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Assessing the Risk of Nipah Virus Emergence in Thailand

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Since the initial outbreak of Nipah virus pneumonia/encephalitis in Malaysian abattoir pig workers in 1998 (Chua et al., 2000), there have been more than 25 human outbreaks in India and Bangladesh. Outbreaks in Bangladesh have occurred almost every year since 2001 and tended to be seasonal (Luby et al., 2009; Lo et al., 2012). Pterodid bats are the primary natural reservoirs (Yob et al., 2001; Halpin et al. 2011; Yadav et al. 2012). Their distribution ranges across the tropical regions of Asia and Africa. Viral transmission occurs among bats and spills over to other dead-end host species including humans. Humans develop disease from having contact with virus contaminated tissues from infected pigs (Malaysia) (Chua, 2003) or otherwise by drinking bat-contaminated fresh date palm sap (Bangladesh) (Luby et al., 2006). Human-to-human transmission poses a serious threat and has been only documented in Bangladesh (Gurley et al., 2007).

To date there has been no report of pig or human cases of Nipah virus (NiV) infection in Thailand. However, there are several factors which could allow NiV emergence in Thailand. Thailand borders Malaysia where NiV outbreaks have been documented in 1998. Thailand harbors at least 20 million bats with 138 species among which several have been reported as NiV reservoirs. There are approximate 9.7 million pigs in this country and this has led to a preparedness initiative program. It consists of cooperation and joint activities among inter-sectoral organizations concerned with surveillance of wildlife, pigs and active testing for NiV infection in patients with encephalitis. Evaluation of health status and determination of risk behaviors as well as serology screening of residents in NiV prevalent zones are being conducted. This has been done in parallel with studies of bat ecology, behavior, population size and relation to seasons.

The Department of Livestock Development (DLD) under the Ministry of Agriculture and Cooperatives of Thailand has conducted sero-surveillance for Nipah infection in pigs since 1998. Regions 8th and 9th adjacent to Malaysia and regions 2nd and 7th

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with high density of pigs were chosen from a total of 9 regions. Serum samples were collected from pigs at both farms and backyards for seroprevalence study. During 1998-2010, 44,658 pig sera were all negative by ELISA testing. In 2011, 3,352 tested pig sera from twenty (of 77) provinces were also negative. Passive surveillance was performed by postmortem examination of pig lung tissues with interstitial pneumonia. A total of 1,996 lung tissue specimens during 1998-2011 were all negative. This surveillance plan has been continually updated and adjusted, based on the previously obtained information. This included risk-based surveillance, according to the geographical location and seasonal preferences. For effective incident management and coordination of emergency responses, DLD has developed a Manual on Emergency Preparedness and Contingency Plan for NIV outbreaks. This manual has been distributed to the relevant DLD officers.

Further surveys of NIV infection in Thai bats is being conducted since 2002. Three species of flying foxes (genus Pteropus); P. lylei, P.hypomelanus, and P.vampyrus, have now been shown to be major reservoirs of NIV in Thailand (Wacharapluesadee et al., 2005). Although NIV infection has been found mainly in 3 species, P. lylei is dominant reservoir due to its population size and distribution. Furthermore, its habitat is closer to humans compared to the other two Pteropus species. Genetic characterization of NIV found in P. lylei in Thailand, based on 357 base pairs of nucleoprotein gene, indicated 2 existing genotypes: Bangladesh- and Malaysian- like (Wacharapluesadee and Hemachudha, 2007). Seasonal prevalence of NIV transmission in P. lylei has been shown during April-May (Wacharapluesadee et al., 2010). Although both strains are co-circulating, the Bangladesh-like genotype dominates in P. lylei bat populations.

Assessing the risk of Nipah virus emergence at the high risk areas, has been conducted in villagers, pigs, and bats at the areas where NIV infection has been demonstrated in bats. Bats were trapped monthly at two pig farms, using mist nets and harp traps. Blood, saliva and urine specimens were collected from each bat for further identification. Numbers of bats that were captured at the pig farms were highest in May, which is the weaning period that juvenile started to fly. Bats that were captured at pig farms were NIV positive only in May (by serology and/or viral RNA). The findings of seasonal preference in May were similar to our previous findings from pooled urine samples at bat roosts (Wacharapluesadee et al., 2010). The finding of NIV infected bats at the pig farms raises concern of possible NIV transmission to pigs. Although there were no evidence of NIV infection in pigs in the same study, measures to prevent bats from coming into contact with pigs and avoidance of feeding pigs with partially eaten fruits must be actively promoted.

To ensure that there is no human transmission of NIV, a community in Chonburi province located near a temple inhabited by NIV infected bats (P.lylei), was chosen for community-level study. After obtaining written consent, a standard questionnaire which included questions related to potential risk behaviors was administered to 418 local residents. Blood samples were assayed for NIV antibody using an indirect ELISA for IgG antibodies against NIV-infected cell lysate. Positive criteria for NIV infection was a dilution ≥1:400. No NIV-specific IgG antibodies were found. The low NIV prevalence in P.lylei (9.3%) and different culture of not drinking fresh date palm sap may have negative impact upon emergence of infection in Thailand. This is in
contrast with the finding in Bangladesh. People living in risk regions are being educated to avoid risk behavior and monitored continuously concerning symptoms possibly related to NIV infection. Febrile patients and those with respiratory or encephalitis symptoms living in or near NIV zones require particular attention. To date, transmission to human has not been identified in Thailand. Cerebrospinal fluid of 232 patients with encephalitis admitted to King Chulalongkorn Memorial Hospital during 2001-2012, were tested negative for NIV RNA.

Inter-sectoral cooperation among wildlife-animal-human departments in preparedness response to emergence of NIV outbreak in Thailand is a successful example of a transboundary “one health” approach. Establishment of alert system and promotion of awareness from the bottom level (village-based) is also the key of the success for this one health initiative. The ultimate goal of the whole process cannot be achieved without public recognition and willingness, otherwise this cannot be sustainable. Policy makers must value this as an opportunity in strengthening public health infrastructure.

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