Report from the LACANET One Health Communication Workshop

18 February 2015
Phnom Penh Hotel

Project Supported by the European Union
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Summary
The LACANET One Health Surveillance and Laboratory Network project (‘LACANET’) is an EU-funded project which brings together partners in the human health, wildlife health and animal health sectors to create capacity to survey, diagnose and understand the drivers of disease at human-animal-environmental interfaces. Currently 75 per cent of emerging infectious diseases are caused by pathogens originating in animals. Zoonoses kill 2.2m people annually at significant economic expense to people’s livelihoods, the environment and the health system. Mitigating the risks of further outbreaks demands intersectoral collaboration and coordination among public health, animal health and wildlife health professionals.

The Cambodian partners to LACANET - Institut Pasteur du Cambodge (IPC), Wildlife Conservation Society (WCS) and the National Veterinary Research Institute (NaVRI) – came together in Phnom Penh on 18 February with other key players in the One Health system. The purpose of the workshop was to assess what routine mechanisms of coordination exist across the three sectors, and to identify where they may be gaps that the LACANET project could attempt to fill.

The workshop discussed lessons learned from case studies from Bolivia and the US, where intersectoral collaboration had been successful and less so, respectively. Participants then mapped current channels of communication in the Cambodian system and discussed where there was room for broadening those mechanisms. Lastly, participants conducted a simulation of a mystery disease outbreak, working in three groups representing animal-, wildlife- and human-health to investigate what capacity currently exists for an effective, cross-sectoral response.

The lessons learned from the workshop, listed below, will inform the next steps of the LACANET project:

1. Effective intersectoral communication and collaboration requires open channels of communication among the animal health, wildlife health and human health sectors.
2. Good communication among public health agencies and among public and animal health including the wildlife health sector (including zoos and those working with free-ranging animals) is essential for an effective response.
3. As is often the case strong links exist in Cambodia between the human and animal health sectors, at least in part due to the collaborative working methods developed in response to Avian influenza (AI). Draft guidelines for a joint human/animal AI investigation covering detection, communication, investigation and response have been developed by the ministries of health and agriculture, forestry and fisheries. These provide an excellent starting point for integrating the wildlife health sector into the system.
4. Those model guidelines envisage feedback of information back to the local level, but that feedback loop does not always function effectively.

5. Mortality reporting by forest ranger patrols and sampling and testing to identify pathogens circulating in wildlife is an effective strategy for early detection of new and re-emerging pathogens.

6. LACANET support for the safe storage and transportation of samples is necessary and welcomed.

7. Wildlife can act as sentinels, indicating a disease outbreak.

8. Villagers or village-based animal health volunteers can notify the District Vet or Village Chief of dead or diseased wildlife or livestock. The District Vet sends carcasses to the Provincial Vet who sends on to NaVRI. The District Vet and OAHP (animal health and production officer at the operational district level) have a direct reporting line to the Governor.

9. District and provincial level vets’ budgets for transporting samples for testing are constrained.

10. NaVRI runs phone Hotlines for the public to report animal mortality or disease. MoH (Ministry of Health) runs public health Hotlines. The LACANET project may be able to make effective use of those Hotlines.

11. Coordination at the local level is more likely to result in connections seen between animal and human illness. Some provinces have effective coordination mechanisms in place, including monthly provincial public health meetings, to which MAFF (Ministry of Agriculture, Forestry and Fisheries) is invited, and quarterly district and provincial livestock health meetings. LACANET should look to attend these meetings in Mondulkiri and Preah Vihear.

12. Managing mortality in wildlife at project sites calls for effective collaboration between FA Project Managers and their counterpart district and provincial vets.

13. Training systems and combined fieldwork foster cross-sectoral understanding and collaboration, including the applied epidemiology training and the Cambodian veterinary epidemiology training. LACANET can support that training through the sharing of technical expertise.

14. Members of the zoonotic Technical Working Group (TWG) comprise the key players in all sectors, including MAFF Department of Animal Health and Production (DAHP) and Forestry Administration (FA), MoH Communicable Disease Control (CDC), WCS, Food and Agriculture Organisation (FAO), World Health Organisation (WHO), IPC, US Centers for Disease Control and Prevention (US CDC) and the US Agency for International Development (USAID). The TWG convenes monthly or on demand to share information, plan, and provide technical input.

15. Testing is expensive so laboratories cannot continue testing indefinitely. Extensive information gathering in the field about illnesses, symptoms and pathology is critical to guide the laboratories on what to test for.
16. It would be useful for the LACANET project to undertake a costing study for a cross-sectoral response to two or three ‘model’ viruses. This would inform donor emergency funds for disease outbreaks.

**List of Acronyms and Abbreviations**

<table>
<thead>
<tr>
<th>Acronym</th>
<th>Definition</th>
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<tr>
<td>ACCB</td>
<td>Angkor Centre for Conservation and Biodiversity</td>
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<td>AI</td>
<td>Avian influenza</td>
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<tr>
<td>AD</td>
<td>Administrative District</td>
</tr>
<tr>
<td>CDC</td>
<td>Communicable Disease Control</td>
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<tr>
<td>DAHP</td>
<td>Department of Animal Health and Production</td>
</tr>
<tr>
<td>FA</td>
<td>Forestry Administration</td>
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<tr>
<td>FAO</td>
<td>Food and Agriculture Organization</td>
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<tr>
<td>IPC</td>
<td>Institut Pasteur du Cambodge</td>
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<tr>
<td>HC</td>
<td>Health Centre</td>
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<tr>
<td>LACANET</td>
<td>Lao PDR-Cambodia One Health Surveillance and Laboratory Network</td>
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<tr>
<td>NaVRI</td>
<td>National Veterinary Research Institute</td>
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<tr>
<td>NIPH</td>
<td>National Institute of Public Health</td>
</tr>
<tr>
<td>MAFF</td>
<td>Ministry of Agriculture, Forestry and Fisheries</td>
</tr>
<tr>
<td>MoH</td>
<td>Ministry of Health</td>
</tr>
<tr>
<td>OAHP</td>
<td>Operational District Animal Health and Production office</td>
</tr>
<tr>
<td>OD</td>
<td>Operational District</td>
</tr>
<tr>
<td>OIE</td>
<td>World Organisation for Animal Health</td>
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<tr>
<td>PAD</td>
<td>Provincial Animal Department</td>
</tr>
<tr>
<td>PHD</td>
<td>Provincial Health Department</td>
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<tr>
<td>PPE</td>
<td>Personal Protective Equipment</td>
</tr>
<tr>
<td>RRT</td>
<td>Rapid Response Team</td>
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<tr>
<td>SOP</td>
<td>Standard Operating Procedure</td>
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<tr>
<td>USAID</td>
<td>United States Agency for International Development</td>
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<tr>
<td>US CDC</td>
<td>United States Centres for Disease Control and Prevention</td>
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<tr>
<td>WCS</td>
<td>Wildlife Conservation Society</td>
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<td>WHO</td>
<td>World Health Organization</td>
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**Introduction to LACANET**

The LACANET One Health Surveillance and Laboratory Network project (hereinafter referred to as ‘LACANET’) is an EU-funded project which brings together partners in the human health, wildlife health and animal health sectors to create capacity to survey, diagnose and understand the drivers of disease at human-animal-environmental interfaces. In Cambodia the project partners are Institut Pasteur du Cambodge (IPC), Wildlife Conservation Society (WCS) and the National Veterinary Research Institute (NaVRI). The project aims to support a bi-national, cross-sectoral Lao PDR-Cambodia One Health Surveillance and Laboratory network, focusing on the following four strategic objectives:

1. Build capacity for surveillance and field investigations for zoonotic diseases
2. Improve laboratory capacity to detect zoonotic diseases
3. Establish a One Health surveillance and laboratory network
4. Conduct strategic research on two important drivers of disease emergence – Wildlife trade and land-use change

Currently, 75 per cent of emerging infectious diseases are caused by pathogens originating in animals. Zoonoses kill 2.2m people annually at significant expense to people’s livelihoods, the environment and the health system. Mitigating the risks of further outbreaks demands intersectoral collaboration and coordination among public health, animal health and wildlife health professionals. The ‘ideal’ approach to disease prevention and control emphasises transmission disruption, with early warning, early detection and early response for the emergence of new zoonotic diseases and the transmission of endemic zoonotic diseases. This ‘ideal’ necessitates well-functioning surveillance systems and epidemiological investigations. Early and accurate diagnosis requires well-equipped and organised laboratories in the medical and veterinary sectors. Early response means timely notification of the disease to Government, international organisations (WHO, FAO, OIE) and neighbouring countries.

**Workshop Objectives**

Effective intersectoral communication and collaboration requires open channels of communication among the animal health, wildlife health and human health sectors. It is often the case that channels of communication exist between the human and animal health sectors, but that the wildlife health sector is less well integrated into the system, despite many diseases first occurring in wildlife. Another common problem is that communication systems develop in an hierarchical and linear manner, feeding information into the human health sector with limited information feeding back to the animal and wildlife health sectors.
LACANET will support mortality reporting by forest ranger patrols and sampling and testing to identify pathogens circulating in wildlife. The purpose of this communication workshop was to assess what routine mechanisms of surveillance currently exist and how the outcomes of such reporting, sampling and testing can be best communicated to the wildlife, animal and human health sectors. The LACANET project will look to build on existing coordination mechanisms, as opposed to replicating what is already working. Similarly, where gaps do exist the aim of the workshop was to identify new initiatives which could be trialed during the life of the project.

Case Studies of Inter-Agency Collaboration: West Nile Virus Outbreak in US and 2012 Outbreak in Bolivia

Dr Amanda Fine, Associate Director-Asia, Wildlife Health and Health Policy Program, WCS, presented two case studies highlighting issues in intersectoral communication. The first revealed challenges faced by a developed country (the US) in staging an effective cross-sectoral response to a zoonotic disease outbreak, and the second demonstrated a successful response in Bolivia to yellow fever, which was originally detected by wildlife rangers.

In 1999 New York experienced its first outbreak of West Nile Virus. Initially it was misdiagnosed as the endemic St Louis Encephalitis. State authorities saw no link between the human outbreak and the sudden death of many birds in the region. The veterinary pathologist at the Bronx Zoo was convinced the human and bird outbreaks were connected and suspected a misdiagnosis. It took considerable effort on her part to find a government laboratory willing to conduct the tests needed. But once they did her suspicions were confirmed and West Nile Virus was diagnosed.

In 2012 wildlife rangers trained under a program similar to LACANET raised the alarm when five Red Howler monkey mortalities were discovered in their project area. Necropsies were conducted at the municipal zoo and yellow fever was detected, all within a matter of days. This enabled an effective and efficient public health awareness and vaccination campaign, as well as vector control, preventing any human cases.

Lessons learned from these case studies show the following:

- local disease surveillance and response is critical for identifying abnormal disease clusters;
- performing full examinations (necropsy and autopsy) is critical for accurate diagnosis – laboratory technicians need to be prepared to diagnose something new;
- individuals within the system need to know what they should report/ when/ and to whom;
- animals such as the Red Howler monkey can act as sentinels, indicating a disease outbreak; and
• good communication among public health agencies and among public and animal health including the wildlife health sector (including zoos and those working with free-ranging animals) is essential for an effective response.

Mapping Cross-Sectoral Communication

Participants formed working groups to represent diagrammatically the current communication channels that exist among the human-, animal- and wildlife-health sectors in Cambodia. The purpose of the exercise was two-fold: To identify existing channels that the LACANET project can build on; and secondly, to identify any gaps which the LACANET project could aim to fill on a trial-basis. (The full results of the exercise are attached at Appendix 4.) An interesting discussion then ensued about the systems that are currently in place, and how those are relevant to the LACANET project.

Below is a summary of the key points as they relate to LACANET:

a. Systems for human surveillance, laboratory testing, response and communication are well established in the human health sector.

b. The wildlife and animal health sectors report to the same ministry and are both supported by NaVRI’s laboratory services.

c. Wildlife rangers report wildlife mortality or illness to their FA (Forestry Administration) Project Manager via phone or a monthly report. The animal may be taken to a wildlife rescue centre eg Angkor Centre for Conservation and Biodiversity (ACCB), Phnom Tamao Zoo or WCS. Those organisations can send samples to IPC.

d. The LACANET project aims to build capacity for the safe handling of wildlife and livestock. Key sites will receive refrigeration for collection and transportation of samples. Some participants had received training the day before the workshop on sampling methods.

e. Provincial Vets have limited resources for sending samples to NaVRI. Priority is given first to outbreaks with potential risks to human health and then economic livelihoods. The LACANET project aims to raise awareness of the human health and economic benefits of responding to an outbreak in wildlife. The project will investigate some such cases so the risks and benefits can be more clearly understood.

f. Villagers or village-based animal health volunteers can notify the District Vet or Village Chief of dead or diseased wildlife or livestock. The District Vet sends carcasses to the Provincial Vet who sends on to NaVRI.

g. The District Vet and OAHP (animal health and production officer at the operational district level) have a direct reporting line to the Governor.

h. NaVRI runs phone Hotlines for the public to report animal mortality or disease. MoH runs public health Hotlines. The LACANET project may be able to make effective use of those Hotlines.
i. Sometimes there is limited incentive for a villager to report their own sick animals as they may be culled. Neighbours are known to report to prevent transmission to their own farms.

j. Some participants felt there was limited feedback to the field level, although a feedback loop is envisaged.

k. Coordination at the local level is more likely to result in connections seen between animal and human illness. Some provinces have effective coordination mechanisms in place, including monthly provincial public health meetings, to which MAFF is invited, and quarterly district and provincial livestock health meetings.

l. The wildlife health sector is not well-integrated at the field level. It should investigate participating in these provincial level coordination mechanisms.

m. Event-based responses involving the human and animal health sectors have improved, and there is close work on H5N1 and Japanese Encephalitis surveillance.

n. Detailed systems for communication between the animal and human health sectors have been developed in response to Avian influenza. These are articulated in the Draft Joint Human-Animal Avian influenza Investigation Guideline; Pilot project: Kampot and Takeo Provinces. Those draft standard operating procedures (SOP) for responding cross-sectorally to an Avian influenza outbreak offer a useful starting point for LACANET to develop a similar SOP.

o. Training systems and combined fieldwork foster cross-sectoral understanding and collaboration, including the applied epidemiology training and the Cambodian veterinary epidemiology training.

p. Members of the zoonotic Technical Working Group (TWG) comprise the key players in all sectors, including MAFF (DAHP FA), MoH (E-CDC), WCS, FAO, WHO, IPC, US CDC and USAID. The TWG convenes monthly or on demand to share information, plan, and provide technical inputs and recommendations.

q. Outside of the TWG there is limited routine sharing of information.

Simulation
Workshop participants conducted a simulation based on the detection of a mystery virus at the LACANET project sites loosely based on the Nipah virus. The objective was to generate a list of proposed procedures for improved communication and collaboration among the One Health sectors for piloting during the LACANET project. Participants formed three teams representing Wildlife Health, Human Health and Animal Health. Each team was drip fed tailored information that they needed to consider and act upon (or not) both internally as well as externally. The scenario evolved with new events requiring action from different actors within the system. Each team drew a timeline to represent the chronology of their response. (A combined timeline is included at Appendix 5.)
Below is a summary of the lessons learned during the simulation as they relate to LACANET:

**Surveillance**
- A serious outbreak is needed to warrant enhanced human surveillance, or alternatively a strong connection to animal illness. Ten people sick in the same village may constitute a threshold, but there is no rule of thumb.
- This highlights the importance of local level coordination mechanisms as the local officers are better placed to draw a connection between animal and human outbreaks.
- Trained patrol teams can take samples. If untrained or unsure they will contact the FA Project Manager and other technical people to seek guidance. The FA Project Manager coordinates with the district and provincial vets to determine what response is required, for example, quarantine or culling. At that stage the FA Project Manager is likely to be in contact with other specialist agencies as well- ACCB, Phnom Tamao or WCS.

**Laboratory**
- Testing is expensive so NaVRI is not likely to continue testing indefinitely. That is why it is important to get as much information as possible from people in the field about illnesses, symptoms and pathology. This guides the laboratories on what to test for.
- As soon as the animal health sector notified the human health sector that it suspected nipah virus, then the human health sector could justify broadening its laboratory tests.

**Response**
- An effective response at the site level calls for collaboration between FA Project Managers and the district and provincial vet services in managing mortality in wildlife.
- Realistically a joint sectoral meeting would have been organised to mobilise a joint investigation as soon as the nipah hypothesis was formulated. A joint investigation team would conduct contact tracing, instigate control measures and feed back to those at risk including the wildlife patrol teams.

**Communication**
- There was good communication between the animal and human health sectors, as a result of the joint investigations fielded for avian influenza. There was less contact with wildlife. There was also limited feedback to the wildlife sector.
- FA Project Managers are the focal point for any outbreak within their project site. Outside of that project site it is beyond their control. This is the reason for piloting
LACANET inside those landscapes where there is more capacity. Hopefully with time this can expand into other areas.

- Patrol teams can disseminate information to communities and erect warning signs. FA Project Managers can request authority to protect an area and for eg, prohibit transport of livestock. For this they require information related to the disease including how it is transmitted to humans.
- The FA Project Manager alerted the animal health sector to problems via the Hotline which worked well.
- The TWG disseminates information about the risk through their contact points.
- Monthly local level coordination mechanisms, which are sponsored by the EU, are effective for local communication. It is important that LACANET builds on existing mechanisms so the project should look to attend the provincial public health monthly meetings and the quarterly district and provincial livestock meetings in Mondulkiri and Preah Vihear.

**Cost**

- It would be useful for the LACANET project to undertake a costing study for a cross-sectoral response to two or three ‘model’ viruses. This would inform donor budgeting exercises for setting aside emergency funds for disease outbreaks.

**Lessons Learned for LACANET**

The objective of this workshop was to gain a better understanding of how One Health communication works in Cambodia, and how the LACANET project can support and strengthen those coordination mechanisms. The lessons learned from the workshop, listed below, will inform the next steps of the project.

1. Effective intersectoral communication and collaboration requires open channels of communication among the animal health, wildlife health and human health sectors.
2. Good communication among public health agencies and among public and animal health including the wildlife health sector (including zoos and those working with free-ranging animals) is essential for an effective response.
3. As is often the case strong links exist in Cambodia between the human and animal health sectors, at least in part due to the collaborative working methods developed in response to avian influenza (AI). Draft guidelines for a joint human/animal AI investigation covering detection, communication, investigation and response have been developed by the ministries of health and agriculture, forestry and fisheries which provide an excellent starting point for integrating the wildlife health sector into the system.
4. Those model guidelines envisage feedback of information back to the local level, but that feedback loop does not always function effectively.

5. Mortality reporting by forest ranger patrols and sampling and testing to identify pathogens circulating in wildlife is an effective strategy for early detection of new and re-emerging pathogens.

6. LACANET support for the safe storage and transportation of samples is necessary and welcomed.

7. District and provincial level vets at times lack the budget to send samples for testing.

8. Wildlife can act as sentinels, indicating a disease outbreak.

9. Villagers or village-based animal health volunteers can notify the District Vet or Village Chief of dead or diseased wildlife or livestock. The District Vet sends carcasses to the Provincial Vet who sends on to NaVRI. The District Vet and OAHP (animal health and production officer at the operational district level) have a direct reporting line to the Governor.

10. NaVRI runs phone Hotlines for the public to report animal mortality or disease. MoH runs public health Hotlines. The LACANET project may be able to make effective use of those Hotlines.

11. Coordination at the local level is more likely to result in connections seen between animal and human illness. Some provinces have effective coordination mechanisms in place, including monthly provincial public health meetings, to which MAFF is invited, and quarterly district and provincial livestock health meetings. LACANET should look to attend the provincial public health monthly meetings and the quarterly district and provincial livestock meetings in Mondulkiri and Preah Vihear.

12. Managing mortality in wildlife in project sites calls for effective collaboration between FA Project Managers and their counterpart district and provincial vets.

13. Training systems and combined fieldwork foster cross-sectoral understanding and collaboration, including the applied epidemiology training and the Cambodian veterinary epidemiology training. LACANET can support that training through the sharing of technical expertise.

14. Members of the zoonotic Technical Working Group (TWG) comprise the key players in all sectors, including MAFF (DAHP FA), MoH (E-CDC), WCS, FAO, WHO, IPC, US CDC and USAID. The TWG convenes monthly or on demand to share information, plan, and provide technical inputs and recommendations.

15. Testing is expensive so laboratories cannot continue testing indefinitely. That is why it is important to get as much information as possible from people in the field about illnesses, symptoms and pathology. This guides the laboratories on what to test for.

16. It would be useful for the LACANET project to undertake a costing study for a cross-sectoral response to two or three ‘model’ viruses. This would inform donor budgeting exercises for setting aside emergency funds for disease outbreaks.
Conclusion

Participants were very positive about the usefulness of the workshop, especially the practical application of the simulation. There was some concern that the simulation represented more the ‘ideal’, rather than the reality. Participants felt that it would be useful to conduct a similar exercise at the provincial level as many of the key actors were located there. Participants realised that regardless of how good the ‘system’, the most important aspect of any coordination mechanism was to have good relationships in place so future meetings should consider allowing more time for getting to know one another.

In response, the project leaders noted that this was just the beginning of the process. They were committed to continue the training to ensure that any systems established during LACANET were sustainable. They noted that the workshop had revealed some solid links between the animal and human health sectors, and they hoped this workshop had contributed to the greater inclusion of wildlife health in a One Health approach. They thanked all participants for their active participation at the workshop, and thanked the EU for their generous support and funding. As the next step, they would disseminate the findings of the workshop, including via the zoonotic TWG, and seek feedback from the different ministries and agencies involved.
Appendix 1: 'One Health and the LACANET Project,' Presentation by Dr Paul Horwood, Coordinator of LACANET Project, Institut Pasteur du Cambodge

One-Health and the LACANET Project

Development of a Lao PDR-Cambodia One Health Surveillance and Laboratory Network

LACANET One-Health Communication Workshop 18th February 2015, Phnom Penh, Cambodia

Dr Paul Horwood
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Institut Pasteur du Cambodge
Phnom Penh, Cambodia

LACANET - One Health Surveillance and Laboratory Network

‘One-Health’ concept

• Definitions for One-Health:
  - "Strategy for expanding interdisciplin ary collaborations and communications in all aspects of health care for humans, animals and the environment"
  - "The collaborative effort of multiple disciplines working locally, nationally, regionally and globally to promote optimal health of humans, animals and the environment"
  - "The One-Health concept encourages the collaborative efforts of multiple disciplines working locally, nationally, and globally, to attain optimal health for people, animals, and our environment"

• The triad of One-Health
  - Human health
  - Veterinary health
  - Wildlife/environmental health

LACANET - One Health Surveillance and Laboratory Network

One-Health challenges

• The support for One-Health activities varies greatly between the 3 sectors
• Different priorities of the 3 One-Health sectors
• Importance of OH is not recognized by all stakeholders and varying support for implementation
• Managing trans-sectoral collaboration and coordination is a challenge
  – Scientific evidence especially those related to emerging diseases is not available to support decision making and to implement One-Health

Communication in One-Health

Outbreaks of disease in domestic animals

Wildlife mortalities

Does disease risk to farmers and ranchers

Human health sector

Wildlife health sector

Animal health sector

LACANET - One Health Surveillance and Laboratory Network
Zoonotic diseases

- More than 75% of emerging infectious diseases are caused by pathogens which originated in animals
- More than 60% of human infectious diseases have a known zoonotic origin

<table>
<thead>
<tr>
<th>Disease</th>
<th>Pathogen</th>
<th>Likely Source</th>
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<tr>
<td>Diphtheria</td>
<td>C. diptheriae</td>
<td>Domestic herbivores</td>
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<tr>
<td>Ebola</td>
<td>Marburg virus</td>
<td>Domestic carnivores [90 AD]</td>
</tr>
<tr>
<td>SARS</td>
<td>CoV</td>
<td>Chimpanzees [1960 AD]</td>
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<tr>
<td>Dengue</td>
<td>Dengue virus</td>
<td>Primates (1800 AD)</td>
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<tr>
<td>Malaria</td>
<td>Plasmodium</td>
<td>Birds (1900 AD)</td>
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<td>Foot-and-mouth</td>
<td>Domestic cattle</td>
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<tr>
<td>Swine fever</td>
<td>Porcine</td>
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<tr>
<td>Influenza</td>
<td>Influenza virus</td>
<td>Aterfowl (1968, 2009)</td>
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Emergence of zoonotic diseases

- Factors leading to the emergence of zoonotic diseases in Southeast Asia
  - Close contact between humans and livestock
  - Richness of wildlife species
  - Live animal trade
  - Habitat destruction
  - Increased international travel
  - Warm and humid climate (climate change?)

Causal factors of disease emergence

- The emergence and exposure to zoonotic diseases is closely connected between the three sectors of One-Health
- Multi-sectoral collaboration is needed to address this issue

Emerging (outbreak) zoonotic diseases

- HIV
- Ebola
- Bird flu (H5N1, H7N9)
- SARS/MERS Coronavirus
- Nipah/Hendra virus
- BSE - ‘mad cow disease’
- West Nile virus

Emerging zoonotic diseases

<table>
<thead>
<tr>
<th>Episode</th>
<th>Human cases</th>
<th>Human Deaths</th>
<th>Estimated Cost (billion USD)</th>
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<tbody>
<tr>
<td>Nipah (Malaysia)</td>
<td>276</td>
<td>106</td>
<td>0.7</td>
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<tr>
<td>SARS-CoV</td>
<td>8,422</td>
<td>916</td>
<td>40</td>
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<tr>
<td>A/H5N1</td>
<td>650</td>
<td>386</td>
<td>20</td>
</tr>
<tr>
<td>Ebola</td>
<td>&gt;22,000</td>
<td>&gt;9,000</td>
<td>&gt;2</td>
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</tbody>
</table>

Sources: World Bank, 2012; International Livestock Research Institute (ILRI), 2014; Reuters, 2015
Endemic zoonotic diseases

- Leptospirosis
- Parasitic zoonoses (e.g. Trichinosis)
- Anthrax
- Brucellosis
- Japanese encephalitis
- Rabies
- Scrub typhus

Important measures to prevent/mitigate zoonotic disease outbreaks

- Intersectorial collaboration/coordination among public health, animal health and wildlife health professionals
- Well functioning surveillance systems and epidemiological investigations
- Early and correct diagnosis supported through well equipped and organised laboratories in the medical and veterinary sectors
- Early notification of the disease to Government, international organisations (WHO, FAO, OIE) and neighbouring countries

Drivers of zoonotic disease emergence and transmission

- The interface between human, animal and wildlife interaction is seen as ‘key’ to zoonotic disease emergence
  - growth in human and livestock populations
  - rapid urbanization
  - rapidly changing farming systems
  - closer integration between livestock and wildlife
  - forest encroachment
  - globalization in human and animal movements

The ‘cost’ of zoonotic diseases

- Zoonotic diseases cost $6.7 billion USD per year.
  - Every year, zoonoses:
    - Affect 2.4 billion people
    - Kill 1.1 million people
    - Affect > 1 in 7 livestock animals
    - Cost $9 billion USD in lost productivity
    - Cost $23 billion USD in animal mortality
    - Cost $50 billion in human health
    - 'Prevention is cheaper than cure'.
  - Control of diseases at an ecosystem source is cost beneficial in terms of the economy and livelihoods

One-Health response to zoonoses

- The ‘ideal’ approach to disease prevention and control emphasizes transmission disruption; with early warning, early detection and early response mechanisms for the emergence of new zoonotic diseases and the transmission of endemic zoonotic diseases
- To effectively deal with zoonotic disease transmission we must understand the drivers of new disease emergence

LACANET One-Health Project

Development of a Lao PDR-Cambodia One Health Surveillance and Laboratory Network
Core partners

Cambodia

Human Health

Lao PDR

Wildlife Health

Animal Health

Project Overview

The Overall Objective of the project is:
To create capacity to survey, diagnose, and understand the drivers of the re-emerging of disease at human-animal-environment interfaces, through a bi-national, cross-sectoral Lao PDR-Cambodia One Health Surveillance and Laboratory Network

OBJECTIVE 1 - Build capacity for surveillance and field investigations for zoonotic diseases

- Training of national and provincial staff to improve surveillance competencies
  - Sample collection, storage and shipping (use of PPE)
  - Disease “hotspot” identification
  - Wildlife identification
  - Wildlife mortality recording (rangers)

OBJECTIVE 2 - Improve the laboratory capacity to detect zoonotic diseases

Training of laboratory staff from NAHL (Laos) and NaVRI (Cambodia)
- PCR and serology to detect regional priority pathogens
- Database management skills
- Biosecurity/biosafety training

OBJECTIVE 3 - Establish a One-Health surveillance and laboratory network

- Gap analysis of One Health national and regional communication
- Improved cross-sectoral and regional knowledge sharing
  - Workshops and meetings
  - An online One-Health communication tool
- Passive surveillance and outbreak response

OBJECTIVE 4 - Strategic research on two important drivers of disease emergence (Wildlife trade and Land-use change)

- Generate data to:
  - refine protocols, procedures and tools for carrying out surveillance and analysis of disease outbreaks
  - undertake risk assessments of wildlife trade and land use change
  - increase understanding of the epidemiology of these important, and often neglected, pathogens
Drivers of disease emergence

- Wildlife trade study (Laos)
  - Sampling in market/trade sites where there is a variety of wildlife (potential hotspots)
  - Samples will be tested at the national veterinary laboratories for zoonotic pathogens
  - Sampling of wildlife and traders
  - Peri-market rats and pigs
    - High risk of disease ‘spill-over’

Acknowledgements

- Thank you all for coming

- Thank you to the European Union for funding this workshop and the project

Land-use change study (Cambodia)

- Land-use change is recognized as an important driver of zoonotic disease emergence
- The study will be conducted in at least 8 sites
  - 3 zones in each site
  - Flora and fauna surveys in all zones
  - Changes in vector distribution, exposure to wildlife, rodent distributions and water distribution
- GIS and satellite mapping and on-the-ground assessments of the sites to characterize land use and disturbance
- Samples collected from:
  - Rodents
  - Mosquitoes and ectoparasites
  - Pigs and other domestic animals
  - Humans (febrile illness study at subset of sites)
Wildlife disease surveillance

What's in common?
Related to wildlife

Wildlife disease surveillance allows to:
- Monitor consequences on wildlife
- Prevent consequences on humans (and livestock)

2 targets for wildlife surveillance:
- Mortality
  - What is the usual mortality?
  - When is it increased?
- Pathogen circulation
  - What pathogens are circulating?
  - What risk for wildlife, humans, and livestock?

Wildlife sampling strategy
Strategy for wildlife disease surveillance

• 2 important observations:
  - Setting up routine mechanisms of surveillance of wildlife
  - Insuring efficient communication of surveillance outcomes between wildlife health, livestock health and human health
  - Mapping communication channels between sectors and between levels within sectors
  - Part of a more general strategy
  - Workshop will contribute to these objectives
  - LACANET can be a pilot

Workshop Objective

Overall objectives

Workshop objectives

• Cross-sectorial communication happens between institutions...
  - ... but primarily between people of these institutions
  - Opportunity to get to know each other
  - Workshop contains:
    - Reflection about institutions
    - Exercises at the individual level
Workshop agenda

- Exercise to initiate inter-personal discussions, and in particular see what we all have in common
- West Nile virus outbreak in the US: motivating example
- Outbreak scenario simulation in Cambodia
- Lunch break
- Scenario debrief and mapping of cross-sectorial communication now and in the future
West Nile Virus Emergence in North America: A Case Study of Inter-agency Collaboration

Amanda E. Fine, VMD, PhD
Wildlife Conservation Society

Outline

- West Nile virus
- The outbreak (timing & events)
- Cracking the case (the diagnosis)
- Lessons learned
- A recent example
- Additional studies

West Nile virus

- Identified in West Nile, Uganda (1937)
- Africa, West Asia, and Middle East (occasional epidemics in Europe)
- Most people infected with WNV have no symptoms (1 of 5 have febrile illness)
- <1% have serious (sometimes fatal) neurologic disease

Arbovirus belonging to the genus Flavivirus

The beginning: suspicious human illness...

- Late August 1999, 6 people admitted to a community hospital in Queens, N.Y. all with:
  - High fever
  - Altered mental status
  - Headache
  - Unusual muscle weakness
  - Suspected encephalitis or meningitis
- Within 3 weeks, 3 elderly patients had died.

The beginning: suspicious human illness...

- September 3, 1999
  - Blood and spinal fluid from hospitalized patients tested at CDC and NY State Lab → rapid tests
  - CDC announces: positive for St. Louis encephalitis

Doctors are unable to find a clear cause or an effective treatment

An infectious disease specialist reports the cluster of cases to:

- New York City Department of Health
- Request HELP from:
  - State Health Department
  - US Centers for Disease Control (CDC)
Looking back, suspicious wild animal illness...

- In late June a Queens, NY veterinary clinic had received several wild birds with nervous system disorders
- Citizen reports of dead birds to local authorities increased through July and into August.

Meanwhile, suspicious zoo animal illness...

- August through September 1999, exotic birds began dying at the WCS Bronx & Queens Zoos in New York
- Over one weekend, the zoo lost:
  - 1 Guanay Cormorant
  - 3 Chilean flamingos
  - 1 Asian pheasant
  - 1 bald eagle
- Zoo keepers report that “birds seem to be dropping out of the sky”

Meanwhile, suspicious zoo animal illness...

- 10 Aug. to 23 Sept. 1999: 27 birds (8 orders, 14 species) die at the Bronx and Queens Zoos
- Primary clinical signs = neurologic disease
  - Ataxia, tremors, abnormal head posture, circling or convulsions
  - Weakness, sternal recumbency, easily caught
- Necropsy Exams
  - Severe pathologic changes in multiple tissues including central nervous system
  - Samples collected: blood, tissues in formalin and frozen and stored at -80 °C

Looking back, suspicious wild animal illness...

- By mid-August dead birds (at least 40) were submitted to the wildlife pathologist at the New York State Department of Environmental Conservation
- No clear cause of death was identified
- Initially no further action
Zoo Animal Disease Investigation

- Convinced the human and bird outbreaks were linked
- And suspected the initial diagnosis of SLE virus was wrong
  - All birds affected were species native to the Western Hemisphere
  - SLE virus infection = no clinical signs

Tracey McNamara
Veterinary Pathologist
Bronx Zoo

Cracking the Case

- Department of Agriculture’s National Veterinary Services Laboratory & USGS
  - Flavivirus detected
  - Biosafety Level 3 required so CDC contacted
- US Army Medical Research Center
  - Provided mobile BSL3 to Bronx Zoo
  - Diagnostic support

HELP!

- US CDC – still convinced outbreaks are not linked “because birds don’t die of SLE virus infection”
- Zoo veterinarians coordinate with state wildlife pathologist and submit samples to Federal Veterinary Laboratories

Tracey McNamara
Veterinary Pathologist
Bronx Zoo
Cracking the Case: West Nile Virus (WN-NY99) Confirmed

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<thead>
<tr>
<th># Birds</th>
<th>Species</th>
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<tr>
<td>8</td>
<td>Crows, magpie</td>
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<tr>
<td>6</td>
<td>Flamingo,* night heron</td>
</tr>
<tr>
<td>3</td>
<td>Cormorants*</td>
</tr>
<tr>
<td>3</td>
<td>Gulls</td>
</tr>
<tr>
<td>2</td>
<td>Pheasants, tragopan</td>
</tr>
<tr>
<td>1</td>
<td>Bald eagle</td>
</tr>
<tr>
<td>1</td>
<td>Owl</td>
</tr>
</tbody>
</table>

*Near threatened

West Nile Virus Confirmed in Birds & Humans

Lessons Learned

- Local disease surveillance and response system is critical
  - Identifying abnormal disease clusters
  - Performing full examinations (autopsy/necropsy)

Lessons Learned

- Uncertainty existed about WHAT to Report, WHEN to Report and to WHOM
  - Better communication among public health agencies
  - Links between public and animal health agencies are becoming more important
    - Domestic animals
    - Wildlife (Zoo and Free-Ranging)

Lessons Learned

- Laboratory capacity and improvement of linkages among laboratories are needed
  - “Expect the Unexpected”
  - Veterinary laboratories did not have the antigen to test for West Nile virus
  - CDC did not initially test for West Nile virus because it had never before been seen in the Western Hemisphere.
A “One Health” Author List

Origin of the West Nile Virus Responsible for an Outbreak of Encephalitis in the Northeastern United States


LACANET - One Health Surveillance and Laboratory Network

A westward spreading “wave” of cases, driven by wild bird migration

2012 outbreak in Bolivia

Wildlife Refuge Park “Ambue Ari”

WCS/PREDICT coordinates outbreak response.

March 29, Dr. Erika Alandia, Fabiola Suárez (WCS/PREDICT) + Rodolfo Nallar (WCS) + Jose Vargas (Zoo) necropsy 2 dead monkeys at Municipal Zoo “Vesty Pakos” (La Paz).

LACANET - One Health Surveillance and Laboratory Network
2012 outbreak in Bolivia

Post-mortem findings included jaundice and numerous small hemorrhages found on liver.

Samples sent for PCR analysis (flavivirus and arenavirus testing).

LACANET - One Health Surveillance and Laboratory Network

2012 outbreak in Bolivia

April 4 - laboratory PCR confirmation that samples are positive for flavivirus.

National crime lab later ran sequencing to confirm yellow fever and to determine specific strains.

LACANET - One Health Surveillance and Laboratory Network

2012 outbreak in Bolivia

April 5 - Notification of health authorities (MOH & PAHO).

WCS/PREDICT responsible for outbreak investigation.

April 7 - public health vaccination, education, vector control campaign launched.

LACANET - One Health Surveillance and Laboratory Network

Impact

Humans:

- 8 days between onset and gov’t notification
- Preventative measures = no human cases

NHPs:

- Reinforced alliances of conservation and human health partners and One Health approach
- Appears to be 1st description of Yellow Fever in Bolivian monkeys
- Builds support for howler conservation efforts – e.g. “Protect our Guardian Angels”
- Prevent/mitigate harmful environmental transformations (e.g. deforestation and agricultural development)

LACANET - One Health Surveillance and Laboratory Network

Acknowledgements

- USAID Emerging Pandemic Threats – PREDICT project
- WCS Team (Erika A. Robles, Fabiola Suárez, Rudolfo Nahí, Alberto Pérez & Marcela M. Urbar)
- Institute of Molecular Biology, University of San Andres (Rosario Rivera & Volga Iñiguez)
- Andean At/WSF-99 Rezcue Center and Ambue Ari Wildlife Rescue Center
- Comunidad Inti Wara Yassi (Sandro Vargas, Luis Morales, Regina Balcazar and Verónica Gómez)
- Vesty Pakos Zoo (Jose Vargas, Mariana Daza & Fidel Fernandez)
- Instituto de Inves Cientifico de la Universidad Policial (Daniela Arteaga & Rudy Luna)
- Bolivian Ministry of Public Health
- PAHO Bolivia

LACANET - One Health Surveillance and Laboratory Network
### Appendix 4: Results of Mapping Cross-sectoral Communication Exercise

#### Group One

<table>
<thead>
<tr>
<th>Human Surveillance</th>
<th>Animal Surveillance</th>
<th>Wildlife Surveillance</th>
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</thead>
<tbody>
<tr>
<td>CamEwarn (syndromic surveillance) incl zero-based reporting</td>
<td>MAFF/DAHP Ministry of Agriculture, Forestry and Fisheries (Department of Animal Health and Production)/NaVRI</td>
<td>MAFF/DAHP/NaVRI/I PC/FA Zoos</td>
</tr>
<tr>
<td>Event-based Sentinel surveillance</td>
<td>Live Bird Markets/ farm/ village District vets</td>
<td></td>
</tr>
<tr>
<td>OD (operational district offices) PHD (provincial health director) National (health centre and hospitals) MoH</td>
<td>OAHP (provincial office of animal health and production)</td>
<td></td>
</tr>
<tr>
<td>CNM (National Centre for Parasitology, Entomology and Malaria Control)/CDC (Communicable Disease Control) Work with Animal sectors on H5N1 and JE incl pig surveillance</td>
<td>Work with Health sectors on H5N1 and JE incl pig surveillance</td>
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</tr>
<tr>
<td>Laboratory</td>
<td>Laboratory</td>
<td>Laboratory</td>
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<tr>
<td>IPC, NIPH AFRIMS (Armed Forces Research Institute of Medical Sciences), NAMRU-2 (Naval Medical Research Unit 2)</td>
<td>NaVRI Hotlines 012 833795 FREE 012214970 1287/1289 RRVET</td>
<td>NaVRI</td>
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<tr>
<td>Response</td>
<td>Communication</td>
<td>Communication</td>
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<tr>
<td>RRTs</td>
<td>MAFF works with MoH AET work with CAVET across animal and wildlife</td>
<td>AET work with CAVET across animal and wildlife</td>
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<td></td>
<td>Zoonotic TWG</td>
<td>Zoonotic TWG</td>
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<tr>
<td></td>
<td></td>
<td>WAHIS-Wild: OIE (World Organisation for Animal Health)</td>
</tr>
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</table>
**Group Two**

Wildlife mortality or illness- ranger takes animal to ACCB, Phnom Tamao or WCS, which sends sample to IPC; ranger informs site manager by phone for every mortality or via the monthly report.

Dead wildlife or livestock mortality or disease - Villagers notify District Vet. District Vet sends carcasses to Provincial Vet who sends on to NaVRI. There is limited feedback to the district level. The provincial vet is invited to attend the Provincial Public Health monthly meetings. Quarterly District and Provincial Livestock Health meetings are held. (Mathieu’s team)

**Group Three**

<table>
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<tr>
<th></th>
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</thead>
<tbody>
<tr>
<td>MAFF (DAHP FA)</td>
<td>Share information on zoonotic diseases</td>
<td>Email, phone, fax</td>
<td>To monitor and control response, prevent zoonotic diseases and enhance cross sectoral coordination (Animal, human, wildlife)</td>
</tr>
<tr>
<td>MoH (E-CDC)</td>
<td>Update activities</td>
<td>Geo-chat (SMS) TWG (outbreak) (MAFF, MOH, IPC, FAO, WHO)</td>
<td></td>
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<tr>
<td>WCS</td>
<td>Planning</td>
<td>Interministerial committee and provincial committee</td>
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<tr>
<td>FAO</td>
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<td></td>
<td></td>
</tr>
<tr>
<td>WHO</td>
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<tr>
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<td></td>
<td></td>
</tr>
<tr>
<td>OIE</td>
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</table>
Appendix 5: Combined Timeline: Results of Simulation Exercise

Nipah Virus Outbreak

10 piglets dead. Owner/villager reports to NaVRI/DV/DAHPO

2 pigs dead Preah Vihear. Take sample. Bury corpse. Report to PM. PM to ACCB.

Ranger sick. Send to hospital. Report to Project Director. Rec family health check. Report to lab/prov health/OD. PM reports to MAFF.

Propose awareness campaign.

Pigs, poultry, ducks. Call chief of PAHPO. DV to check with VAHW/VC. Meets owner.

PV informs PAHPO, informs PDA. DV collects sample, supported by PAHPO. Sample to NaVRI.

NaVRI tests PRRS/CSF/Pasteurellosis. Farm report 2 cows/1 goat dead. Need more info, incl carcass disposal. Wildlife ranger calls - 1 wild pig dead (from 18 Feb).

NaVRI receives report. NaVRI receives samples and process testing (NV). NaVRI collects and send samples to lab.

NaVRI collects and send samples to lab.

PV informs PAHPO, informs PDA. DV collects sample, supported by PAHPO. Sample to NaVRI.

PV reports to MAFF.


2 nurses symptoms similar to village. Samples collected by central epi team. Decide if need to do study. Sent to NPH.

Tests for PRRS and CSF are negative with some growth for 1 culture. Results to network. Collect feed and water samples. Need info on human cases and lab results.

RRT deployed. Line listing and finding information. Risk assessment at local level and decide team (investigation).

Central epi team deployed. Samples arrive NIPH.

Samples rec'd from NaVRI, which suspects NIPAH. Flu and RSV neg.

Preliminary epi findings. Incr resp cases (25%). Pig farmers 5x more likely to be sick incl 3 deaths.

Prioritizes epi findings. Incrresp cases (25%). Pig farmers more likely to be sick incl 3 deaths.

PV collects sample. Bury corpse. Report to PM. PM to ACCB.

PV calls chief of PAHPO. DV to check with VAHW/VC. Meets owner.

PV informs PAHPO, informs PDA. DV collects sample, supported by PAHPO. Sample to NaVRI.

PV reports to MAFF.

PV informs PAHPO, informs PDA. DV collects sample, supported by PAHPO. Sample to NaVRI.

PV reports to MAFF.

10 villagers sick with resp illness. 2 die. Health centre reports event to ph - PHD to Central to WHO. Central deploys RRT. Collects samples (NP swabs). NIPH test for Nipah pathogens, RSV etc.

PV informs PAHPO, informs PDA. DV collects sample, supported by PAHPO. Sample to NaVRI.

PV reports to MAFF.

PV informs PAHPO, informs PDA. DV collects sample, supported by PAHPO. Sample to NaVRI.

PV collects sample. Bury corpse. Report to PM. PM to ACCB.

PV calls chief of PAHPO. DV to check with VAHW/VC. Meets owner.

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PV reports to MAFF.

PV informs PAHPO, informs PDA. DV collects sample, supported by PAHPO. Sample to NaVRI.

PV reports to MAFF.
Appendix 6: Workshop Outline

LACANET One Health Project, Communications Workshop Outline

Venue: Phnom Penh Hotel, #53 Monivong Boulevard
Date: Wednesday 18 February, 2015

0800-0830: Registration

0830-0920: Introduction to LACANET and the workshop by Project Leads:
  • Dr Paul Horwood, Deputy-Head of Virology Unit, Institut Pasteur in Cambodia
  • Dr Mathieu Pruvot, Veterinary Epidemiologist, Wildlife Conservation Society, Cambodia and Laos

0920-0945: Coffee break

0945-1015: Introductions

1015-1115: Case Study of Inter-agency Collaboration, West Nile Outbreak
  • Presenter: Dr Amanda Fine, Associate Director-Asia, Wildlife Health and Health Policy Program, Wildlife Conservation Society

1115-1230: Mapping current cross-sectoral communication

1230-1400: Lunch break

1400-1530: Simulation exercise

1530-1600: Coffee break

1600-1700: Lessons learned from simulation exercise and wrap up
### Appendix 7: List of Workshop Participants

<table>
<thead>
<tr>
<th>Title</th>
<th>Name of Participant</th>
<th>Institution</th>
<th>Email</th>
<th>Mobile phone</th>
</tr>
</thead>
<tbody>
<tr>
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<td>017464663</td>
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