccination) during high-risk periods and after epidemic prediction.	DOS/BEP	Kariuki Njenga	OSELS

Project Title	Pathogen	Brief Description	Sources of Funding	CDC PI	CDC Headquarters Collaborating Programs
Brucellosis studies	<i>Brucella</i> spp.	Completing seroprevalence study in suspected high and low risk counties. Also starting a brucellosis incidence study in a high risk county (Kajiado)	DTRA, HHS/CDC	Marta Guerra	NCEZID/BSPB
Population-based animal syndromic surveillance	Multiple	A population-based animal syndromic surveillance and socio-economic status study within a site of a human population-based surveillance	Paul Allen Foundation/Washington State University	Kariuki Njenga, Joel Montgomery	-
Animal influenza surveillance	Influenza virus	Animal (particularly pigs) surveillance among farmers and live-bird markets to identify animal-to-human virus transmission	NIH, HHS/CDC	Peninah Munyua, Joshua Mott	NCRID/ID

Contact information for CDC PIs

Barry Fields: bsf2@cdc.gov

Marta Guerra: hzg4@cdc.gov

Joel Montgomery: jmontgomery@ke.cdc.gov

Joshua Mott: zud9@cdc.gov

Peninah Munyua: ikg2@cdc.gov

Kariuki Njenga: knjenga@ke.cdc.gov; byi6@cdc.gov

James Zingeser: james.zingeser@fao.org; jaz1@cdc.gov

Publications

Anyangu AS, Gould LH, Sharif SK, Nguku PM, Omolo JO, Mutonga D, Rao CY, Lederman ER, Schnabel D, Paweska JT, et al. Risk factors for severe Rift Valley fever infection in Kenya, 2007. *Am J Trop Med Hyg* 2010 Aug;83(2 Suppl):14-21.

Ari MD, Guracha A, Fadeel MA, Njuguna C, Njenga MK, Kalani R, Abdi H, Warfu O, Omballa V, Tetteh C, et al. Challenges of establishing the correct diagnosis of outbreaks of acute febrile illnesses in Africa: the case of a likely *Brucella* outbreak among nomadic pastoralists, northeast Kenya, March-July 2005. *Am J Trop Med Hyg* 2011 Nov;85(5):909-12.

Benitez AJ, Diaz MH, Wolff BJ, Pimentel G, Njenga MK, Estevez A, Winchell JM. Multilocus variable-number tandem repeat analysis of *Mycoplasma pneumoniae* clinical isolates from 1962 to the present: a retrospective study. *J Clin Microbiol*. 2012 Nov;50(11):3620-6. doi: 10.1128/JCM.01755-12. Epub 2012 Sep 5.

Breiman RF, Minjauw B, Sharif SK, Ithondeka P, Njenga MK. Rift Valley Fever: scientific pathways toward public health prevention and response. *Am J Trop Med Hyg* 2010 Aug;83(2 Suppl):1-4.

Feikin DR, Njenga MK, Bigogo G, Aura B, Aol G, Audi A, Jagero G, Muluare PO, Gikunju S, Nderitu L, et al. Viral and bacterial causes of severe acute respiratory illness among children aged less than 5 years in a high malaria prevalence area of western Kenya, 2007-2010. *Pediatr Infect Dis J*. 2013 Jan;32(1):e14-9. doi: 10.1097/INF.0b013e31826fd39b.

Feikin DR, Njenga MK, Bigogo G, Aura B, Aol G, Audi A, Jagero G, Muluare PO, Gikunju S, Nderitu L, et al. Etiology and Incidence of viral and bacterial acute respiratory illness among older children and adults in rural western Kenya, 2007-2010. *PLoS One*. 2012;7(8):e43656. doi: 10.1371/journal.pone.0043656. Epub 2012 Aug 24.

Feikin DR, Njenga MK, Bigogo G, Aura B, Gikunju S, Balish A, Katz MA, Erdman D, Breiman RF. Additional diagnostic yield of adding serology to PCR in diagnosing viral acute respiratory infections in Kenyan patients 5 years of age and older. *Clin Vaccine Immunol*. 2013 Jan;20(1):113-4. doi: 10.1128/CVI.00325-12. Epub 2012 Oct 31.

Feikin DR, Ope MO, Aura B, Fuller JA, Gikunju S, Vulule J, Ng'ang'a Z, Njenga MK, Breiman RF, Katz M. The population-based burden of influenza-associated hospitalization in rural western Kenya, 2007-2009. *Bull World Hlth Organ* 2012 Apr 1;90(4):256-263A.

Fuller JA, Njenga MK, Bigogo G, Aura B, Ope MO, Nderitu L, Wakhule L, Erdmann DD, Breiman RF, Feikin DR. Association of the C_T values of the real time PCR of viral upper respiratory tract infection with clinical severity, Kenya. *J Med Virol* 2013;85(5):924-32.

Hightower A, Kinkade C, Nguku PM, Anyangu A, Mutonga D, Omolo J, Njenga MK, Feikin DR, Schnabel D, Ombok M, et al. The relationship of climate, geography, and geology to the incidence of Rift Valley fever in Kenya during the 2006-2007 outbreak. *Am J Trop Med Hyg* 2012; 86:373-80.

Kahlon SS, Peters CJ, Leduc J, Muchiri EM, Muiruri S, Njenga MK, Breiman RF, White AC Jr, King CH. Severe Rift Valley fever may present with a characteristic clinical syndrome. *Am J Trop Med Hyg* 2010 Mar;82(3):371-5.

Katz MA, Lebo E, Emukule G, Njuguna HN, Aura B, Cosmas L, Audi A, Junghae M, Waiboci LW, Olack B, et al. Epidemiology, seasonality, and burden of influenza and influenza-like illness in urban and rural Kenya, 2007-2010. *J Infect Dis*. 2012 Dec 15;206 Suppl 1:S53-60. doi: 10.1093/infdis/jis530.

Katz MA, Schoub BD, Heraud JM, Breiman RF, Njenga MK, Widdowson MA. Influenza in Africa: uncovering the epidemiology of a long-overlooked disease. *J Infect Dis*. 2012 Dec 15;206 Suppl 1:S1-4. doi: 10.1093/infdis/jis548.

- Kim CY, Breiman RF, Cosmas L, Audi A, Aura B, Bigogo G, Njuguna H, Lebo E, Waiboci L, Njenga MK, et al. Secondary household transmission of 2009 pandemic influenza A (H1N1) virus among an urban and rural population in Kenya, 2009-2010. *PLoS One* 2012;7(6):e38166.
- Knobel DL, Maina AN, Cutler SJ, Ogola E, Feikin DR, Junghae M, Halliday JEB, Richards AL, Breiman RF, Cleaveland S, et al. *Coxiella burnetii* in humans, domestic ruminants, and ticks in rural Western Kenya. *Amer J Trop Med Hyg* 2013 Mar;88(3):513-8. PMID 23382156
- Maina AN, Knobel DL, Jiang J, Halliday J, Feikin DR, Cleaveland S, Ng'ang'a Z, Junghae M, Breiman RF, Richards AL, et al. *Rickettsia felis* infection in febrile patients from a region with high seroprevalence of Rickettsial infections, Western Kenya, 2007-2010. *Emerg Infect Dis* 2012;18:328-31.
- Mohamed M, Mosha F, Mghamba J, Zaki SR, Shieh WJ, Paweska J, Omulo S, Gikundi S, Mmbuji P, Bloland P, et al. Epidemiologic and clinical aspects of a Rift Valley fever outbreak in humans in Tanzania, 2007. *Am J Trop Med Hyg* 2010 Aug;83(2 Suppl):22-7.
- Munyua P, Murithi RM, Wainwright S, Githinji J, Hightower A, Mutonga D, Macharia J, Ithondeka PM, Musaa J, Breiman RF, et al. Rift Valley fever outbreak in livestock in Kenya, 2006-2007. *Am J Trop Med Hyg* 2010 Aug;83(2 Suppl):58-64.
- Murithi RM, Munyua P, Ithondeka PM, Macharia JM, Hightower A, Luman ET, Breiman RF, Njenga MK. Rift Valley fever in Kenya: history of epizootics and identification of vulnerable districts. *Epidemiol Infect* 2011 Mar;139(3):372-80.
- Murray EL, Khagayi S, Ope M, Bigogo G, Ochola R, Muthoka P, Njenga MK, Odhiambo F, Burton D, Laserson KF, et al. What are the most sensitive and specific sign and symptom combinations for influenza in patients hospitalized with acute respiratory illness? Results from western Kenya, January 2007-July 2010. *Epidemiol Infect* 2013 Jan;141(1):212-22. doi: 10.1017/S095026881200043X. Epub 2012 Mar 15.
- Nderitu L, Lee JS, Omolo J, Omulo S, O'Guinn ML, Hightower A, Mosha F, Mohamed M, Munyua P, Nganga Z, et al. Sequential Rift Valley fever outbreaks in eastern Africa caused by multiple lineages of the virus. *J Infect Dis* 2011 Mar 1;203(5):655-65.
- Nguku PM, Sharif SK, Mutonga D, Amwayi S, Omolo J, Mohammed O, Farnon EC, Gould LH, Lederman E, Rao C, et al. An investigation of a major outbreak of Rift Valley fever in Kenya: 2006-2007. *Am J Trop Med Hyg* 2010 Aug;83(2 Suppl):5-13.
- Nsubuga P, Johnson K, Tetteh C, Oundo J, Weathers A, Vaughan J, Elbon S, Tshimanga M, Ndugulile F, Ohuabunwo C, et al. Field epidemiology and laboratory training programs in sub-Saharan Africa from 2004 to 2010: need, the process, and prospects. *Pan Afr Med J* 2012;10:24.
- Richards AL, Jiang J, Omulo S, Dare R, Abdirahman K, Ali A, Sharif SK, Feikin DR, Breiman RF, Njenga MK. Human infection with *Rickettsia felis*, Kenya. *Emerg Infect Dis* 2010 Jul;16(7):1081-6.
- Rostal MK, Evans AL, Sang R, Gikundi S, Wakhule L, Munyua P, Macharia J, Feikin DR, Breiman RF, Njenga MK. Identification of potential vectors of and detection of antibodies against Rift Valley fever virus in livestock during interepizootic periods. *Am J Vet Res* 2010 May;71(5):522-6.
- Shieh WJ, Paddock CD, Lederman E, Rao CY, Gould LH, Mohamed M, Mosha F, Mghamba J, Bloland P, Njenga MK, et al. Pathologic studies on suspect animal and human cases of Rift Valley fever from an outbreak in Eastern Africa, 2006-2007. *Am J Trop Med Hyg* 2010 Aug;83(2 Suppl):38-42.
- Thompson MG, Breiman RF, Hamel MJ, Desai M, Emukule G, Khagayi S, Shay DK, Morales K, Kariuki S, Bigogo GM, et al. Influenza and malaria coinfection among young children in western Kenya, 2009-2011. *J Infect Dis* 2012 Dec 1;206(11):1674-84. doi: 10.1093/infdis/jis591. Epub 2012 Sep 14.

Nigeria

The CDC Nigeria office, located in Abuja, the Federal Capital Territory of Nigeria, was established in 2001. Okey Nwanyanwu, PhD, joined CDC-Nigeria as the country director in 2010. Animal-Human Interface Officer, Lora Davis, DVM, MPH, began working in-country on September 28, 2009 and provides consultation to country partners on veterinary and public health issues.

In-country One Health Collaborations

The Animal-Human Interface Project in Nigeria encourages interagency collaboration, preparedness, and response to outbreaks of zoonotic diseases. The program provides consultation to country partners on animal and public health issues and is actively involved in outbreak response and coordination of human and animal health organizations. Important collaborators have included the Federal Ministry of Health, the Federal Ministry of Agriculture, and the state Ministries of Health and Agriculture.

One of the ongoing projects in Nigeria is a collaborative study among CDC, the Nigerian Federal Ministry of Health, and Ahmadu Bello University to detect new and existing viruses in bats. The study will also identify associated diseases in humans and domestic animals with bat contact.

Epidemiology Training Program

The FELTP in Nigeria was established in 2008 and prepares field public health laboratory, epidemiology and veterinary epidemiology residents to work in leadership positions in the Ministry of Health and the Federal Ministry of Agriculture and Water Resources. It was the first FELTP to mandate that veterinarians be included in each cohort. Dr. Davis serves as a veterinary resident advisor providing guidance on research proposals, advising field site projects and research, and serving as a liaison between veterinary residents and field and academic supervisors. The most recent cohort began the program in January 2013 and had a total of 49 residents (33 physicians, 4 veterinarians, and 12 laboratory scientists).

Country Contacts

AHI Officer—Lora Davis, DVM, MPH DavisL@ng.cdc.gov, bvz8@cdc.gov
Country Director—Okey Nwanyanwu, PhD, NwanyanwuO@ng.cdc.gov

Additional Information

<http://nigeria.usembassy.gov/cdc.html>

<http://www.nigeria-feltp.net/index.php>

<http://www.cdc.gov/globalhealth/countries/nigeria/default.htm>

One Health and Zoonoses Activities in Kenya (April 2012-May 2013)

Project Title	Pathogen	Brief Description	Sources of Funding	CDC PI	CDC Headquarters Collaborating Programs
Assessment of heavy metal concentrations in animals and animal products consumed by families living in lead poisoned communities in Zamfara State, Nigeria, 2011	Lead	Assess lead, mercury, and manganese concentrations in animal products and tissues consumed by villagers living in communities known to be affected by lead poisoning	USAID Office of U.S. Foreign Disaster Assistance, Nigerian Animal-Human Interface Project, Nigerian federal and state agencies	Lora Davis, Mary Jean Brown	NCEZID, NCEH/DEEHS/Healthy Homes and Lead Poisoning Prevention Program, NCEH-ATSDR/DTHHS
Assessment of novel and existing diseases in bats; 2010, 2013	Lyssa viruses (Rabies, Lagos Bat Virus); coronaviruses; orthomyxoviruses; <i>Bartonella</i> spp.; pathogen identification	Detect novel and known pathogens in bats; project identified novel flaviviruses and pegiviruses; results from 2013 project are pending	HHS/CDC, Nigerian Animal-Human Interface Project, DOS/BEP	Michael Niezgod, Lora Davis	NCEZID/DHCPP/PRB, NCEZID/DHCPP/IDPB
Human and domestic animal exposure to zoonotic diseases in bats during the Idanre bat festival; 2010, 2013	Lyssa viruses (Lagos Bat Virus, rabies); coronaviruses; Influenza A; <i>Bartonella</i> spp. pathogen identification	Assess human knowledge, attitudes, and behaviors of rabies and other bat diseases; assess human and domestic animal illness pre- and post-participation in the bat festival; serological testing of acute and convalescent specimens in humans and domestic animals.	DOS/BEP, Nigerian Animal-Human Interface Project, Ondo State Ministries of Health and Agriculture	Sergio Recuenco, Lora Davis	NCEZID/DHCPP/PRB, NCEZID/DHCPP/IDPB
Detection of influenza A viruses (H1, H3, & H5) in slaughtered pigs and abattoir workers in Lagos State, Nigeria, March—May 2010;	Influenza	Determined current or past exposure of abattoir workers and pigs to influenza A viruses	African Field Epidemiology Network, Nigerian Animal-Human Interface Project	Lora Davis	None
Detection of influenza A viruses (H1, H3, H5, and H7) in slaughtered pigs, poultry, and abattoir workers in Enugu State, Nigeria, 2013;	Influenza	Determine current or past exposure of abattoir workers, pigs, and poultry to influenza A viruses and genetically characterize the viruses detected	African Field Epidemiology Network, Nigerian Animal-Human Interface Project	Lora Davis	None
Human influenza risk factor survey	Influenza	Assessed influenza risk factors using the Nigerian National Sentinel Site surveillance data from 2008-2011	African Field Epidemiology Network, Nigerian Animal-Human Interface Project	Lora Davis	None

Project Title	Pathogen	Brief Description	Sources of Funding	CDC PI	CDC Headquarters Collaborating Programs
Surveillance system evaluations	Influenza A	<p>Nigerian Field Epidemiology and Laboratory Training Program – Supervised resident activities:</p> <ul style="list-style-type: none"> • National Influenza Sentinel Surveillance System and review of surveillance data—Nigeria, 2011; • Participatory disease surveillance techniques to detect outbreaks of highly pathogenic avian influenza, Niger State, Nigeria • Highly pathogenic avian influenza surveillance system and review of surveillance data in 4 states, Nigeria, 2008-2011 	Federal Ministry of Agriculture and Rural Development, African Field Epidemiology Network, Nigerian Animal-Human Interface Project	Lora Davis	None
Survey of knowledge, attitudes, and practices toward avian influenza	Influenza A	<p>Nigerian Field Epidemiology and Laboratory Training Program – Supervised resident activities:</p> <ul style="list-style-type: none"> • Assessed risk perception and behaviors of small flock owners towards avian influenza in Ibagwa-aka rural community, Enugu State—Nigeria 2010 • Conducted a KAP assessment of poultry farmers and live bird marketers to biosecurity practices for avian influenza—Ogun State, Nigeria, 2012 	Federal Ministry of Agriculture and Rural Development, African Field Epidemiology Network, Nigerian Animal-Human Interface Project	Lora Davis	None
One Health curriculum consultant committee	--	Established a multidisciplinary committee to review and assess veterinary-specific curriculum, course content, and competencies for applied epidemiology programs.	Nigerian Animal-Human Interface Project	Lora Davis	None

Nigeria

Project Title	Pathogen	Brief Description	Sources of Funding	CDC PI	CDC Headquarters Collaborating Programs
One Health curriculum recommendations	--	Developed recommendations and training materials for One Health curriculum as a template for use by for applied epidemiology training programs	Nigerian Animal-Human Interface Project	Lora Davis	NCEZID, CGH/DPHSWD/FAETP
Polio eradication among nomadic populations in Northern Nigeria	Polio, Contagious bovine pleuro-pneumonia in cattle, Peste des petits ruminants in sheep and goats	Conducted workshops with CDC polio-eradication team, Nigerian Federal Ministry of Agriculture, Kano State Ministry of Agriculture, and Ahmadu Bello University to identify ways to optimize professional encounters, share infrastructures, reduce costs, and increase acute flaccid paralysis surveillance activities and polio vaccination among nomadic populations	HHS/CDC, Nigerian Animal-Human Interface Project	Victoria Gammino	CGH/GID/DEEB—PEI, CGH/DPHSWD
Multiagency task force for response to rabies outbreaks	Rabies	Work with Nigeria's Federal Ministry of Health, Ministry of Agriculture, the National Veterinary Research Institute to create protocols for response to rabies outbreaks; guidelines for post-exposure prophylaxis use	Nigeria's Federal Ministry of Health and Federal Ministry of Agriculture	Lora Davis	NCEZID/DHCPP/PRB
Lassa fever studies, prevention and control promotion	Lassa fever	Training for Nigeria FELTP residents	DOS/BEP	Lora Davis	NCEZID/DHCPP/IDPB

Contact Information for CDC PIs

Mary Jean Brown: mjb5@cdc.gov

Lora Davis: DavisL@ng.cdc.gov; bvz8@cdc.gov

Victoria Gammino: vmg0@cdc.gov

Michael Niezgoda: man6@cdc.gov

Sergio Recuenco: fni9@cdc.gov

Publications

Quan PL, Firth C, Conte JM, Williams SH, Zambrana-Torrel CM, Anthony SJ, Ellison JA, Gilbert AT, Kuzmin IV, Niezgoda M, et al. Bats are a major natural reservoir for hepaciviruses and pegiviruses. *Proc Natl Acad Sci* 2013 May 14;110(20):8194-9. doi: 10.1073/pnas.1303037110. Epub 2013 Apr 22.

Nsubuga P, Johnson K, Tetteh C, Oundo J, Weathers A, Vaughan J, Elbon S, Tshimanga M, Ndugulile F, Oluabunwo C, et al. Field epidemiology and laboratory training programs in sub-Saharan Africa from 2004 to 2010: need, the process, and prospects. *Pan Afr Med J* 2011;10:24. Epub 2011 Oct 19.

Lo YC, Dooyema CA, Neri A, Durant J, Jefferies T, Medina-Marino A, de Ravello L, Thoroughman D, Davis L, Dankoli RS, et al. Childhood lead poisoning associated with gold ore processing: a village-level investigation—Zamfara State, Nigeria, October-November 2010. *Environ Health Perspect* 2012;120(10):1450-5.

Dalhatu IT, Medina-Marino A, Olsen SJ, Hwang I, Gubio AB, Ekanem EE, Coker EBA, Akpan H, Adedeji AA. Influenza Virus in Nigeria, 2009-2010: Results from the first 17 months of a national influenza sentinel surveillance system. *J Infect Dis* 2012;206(Supplement 1):S121-8.

Ekong PS, Juryit R, Dika NM, Nguku P, Musenero M. Prevalence and risk factors for zoonotic helminth infection among humans and animals - Jos, Nigeria, 2005-2009. *Pan Afr Med J* 2012;12:6. Epub 2012 May 12.

Nzussouo NT, Michalove J, Diop OM, Njouom R, Monteiro MD, Adje HK, Manoncourt S, Amankwa J, Koivogui L, Sow S, et al. Delayed 2009 Pandemic influenza A virus subtype H1N1 circulation in West Africa, May 2009-April 2010. *J Infect Dis* 2012;206(Supplement 1):S101-7.

Dooyema CA, Neri A, Lo YC, Durant J, Dargan PI, Swarthout T, Biya O, Gidado SO, Haladu S, Sani-Gwarzo N, et al. Outbreak of fatal childhood lead poisoning related to artisanal gold mining in northwestern Nigeria, 2010. *Environ Health Perspect* 2012;120(4):601-7.

Republic of Georgia

CDC established the Georgia Country Office in Tbilisi, Georgia in 2009 to build public health workforce capacity and strengthen public health systems and institutions needed to effectively respond to health problems in the region. In March 2012, the GDD South Caucasus Regional Center was established to coordinate activities in the countries of Armenia, Azerbaijan, and Georgia. Currently, the Office Director is Ed Maes, PhD. The office anticipates stationing an AHI Officer in the region beginning in December 2013—January 2014.

In-country One Health Collaborations

CDC partners with many partners in the region, including the Ministries of Health and Ministries of Agriculture. The Office has served as an active member of the Ministry of Agriculture steering committee and also works with DTRA, USDA, USAID, and other stakeholders to support agricultural work in the country.

CDC recently supported a temporary duty assignment for investigating an outbreak of anthrax and planning follow-up interventions. The Office has also supported a new rabies surveillance and control program. More zoonotic disease programs and research are planned for CDC's 2013-2014 cooperative agreement with the Georgian National Center for Disease Control & Public Health.

Epidemiology Training Program

In September 2009, CDC established the South Caucasus FELTP which is hosted by the Georgia National Center for Disease Control and Public Health in Tbilisi, Georgia. It is the first FELTP to be based on integrated training of professionals from both the Ministries of Health and the Ministries of Agriculture in the region. The program accepts medical doctors, laboratory specialists, veterinarians, and public health professionals from Armenia, Azerbaijan, and Georgia.

Additional Country-Specific Information

CDC has worked with partners in the region on several anthrax investigations. A large multi-country outbreak occurred in 2013 which resulted in both human and animal cases. CDC has also been involved in program reviews in all three countries, including a recent review of the national rabies program in Azerbaijan.

Country Contacts

Country Director—Ed Maes, PhD, emaes@cdc.gov

Deputy Director—Chris Duggar, MPH, cnd8@cdc.gov

Additional Information

<http://sc-feltp.net/>

http://www.cdc.gov/globalhealth/fetp/pdf/DPHSWD_SouthCaucasus.pdf

<http://www.cdc.gov/globalhealth/countries/georgia/>

One Health and Zoonoses Activities in Georgia (April 2012-May 2013)

Project Title	Pathogen	Brief Description	Sources of Funding	CDC PI	CDC Headquarters Collaborating Programs
Anthrax (Human) outbreak preparation and investigation (Azerbaijan and Georgia)	Anthrax	Temporary duty support and intensive planning for 2013 Anthrax Seasonal Outbreaks in Azerbaijan and Georgia (including enhanced surveillance and Public Awareness)	Temporary duty – GDD/TSC; Public Awareness – Country Office Operations	Sean Shadomy	NCEZID/BSPB; FELTP; GDD
Rabies control	Rabies	Clearance and installation of Lab equipment; scheduling of lab training; shipment of samples	HHS/CDC	Jesse Blanton	NCEZID/PRB; GDD
Brucellosis knowledge, attitudes, and practices survey	Brucellosis	FELTP knowledge, attitudes, and practices survey in Georgia and Azerbaijan	FELTP	Ed Maes	
Anthrax knowledge, attitudes, and practices survey	Anthrax	FELTP knowledge, attitudes, and practices survey in Georgia and Azerbaijan	FELTP	Ed Maes	

Contact Information for CDC PIs

Jesse Blanton: asi5@cdc.govEd Maes: emaes@cdc.govSean Shadomy: auf4@cdc.gov

Publications

Rush T. Disease surveillance system evaluation as a model for improved integration and standardization of the laboratory component in the Field Epidemiology and Laboratory Training Program (FELTP) curriculum worldwide. J Public Health Policy 2012 Nov;33(4):390-400.

South Africa

The CDC South Africa office was established in Pretoria in 2000. In 2010, a GDD Regional Center was established in South Africa. The current CDC Office Director in South Africa is Nancy Knight, MD.

In-country One Health Collaborations

CDC partners in-country with the National Department of Health and the National Health Laboratory Service. South Africa is a member of the Southern African Center for Infectious Disease Surveillance, together with other Sub-Saharan countries. The Southern African Center for Infectious Disease Surveillance is a One Health consortium of South African medical and veterinary institutions involved in zoonotic disease research. The Center partners with Royal Veterinary College-London University, London School of Hygiene & Tropical Medicine, London Centre for International Development, and the International Livestock Institute, among others.

The GDD Regional Center in South Africa, in close collaboration with the National Department of Health, the National Institute for Communicable Diseases, and veterinary partners at the National Department of Agriculture, the Onderstepoort Veterinary Institute, and the University of Pretoria, is working to establish a One Health zoonotic disease reference center, with funding provided by GDD. Key upcoming activities are to hire a CDC direct hire to direct the One Health Program in-country, conduct a gap analysis and develop a plan for a One Health disease reference center, and to train public health veterinarians in conjunction with the Field Epidemiology and Laboratory Training Program.

Epidemiology Training Program

South Africa established the South Africa FELTP in May 2006. The FELTP in South Africa is a two-year program, which accepts 10-15 participants each year and leads to a Master of Public Health from the University of Pretoria. Students can choose to enter the field of epidemiology track or the laboratory management track. FELTP partner institutions include: South African Department of Health, National Institute of Communicable Diseases, National Health Laboratory Service, and University of Pretoria.

Country Contacts

Country Director—Nancy Knight, MD, fma2@cdc.gov

Additional Information

<http://www.cdc.gov/globalhealth/countries/southafrica/>

<http://www.nicd.ac.za/?page=safeltp&id=74>

South Africa

One Health and Zoonoses Activities in South Africa (April 2012-May 2013)

Project Title	Pathogen	Brief Description	Sources of Funding	CDC PI	CDC Headquarters Collaborating Programs
Strengthen laboratory and epidemiologic capacity of national health authorities for the detection, surveillance, and response to seasonal, pandemic, and zoonotic influenza in South Africa and selected countries of the South Africa Development Community	Influenza virus	CDC sponsors a laboratory management training course for influenza laboratories and a data management training course for influenza surveillance data managers and epidemiologists.	HHS/CDC	Adam Cohen	NCIRD/ID
Surveillance for multiple zoonotic diseases	<i>Brucella</i> spp., Eastern equine encephalitis virus, <i>Leptospira</i> spp., viral hemorrhagic fever viruses, West Nile virus, Sindbis virus	CDC supports surveillance activities in animals as sentinels for multiple zoonotic diseases.	HHS/CDC	Rachel Eidex	--

Contact Information for CDC PIs

Adam Cohen: dvj1@cdc.gov

Rachel Eidex: zvd3@cdc.gov

Publications

None

Thailand

The CDC has collaborated with the Ministry of Public Health and other Thai institutions since 1980. In 2004, CDC established the GDD Regional Center in Bangkok to cover the countries of Thailand, the Lao People's Democratic Republic, and Cambodia. Currently, the Office Director is Mitch Wolfe, MD, MPH. The GDD core programs (International Emerging Infections Program, Influenza, and FETP) began to incorporate zoonoses as a component of the programs in 2007. To further develop the One Health and Zoonoses program, the GDD Regional Center in Thailand established the Animal-Human Interface Officer position in early 2012. The position is currently filled by Pawin Padungtod, DVM, PhD.

In-country One Health Collaborations

In addition to its long-term partnership with the Ministry of Public Health, CDC is expanding collaboration to new in-country animal health partners, including departments within the Ministry of Agriculture (Department of Livestock and Development, Department of Livestock and Fisheries, Department of Animal Health and Production) and the Ministry of Natural Resource and Environment (Department of National Park and Wildlife Conservation). Non-governmental collaborators include the Zoological Parks Organization, and Mahidol and Chiang Mai Universities. These partnerships have led to several multi-sectorial zoonotic disease collaborations including studies of Q fever, occupational risks of zoonoses for workers in zoological parks and wildlife breeding centers, and cross-species transmission of tuberculosis between captive elephants and humans.

The Thai One Health Network began with the announcement of the Declaration of Intention on One Health on July 7, 2011. The network, which is comprised of human health, animal health, wildlife health and ecosystem programs in the public sector, private sector and academic institutions, intends to advocate for the One Health concept and to work collaboratively among network members with the common aim of achieving public benefit and optimal health for all Thais. In order to foster collaborations at the provincial level, provincial One Health Epidemiology teams were developed in five pilot provinces. These teams, comprised of staff from Ministry of Public Health, Department of Livestock Development, Department of National park and Wildlife Conservation, Zoological Park Organization and Thai Universities, are available to complement the existing Ministry of Public Health surveillance and rapid response teams to improve early detection and facilitate zoonoses control at the animal sources

Epidemiology Training Program

The FETP was established in 1980, and was the first program of its kind established outside of the United States. In 1998, the program expanded its mission to strengthen regional capacity in field epidemiology by accepting trainees from neighboring countries and regions, including Cambodia, Laos, Malaysia, Myanmar, Southern China, and Vietnam. Currently only physicians are accepted into the program, but collaboration between FAO and the Thailand Department for Livestock development supports a two-year FETPV program for veterinarians (supported by USAID funds).

Additional Country-Specific Information

The Prince Mahidol Award Conference was held in Bangkok, Thailand on Jan 31- Feb 3, 2013, an annual conference hosted by Royal Thai Government. This year's theme was "A world united against infectious diseases: cross-sectorial solutions." The Thai One Health Network organized a side meeting "Collaborative One Health Projects by Epidemiological Teams at the Provincial and District Levels in Thailand" to highlight One Health accomplishments at the local level.

Country Contacts:

AHI Officer—Pawin Padungtod, DVM, PhD PawinP@th.cdc.gov
Office Director—Mitch Wolfe, MD, MPH, mw6@cdc.gov

Additional Information

FETP website link: http://www.cdc.gov/globalhealth/FETP/pdf/Thailand_factsheet.pdf
GDD website link: <http://www.cdc.gov/globalhealth/gdder/GDD/thailand.htm>

One Health and Zoonoses Activities in Thailand (April 2012-May 2013)

Project Title	Pathogen	Brief Description	Sources of Funding	CDC PI	CDC Headquarters Collaborating Programs
Surveillance of emerging and re-emerging infectious diseases in agricultural communities in Chiang Mai and Nakorn Ratchasima provinces	Influenza A, dengue virus, <i>Leptospira</i> spp., <i>Salmonella</i> spp., <i>Orientia tsutsugamushi</i> , <i>Plasmodium</i> spp.	Hospitalized patients with fever of uncertain etiology are screened for endemic zoonoses. Undiagnosed specimens are tested for additional pathogens at the central laboratory. If the etiological agent is zoonotic, a veterinarian team is sent to investigate the disease among animals around the participants' farm or house. Training has been started and surveillance protocols developed. Patient enrollment is expected to begin this year.	USAID	Pawin Padungtod	NCEZID/OHO
Development of improved surveillance, laboratory capacity for the detection of zoonotic pathogens at the Human-Animal Interface	<i>Coxiella burnetii</i>	The joint livestock, wildlife and public health surveillance and investigation of Q fever in Chiang Mai and Nakhon Ratchasima province. This project is in its second year and involves laboratory diagnostic training, laboratory workgroup meetings and consultative meetings with Department of Livestock Development and other in-country partners.	HHS/CDC	Pawin Padungtod	NCEZID/DVBD/RZB
Thai Rabies Network Information System: Post-exposure prophylaxis management	Lyssavirus (rabies)	The incorporation of Post-Exposure Prophylaxis Management as a component of the Thai Rabies Network Information System to improve management of the existing system and facilitate integration of data within the system. This information contained in the system can be analyzed to provide a complete understanding of disease occurrence, distribution, and risk factors in both humans and animals, as well as coordinate response to unusual increase of incidence and guide rabies prevention and control policy at country level using One Health approach.	HHS/CDC	Pawin Padungtod	NCEZID/DHCPP/PRB

Project Title	Pathogen	Brief Description	Sources of Funding	CDC PI	CDC Headquarters Collaborating Programs
Strengthen One Health epidemiological teams at the provincial and district levels	<i>Borrelia burgdorferi</i> , <i>Coxiella burnetii</i> , <i>Brucella</i> spp., <i>Leptospira</i> spp., <i>Burkholderia pseudomallei</i> , <i>Bartonella</i> spp., <i>Streptococcus suis</i> , Rabies (Lyssavirus) West Nile virus Influenza A	This project was led by the Thai Bureau of Epidemiology in collaboration with several national and international partners, and with the intent of strengthening epidemiological teams at provincial and district levels. Activities included; training mentors for the One Health Epidemiological teams (February, 2012); a workshop for provincial teams (March 2012); field projects in 5 pilot provinces (March to August, 2012); and a final project conclusion workshop (August 2012).	USAID	Alden Henderson	NCEZID/OHO, CGH/DGHP
Strengthen One Health collaboration*	--	The Department of Disease Control has assigned the Bureau of Epidemiology to collaborate with the bureau of Emerging Infectious Diseases, Department of Livestock Development, Department of Natural Park, and Zoological Park Organization of Thailand. The main goal of this project is to enable the Bureau of Epidemiology and collaborating partners to develop disease surveillance, prevention and control system in line with One Health concepts and to develop an integrated management system for emerging infectious disease preparedness and emergency response.	DOD/DTRA	Alden Henderson	NCEZID/OHO, CGH/DGHP
Q fever and rickettsial diseases*	<i>Coxiella burnetii</i> and other rickettsiae	This study will provide the necessary reagents and laboratory support to establish laboratory diagnostic capacity in Thailand through the Thai National Institute of Health, the National Institute of Animal Health, and selected clinical diagnostic laboratories. Environmental and veterinary specimens will be tested; animal reservoirs for <i>C. burnetii</i> will be identified; isolates will be characterized to identify strains circulating in SE Asia; and risk factors for Q fever and other rickettsial diseases will be identified.	DOD/DTRA	Robert Massung	NCEZID/DVBD/RZB

* Approved but not started

Project Title	Pathogen	Brief Description	Sources of Funding	CDC PI	CDC Headquarters Collaborating Programs
Building capacity for zoonotic endocarditis*	<i>Coxiella burnetii</i> , <i>Bartonella</i> spp., <i>Streptococcus suis</i>	This project is in collaboration with Khon Kaen University Hospital, Pasteur Institute of Ho Chi Minh City in Vietnam, and with in-country public health scientists and clinicians in SE Asia. The project will establish and improve diagnostic capacity for <i>C. burnetii</i> , <i>Bartonella</i> spp., and <i>Streptococcus suis</i> . Improved diagnostic capabilities will generate epidemiological information that can be used to understand impact of the pathogens within the human and veterinary populations	DOD/DTRA	Michael Kosoy	NCEZID/DVBD/BDB
One Health approach to Q fever in Thailand*	<i>Coxiella burnetii</i>	Training: Three scientists from Thailand National Institute of Animal Health and National Institute of Health will travel to Atlanta for training on the analysis of human, animal and environmental samples for <i>C. burnetii</i> . CDC scientists will also visit Thailand for additional on-site training. Human/livestock studies: In collaboration with Thailand Bureau of Epidemiology, serum samples from farmers in Northern Thailand, cattle and goats, will be tested for <i>C. burnetii</i> using ELISA, IFA, and PCR. PCR positive samples will be used for isolation and genotyping of new strains.	HHS/CDC	Gilbert Kersh	NCEZID/DVBD/RZB

* Approved but not started

Contact Information for CDC PIs

Alden Henderson: akh0@cdc.gov

Gilbert Kersh: hws7@cdc.gov

Michael Kosoy: mck3@cdc.gov

Robert Massung: rhm2@cdc.gov

Pawin Padungtod: PawinP@th.cdc.gov

Publications

- Bai Y, Kosoy M, Diaz M, Winchell J, Baggett H, Maloney S, Boonmar S, Bhengsri S, Sawatwong, Peruski L. *Bartonella vinsonii subsp. arupensis* in humans, Thailand. *Emerg Infect Dis* 2012;18(6):989-91.
- Bhengsri S, Baggett HC, Peruski LF, Morway C, Bai Y, Fisk TL, Sitdhirasdr A, Maloney SA, Dowell SF, Kosoy M. *Bartonella* seroprevalence in rural Thailand. *Southeast Asian J Trop Med Public Health* 2011;42:687-92.
- Bhengsri S, Baggett HC, Peruski LF Jr, Morway C, Bai Y, Fisk TL, Sitdhirasdr A, Maloney SA, Dowell SF, Kosoy M. *Bartonella* spp. infections, Thailand. *Emerg Infect Dis* 2010;16:743-5.
- Bhengsri S, Baggett HC, Jorakate P, Kaewpan A, Prapasiri P, Naorat S, Thamthitawat S, Tanwisaid K, Chantra S, Salika P, et al. Incidence of bacteremic Melioidosis in eastern and northeastern Thailand. *Am J Trop Med* 2011;85(1):117-20.
- Bai Y, Kosoy M, Boonmar S, Sawatwong P, Sangmaneedet S, Peruski L. Enrichment culture and molecular identification of diverse *Bartonella* species in stray dogs. *Vet Microbiol* 2010 Dec 15;146(3-4):314-9.
- Bai Y, Kosoy M, Lerdthusnee K, Peruski L, Richardson J. Prevalence and genetic heterogeneity of *Bartonella* strains cultured from rodents from 17 provinces in Thailand. *Am J Trop Med* 2009;81(5):811-6
- Kosoy M, Bai Y, Sheff K, Morway C, Baggett H, Maloney SA, Boonmar S, Bhengsri S, Dowell SF, Sitdhirasdr A, et al. Identification of *Bartonella* infections in febrile human patients from Thailand and their potential animal reservoirs. *Am J Trop Med Hyg* 2010;82:1140-5.
- Pachirat O, Fournier PE, Pussadhamma B, Taksinachanekij S, Lulitanond V, Baggett HC, Thamthitawat S, Watt G, Raoult D, Maloney SA. The first reported cases of Q fever endocarditis in Thailand. *Infect Dis Rep* 2012;4:e7.
- Pachirat O, Kosoy M, Bai Y, Prathani S, Puapairoj A, Zeidner N, Peruski LF, Baggett HC, Watt G, Maloney SA. The first reported case of *Bartonella* endocarditis in Thailand. *Infect Dis Rep* 2011;3:e9.
- Robertson K, Lumlertdacha B, Franka R, Petersen B, Bhengsri S, Henchaichon S, Peruski LF, Baggett HC, Maloney SA, Rupprecht CE. Rabies-related knowledge and practices among persons at risk of bat exposures in Thailand. *PLoS Negl Trop Dis* 2011;5:e1054.
- Thamthitawat S, Marin N, Baggett HC, Peruski LF, Kiatkulwiwat W, Panumatrasmee V, Varma JK, Nateniyom S, Akarasewi P, Maloney SA. *Mycobacterium bovis* (Bacille Calmette-Guerin) bacteremia in immunocompetent neonates following vaccination. *Vaccine* 2011;29:1727-30.

Uganda

CDC has been working in Uganda since 1991 providing technical leadership and direct assistance to the Government to strengthen public health workforce capacity, health information systems, epidemiology, surveillance, laboratory, and operations research. The Uganda Virus Research Institute, a primary CDC partner, was established in 1936 as the Yellow Fever Research Institute by the Rockefeller Foundation. In 1977, it became a Uganda Government public health research institution and first began hosting CDC on its campus in 1994.

In-country One Health Collaborations

CDC's activities in Uganda have grown from providing support for HIV/AIDS and malaria prevention, care and treatment programs, to the diagnosis and analysis of a wide range of zoonoses. For the last 20 years, NCEZID/DVBD has partnered with the Uganda Virus Research Institute to discover and characterize arboviruses and, more recently, to carry out the first in-depth studies of endemic plague. Since 2003, through a cooperative agreement, NCEZID divisions and branches have partnered with Uganda Virus Research Institute, the Ministry of Health, and universities to address the burden of diseases such as viral hemorrhagic fever viruses, leptospirosis, rabies, acute febrile illnesses, and vector-borne viruses and bacteria, as well as fevers of unknown origin. In 2012, with support from the NCEZID/DHCPP/VSPB, the Uganda Virus Research Institute opened a dedicated viral hemorrhagic fever lab, the finest containment facility in East Africa, and DVBD created the first national lab for diagnosing yellow fever and other vector-borne viruses.

CDC has provided critical support for identifying and responding to epidemics of zoonoses. From July to November 2012, DHCPP/VSPB was able to respond quickly to four filovirus outbreaks. The viral hemorrhagic fever reference laboratory cut the time to diagnostic results from weeks to days. The surveillance sites were instrumental in monitoring for additional viral hemorrhagic fever cases in the time during and after the outbreaks. Similarly, CDC detected a rare outbreak of pneumonic plague on the northwestern border with the Democratic Republic of Congo using a rapid diagnostic test developed at CDC. Extensive distribution of prophylactic antibiotic was credited with preventing an epidemic. CDC-Uganda and CDC headquarters were part of the outbreak response from the beginning—supporting the government through laboratory testing at CDC's laboratory in the Uganda Virus Research Institute, contact tracing of all those who may have had contact with suspect or confirmed cases, providing critical supplies, and more.

CDC/NCEZID is also currently involved in field research on the transmission of plague in the northwest and of Marburg virus in the southwest border regions.

Epidemiology Training Program

Uganda currently has a Public Health School Without Walls training program within Makerere University that offers a two-year master's degree and is intended to serve as the in-service training program for the Ministry of Health. CDC's Division of Public Health Systems and Workforce Development has supported the training and placement of numerous public health professionals through public health workforce capacity development programs; these professionals now serve in key public health roles throughout the country.

Through CDC's partnership with the USAID EPT program, FETP will work with the government and other partners to produce qualified field epidemiologists that strengthen public and animal health systems. For the upcoming introductory course for post-MPH fellows, efforts will be made to include veterinarians. When established, the program will include a focus on One Health and (re-)emerging and endemic zoonotic diseases.

Country Contact

Country Director—Tadesse Wuhib, MD, MPH, tew7@cdc.gov

Additional information

<http://www.cdc.gov/globalaids/Global-HIV-AIDS-at-CDC/countries/Uganda/> <http://www.cdc.gov/globalhealth/countries/uganda/>

One Health and Zoonoses Activities in Uganda (April 2012-May 2013)

Project Title	Pathogen	Brief Description	Sources of Funding	CDC PI	CDC Headquarters Collaborating Programs
Activities to support the EPT Program: Assessing the risk from emerging zoonotic pathogens	Vector-borne viruses	1) Surveillance for acute febrile illness, especially in high risk locations; 2) development of affordable point-of-care tests and local lab capacity to rule-out endemic diseases; 3) training of national and local staff in laboratory testing; and 4) identifying newly emerged pathogens.	USAID	Barry Miller	NCEZID/DVBD/OD
Activities to support the EPT Program: National viral hemorrhagic fever surveillance and capacity building	Viral Hemorrhagic Fevers	Multiple activities to determine the distribution of viral hemorrhagic fever viruses and the risks they pose to the human population. Building viral hemorrhagic fever laboratory capacity at the Uganda Virus Research Institute.	USAID	Trevor Shoemaker	NCEZID/DHCPP/VSPB
Activities to support the EPT Program: Retrospective and prospective studies and serosurvey analysis of undifferentiated acute febrile illness	Leptospirosis, brucellosis, malaria, typhoid fever, spotted fever and Typhus group rickettsial infection, and arboviral infections	Retrospective assessment of clinic records, 2004/05 and 2011 national serosurveys, and environmental data to evaluate trends in acute febrile illness and regional disease prevalence; prospective clinical study to determine incidence of selected acute febrile illnesses.	USAID	Dave Blaney Sean Shadomy	NCEZID/DHCPP/BSPB
Activities to support the EPT Program: Detection and surveillance of lyssaviruses in wildlife and characterization of potential human risk	Lyssaviruses	Determination of environmental, socio-economical, and medical factors that may be significantly associated with zoonotic disease transmission, outbreaks, and human fatalities; development of community-appropriate strategies for reducing human/domestic animal/wildlife exposure risks from zoonotic agents. Enhancement of laboratory diagnostic capacity	USAID	Richard Franka	NCEZID/DHCPP/PRB

Contact Information for CDC PIs

Dave Blaney: znr5@cdc.gov

Richard Franka: rpf5@cdc.gov

Barry Miller: brm4@cdc.gov

Sean Shadomy: auf4@cdc.gov

Trevor Shoemaker: tis8@cdc.gov

Publications

- Albarino C, Shoemaker T, Khristova M, Wamala J, Muyembe J-J, Balinandi S, Tumusiime A, Campbell S, Cannon D, Gibbons A, et al. Genomic analysis of filoviruses associated with four viral hemorrhagic fever outbreaks in Uganda and the Democratic Republic of the Congo in 2012. *Virology* 2013; *in press*.
- Amman BR, Carroll SA, Reed ZD, Sealy TK, Balinandi S, Swanepoel R, Kemp A, Erickson BR, Comer JA, Campbell S, et al. Seasonal pulses of Marburg virus circulation in juvenile *Rousettus aegyptiacus* bats coincide with periods of increased risk of human infection. *PLoS Pathog* 2012;8(10):e1002877.
- Borchert JN, Eisen RJ, Holmes J, Atiku LA, Tendo J, Babi N, Montenieri JA, Ensore RE, Gage KL. Evaluation and modification of off-host flea collection techniques used in northwest Uganda: laboratory and field studies. *J Med Entomol* 2012 Jan;49(1):210-214.
- Borchert JN, Eisen RJ, Atiku LA, Delorey MJ, Mpanga JT, Babi N, Ensore RE, Gage KL. Efficacy of Indoor residual spraying using lambda-cyhalothrin for controlling fleas on commensal rodents in a plague endemic region of northwest Uganda. *J Med Entomol* 2012 Sep;49(5):1027-34.
- Borchert JN, Ensore RE, Eisen RJ, Atiku LA, Owor N, Acayo S, Babi N, Montenieri JA, Gage KL. Evaluation of rodent bait containing imidacloprid for the control of fleas on commensal rodents in a plague endemic region of northwest Uganda. *J Med Entomol* 2010 Sep;47(5):842-50.
- Carroll SA, Towner JS, Sealy TK, McMullan LK, Khristova ML, Burt FJ, Swanepoel R, Rollin PE, Nichol ST. Molecular evolution of viruses of the family Filoviridae based on 97 whole genome sequences. *J Virol* 2013;87:2608-2616.
- Crabtree, M, Kading, RC, Mutebi J-P, Lutwama, J, Miller, BR. Identification of host blood from engorged mosquitoes collected in western Uganda using cytochrome oxidase I gene sequences. *J Wildlife Dis* 2013; *in press*.
- Eisen RJ, Borchert JN, Mpanga JT, Atiku LA, MacMillan K, Boegler KA, Montenieri JA, Monaghan A, Gage KL. Flea diversity as an element for persistence of plague bacteria in an East African plague focus. *PLoS One* 2012;7(4):e35598. doi:10.1371/journal.pone.0035598
- Eisen RJ, Griffith KS, Borchert JN, MacMillan K, Apangu T, Owor N, Acayo S, Acidri R, Zielinski-Gutierrez E, Winters AM, et al. Assessing human risk exposure to plague bacteria in northwestern Uganda based on remotely sensed predictors. *Am J Trop Med Hyg* 2010;82(5):904–911. doi:10.4269/ajtmh. 2010.09-0737
- Graham CB, Black WC, Boegler KA, Montenieri JA, Holmes JL, Gage KL, Eisen RJ. Combining real-time polymerase chain reaction using SYBR Breen I detection and sequencing to identify vertebrate blood meals in fleas. *J Med Entomol* 2012 Nov;49(6):1442-52.
- Graham CB, Borchert JN, Black WC, Atiku LA, Mpanga JT, Boegler KA, Moore SM, Gage KL, Eisen RJ. Blood meal identification in off-host cat fleas (*Ctenocephalides felis*) from a plague-endemic region of Uganda. *Am J Trop Med Hyg* 2013 Feb;88(2):381-9.
- Johansson MA, Arana Vizcarrondo N, Biggerstaff BJ, Staples JE, Gallagher N, Marano N. On the treatment of airline travelers in mathematical models. *PLoS One* 2011;6(7):e22151.
- Kading RC, Borland E, Cranfield M, Powers A. Seroprevalence of alphaviruses and flaviviruses in free-ranging game animals and non-human primates in the Congo Basin. Manuscript in press, *J Wildlife Dis* 2013; *in press*.

MacMillan K, Ensore RE, Atiku LA, Borchert JN, Babi N, Amatre G, Mead PS, Gage KL, Eisen RJ. Landscape and residential variables associated with plague-endemic villages in the West Nile region of Uganda. *Am J Trop Med Hyg* 2011 Mar;84(3):435-42.

MacMillan K, Monaghan AJ, Apangu T, Griffith KS, Mead PS, Acayo S, Acidri R, Moore SM, Mpanga JT, Ensore RE, et al. Climate predictors of the spatial distribution of human plague cases in the West Nile region of Uganda. *Am J Trop Med Hyg* 2012;86(3):514–523.

McMullan LK, Frace M, Sammons SA, Shoemaker T, Balinandi S, Wamala JF, Lutwama JJ, Downing RG, Stroehrer U, Macneil A, et al. Using next generation sequencing to identify yellow fever virus in Uganda. *Virology* 2012;422:1-5.

Moore SN, Monaghan A, Griffith KS, Apangu T, Mead PS, Eisen RJ. Improvement of disease prediction and modeling through the use of meteorological ensembles: human plague in Uganda. *PLoS One* 2012; 7(9):e44431.doc10/1371/journal.pone.004431

Mutebi JP, Crabtree MB, Kading RC, Powers AM, Lutwama JJ, Miller BR. Mosquitoes of western Uganda. *J Med Entomol* 2012 Nov;49(6):1289-306.

Shoemaker T, Macneil A, Balinandi S, Campbell S, Wamala JF, McMullan LK, Downing R, Lutwama J, Mbidde E, Ströher U, et al. Reemerging Sudan ebola virus disease in Uganda, 2011. *Emerg Infect Dis* 2012;18(9):1480-3.

Towner JS, Amman BR, Nichol ST 2011. Filoviruses. In SH Newman, H Field, J Epstein, C deJong (eds), *Investigating the Role of Bats in Emerging Zoonoses: Balancing Ecology, Conservation, and Public Health Interest*. Food and Agriculture Organization of the United Nations. FAO Animal Production and Health Manual No. 12. Rome.

Vietnam

The CDC Vietnam office, located in Hanoi, was established in 2001, and works in partnership with the Government of Vietnam and local and international organizations. The current office director is Michelle McConnell, MD. James Kile, DVM, MPH, DACVPM, was hired in 2009 to start the new animal-human interface initiative as part of the Influenza Program at CDC Vietnam, which had been established in 2005.

In-country One Health Collaborations

Since 2006, CDC cooperative agreement partnerships have supported Vietnam's National Influenza Surveillance System to conduct continuous passive and active surveillance for influenza-like illness and severe acute respiratory illness caused by seasonal, pandemic, and animal-origin strains of influenza virus. CDC strengthened Vietnam's pandemic preparedness plans and communication strategy to quickly detect influenza viruses and to respond rapidly. This included rapid response to pandemic Influenza A (H1N1)2009 virus. Working with the Ministry of Health and Ministry of Agriculture and Rural Development partners, CDC conducts research on influenza and other zoonotic diseases to better identify the viruses of interest in Vietnam, including the evolution of influenza viruses in Vietnam, and to identify the risks of transmission of viruses between species.

In 2011, Dr. Kile helped facilitate a Letter of Agreement between the Ministry of Health and the Ministry of Agriculture and Rural Development for an inter-agency and intra-agency partnership for influenza and other zoonotic disease projects and activities in Vietnam. This Letter of Agreement, in conjunction with a previous Letter of Intent in 2010 between the Ministry of Health and HHS, enhanced the establishment of a unique cooperative agreement international partnership in September 2012 between CDC, a public health agency, and the Ministry of Agriculture and Rural Development Department of Animal Health, an animal health agency. The Influenza Program's AHI initiative at CDC Vietnam works in close collaboration with other USG departments and agencies, including the Department of State and U.S. Embassy in Hanoi, the Agency for International Development, the Department of Agriculture, and the Department of Defense. Dr. Kile presented this collaborative work in a presentation at the Prince Mahidol Award Conference in Bangkok, Thailand (Jan 31- Feb 3, 2013) titled "One Health collaborative mechanisms at the international level in Vietnam."

Epidemiology Training Program

The Field Epidemiology and Training Program began in 2007, with the first class of eight Fellows entering in 2009 and graduating in 2011. CDC works in partnership with the World Health Organization, the Ministry of Health, and Hanoi School of Public Health to train public health professionals through a two-year FETP that builds capacity to address communicable and non-communicable health priorities and disease threats. Currently, veterinarians are trained separately through the Applied Veterinary Epidemiology Training program, coordinated with the Veterinary College in Hanoi and the Food and Agriculture Organization of the United Nations.

Additional Country-Specific Information

On November 14, 2012, Dr. Thomas Frieden travelled to Vietnam and addressed an audience of top Vietnamese leaders, health officials and students at the Hanoi Medical University in honor of the university's 110th anniversary. Dr. Frieden also met with a Vice Minister of the Ministry of Agriculture and Rural Development, which included discussions of the unique cooperative agreement partnership between the two health sectors.

Country Contacts:

Office Director— Michelle McConnell, MD, McConnellM@vn.cdc.gov

AHI Officer — James Kile, DMV, MPH, DACVPM KileJC@vn.cdc.gov

Additional Information

CDC Vietnam: <http://www.cdc.gov/globalhealth/countries/vietnam/>

One Health and Zoonoses Activities in Vietnam (April 2012-May 2013)

Project Title	Pathogen	Brief Description	Sources of Funding	CDC PI	CDC Headquarters Collaborating Programs
Studies at the AHI of influenza and other zoonotic diseases in Vietnam (cooperative agreement)	Influenza A	Cooperative Agreement award with Vietnam Ministry of Agriculture and Rural Development in Sep 2012. To provide technical and funding support for joint Ministry of Health and Ministry of Agriculture and Rural Development co-project activities. Includes 6 proposed study activities and/or capacity building workshops and training. Study activities include surveillance and/or research of people, pigs, and poultry. Specific activities occurring within time-frame include 1) initial Inception Workshop (Mar 2013) for opening of the cooperative agreement and first-year activities, 2) preparations for study planned to start Jul 2013, "Cross-sectional study of Influenza in pigs and humans in select areas in Vietnam", and 3) Cross-sectional study Training also planned for Jul 2013.	HHS/CDC	James Kile	NCIRD/ID
Pilot extension project south for influenza viruses infecting humans and animals in Vietnam	Influenza A	Study activity from Cooperative Agreement award with Vietnam Ministry of Health. To conduct a cross-sectional study of people, pigs, and poultry in south Vietnam, to identify a base-line prevalence and sub-types of Influenza A virus in relevant populations.	HHS/CDC	James Kile	NCIRD/ID
AHI longitudinal study to identify influenza viruses infecting humans and animals over time in Vietnam	Influenza A	Study activity from Cooperative Agreement award with Vietnam Ministry of Health. To identify circulating Influenza viruses over time in people, pigs, and poultry living in close proximity. To identify risk factors for cross-species transmission of Influenza virus.	HHS/CDC	James Kile	NCIRD/ID

Contact Information for CDC PIs

James Kile: KileJC@vn.cdc.gov

Publications

Vuong CD, Hoang PM, Nguyen HL, Nguyen HT, Nguyen TC, Le TT, Dennis DT, Kapella BK, Kile JC, Le MQ. The genetic match between vaccine strains and circulating seasonal influenza A viruses in Vietnam, 2001-2009. *Influenza Other Respi Viruses* 2012 Nov 8. doi: 10.1111/irv.12038. [Epub ahead of print]

Food and Agriculture Organization of the United Nations (FAO)

The collaboration between FAO and CDC to implement a One Health model for disease surveillance and response benefits both organizations by reducing or breaking the transmission of transboundary and zoonotic disease and mitigating the impact of these diseases in terms of economic losses and human or animal suffering. FAO offers complementary experience and resources to CDC efforts in training and capacity building in developing countries. Given its broad scope of resources and experience, FAO is a key strategic partner in developing a model for One Health disease surveillance and response. FAO expertise in surveillance and control of transboundary animal diseases and zoonoses, wildlife biology, environmental studies, and agriculture complements CDC expertise and experience in epidemiology, laboratory science, and public health. Furthermore, FAO provides access to its broad networks of member states, scientific laboratories, and development projects. FAO is also a leading partner in UN-based One Health activities through GLEWS, Codex Alimentarius, WHO-FAO-OIE Tripartite, OFFLU, WHO Working Groups on Neglected Zoonoses and Neglected Tropical Diseases, collaboration with UNSIC, and the Toward a Safer World initiative.

Jim Zingeser, DVM, MPH, began working as the CDC-FAO liaison in August 2009. The overall goal of the liaison is to improve human and animal health by advancing scientific knowledge about disease emergence and transmission at the animal-human-ecosystem interface, including zoonotic influenzas and other major zoonoses, and enhancing collaboration among animal and human health agencies to control or potentially eliminate these diseases from wildlife, domestic animal, and human populations. The CDC-FAO collaboration focuses on improving global health through the implementation of One Health models. This is achieved at the global level through partnerships of key institutions, e.g., developing the GLEWS platform to improve early warning, prevention and support response activities. At more local levels, the CDC-FAO collaboration is assisting regions, nations and communities to develop and implement One Health through technical assistance, resource provision, and training and capacity building for the detection and control of zoonotic and transboundary animal diseases. Collaborative activities include:

- Conducting risk analyses of major zoonoses and transboundary animal diseases with a particular focus on HPAI, Rift Valley Fever, rabies, anthrax and brucellosis.
- Tracking and verification of major epidemiological events for select transboundary animal diseases, including HPAI and priority zoonoses.
- Providing technical support to FAO activities in Egypt to strengthen the detection and control of HPAI.
- Developing, implementing, and evaluating the GLEWS platform for animal health data integration and dissemination, including tracking of major zoonoses and foodborne pathogens.
- Developing, implementing, and evaluating the FAO One Health strategy for surveillance, prevention, and response to priority zoonotic and transboundary diseases at the animal-human-ecosystem interface, including diseases in wildlife.
- Developing, implementing, and evaluating surveillance and response to priority zoonotic and emerging diseases at the livestock-wildlife interface.
- Providing technical support to field epidemiology training efforts, including FELTP, FETPV, and simulation exercises for priority zoonotic diseases and emerging wildlife diseases.
- Planning and facilitating training and capacity building, including the participation of FAO personnel, national counterparts, or selected experts at meetings, workshops, and field missions to advance the goals of the CDC-FAO collaboration.

Additional information is available at: http://www.fao.org/index_en.htm

World Organisation for Animal Health (OIE)

The OIE has been an international leader in advancing the One Health agenda and has expanded its activities to be consistent with its mandate of improving animal health, veterinary public health, and animal welfare worldwide. As the organization recognized for establishing international standards for animal health, the OIE supports countries to be compliant with these standards to prevent and control animal diseases transmissible to humans, to reduce risks from infectious diseases at the animal-human-ecosystem interface, and to improve animal production food safety measures. By highlighting the importance of in-country veterinary service organizations and their fundamental role in improving public health as well as animal health, and incorporating these principles into the international animal health standards, the OIE plays an important role in reducing health risks at the animal-human interface.

Kate Glynn, DVM, MPVM, served as the CDC-OIE liaison from December 2008 – December 2012. Dr. Glynn's activities focused on a number of key areas: surveillance systems, including a strengthening of the World Animal Health Information System and general international wildlife/ecosystems health capacity; information and disease intelligence systems, common or shared (e.g. GLEWS); identifying incentives for early animal disease reporting and notification under the relevant OIE standards; improving laboratory capacity to detect known and emerging pathogens that leads to rapid response capacity; and enhancing the contribution and heightened role of the private sector. The CDC-OIE collaboration focuses on international level activities with specific country benefits. Collaborative activities include:

- Assessing current standards and updating or developing new OIE standards for important zoonotic diseases (i.e., rabies, HPAI and other zoonotic influenza viruses, Crimean–Congo hemorrhagic fever, Rift Valley Fever).
- Expanding the knowledge and guidance for swine influenza viruses through the establishment of the Expert Swine Influenza Group within OFFLU; through OFFLU, integrating information on animal influenza viruses into the WHO annual strain selection process.
- Collaborating on the CDC Risk Assessment Tool for influenza viruses.
- Monitoring official national reports of animal diseases, officially notifiable or new emerging diseases, to improve prevention, detection, and control.
- Maintaining and advancing collaboration with international organizations to develop and jointly disseminate strategies and concrete ways to operationalize One Health approaches at the regional and national level.
- Incorporating One Health components into PVS Pathway, a process for the animal health sector similar to the IHR, to improve a country's ability to be compliant with the regulations.
- Participating with FAO and WHO in the GLEWS platform to share information on major zoonoses and foodborne pathogens and promote earlier response and control of these events.
- Improving the OIE standards for wildlife diseases and surveillance, including reporting of wildlife health events.
- Improving laboratory capacity to rapidly and accurately diagnose zoonotic animal diseases through the laboratory twinning projects, training on laboratory methods and strategic laboratory planning, and networking between national veterinary laboratories and international reference laboratories and collaborating centers.
- Developing methods for countries to conduct a gap analysis of national veterinary laboratory systems, and methods to meet those needs through creative partnerships including with CDC assets and other public health laboratories in their country.

Additional information is available at: <http://www.oie.int/>

Acronyms

AHI	Animal-Human Interface
APHIS	Animal and Plant Health Inspection Service (USDA)
ATSDR	Agency for Toxic Substances and Disease Registry (CDC)
BDB	Bacterial Diseases Branch (CDC)
BEP	Biosecurity Engagement Program (DOS)
BSE	Bovine spongiform encephalopathy
BSPB	Bacterial Special Pathogens Branch (CDC)
CBEP	Cooperative Biological Engagement Program (DOD)
CDC	Centers for Disease Control and Prevention
CGH	Center for Global Health (CDC)
DBD	Division of Bacterial Diseases (CDC)
DEEB	Disease Eradication and Elimination Branch (CDC)
DEEHS	Division of Emergency and Environmental Health Services (CDC)
DFA	Direct fluorescent antibody
DFWED	Division of Foodborne, Waterborne, and Environmental Diseases (CDC)
DGHP	Division of Global Health Protection (CDC)
DHCPP	Division of High-Consequence Pathogens and Pathology (CDC)
DNDHI	Division of Notifiable Diseases and Healthcare Information (CDC)
DOD	United States Department of Defense
DOS	United States Department of State
DPEI	Division of Preparedness and Emerging Infections (CDC)
DPHSWD	Division of Public Health Systems and Workforce Development (CDC)
dRIT	Direct rapid immunohistochemical test
DTRA	Defense Threat Reduction Agency (DOD)
DTHHS	Division of Toxicology and Human Health Sciences (CDC)
DVBD	Division of Vector-Borne Diseases (CDC)
EDEB	Enteric Diseases Epidemiology Branch (CDC)
EDLB	Enteric Disease Laboratory Branch (CDC)
ELISA	Enzyme-linked immunosorbent assay
EMARIS	Eastern Mediterranean Acute Respiratory Infection Surveillance
EPT	Emerging Pandemic Threats (USAID)
FAETP	Field and Applied Epidemiology Training Program (CDC)
FAO	Food and Agriculture Organization of the United Nations
FETP	Field Epidemiology Training Program
FETPV	Field Epidemiology Training Programme for Veterinarians
FELTP	Field Epidemiology and Laboratory Training Program
GDD	Global Disease Detection (CDC)
GDDER	Global Disease Detection and Emergency Response (CDC)
GEIS	Global Emerging Infections Surveillance and Response System (DOD)
GFN	Global Foodborne Infections Network
GID	Global Immunization Division (CDC)
GLEWS	Global Early Warning System
HHS	United States Department of Health and Human Services
HPAI	Highly Pathogenic Avian Influenza
ID	Influenza Division (CDC)
IDPB	Infectious Diseases Pathology Branch (CDC)
IFA	Immunofluorescence assay
IHR	International Health Regulations
MERS-CoV	Middle East Respiratory Syndrome Coronavirus
NAMRU-3	Naval Medical Research Unit No. 3 (Egypt)

NAMRU-6	Naval Medical Research Unit No. 6 (Peru)
NCEH	National Center for Environmental Health (CDC)
NCEZID	National Center for Emerging and Zoonotic Infectious Diseases (CDC)
NCIRD	National Center for Immunization and Respiratory Diseases (CDC)
NIH	National Institutes of Health
NNDSS	National Notifiable Diseases Surveillance Systems (CDC)
OD	Office of the Director (CDC)
OHO	One Health Office (CDC)
OID	Office of Infectious Diseases (CDC)
OIE	World Organisation for Animal Health
OSELS	Office of Surveillance, Epidemiology, and Laboratory Services (CDC)
PAHO	Pan American Health Organization
PCR	Polymerase chain reaction
PEER	Partnerships for Enhanced Engagement in Research (USAID and NIH)
PEI	Polio Eradication Initiative
PFGE	Pulsed field gel electrophoresis
PI	Principle investigator
POC	Point of contact
PPHO	Prion and Public Health Office (CDC)
PRB	Poxvirus and Rabies Branch (CDC)
PVS	Performance of Veterinary Services
RDB	Respiratory Diseases Branch (CDC)
RECETA	Red Centroamericana para la Vigilancia de Enfermedades Transmitidas por Alimentos
RZB	Rickettsial Zoonoses Branch (CDC)
SARI	Severe Acute Respiratory Infections
SARS	Severe acute respiratory syndrome
TSC	Temporary Support Corps (CDC)
UNICEF	United Nations Children's Fund
UNSC	United Nations System Influenza Coordination
USAID	United States Agency for International Development
USDA	United States Department of Agriculture
USG	United States Government
ViCo	Vigilancia Comunitaria
VSPB	Viral Special Pathogens Branch (CDC)
WHO	World Health Organization

Table Definitions

Table of One Health and Zoonoses Activities at Select International Locations

Column Heading	Definition
CDC One Health POC	Does the country have a primary contact for in-country One Health and zoonotic disease projects?
National-level One Health Organization	Does the country have a government endorsed One Health Organization or maintain an ongoing agreement for collaboration between ministries?
FETP or FELTP	Does the country have a CDC-led Field Epidemiology Training Program, Field Epidemiology and Laboratory Training Program, or Epidemic Intelligence Service-like program? Refer to http://www.cdc.gov/globalhealth/fetp/ for more information.
Sources of Non-CDC Funds for Zoonoses Activities	All non-CDC funding sources for zoonotic disease programs or projects for which CDC is a collaborative partner
Diseases Addressed by CDC Zoonoses Activities	List of zoonotic diseases for which activities have taken place in-country (or with the region, if regional office), and for which CDC has been a collaborative partner
Recent Zoonotic Outbreaks (country, species)	A list of outbreaks of suspected zoonotic origin. The disease is listed. If applicable, the region where the outbreak occurred is listed. Affected species are listed in parentheses (if available).
Zoonoses Surveillance in Animals (species)	A list of diseases and syndromes with active or passive surveillance in animals, in place within the country. Surveillance may be implemented at the regionals or national level, and may be supported in-whole, in-part, or not at all by the CDC regional office. The pathogen, disease, or syndrome is listed, followed by animal species in parentheses (if available).
Zoonoses Surveillance in Humans	A list of diseases and syndromes with active or passive surveillance in humans in place within the country. Surveillance may be implemented at the regional or national level.

Country Profile Tables

Column	Definition
Project Title	Titles of projects which have been granted funding. An asterisk (*) indicates that the project is funded, but has not yet started
Pathogen	List of pathogens addressed in the project
Brief Description	Short narrative of project
Sources of Funding	List of institutions financing the project
CDC PI	Name of the CDC Principal Investigator (may be located in-country or at CDC headquarters). Email contact information for the principal investigator is listed at the end of the table.
CDC Headquarters Collaborating Programs	List of programs at CDC headquarters that are involved in the project. When applicable, Center/Division/Branch/Office is listed

Location	AHI Officer	Email Address
Bangladesh	Nord Zeidner	nord@icddrb.org ; naz2@cdc.gov
Egypt	Noha Farag	iym0@cdc.gov
Guatemala	Daniel Garcia	int7@cdc.gov
India	Shaikh Shah Hossain	vpk4@cdc.gov
Kenya	M. Kariuki Njenga	knienga@ke.cdc.gov ; byi6@cdc.gov
Nigeria	Lora Davis	DavisL@ng.cdc.gov ; bvz8@cdc.gov
Thailand	Pawin Padungtod	PawinP@th.cdc.gov
Vietnam	James Kile	KileJC@vn.cdc.gov
FAO	Jim Zingeser	james.zingeser@fao.org ; jaz1@cdc.gov