

STRATEGIC MULTILATERAL DIALOGUE ON BIOSECURITY

UPMC CENTER FOR HEALTH SECURITY



Report on the second dialogue session held between the
United States, Singapore, Malaysia, and Indonesia

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Executive Summary

Southeast Asia is a region of strategic importance to the United States. The Obama administration has endeavored to strengthen ties in the region, formally announcing a “strategic pivot” to East Asia in its foreign engagement priorities in 2011.¹ Within the region, Singapore, Malaysia, and Indonesia have emerged as strong partners to the US in efforts spanning trade, diplomacy, and defense. These countries also share concerns about biological threats, particularly in light of recent high rates of human migration, climate changes, as well as growing terrorist activity in the region.

In recognition of these worrisome trends, the UPMC Center for Health Security (UPMC) initiated the first-of-its-kind Track II multilateral biosecurity dialogue in 2015, with delegations from Singapore, Malaysia, Indonesia and the US. The dialogue builds upon a bilateral biosecurity dialogue UPMC led between the US and Singapore in 2014. The effort has been supported by the Project on Advanced Systems and Concepts for Countering WMD and sponsored by the US Defense Threat Reduction Agency. The most recent multilateral dialogue session took place in Kuala Lumpur, Malaysia on December 2-3, 2015. The meeting consisted of four plenary sessions, followed by a tabletop exercise examining state and regional responses to an unusual and large outbreak of Nipah virus in Southeast Asia.

Dialogue participants shared perspectives on the biosecurity challenges facing their nations, and discussed areas in need of progress. The following are high-level findings from the meeting:

1. Participants expressed heightened concerns about threats related to diversion of pathogens from biological laboratories and dual use science.

Attendees agreed that the safe transportation of toxic agents and the security of labs are tremendously important, considering that different terrorist groups, including ISIL, have demonstrated an interest in biological weapons. Of particular concern to the group is the potential for radicalization of scientists with access to pathogens categorized as select agents, as well as other high-consequence pathogens. Many Southeast Asian participants noted that the importance of rigorous laboratory security and issues around dual use science are not well understood at senior levels and therefore not a high enough priority in some countries. In Indonesia, personnel reliability measures have been applied in large national labs, but have not been systematically implemented in provincial labs. Malaysia does not have personnel reliability programs per se. While all four countries do some amount of screening of lab personnel, it was acknowledged that such measures may not be foolproof. Additionally, while there are more systematic programs in the US and Singapore, there are questions about how to evaluate the effectiveness of those programs in reducing insider threats.

2. Coordinating defense, health, science, police, and intelligence sector roles in responding to biological threats remains a significant hurdle.

Nations are faced with a complex array of naturally occurring, accidental, and intentional biological threats which ideally require a harmonized response from the health, science, and national security communities. However, participants reported challenges in facilitating essential collaboration during biosecurity emergencies. In Malaysia, for example, the Ministry of Health assumes responsibility for mitigating the health consequences associated with biosecurity emergencies but the country’s police, military, and National Security Council are not very engaged. One Malaysian participant suggested that a national policy on biosecurity in Malaysia would be desirable because it could promote a multi-sectoral approach. Conversely, the Ministry of Defense leads defense and biosecurity efforts in Indonesia, while their MOH

plays a more peripheral role, offering technical expertise when requested. Meanwhile, the US biosecurity enterprise also faces obstacles in integrating public health and security capabilities. Due to its size, Singapore seems to benefit from a more harmonized approach to biosecurity across various ministries, although close coordination presents regular challenges.

- 3. Information on biological threats is shared through informal channels within the Southeast Asian region, but there is little official coordination on biosecurity matters on a regional level.**
Several participants expressed frustration that while their nations have put forward commitments to improve detection and response to a range of infectious disease threats, there is no formal and coordinated framework that links the *national* efforts in Southeast Asian countries to prevent and combat biological threats into a *regional* approach. Many of the countries in the region are participants in the Global Health Security Agenda, an indicator of their national commitments on these issues, but thus far the GHSA has not focused on regional preparedness benchmarks. Attendees discussed the Association of Southeast Asian Nations as a potential forum for coordinating regional work, but reported that other states have not contributed to conversations around global health security issues at ASEAN meetings. Regional coordination continues to be a clear “next step” for biosecurity preparedness in the region but without an implementation framework.
- 4. Nations share technical challenges towards early warning and response to biological threats.**
Participants underscored the importance of early-warning surveillance systems to detect and prepare for biological threats, and discussed their strategies for tracking pathogens and disease. The US delegation addressed the merits and shortcomings of BioWatch, monitoring social media and search engine queries, reviewing electronic health records for emergent health trends, and tracking purchases of over-the-counter remedies. The Singaporean and Indonesian delegations described their systems for infectious disease surveillance, including, respectively, fever screenings at border checkpoints and a national network of reference laboratories for diagnosing highly prevalent diseases. Malaysia relies on lab-based surveillance networks, including one dedicated system for influenza and another for flaviviruses (e.g. dengue, West Nile, Zika, yellow fever). Despite the diversity of national systems used to track biological threats, participants agreed that the real warning systems for urgent threats are astute practitioners at the frontlines, and that equipping those practitioners with reliable tools – such as point-of-care diagnostics and user-friendly electronic health records– is the best way to ensure rapid detection of potentially destabilizing infectious diseases.

At the conclusion of the meeting, the Southeast Asian participants conveyed their support for the dialogue and reported that their respective governments find it a valuable tool for exchange of views on biological threats. The Minister of Health from Malaysia expressed his support by personally attending the formal dinner of dialogue participants in Kuala Lumpur. Indonesian participants confirmed that they have personally briefed their Minister of Defense about the dialogue. In addition, they provided reports about the dialogue to 11 other Ministers. The Permanent Secretaries of the Ministries of Defense and Health in Singapore have likewise received briefings about the outcomes of the dialogue.

Introduction

On December 2-3, 2015, the UPMC Center for Health Security hosted the second meeting of Track II biosecurity dialogue between the United States, Singapore, Malaysia, and Indonesia. The meeting took place in Kuala Lumpur, Malaysia and was co-sponsored by the Malaysian Ministry of Health (MOH). The dialogue is supported by the Project on Advanced Systems and Concepts for Countering WMD (PASCC) of the Center on Contemporary Conflict, sponsored by the US Defense Threat Reduction Agency (DTRA).

The purpose of the second meeting of the dialogue – which is the focus of this report – was to engage participants in deeper conversations around the unique biosecurity landscapes of Singapore, Malaysia, Indonesia, and the US; examine ongoing national, regional, and global biosecurity threats; identify and critique current policies and approaches to biological threat mitigation; and exchange best practices in biorisk management to strengthen responses to emerging and evolving biological threats. The dialogue featured participants representing various levels of academia, and government, including experts in the life sciences, defense, public health, animal health, journalism, medicine, terrorism, and security.

Broadly, topics of discussion included: national priorities for mitigating biosecurity threats; approaches to biological risk assessment; biosafety and biosecurity at national laboratories; early-warning surveillance systems for novel biological threats; emerging zoonoses at the human-animal-ecosystem interface that could present security issues; and the growing threat of terrorism and its corresponding implications for both regional and international security. The Malaysian Minister of Health of Malaysia, the Honorable Datuk Seri Dr. S. Subramaniam, expressed his strong support for the dialogue by attending the formal dinner of the group after the first day of meetings. On the second day, attendees participated in a tabletop exercise designed to examine country responses to a destabilizing and unusual outbreak of Nipah virus in Southeast Asia.

Dialogue participants made numerous remarks about the value of the Track II dialogue process, noting its utility in facilitating frank discussions of strengths and weaknesses, as well as opportunities to build collaborative working relationships. Meeting attendees also expressed broad interest in continuing the dialogue in 2016. The following sections describe key observations and findings from the meeting discussions.



Participants of Biosecurity Dialogue in Kuala Lumpur

Participants expressed heightened concerns about threats related to biological laboratories.

More so than during past dialogue sessions, participants expressed concern about security risks emanating from biological laboratories, including: terrorist access to dangerous pathogens in a legitimate research facility, radicalization of scientists working in labs containing such pathogens, the growing potential for the misuse of technology; and the possibility that laboratory accidents could have grave consequences in the broader community.

A Malaysian participant raised the possibility that ISIL could break into or have access to a research facility and either steal specimens, such as anthrax, from the lab or actually take control of and use the facility to produce biological weapons. ISIL leadership has explicitly expressed intent to develop and utilize biological weapons (BW), and while they have yet to achieve that objective, they have made concrete strides in that direction. The seizure of a laptop computer containing information relevant to biological threats, and the recent execution of an Iraqi professor for reportedly refusing to aid in BW research and development are cause for concern.

Related to the ISIL threat is the potential that scientists working in laboratories could become radicalized and persuaded to assist ISIL in making BW or acquiring anthrax or other biological agents. The emphasis placed on securing laboratories in Southeast Asia against such threats varies, but participants in the region seemed to agree that their high level officials have not identified laboratory biosecurity or biosafety as particular priorities. Indeed, in many cases, leaders with the power to systematically address these risks may not understand the nature of the threat or the ways in which their laboratories could be exploited. It was suggested that leaders need to better appreciate these issues and the vulnerabilities that exist in labs. A participant suggested that it would be beneficial to have regional mechanisms to address these threats, but none exist.

In terms of addressing the risk of insider threats, countries have varying approaches. None of the countries in the region seem to have implemented the kind of personnel reliability programs utilized in the US. This is likely due to the fact that none of them experienced a BW attack similar to the 2001 anthrax attacks in the US. An Indonesian participant speculated that large national labs in Indonesia implement personnel reliability measures more consistently than do provincial labs, which is cause for concern. Malaysia does not have a full blown personnel reliability program for labs handling high consequence pathogens, and participants worried about their ability to effectively monitor people who work in labs in order to mitigate insider threat issues. It was noted that a false report could have a detrimental effect on one's career. Malaysia MOH does have a national registry of labs that handle high consequence pathogens. Singapore has a clearance system for laboratorians who work with high consequence pathogens, and they are interested in learning about the latest technology and/or systems to screen workers.

Participants also discussed their concerns about the potential misuse of technology and noted the recent publication of "dual use" experiments that have been particularly controversial. A Malaysian participant stated that there is a need for a code of conduct to guide the life sciences community. Others agreed.

In terms of biological accidents from laboratories, participants agreed that there is a need to improve biosafety. Recent experiences in the US have underscored the fact that mistakes can occur even with

rigorous protocols in place. One US participant suggested that there should be a no-fault reporting system established to encourage laboratorians to report accidents and unintentional breaches of protocol. Such a system would allow people to go to a central database and read about the causes of accidents and how problems were corrected. Personal information could be redacted in order to remove any stigma in reporting.

Discussants agreed that the whole area of laboratory biosafety/biosecurity deserves more attention and best practice exchange during future meetings.

Coordinating defense, health, science, police, and intelligence sector roles in responding to biological threats remains a significant challenge.

During the meeting, a number of participants spoke candidly and more specifically than before about the gaps in coordination between government agencies that share some responsibility for countering biological threats. Not surprisingly, both the size and the particular historical context of each country have contributed to current modes of communication and collaboration within their government structures.

Indonesian participants explained that the 32 years of military rule in Indonesia continues to have an impact on the ways in which their government addresses many security issues, including biological threats. The Ministry of Defense clearly has the lead role in addressing biological threats and security challenges, while their Ministry of Health plays more of a technical support role on health issues. Participants in the dialogue are working to address this disconnect between their MOH and MOD on biological threats. Like in many other countries, the police and the military in Indonesia have an historic rivalry. The military has a more sophisticated intelligence capability, but it is sometimes reluctant to share information with the police, which could potentially affect timely response during a biological incident. The police do not have much background in biological weapons; they know more about detecting and responding to chemical weapons.

In strategic contrast, in Malaysia, the Ministry of Health assumes a much greater role than the military in addressing biological threats. The MOH would welcome a more multi-sectoral approach, but there is limited engagement currently from the security side. Because of perceived limitation with this approach, at least some influential officials in the MOH are advocating progress on a national policy on biosecurity in order to encourage a more coordinated response across the Malaysian government. In an effort to build more cross-agency connections on these issues, the MOH participants invited a representative from their National Security Council to attend the KL meeting, and this individual participated in both days of the dialogue session. For Malaysia and Indonesia, in particular, the Global Health Security Agenda requirements seem to be stimulating new efforts to improve interagency coordination on biological threat issues.

A US participant noted that it is indeed a challenge for the US and other countries to successfully bring together national security and public health components of government in order to adequately meet the challenge presented by biological weapons and serious epidemics that pose national security threats. The continuous advances in the biological sciences also will impact the risk profile, as cutting edge scientific advancements spread quickly and employed by many.

Singapore, as a smaller country, faces perhaps more manageable hurdles in achieving inter-departmental coordination on biothreats. They have strategically designated at least one high-ranking official (a participant in the dialogue) to hold dual roles at both MOD and MOH in order to better coordinate biological threat reduction efforts. Also significant is the more than 200 cases of SARS in Singapore in 2003, which sensitized the nation to the potential for serious infectious disease outbreaks with potential to radically affect national security and economic interests. Nevertheless, it requires ongoing efforts to effectively coordinate preparedness and response efforts across government.

Information on biological threats is shared through informal channels within the Southeast Asian region, but there is little official coordination on biosecurity matters on a regional level.

Participants from all four nations acknowledged the need for strong regional approaches to transnational biosecurity threats, citing globalization as a powerful driving force behind increasing movement of goods, services, and people across borders. However, this ideal is far from a reality at this point. It is clearly a frustration for many dialogue participants that regional policies, plans and information sharing do not exist broadly for preparedness and response to biological threats.

Nevertheless, there are a number of promising initiatives underway. The Global Health Security Agenda (GHSA) has catalyzed some national efforts to enhance defenses against a range of natural, accidental, and intentionally caused biosecurity threats. Singapore is a contributing country to the GHSA, and Malaysia and Indonesia lead action packages aiming to strengthen Emergency Operations Centers (EOCs) and combat the spread of zoonotic diseases, respectively. Both countries also contribute to other action packages focused on building national laboratory systems, linking public health with law and multi-sectoral rapid response, mitigating antimicrobial resistance, and enhancing real-time surveillance systems.² Indonesia is currently serving as the lead country for the GHSA Steering Committee. Of the ten countries in the Association of Southeast Asian Nations (ASEAN), only four are heavily involved in the GHSA (Malaysia, Indonesia, Thailand, and Vietnam). A Malaysian participant noted that ASEAN itself does not seem engaged or interested in leveraging the GHSA to promote more regional efforts to combat biological threats.

Attendees described a range of ongoing regional biosecurity-strengthening efforts. Indonesia and Malaysia, for instance, participate in the PREDICT Program (supported by the US Agency for International Development's Emerging Pandemic Threats initiative), which aims to enhance mechanisms for wildlife and zoonotic disease surveillance. PREDICT-Indonesia has thus far trained over 50 individuals in field sampling techniques, biosafety practices, and laboratory testing methods; enhanced collaboration between animal and human health professionals, policymakers, and researchers; and established a reporting mechanism for emerging zoonoses.³ Additionally, PREDICT-Malaysia has convened ministerial meetings to examine zoonotic threats and strengthen national networks for wildlife surveillance, as well as enhance biosafety protocols and molecular diagnostic capabilities at BSL-2 laboratories across the country.⁴

The Singaporean delegation, meanwhile, described regional biosecurity threats with respect to securing its national borders. Singapore relies heavily in border surveillance mechanisms in the form of land checkpoints operated by the Ministry of Home Affairs. Additionally, because Singapore imports the majority of its food and animal products, its Agri-Food & Veterinary Authority (AVA) has encountered challenges in ensuring that such products are free of potentially dangerous pathogens. Consequently, AVA has partnered with Malaysian authorities to coordinate screening and security measures for frequently traded animals like chickens and horses.

Despite a number of good efforts to promote regional coordination, some participants shared specific examples of failed attempts to extend regional coordination and information sharing on critical biological threat issues. Malaysia in particular seems motivated to use ASEAN as a platform for examining and resolving biosecurity challenges. For example, several ASEAN member states (Indonesia, Malaysia, Singapore, Brunei, and Thailand) have begun designing a network of EOCs to respond to future

biosecurity emergencies. Efforts to establish an ASEAN network of reference laboratories are also underway, with five participating countries and two years of funding. Additionally, Malaysia has submitted a proposal to ASEAN to improve risk analysis for the region's risk communication centers, and has developed a training module on biothreat-specific risk communication. .

Despite these advances on particular initiatives, countries in the region do not routinely share threat information with each other. Overcoming political barriers to actualize regional collaboration remains a key challenge. Information is sporadically shared at lower levels based on personal relationships between professionals in different countries. However, there is no agreed or formal mechanism for ASEAN countries to share information or jointly prepare for public health emergencies stemming from BW or naturally occurring outbreaks of infectious disease. Some participants suggested that the dialogue members should consider ways to influence thinking in this area during future meetings.

Nations share technical challenges towards early warning and response to biological threats.

Each of the four nations maintains sophisticated systems for detecting and characterizing a range of biological threats to plant, animal, and human health and security. Dialogue participants reflected on their nations' existing capabilities and discussed strategies for strengthening surveillance in the face of emerging and evolving biosecurity threats.

In response to past outbreaks of SARS, H5N1, and H1N1, Indonesia – which reports a higher infectious disease burden than Malaysia, Singapore, and the US – has implemented surveillance efforts targeting a wide range of infectious threats: malaria, HIV/AIDS, hepatitis, avian influenza, multidrug-resistant and extensively drug-resistant tuberculosis, diphtheria, measles, and other antibiotic-resistant pathogens. Emerging biothreats of concern in Indonesia include Zika virus, chikungunya, and dengue. Furthermore, the Indonesian delegation reported being unable to diagnose about 20% of collected blood samples despite using numerous batteries. Fortunately, through its involvement with the PREDICT project, Indonesia has collected over 2,000 human and animal specimens from across the country and created a repository of 21 families of emerging viruses. Additionally, its Ministries of Health and Agriculture, in partnership with several universities and research institutes, have established a national committee to examine challenges associated with prevention and management of zoonotic diseases.

The Malaysian delegation reported that Malaysia maintains an extensive network of reference laboratories conducting surveillance for influenza, dengue, flaviviruses, and several other pathogens. Notable among these are a National Laboratory-Based Surveillance system and the Malaysia Influenza Surveillance System (MISS), both coordinated by the Ministry of Health's Communicable Disease Surveillance Section. MISS, which offers viral isolation services to the World Health Organization's reference laboratories, features over 800 sentinel clinics that aim to provide early warnings for outbreaks of both known and emerging influenza strains, dengue, and other influenza-like illnesses.⁵ A Malaysian Ministry of Health representative shared that clinical patients are screened for 8 different viruses using point-of-care diagnostic tests. Positive specimens are subsequently sent to sentinel laboratories to be tested for dengue. The Malaysian delegation also noted that, over time, its in-country and regional efforts would enable its health authorities to track patterns in the movement of viruses and other pathogens both in Malaysia and throughout Southeast Asia.

In addition to its work on traditional biosecurity threats, Malaysia has identified and begun to address biosecurity threats as they relate to plant and animal health. The Malaysian delegation noted that biothreats among animal products and populations also pose considerable threats to economies, biodiversity, food security and safety, and public health. One participant observed that the farm-to-table continuum is really very porous. There could be intentional contamination at any point along that continuum. In response to this challenge, Malaysian veterinary and agricultural authorities have created teams to conduct safety analyses on imported products. However, the Malaysian attendees agreed that in-country threats are more serious because a nefarious actor could enter farms freely and contaminate food at its source. One speaker also noted that although animals are reservoirs for certain pathogens, they also function as biosensors for emerging diseases, toxins, and infectious agents. In fact, existing disease surveillance and intelligence systems that detect natural outbreaks among animals could also be leveraged to detect abnormal releases of infectious agents and toxins. However, an American participant noted that, despite the importance of plant and animal biosecurity, for many policymakers in the US, the economic value of animal product trade often trumps biosecurity concerns.

Like other nations in the region, Singapore's experience with SARS has shaped its current approaches to biothreat mitigation; one participant described SARS as "a big wake-up call." Given the large numbers of travelers crossing its borders, and the fact that 90% of its food supply is imported, Singapore maintains robust border surveillance efforts and closely monitors agricultural products entering the country; namely, pork and poultry products from Indonesia and Malaysia, respectively. The Singaporean delegation also noted that the nation's clinics and schools are required to report unusual cases of illness to health authorities. One participant highlighted the tension between ensuring accurate data collection and alerting responders about potential crises, noting, "The aim of a biosurveillance system needs to be very clear. If you take environmental samples, you have to worry about cross-reactivity with other contaminants in the environment. When we started the border security watch, it was to minimize the number of people going into [mass casualty] mode. It was helpful to give data to the MOH and clinics because they would know to be on the lookout for cases. But at what point do you have to alert the public to an emergency?"

All four delegations highlighted key strengths and weaknesses in existing methods of detecting and characterizing infectious agents, and debated the merits of incorporating novel technologies into future biosurveillance strategies. Regarding syndromic surveillance, an American speaker remarked, "I think syndromic surveillance is somewhat uncertain. Who's going to do the programming? It would entail a huge IT commitment. Compared to [CDC's] Biosense, there are many other options that are easier to use. But the bottom line is that all of these things take time, and you run into the problem of overworked health workforces. You have to decide on quality data points to focus on and stick to them." Participants identified several possible data points that could inform future surveillance efforts, including Internet search terms, social media trends, and purchases made at pharmacies. In addition to syndromic surveillance, sentinel surveillance (collection of disease-specific data from a limited number of high-priority sites) was described as an important complement to passive surveillance strategies, albeit one that requires skilled laboratory and healthcare workforces. Several participants also affirmed the need for affordable, user-friendly, and accurate point-of-care diagnostics to accelerate detection of potential outbreaks. Although these and other emerging technologies will likely play important roles in future surveillance efforts, participants from all four nations agreed that astute practitioners at the frontline remain the best warning systems for identifying health threats, particularly if they have point of care diagnostics.

Tabletop Exercise: Finding Nipah

Dialogue participants engaged in a tabletop exercise, Finding Nipah, to explore their nations' potential responses to a novel and fast-spreading strain of Nipah virus (see Appendix A for the scenario and associated documents). This tabletop exercise was developed based on previous outbreaks of Nipah virus in Malaysia, Singapore, India, and Bangladesh. The scenario challenged Singapore, Malaysia, and Indonesia by incorporating respiratory transmission of the virus, an epidemiology not typically associated with Nipah virus outbreaks in this region, and challenged the US with the prospect of imported Nipah cases and potential impacts on regional military assets and national security. In addition to addressing the medical and public health implications of a Nipah outbreak, the exercise also encouraged participants to consider economic implications, national security, and risk communication strategies across both traditional and social media platforms. The exercise consisted of five segments, during which participants received information about a surprising and evolving Nipah outbreak, and then examined a series of discussion questions. The exercise highlighted a range of operational and policy challenges, and allowed participants to collaboratively explore responses to these challenges. Following are major themes and findings that emerged from the tabletop scenario.

All four countries have policies or plans in place to address containment of a multinational communicable disease outbreak.

Every communicable disease outbreak will pose a different set of containment challenges. In the Finding Nipah scenario, the four countries were faced with Nipah virus with increased respiratory transmission (as well as the possibility of superspreading events). In response, participants cited several existing plans and policies and also suggested new strategies for containing highly communicable respiratory viruses. Taking advantage of its limited points of entry, the Singaporean delegation planned to increase security at border checkpoints to curb the movement of the virus. The Singaporean speakers also stated that they would establish isolation wards for suspect cases, a lesson learned from their experience with SARS. The Malaysians indicated that existing port regulations would identify potentially infected passengers or crew on inbound ships, efforts that would be overseen by their maritime enforcement agency. They also advocated for exit screenings by affected countries, positing that such measures would be more efficient and less resource-intensive than worldwide entry screenings.

The Indonesian participants acknowledged that their nation's high population density could hinder case investigations; however, they cited local media outlets as important channels of communication with the public. Additionally, Indonesia has implemented plans in hundreds of its hospitals to address emerging infections, as well as protocols to ensure proper packaging and shipment of infectious material. In this scenario, the US did not have any domestic cases, but the US delegation acknowledged the importance of coordinating with affected countries to identify recovered cases entering the US and conducting follow-up monitoring. The US speakers indicated that DoD could issue a "stop movement order" to limit the travel of non-essential military personnel to affected areas. Additionally, the US could implement entry screening measures similar to those for Ebola and, like Malaysia, has enacted protocols to identify potentially ill individuals on inbound vessels. The delegations from Singapore, Malaysia, and Indonesia indicated that their countries would not impose any travel restrictions between the affected countries.

There is a lack of formal mechanisms for international coordination, particularly for sharing medical resources such as ventilators and medical countermeasures (MCMs).

All four delegations identified low availability of critical resources -- specifically, investigational therapeutics and ventilators -- as a potential barrier to effective response. Currently, the four participating nations lack formal processes for handling international requests to procure or share such vital resources in the midst of a crisis, and informal mechanisms rely heavily on the quality of inter-state relationships and the willingness of well-resourced nations to share potentially limited supplies of countermeasures. Many participants expressed concern that countries in possession of needed MCMs might be reluctant to share out of concern for the health of their own citizens. Participants identified the need for international organizations, like WHO, to establish formal materiel transfer protocols and MCM sharing agreements, indicating that WHO should also lead regional and international coordination efforts during public health emergencies. The US, however, stated that they would likely operate independently of WHO or any declaration of a public health emergency of international concern. The Malaysian representatives stated that their domestic commercial industries could support ventilator requirements for the Finding Nipah outbreak scenario (which included several dozen cases of Nipah at the end of the exercise timeline), but that a larger outbreak would require external assistance. The Indonesians noted that, while they would be primarily concerned with the wellbeing of their own citizens during a regional outbreak, future joint training and simulations would help facilitate coordinated regional responses. The Americans acknowledged the need to be more cooperative in global response efforts, recalling how the US government encountered backlash for offering American patients preferential treatment during the West African Ebola epidemic.

Effective media engagement prior to and during an incident is critical to informing the public and maintaining credibility.

All four countries acknowledged the need to inform and update the public on the status of an outbreak and ongoing response efforts, as well as the significance of transparency in earning the public's trust. Participants emphasized the importance of actively providing early and accurate information to the media. The willingness of the public to adhere to recommended actions depends heavily on their opinion of the government's credibility, and establishing and maintaining transparency throughout the response is vital to building and maintaining this credibility. Speakers from all four countries expressed concern that during a crisis, the media might seek out unofficial sources for information or generate unnecessary concern among the public. The US delegation asserted the need for a reliable, consistent spokesperson for the media. The Indonesians agreed, and -- citing experiences with HIV, SARS, and MERS -- also suggested training and building relationships with media correspondents before an emergency to ensure accurate media coverage during a crisis. The participants also identified the need to coordinate messaging internationally. Regional organizations like ASEAN were viewed by the participants as potentially powerful mechanisms by which nations could keep regional partners apprised of ongoing response efforts and enhance regional cooperation on infectious disease threats. In fact, discussions of establishing an ASEAN emergency operations center to coordinate regional responses and communication are underway.

Coordination between agencies or ministries within each country is essential to managing complex incident responses.

The Indonesian delegation identified a lack of available hospital beds as a limitation in their response capabilities, but noted that coordination between their Ministries of Health and Defense could make additional resources and expertise available. The Indonesians also shared that the police would help conduct contact tracing to relieve some of the burden on the public health system, an important lesson learned from the avian influenza outbreak of 1997. If the incident was suspected to be intentional, the Indonesian Ministries of Foreign Affairs, Home Affairs, and Defense would work closely to determine the appropriate response. The Malaysians stated that they would utilize defense resources to enforce

quarantine measures and that the Royal Malaysian Police would be involved if there were suspicions of an intentionally caused outbreak. The Americans stated that in the event of such an incident on US soil, CDC, DoD, the Federal Bureau of Investigation, and other national security and law enforcement agencies would be involved in shaping the response from the start, a strategy echoed by the other delegations. All four nations acknowledged the value of educating the security community about public health and healthcare sector needs and outbreak response policies prior to an event.

Future Directions

Following the tabletop exercise, participants discussed potential topics of interest for the next meeting of the multilateral biosecurity dialogue (tentatively scheduled to be held in June 2016 in Washington, DC). Participants expressed satisfaction with the content and quality of the dialogue, and were eager to collectively continue examining biological threats. As one speaker noted, “Track II meetings like this are very valuable for being able to discuss proposals, whereas Track I meetings have limitations on what they can accomplish. These meetings help us coordinate efforts at a regional level.”

Proposed activities for the next meeting include deeper conversations around early warning systems, as well as discussions on trade, migration, future roles and uses of big data, and potential applications of information technology in mitigating biothreats. Others suggested involving representatives of intelligence agencies and the private sector to encourage more in-depth discussions of their roles in the biosecurity enterprise. Several speakers affirmed the value of conducting group exercises, and suggested that one of the Southeast Asian delegations take the lead in designing a simulation training exercise focused on regional biosecurity issues of mutual interest to all the delegations.

In the interest of continuing to build regional cooperation on biosecurity, some participants expressed great interest in including additional countries in future deliberations, identifying Vietnam, Thailand, the Philippines, and Australia as potential partners. To further encourage sharing of best practices and strategies in biothreat mitigation, participants also suggested developing written products and other shareable deliverables, including joint papers or consensus statements.

Appendix A: Tabletop Scenario Materials

Following are materials used by dialogue participants during the Finding Nipah tabletop exercise.

Background

The scenario occurs in 2018 and coincides with the northern hemisphere flu season. This period of time also coincides with “sailing season,” during which the weather is most supportive for Rohingya and other refugees to board rafts and smugglers’ boats in Bangladesh bound for other Southeast Asian countries.

Other assumptions:

- Countries worldwide are struggling to meet the needs of their respective refugee populations. Malaysia and Indonesia, in particular, have experienced challenges in educating, employing and providing health services to the Rohingya Muslim, Syrian and Bangladeshi refugees living within their borders.
- Many nations have redirected their efforts and resources toward mitigating the burden of non-communicable diseases (a new priority for WHO) and achieving the targets specified by the UN Sustainable Development Goals.
- In response to growing concerns over refugee migration and human trafficking and smuggling, the Combined Maritime Forces (CMF) has expanded its area of operations to include the Bay of Bengal, Andaman Sea and Southeast Asia. Indonesia has joined Malaysia, Singapore, the US and 27 other countries in these efforts. In 2016, CMF formed Combined Task Force 153 (CTF 153), operating out of Changi Naval Base in Singapore, to conduct maritime security operations in coordination with the ASEAN anti-trafficking task force established in 2015.

Prologue

- November 8 -The cargo ship Dolphin Mariner—originating from Valencia, Spain—pulls into Chittagong Port in Bangladesh to transfer cargo. The ship has an international crew of twenty, representing Europe, Asia, the Middle East, Australia and the US. Dolphin Mariner is scheduled to transfer supplies in Port Klang, Malaysia; Singapore; Jakarta, Indonesia; Ho Chi Minh City, Vietnam; and Manila, Philippines before heading north to China, Korea and Japan. Previous ports on this journey include Gioia Tauro, Italy; Mersin, Turkey; Jeddah, Saudia Arabia; Dubai, UAE; and Mumbai, India.
- Patient Zero, a Portuguese national and one of the cooks on Dolphin Mariner, is a bit of a loner on the ship, preferring to talk to the port crews rather than his fellow crew members. After unloading the cargo, Patient Zero barterers with a port worker and acquires a small quantity of fresh palm date sap for personal consumption over the next several days.
- Infected: 1 Symptomatic: 0 Sought Care: 0 Dead: 0**
- November 9 -Dolphin Mariner gets underway, bound for Port Klang, Malaysia.
- Infected: 1 Symptomatic: 0 Sought Care: 0 Dead: 0**
- November 12 -Patient Zero begins experiencing an elevated temperature and body aches. He continues to work onboard the ship. He received his influenza vaccination prior to departing Valencia, so he is not very concerned.
- Infected: 1 Symptomatic: 1 Sought Care: 0 Dead: 0**
- November 14 -Patient Zero develops a cough. The head cook will not allow Patient Zero in the kitchen, so he stays in bed during most of the day. One of Patient Zero’s only friends onboard Dolphin Mariner, Patient A, an American, offers to bring Patient Zero’s meals to his cabin.
- Infected: 2 Symptomatic: 1 Sought Care: 0 Dead: 0**
- November 15 -Dolphin Mariner arrives in Port Klang, Malaysia to transfer cargo to be shipped into nearby Kuala Lumpur.
- Patient Zero still has a fever, body aches and a cough. He takes some aspirin to ease his aches and reduce his fever, and he continues working. He continues conversing with the port workers rather than the Dolphin Mariner crew members while he works.
- Infected: 7 Symptomatic: 1 Sought Care: 0 Dead: 0**
- November 16 -Dolphin Mariner gets underway, bound for Port Singapore, one of the largest and busiest ports in the world.
- Patient Zero’s coughing persists, and his fever is getting worse.
- Infected: 7 Symptomatic: 1 Sought Care: 0 Dead: 0**
- November 17 -Dolphin Mariner arrives in Port Singapore to transfer cargo.
- Patient Zero is too ill to unload the cargo, so he is assigned to work with a member of the port staff to verify the inventory for the transferred cargo. He collapses during the shift with a high fever and difficulty breathing. Several members of the port crew escort him to the port medical facility.

-Patient Zero is too ill to continue the trip with the rest of his crew. He is transported to a nearby medical facility to be treated for suspected severe influenza infection. He is conscious, but he is confused and disoriented.

-Patient Zero's rapid influenza diagnostic is negative, and a RT-PCR test is ordered to confirm influenza infection. The medical staff obtain a thorough travel history while they await the final influenza test results. When they identify that the ship was recently in Jeddah and Jebel Ali, they initiate testing for MERS as well.

Infected: 8 Symptomatic: 1 Sought Care: 1 Dead: 0

November 18 -The cargo ship departs for Jakarta, Indonesia.

Infected: 8 Symptomatic: 1 Sought Care: 1 Dead: 0

November 19 -Patient Zero's influenza and MERS RT-PCR tests are both negative. He is clinically diagnosed with encephalitis, but the infectious disease specialist at the medical facility is unable to determine the cause. He orders a diagnostic panel for traditional causes of encephalitis.

-Patient Zero requests to speak with a Catholic priest.

-Patient A develops a slight fever.

Infected: 10 Symptomatic: 2 Sought Care: 1 Dead: 0

November 21 -The Dolphin Mariner pulls into Jakarta to transfer cargo.

-The medical facility where Patient Zero is being treated locates a local Catholic priest to provide comfort for Patient Zero. He volunteers to spend several hours at Patient Zero's bedside, providing comfort and spiritual guidance before returning to his parish in Singapore. He wears a surgical mask for the majority of his visit, but he removes it several times to pray and kiss Patient Zero's forehead.

-Dolphin Mariner must delay her departure from Jakarta in order to complete some maintenance. The ship will get underway the afternoon of November 23 for Ho Chi Minh City, Vietnam.

-With the ship now scheduled to be in port an extra night, several of the Dolphin Mariner crew decided to take a taxi into Jakarta to get some dinner and drinks. Patient A has developed a cough, but his fellow crew members convince him to join them. They have all received their seasonal influenza vaccinations, and they are not concerned about catching the flu.

-The Dolphin Mariner crew members eat dinner at a beer garden in downtown Jakarta. At the bar, they meet several officials from the Indonesian MOD who are hosting a reception for some of the staff from the US Embassy.

Infected: 23 Symptomatic: 2 Sought Care: 1 Dead: 0

November 22 -Patient Zero begins having seizures.

-The Dolphin Mariner crew expects to complete the maintenance by the following morning, and the ship remains on schedule to get underway in the afternoon.

-A Port Klang customs official who lives in Kuala Lumpur develops a fever.

Infected: 23 Symptomatic: 3 Sought Care: 1 Dead: 0

November 23 -Patient Zero slips into a coma. He is intubated and placed on a ventilator.

-Patient A is taken to the Cipto Mangunkusumo Hospital (RSCM) in Jakarta with a high fever and respiratory distress. He is also disoriented. His rapid influenza diagnostic is

negative, but his doctors prescribe him ribavirin to treat influenza while they await the results of his RT-PCR. He is too ill to continue on with the Dolphin Mariner and remains in Jakarta to receive medical care.

-The Dolphin Mariner gets underway for Ho Chi Minh City, Vietnam.

Infected: 24 Symptomatic: 3 Sought Care: 2 Dead: 0

November 24 -Patient Zero dies.

-The customs official in Kuala Lumpur develops a cough and body aches. His wife and daughter provide care for him in their home.

Infected: 26 Symptomatic: 3 Sought Care: 2 Dead: 1

November 25 -Patient Zero's autopsy confirmed that he had encephalitis, but the pathologist was unable to determine the cause. She ordered diagnostic tests for several expected causes of encephalitis and obtained several additional samples for additional testing, if needed.

-Patient A's respiratory condition worsens, and he is transferred from an open patient ward to an isolated room and placed on a ventilator.

Infected: 31 Symptomatic: 3 Sought Care: 2 Dead: 1

November 26 -The Malaysian customs official is taken to the emergency room at Tawakkal Hospital in Kuala Lumpur with a high fever, respiratory distress and disorientation. His family indicates that his symptoms began several days before. They initially believed he had influenza and attended to him closely in their home; however, when he became confused and disoriented, they brought him to the hospital. A rapid influenza diagnostic is negative, and additional samples are sent to the hospital lab to test for RT-PCR testing. The patient's family indicates that he has not left the region in the past several months.

-Patient B, an Indonesian MOD official in Jakarta, develops a fever.

-A Port Klang dock worker, Patient C, develops a fever.

Infected: 31 Symptomatic: 4 Sought Care: 2 Dead: 1

November 27 -The Catholic priest that visited Patient Zero develops a fever. Several dozen members of his congregation volunteer to keep him company and provide him with food and basic care while he fights off the flu. They each spend several hours with the priest over the course of several days.

-Patient A's cognitive condition deteriorates, and he is clinically diagnosed with encephalitis. The infectious disease specialist at the hospital orders an encephalitis diagnostic panel to identify the infection causing the encephalitis.

-The samples from Patient Zero's autopsy were negative for all ordered tests.

-One of the Dolphin Mariner crew members develops a fever.

-A second Port Klang dock worker, Patient D, develops a fever

Infected: 35 Symptomatic: 7 Sought Care: 3 Dead: 1

November 28 -The Dolphin Mariner pulls into Ho Chi Minh City, Vietnam to transfer cargo.

-The ill Dolphin Mariner develops a cough, and a second crew member develops a fever. They complain to the Captain that the influenza vaccination is not working or is making people sick.

- Patient B's fever is significantly worse than the day before. His wife drives him to the emergency room at RSCM hospital. In addition to a fever, he is experiencing body aches and chills. His rapid influenza diagnostic is negative, and he is admitted to the hospital and prescribed antivirals while awaiting the result of his influenza RT-PCR diagnostic.
- Patient C develops a cough. He stays home from work, but he has to walk to a local store to buy food and cough suppressant.

Infected: 39 Symptomatic: 8 Sought Care: 4 Dead: 1

- November 29
- The Catholic priest develops a cough. His congregation continues to provide care for him in his home.
 - The Dolphin Mariner gets underway for Manila, Philippines. Several crew members have developed fevers and respiratory symptoms. They complain to the captain about the influenza vaccine making them sick but continue working.
 - Patient A's encephalitis panel is negative for all traditional causes of encephalitis. The infectious disease specialist orders RT-PCR diagnostic tests for a number of exotic viral, bacterial and fungal causes of encephalitis.
 - Patient D's fever gets worse, and he drives himself to an emergency room in Kuala Lumpur. His rapid influenza diagnostic is negative. He is admitted to the hospital and prescribed antivirals while awaiting the result of his influenza RT-PCR.

Infected: 48 Symptomatic: 10 Sought Care: 5 Dead: 1

- November 30
- Patient C's cough worsens, and his fever spikes. He goes to a local health clinic to see a doctor. He waits in a crowded waiting room for several hours before he is able to see a clinician. His rapid influenza diagnostic is negative, so an influenza RT-PCR diagnostic is ordered. He is prescribed ribavirin with a presumptive diagnosis of influenza and sent home with instructions to call back in two days to get the result of his test.
 - Patient B's condition deteriorates rapidly. He becomes disoriented and has a seizure and slips into a coma. He is clinically diagnosed with encephalitis. The infectious disease specialist is unable to determine any connection between the two encephalitis cases, Patients A and B, but he believes that the odds of them being completely unrelated are extremely low. While the encephalitis panel for Patient B is not yet complete, the infectious disease specialist orders diagnostics for the same exotic causes of encephalitis that he ordered for Patient A.
 - A third Port Klang dock worker develops a fever.

Infected: 90 Symptomatic: 11 Sought Care: 5 Dead: 1

Scenario: December 1, 14:30 (Western Indonesian Time/WIB)

The Indonesian Ministry of Health received a report of one confirmed case and one suspect case of Nipah virus infection at Cipto Mangunkusumo Hospital (RSCM) in Jakarta.

Patient A, the confirmed case, is a 39-year-old male American citizen working on a cargo ship, the Dolphin Mariner, that recently transferred cargo in Jakarta, Indonesia. Patient A was admitted to the hospital on November 23 with a fever, nausea, body aches and respiratory symptoms. While the hospital staff suspected influenza, the rapid influenza diagnostic and RT-PCR test were both negative. Patient A developed encephalitis five days ago, but the encephalitis diagnostic panel was negative for all traditional causes. After the negative encephalitis panel, an infectious disease specialist at RSCM ordered RT-PCR tests for several other potential causes of encephalitis, including Nipah virus. The Nipah virus RT-PCR came back positive late this morning. Patient A is experiencing seizures on a regular basis, and he is disoriented but still conscious. Patient A reported that his ship's two previous port visits were Singapore and Port Klang (Malaysia).

Patient B, the suspect case, is a 53-year-old male. He is a senior Indonesian MOD official stationed in Jakarta. He was brought to the hospital by his family in an impaired mental state on November 28 and slipped into a coma yesterday. Patient B was clinically diagnosed with encephalitis, and an encephalitis diagnostic panel was ordered. The test is not yet complete (expected tomorrow morning), but the infectious disease specialist has already ordered a Nipah virus RT-PCR and expects that it will be positive as well. Due to the patient's cognitive state at the time of admission, the hospital staff obtained only a limited medical and travel history from his family. They indicated that Patient B has not recently traveled abroad and has had no known unusual exposures to animals or exotic foods.

The infectious disease specialist has not been able to determine any epidemiological link between the two patients, but indicated that the odds of a single hospital having two completely unrelated encephalitis cases at the same time are extremely low.

Questions:

- How would Indonesia MOH respond to these cases?
 - How would Singapore, Malaysia and the US respond under the same circumstances?
- How would other components of government (e.g., Ministry of Home Affairs, Ministry of Agriculture, Ministry of Defense) be involved?
- How confident are you in your organization's or country's ability to identify and track other cases of Nipah?
 - What surveillance systems are in place in your country to accomplish this?
 - What laboratory capabilities are available for Nipah virus diagnostic tests?
- How would regional partners be involved with the initial investigation?
- How would information about these cases be shared internationally?
- What are the implications of the index case being American?

Update 1: December 1, 21:45 (WIB)

The Indonesian MOH received an update from RSCM stating that Patient B, the Indonesian MOD official, is now confirmed as having Nipah virus infection, based on a positive RT-PCR diagnostic test.

The Indonesian MOH contacted Patient A's ship, the Dolphin Mariner. The ship left Jakarta on November 23 and arrived in Ho Chi Minh City, Vietnam on November 28. The ship left Vietnam on November 29 and is en route to Manila, Philippines. The ship's captain reported that they are experiencing a small influenza outbreak on the ship, but the crew had all been recently vaccinated and he was not concerned. In addition to Patient A, another crew member became severely ill with influenza-like symptoms when the ship was in Singapore and was left behind for medical treatment. The ship remained in Jakarta an extra night to complete some maintenance before getting underway for Ho Chi Minh City, Vietnam.

The Dolphin Mariner's captain provided further detail on the ship's schedule for the current voyage:

- September 16: Depart Valencia, Spain
- September 20-21: Gioia Tauro, Italy
- September 28-29: Mersin, Turkey
- October 5-6: Jeddah, Saudi Arabia
- October 19-20: Dubai, UAE
- October 26-27: Mumbai, India
- November 8-9: Chittagong, Bangladesh
- November 15-16: Port Klang, Malaysia
- November 17-18: Singapore
- November 21-23: Jakarta, Indonesia
- November 28-29: Ho Chi Minh City, Vietnam

Brief interviews with several of the Dolphin Mariner crew members indicated that some of them may have been in contact with the Patient B several days prior at a bar in Jakarta. On November 21, several of the crew members took a taxi from the port to a beer garden in the city for dinner and drinks. Patient A wasn't feeling well that evening, but the crew members convinced him to join them. Several of the crew members recognized Patient B from a photo provided by the Indonesian MOH. They remembered him being part of a group of Indonesian MOD officials having a dinner event at the beer garden with several officials from the US Embassy. The crew confirmed the ship's recent schedule and that another crew member had severe influenza symptoms in Singapore and had to be transported to the port medical facility. None could recall any recent exposure to bats or pigs, but several of them stated that they were experiencing influenza-like symptoms, including fever and cough. They complained about the seasonal influenza vaccine not working or even giving them the flu.

Complete documentation of the Dolphin Mariner's cargo and schedule will be sent to the Indonesian MOH as soon as Dolphin Mariner pulls into Manila and has access to additional communications equipment. The entire crew will also be made available for more extensive interviews, if desired. The Dolphin Mariner is expected to arrive in Manila on December 5.

The potential contact between the American Dolphin Mariner crew member, Patient A, and the Indonesian MOD official, Patient B, at the restaurant in Jakarta has raised concerns among Indonesian

MOH staff that there could be respiratory transmission of Nipah virus. Additionally, they believe that there be additional unidentified Nipah cases, particularly among the Dolphin Mariner crew. Staff at the Indonesian MOH notified the Vietnam and Philippine MOHs of possible Nipah virus infections onboard the Dolphin Mariner. The Philippine MOH will coordinate obtaining and testing specimens from the Dolphin Mariner crew once the ship arrives in Manila.

Indonesia MOH staff have determined that a Nipah virus monoclonal antibody therapeutic may be available from Australia; however, the current stockpile of 250 doses is only enough to treat 125 patients. Efforts are underway to obtain any available inventory of the monoclonal antibody, but the manufacturer estimates that they can only produce another 250 doses in the next month. Production capacity can be scaled up further, but there is considerable uncertainty regarding production estimates and delivery timelines.¹

Questions:

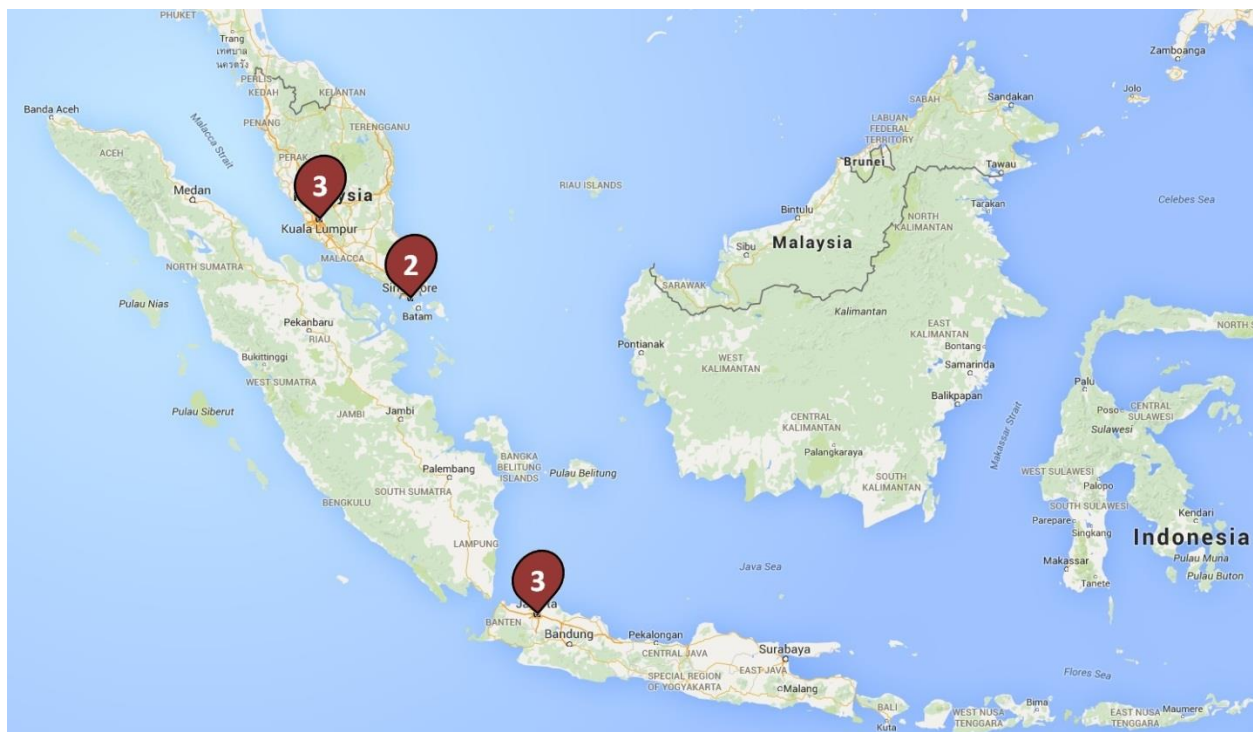
- How does the potential for respiratory transmission change your response?
 - What additional agencies would need to be involved?
- What information would you publicly release?
 - What information would the media request from the government?
- After the news breaks about respiratory transmission of Nipah, would Singapore, Malaysia and the US consider implementing travel restrictions and/or screening measures?
- What is the process for international sample sharing?
- What do you think about the Philippines' ability to handle potential Nipah cases?

¹ Nipah virus monoclonal antibody inventory and production capacity are provided for the purpose of the exercise only. These values are estimated by the scenario developers and not based on actual information provided by the manufacturer.

Update 2: December 3, 1100 (WIB)

A Singaporean MOH investigation determined that the Dolphin Mariner cook, Patient Zero, who was left in Singapore died on November 24 of complications from encephalitis. Patient Zero developed influenza-like symptoms 12 days prior and was transported to the port medical facility after collapsing while working to unload the cargo ship in Port of Singapore. His cognitive state was impaired, and he was experiencing respiratory distress. He was clinically diagnosed with encephalitis and tested for influenza. His rapid influenza diagnostic was negative, and he was prescribed ribavirin while awaiting the results of the RT-PCR. The PCR was negative for influenza, and the patient died before further tests could be completed. An autopsy confirmed encephalitis but did not reveal the cause. The pathologist ordered several tests for expected causes of encephalitis, but all were negative. Upon receiving notification of the Nipah virus outbreak, she ordered a RT-PCR for Nipah virus, which was positive. The pathologist and other staff who were in contact with Patient Zero's body are under close surveillance by the Singaporean MOH.

International coordination and widespread notification of the Nipah virus cases across the healthcare and public sectors in Indonesia, Malaysia and Singapore led to the identification of five additional suspect and confirmed Nipah virus cases—3 in Malaysia, 1 in Singapore and 1 in Indonesia. The majority of the suspect cases were admitted to hospitals initially for treatment of suspected influenza. Confirmatory diagnostic RT-PCR tests for the suspect cases have been prioritized, and results are expected by tomorrow.



Malaysia

In Kuala Lumpur, two suspect cases were identified in Port Klang workers. One of the patients is exhibiting respiratory symptoms and has been placed in a negative pressure room at the hospital; two of his family members have voluntarily quarantined themselves in their home. The other suspect case has

a fever and is exhibiting signs of altered mental state but no respiratory symptoms; the hospital has implemented droplet precautions but not respiratory precautions for this patient.

The Malaysian Ministry of Health is currently searching for a confirmed case of Nipah virus infection (Patient C). Patient C also works at Port Klang, and he visited a clinic on November 30, seeking care for severe influenza-like symptoms. He reportedly waited several hours in a crowded clinic waiting room before being seen by a clinician. His medical record indicates that he had a fever, body aches and respiratory symptoms. His rapid influenza diagnostic test was negative, but he was prescribed antiviral medication for a presumed influenza infection and sent home while awaiting RT-PCR results. The RT-PCR was negative for influenza, and based on Malaysian MOH instructions, the clinic ordered a test for Nipah virus. The clinic received the positive Nipah virus result this morning. Initial attempts to contact Patient C have been unsuccessful, so the clinic requested assistance from the Malaysian MOH. An investigation is also ongoing to identify the exposed population from the waiting room. While the epidemiological efforts are only in the preliminary stage, MOH officials have already identified and notified 25 people.

Singapore

In Singapore, a Catholic priest is suspected to be infected with Nipah virus. He spent several hours on November 21 providing comfort for the ill (now dead) Dolphin Mariner cook before returning to his parish. He developed a fever and a cough about a week ago, and as many as 40 members of his congregation volunteered to cook and care for him before his condition deteriorated to the point of requiring hospitalization. The hospital has implemented airborne precautions and isolated the priest while awaiting the results of his RT-PCR.

Indonesia

In Indonesia, a female healthcare worker that treated Patient A developed a fever and disorientation. She has not yet developed respiratory symptoms, but she has been placed in an isolation room at the hospital and prescribed ribavirin antivirals.

MOH officials in Singapore, Malaysia and Indonesia believe that the suspected transmission patterns for these suspect and confirmed cases provide strong evidence that respiratory transmission of Nipah virus is occurring. Not all patients are exhibiting respiratory symptoms; however, those that are may be a high risk for transmission to those in close contact with them. The potential exposed population due to the case under investigation in Kuala Lumpur and the priest in Singapore could result in a high number of cases over the next several days or weeks.

A social media video was posted overnight by members of the Islamic State claiming responsibility for the Nipah virus outbreak. The video states that ISIL agents targeted the American in Indonesia to demonstrate their bioweapons capacity. They assert that more Americans and Europeans will be targeted unless Indonesia breaks political and economic ties with the West. Intelligence and military analysts from Singapore, Malaysia, Indonesia and the US are currently assessing the video's authenticity and merit.

Questions:

- How does your response change if the outbreak is intentional?
 - How does the coordination work between MOH and MOD?

- How do Singapore, Malaysia, Indonesia and the US coordinate response to the ISIL threat?
- How would your MOH coordinate with Health Ministries in other countries?
- What concerns does your government have regarding commercial activity in the region (e.g., travel, pork industry, business community)?
- How would your country mitigate community transmission?
- Would you consider authorizing the horse vaccine for use in humans?
- If supplies of the monoclonal antibody were available, how would you propose they be allocated between the affected countries?
 - Would there be coordination through ASEAN or WHO?

Military and intelligence officials from Indonesia, in collaboration with Malaysia, Singapore and the US, have discredited the Islamic State video claiming responsibility for the Nipah virus outbreak. The intelligence communities in all four countries will continue to monitor ISIL and other extremist groups in the region, but the current outbreak is believed to be naturally occurring.

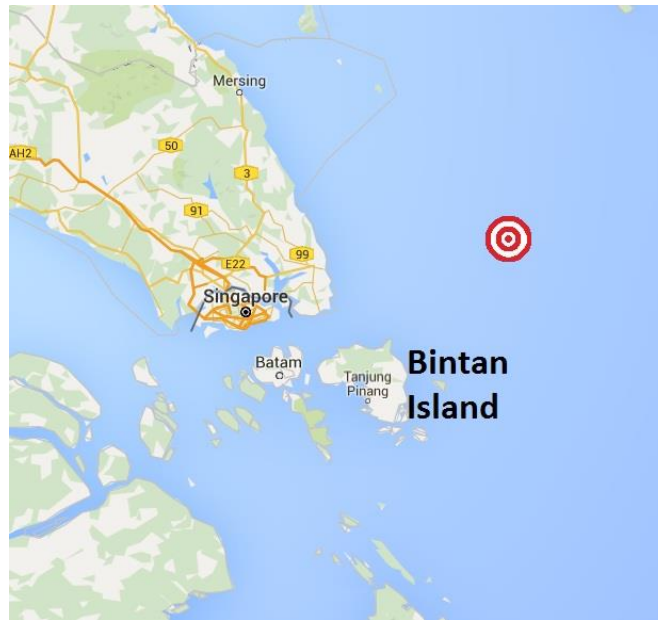
Several members of the Dolphin Mariner crew tested positive for Nipah virus in Manila. The Philippine MOH isolated the infected crew members and placed the rest of the crew, as well as the ship and cargo, under quarantine. The Philippine MOH also conducted in-depth interviews with the crew members and determined that the Dolphin Mariner cook who died in Singapore obtained some palm date sap while the ship was in Chittagong, Bangladesh. All the sap was consumed, so it is not available for testing. The Ministries of Health in Malaysia, Singapore and Indonesia have completed genetic characterization of more than ten patient samples. They found that the viral samples from the current outbreak are nearly homologous to strains identified in earlier Nipah virus outbreaks in Bangladesh, albeit with small sequence changes. MOH virologists believe that the similarities to Bangladesh strains may explain the respiratory transmission not typically seen in Malaysia, but they are unclear whether the subtle differences could account for the significant increase in respiratory transmission observed in the current outbreak.

Surveillance efforts in Singapore, Malaysia and Indonesia have identified 27 confirmed cases of Nipah virus infection, including 5 healthcare workers across the three countries. There are currently 9 cases in Malaysia, 13 cases in Singapore and 5 cases in Indonesia. All identified cases in these three countries have been placed in isolation. At least 10 cases have been identified in Bangladesh and the Philippines as well, but neither country has released official numbers. While the majority of the identified cases are epidemiologically linked to other known Nipah virus cases, several have no known exposure. MOH and local public health officials are currently monitoring more than 100 potentially exposed contacts in Singapore, Malaysia and Indonesia; however, respiratory transmission of the virus is making it difficult for them to identify the entire exposed population. Fearing possible infection, many in the public are questioning the safety of using public transportation, commuting to other affected nations, attending school or other public gatherings or visiting the hospital for routine medical care.



NOTE: Additional Nipah cases possible in the Rohingya refugees and US Navy Sailors.

In addition to the ongoing surveillance and response efforts, the USS John Finn—part of CTF 153—boarded a derelict vessel containing 65 Rohingya refugees several hours ago. The ship was drifting approximately 80 km (50 miles) northeast of Bintan Island, Indonesia in international waters. Based on information obtained through a translator, the refugees originated from Cox’s Bazar in southern Bangladesh. They had paid for transport to Brunei, but several days into the voyage, the crew beat them and chased them into the cargo hold without food or water and then abandoned the ship. Several of the refugees were dead, and a number of them had a fever and were experiencing respiratory distress. Based on discussions between the USS John Finn and Singapore MOD and MOH, the refugees’ symptoms, combined with their origin in Bangladesh, are consistent with Nipah virus infection; however, this assessment is based on very limited information.



CTF 153 was aware of the ongoing Nipah virus outbreak; however, the boarding team opened the cargo hold and were exposed to the refugees without wearing any personal protective equipment. The team provided first aid to those with wounds from the beating and those with heat-related conditions. Further medical support was provided by properly equipped medical staff from the USS John Finn. The refugees and exposed boarding team members are currently quarantined on the seized ship, and they are en route to Changi Naval Base. The medical staff collected several blood and sputum samples, and they are being flown by helicopter to Singapore to begin testing for Nipah virus and other possible pathogens. Results from these tests are not expected prior to the ships arriving in Singapore. The Nipah virus outbreak is receiving widespread global media attention, and the Rohingya refugee story has prompted public discourse over providing humanitarian aid. Traditional media outlets and social media users, particularly in Singapore, Malaysia and Indonesia, are debating the merits of allowing the refugees into their respective countries. Many argue against doing so, citing the potential for further spread of Nipah infections, while others, particularly high-profile humanitarian aid organizations, tout the obligation to provide aid to a population very much in need. Media in the US are demanding to know how the US President, DOD and CDC are planning to protect Americans and prevent the spread of Nipah virus to the US.

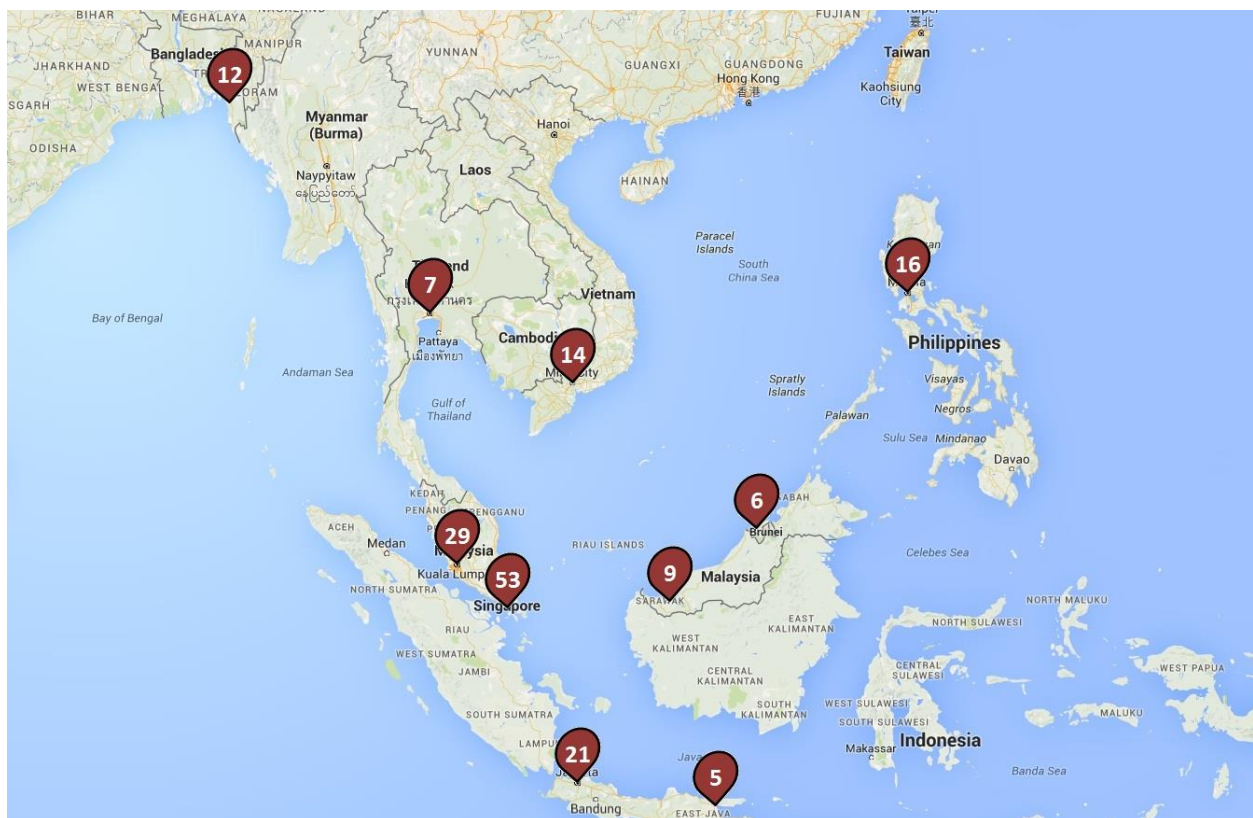
Questions:

- Would your country's policies for travel restrictions/screening change with the increase in cases?
- How many hospitals in your country could handle cases of a highly lethal respiratory disease?
- Would the USS John Finn be permitted to pull into Changi Naval Base with refugees and US Sailors potentially infected with Nipah virus?
 - Would Malaysia or Indonesia allow the ships to pull into port?
 - How would your country handle 65 Nipah cases?
- How would the presence of refugees shape public concern and media reporting on the Nipah outbreak?
- If your country had limited supplies of medical countermeasures for Nipah, would you provide some to the refugees?

Update 4: December 14, 1100 (WIB)

Singaporean MOH officials determined that the Rohingya Muslim refugees discovered aboard the smugglers' ship were suffering from the effects of heat stress and dehydration. RT-PCR diagnostic tests confirmed that none of the refugees or their rescuers are infected with Nipah virus.

Current surveillance indicates that there are 117 confirmed and suspect cases of Nipah virus across Singapore, Malaysia and Indonesia, including 22 deaths. Malaysia has 38 cases, Singapore has 53 cases and Indonesia has 26 cases. Additional cases have also been identified in Bangladesh, Thailand, Brunei, the Philippines and Vietnam. MOH officials in Singapore, Malaysia and Indonesia are monitoring more than 1,000 potentially exposed persons across the three countries. Epidemiological investigations have identified several "super-spreaders" among the confirmed cases, while the majority of cases do not appear to have transmitted the virus to anyone else. Current data suggests that super-spreading events are directly responsible for more than 70 percent of Nipah virus cases in this outbreak.



Among the confirmed cases are 7 members of the Indonesian Army stationed in Jakarta. The soldiers are from three different units on the same base. The base commander has recalled all members of the affected units to the base and placed them under quarantine. The 7 cases have been placed in isolation at Gatot Soebroto Army Hospital in Jakarta.

Some epidemiologic models developed by MOHs in Southeast Asia and the US CDC forecast that the outbreak will continue to grow over the next several weeks. Other models based on previous Nipah virus outbreaks project that the outbreak should be reaching its peak and will soon come to an end. MOH staffs in Singapore, Malaysia and Indonesia agree that the increased rates of respiratory

transmission suggest that the current outbreak is atypical and that a significant increase in new cases should be expected. The prospect of a surge in Nipah cases amidst the ongoing flu season has prompted concerns among some hospitals and public health agencies in all three countries regarding limited availability of beds, ventilators and ribavirin. Some hospitals are expressing concern that the high volume of cases with severe respiratory distress or encephalitis will quickly exceed the number of available ventilators and the capacity of isolation rooms, and they are requesting assistance from their respective MOH in obtaining necessary resources.

Questions:

- Given the pressures on the healthcare system, would your country's MOH seek help from the MOD?
 - If so, what resources would you request?
- How would MOD respond to military cases of Nipah virus infection?
 - How would Singapore, Malaysia and the US respond under similar circumstances?
- If ventilator requirements exceed national availability, is there a process for procuring additional ventilators?
- How would your country allocate scarce resources such as ventilators?
 - How would you identify priority populations?
- What would public opinion in your country likely be at this point with respect to the outbreak and ongoing response?
 - How would this impact your response policy and activities?

Epidemiology

The first outbreak of Nipah took place in Malaysia and Singapore between 1998 and 1999, resulting in 257 cases and 100 deaths. The main source of human infection was exposure to pigs. Since then, eight more outbreaks of Nipah have occurred in both Bangladesh and India, during which human-to-human transmission of Nipah was also documented. Contact with infected bats and/or infectious bat secretions may also result in infection; for example, consumption of date palm sap contaminated with infected bat fecal matter has been documented as a mode of Nipah virus transmission.⁶

Between 2001 and 2015, there were a total of 263 cases of Nipah infection and 196 deaths worldwide. The average case fatality rate for encephalitic Nipah infections is 74.5%. Case fatality rates observed for respiratory Nipah infections in 2001 and 2004 were 69% and 74%, respectively.⁷

Symptoms

The incubation period for Nipah infections lasts between 5 and 14 days. Symptoms of infection include:

- Fever
- Headache
- Nausea
- Drowsiness
- Disorientation
- Mental confusion
- Coma
- Respiratory distress
- Encephalitis

Medical Countermeasures

Treatment for Nipah infections is limited largely to supportive care. Mechanical ventilation may be required for patients who experience seizures or become comatose. Ribavirin, an antiviral drug often used to treat hepatitis and viral hemorrhagic fevers, has proven efficacious against Nipah virus in vitro, but its effectiveness in treating human cases in clinical settings remains uncertain.⁸ Similarly, chloroquine (an antimalarial drug) has demonstrated efficacy against Nipah virus in cell culture, but shows minimal effectiveness in clinical settings.⁹

A vaccine against Hendra virus (a pathogen closely related to Nipah) and Nipah virus has been approved for use in horses in Australia. However, there are currently no approved vaccines against Nipah for human use. As of August 2015, the Australian Pesticides and Veterinary Medicines Authority reported 633 probable links and 125 possible links between the vaccine and adverse reactions in horses out of a total of over 340,000 doses administered.¹⁰

Passive, post-exposure immunotherapy using a human monoclonal antibody has proven beneficial in both hamsters and nonhuman primates. Studies indicate that this antibody has strong potential for treating humans as well.⁹ This treatment is currently in the early stages of clinical trial testing, but its safety and efficacy have yet to be determined.

***NOTE: Monoclonal antibody production capabilities (as described in the scenario) are assumed strictly for the purposes of this tabletop exercise.**

Safety & Security Considerations

Nipah virus is classified as a select agent in the United States. Viral samples and diagnostic specimens suspected of carrying Nipah are required to be handled in BSL-4 facilities.

Airborne precautions are recommended at healthcare facilities treating patients with Nipah infections.¹¹

Appendix B: Meeting Participants

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Appendix C: References

1. Clinton H. America's Pacific Century. Foreign Policy. Washington, DC: FP Group; 2011.
2. *Global Health Security Agenda: Action Packages*. Atlanta, GA: US Centers for Disease Control and Prevention; September 24 2014.
3. US Agency for International Development. *PREDICT: Indonesia*.
4. US Agency for International Development. *PREDICT: Malaysia*.
5. *Malaysia Influenza Surveillance Systems (M.I.S.S): Clinical & laboratory surveillance*. Ministry of Health Malaysia; September 2004.
6. Nipah Virus (NiV): Transmission. 2014; <http://www.cdc.gov/vhf/nipah/transmission/index.html>. Accessed January 28, 2016.
7. Nipah virus outbreaks in the WHO South-East Asia Region. *Surveillance and outbreak alert*. http://www.searo.who.int/about/contact_us/en/. Accessed January 28, 2016.
8. Nipah Virus (NiV): Treatment. 2014; <http://www.cdc.gov/vhf/nipah/treatment/index.html>. Accessed January 28, 2016.
9. Broder CC, Xu K, Nikolov DB, et al. A treatment for and vaccine against the deadly Hendra and Nipah viruses. *Antiviral Res*. 2013;100(1):8-13.
10. Branco J. Hendra virus vaccine for horses approved despite possible deaths. *Brisbane Times*. August 5, 2015;Queensland News.
11. Viral agents. *Biosafety in microbiological and biomedical laboratories*. 5th ed. Atlanta, GA: US Centers for Disease Control, US Dept of Health and Human Services; 2009:200-232.

