Short Communication

Influenza Viruses Circulating in Thailand in 2004 and 2005

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SUMMARY: Determining the local circulating strain of influenza is essential to prevent and control epidemics. In the years 2004 and 2005, the National Influenza Center of Thailand received 3,854 and 3,834 specimens, respectively, from patients throughout the country, including submissions from 4 established influenza surveillance sentinel sites. In 2004, of 539 influenza-positive specimens, 461 were positive for influenza A and 78 were positive for influenza B by isolation. Influenza A subtyping revealed that 249, 197, and 15 isolates were H1N1, H3N2, and H5N1, respectively. In 2005, of 748 influenza-positive specimens, 492 were influenza A and the remaining 256 were influenza B. The results of influenza A subtyping indicated that 55, 437, and 5 isolates were H1N1, H3N2, and H5N1. All isolated strains of subtype H1N1 were A/New Caledonia/20/99-like. The isolated strains of H3N2 were A/Fujian/411/2002-like in the first half of the year 2004, while those in the latter half of 2004 gradually drifted to a mixture of A/Wellington/1/2004-like, A/California/7/2004-like, and A/Wisconsin/67/2005-like, and this mixture continued through the end of 2005. The influenza B strains were B/Sichuan/379/99-like, B/Hong Kong/330/2001-like, B/Shanghai/361/2002-like and B/Malaysia/2506/2004-like. The strains circulating in the years 2004 and 2005 were antigenically similar to the vaccine formulas recommended in the same period by WHO. Our results underscore that local influenza surveillance plays an important role in responding to epidemics and potential pandemics.

Influenza viruses cause recurrent epidemics and pandemics due to the frequent antigenic variation of their viral surface antigens. This capacity for constant mutation explains why influenza continues to be a major epidemic disease in humans, despite efforts for prevention and control by vaccination. In Thailand, several outbreaks of influenza have been described. The most severe pandemic occurred in 1918, causing 20 - 40 million deaths worldwide (1,2). In order to minimize the impact of this disease, the World Health Organization (WHO) formed an Influenza Surveillance Network to collect influenza isolates and epidemiological information. At present 118 National Influenza Centers (NIC) have been located in 89 countries. The Thai NIC was established at the National Institute of Health of the Department of Medical Science, Ministry of Public Health in 1972, and continuous active surveillances has been carried out by this center ever since. In past surveillance efforts, clinic doctors selected patients with symptoms of acute respiratory infection (ARI) for their analyses. Throat swab specimens were collected from these patients twice a week throughout the year at a Health Center in the Bangkok area. However, due to the limited geographical area of the specimen collection, these data could not be considered representative of the influenza strains circulating throughout the whole country. Since 2001, the Thai NIC has established sentinel surveillance sites in each of the four main geographical regions of the country. These sentinel sites were selected for their proximity to neighboring countries from which movement across the borders may result in importation of new strains. Such new strains could cause a new epidemic or pandemic. Local surveillance of influenza circulating strains is the best and most rapid method to detect the novel strains by viral isolation. In this manuscript, we present data on influenza strains circulating in Thailand over the years 2004-2005, which confirms that the vaccine and circulating strains do indeed match. Between there were avian influenza outbreaks over this period, the data of avian influenza detections are also reported.

In 2004 and 2005, the provincial hospitals at Tak province in northern Thailand, Nongkhai province in northeastern Thailand, and Songkhla province in southern Thailand were selected as influenza surveillance sentinel sites in addition to one provincial hospital at Chanthaburi province and one health center in Bangkok in central Thailand. Each sentinel site was required to collect specimens twice a week throughout the year. All throat swab or nasopharyngeal aspirate specimens were collected by the clinic doctors from out-patients with symptoms of influenza-like illness (ILI) and inpatients with suspected pneumonia who presented at the sentinel sites on those days. Only one specimen was collected from each patient for the virus isolation and identification in this study. During this period, avian influenza outbreaks occurred in Thailand. Therefore, the Ministry of Public Health issued an order to all public health officers to collect specimens from probable and suspected avian influenza cases with ILI pneumonia, and a history of contact with sick poultry for H5 detection at the NIC. These specimens were tested by virus isolation in MDCK cells as previously reported (4) and by conventional reverse transcriptase-polymerase chain reaction (RT-PCR) using primer sets from the WHO and the Centers for Disease, Control and Prevention (CDC) at Atlanta, Georgia, USA (5,6). The influenza strains were analyzed by a hemagglutination inhibition (HAI) test using a WHO influenza reagent kit and guidelines. A representative number of influenza isolates was sent to the WHO Collaborating Center at Melbourne, Australia and the CDC for antigenic analysis.

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It was found that 539 (13.9%) of 3,854 and 748 (19.5%) of 3,834 clinical specimens were positive for influenza virus in the years 2004 and 2005, respectively. Of the 539 influenza-positive specimens in 2004, 461 (85.5%) were identified as influenza A and 78 (14.4%) were identified as influenza B. Subtyping for all 461 influenza A-positive isolates revealed that 249 (54.0%), 197 (42.7%), and 15 (3.2%) isolates were A/H1N1, A/H3N2, and A/H5N1 subtypes, respectively. Of 748 influenza-positive specimens in 2005, 492 (65.7%) were identified as influenza A and the remaining 256 (34.2%) were identified as influenza B. The results of subtyping identified that 55 (11.2%), 437 (88.8%), and 5 (1.0%) influenza-positive isolates were A/H1N1, A/H3N2, and A/H5N1, respectively (Table 1).

In the first half of 2004, a large percentage of the influenza A-positive isolates were subtype A/H3N2, whereas the subtype A/H1N1 of isolates was predominant in the latter half of the year. However, a small number of influenza B-positive isolates was also detected throughout this year. In 2005, the predominant influenza subtype was H3N2. The prevalence of influenza B-positive isolates increased, while the number of influenza A-positive isolates of subtype A/H1N1 decreased (Fig. 1).

Influenza virus was isolated from all specimens over the 2 years studied. In 2004 the prevalence of influenza-positive isolates was found in October, whereas in 2005 a small peak of influenza virus isolates was observed in November (Fig. 1). The results of the strain analyses in 2004 - 2005 showed that all isolated influenza A-positive strains of subtype H1N1 were A/New Caledonia/20/99-like. At the beginning of 2004, the isolated influenza A-positive strains of subtype H3N2 were A/Fujian/411/2002-like, but in the latter half of this year the strains gradually drifted to a mixture of A/Welington/1/2004-like, A/California/7/2004-like, and A/Wisconsin/67/2005-like, and this mixture continued until the end of 2005. The isolated influenza B-positive strains were B/Sichuan/379/99-like, B/Hong Kong/330/2001-like, B/Shanghai/361/2002-like, and B/Malaysia/2506/2004-like (Fig. 2). The circulating influenza B strains were found to be both B/Yamagata/16/88 and B/Victoria/2/87 during these 2 years.

In 2004, the results for the total group of influenza-positive isolates showed that influenza A predominated (85.5%), while only a small amount of influenza B (14.5%) was in circulation. From January to July, the major subtype of our isolates was H3N2, whereas from August to November, the subtype of the isolates changed to H1N1. A comparison between the WHO worldwide influenza activity in the year 2004 and our own results for this period revealed similar influenza subtype patterns. In 2005, most of our influenza-positive isolates (65.7%) were influenza A and the remaining ones (34.2%) were influenza B. Subtype H3N2 of the isolated strains accounted for 88.8% and the other isolated strains of subtype H1N1 accounted for 11.2%. These findings are in agreement with the WHO report of worldwide influenza activity in 2005 (7).

Table 1. Breakdown of influenza positive isolates by type and subtype in 2004-2005

<table>
<thead>
<tr>
<th>Year</th>
<th>No. of specimens</th>
<th>No. of positives</th>
<th>Type</th>
<th>Subtype of influenza A</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>A/H1N1</td>
</tr>
<tr>
<td>2004</td>
<td>3,854</td>
<td>539</td>
<td></td>
<td>461</td>
</tr>
<tr>
<td>2005</td>
<td>3,834</td>
<td>748</td>
<td></td>
<td>492</td>
</tr>
</tbody>
</table>

Fig. 1. Monthly distribution of influenza isolates in 2004-2005.

Fig. 2. Breakdown of influenza isolates by strain in 2004-2005.
smaller peak was also seen around the cool season between January and March in the years 2004 and 2005 (8-10). From our data in 2004 and 2005, we were unable to detect more than a minimal increase in the number of influenza-positive isolates by month, although the peaks were found in October 2004 and November 2005. In previous surveillance, influenza-positive isolates were seen to roughly coincide with the rainy season and the cool season. The consistent surveillance of local circulating strains takes on an even greater importance in deciding when vaccination should take place. In Thailand, influenza vaccination has been recommended during the months from March to June, prior to the start of the rainy season (11).

All influenza-positive strains isolated in 2004 and 2005 were included in the WHO vaccine formulas for use in the southern and northern hemispheres over the same period. The data on circulating strains aids in the choice each country makes to select the most effective vaccine for disease control. This data also provides important information used by the WHO to determine the most appropriate vaccine strains for global use each year.

During the avian influenza outbreaks in 2004 - 2005, specimens were collected not only from suspected and probable avian-infected cases, but also from patients with ILI symptoms. Therefore, influenza-positive isolates of subtypes H5N1, H1N1, H3N2, and influenza B were detected. For this reason, it is necessary to add all data from avian influenza surveillance to that from the seasonal influenza surveillance. In the future, the development of a feasible surveillance system for influenza strains with pandemic potential, including H5N1, should improve the ability to respond to a potential pandemic.

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