Influenza Virus Isolated in Thailand and Manila during the Period of August, 1979-August, 1981

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Summary

One hundred and thirty-six strains of influenza viruses isolated from patients in Thailand and Manila during the period of August, 1979-August, 1981 were studied by hemagglutination inhibition reaction with postinfection ferret sera. The Hong Kong subtype (H3N2) was prevalent in Thailand and Manila in the rainy season of 1980, while the USSR subtype (H1N1) was prevalent in Thailand in 1981. A/USSR/92/77- and A/Brazil/11/78-like viruses (H1N1) seemed to have circulated for longer period than in Japan.

Two strains of a new variant of Hong Kong subtype (H3N2), A/Kyoto/C-1/81-like virus, were first isolated in Bangkok in August, 1980. These variant strains of H3N2 were again isolated in Bangkok in January and August of 1981. Twelve strains of type B virus, isolated in Thailand and in Manila since May, 1980 were similar to those isolated in Japan during the same period, and the isolation of a new variant, B/Shiga/75/81-like virus, in Thailand was about 6 months after the isolation in Japan.

Introduction

It is difficult to explain the epidemic behavior of influenza on a simple model, like that of measles. The main features giving rise to epidemiological difficulties are (1) seasonal occurrence, (2) antigenic drift of virus, (3) antigenic shift of virus, and (4) world-wide distribution of influenza at all inhabited areas, in all climates, and in persons of all ages. Seasonal occurrence, so regular and familiar that it tends to be taken for granted, can be followed on a global scale in successive issues of the Weekly Epidemiological Record of the World Health Organization, in which influenza epidemics appear to be travelling to and fro across the world almost annually. Season rather than climate is their determinant as shown by seasonal epidemics of influenza in the temperate zones during the winter seasons and in the tropics during the rainy seasons of monsoons¹⁾. In the latter zone, the mean monthly temperature and sometimes humidity may vary only a little throughout the year. One hypothesis, dealing with the epidemiology of influenza virus, proposes the temperate epidemic zone and the tropical virus-reservoir zone²⁾³⁾. Japan may be included in the former, while South-East (SE) Asia and the Tropical Western Pacific in the latter. This hypothesis is seemingly supported by the following facts: (1) the yearly occurrence of influenza alternates between these two zones (mainly in November-April in Japan, and April-November in SE Asia and the Tropical Western Pacific)¹⁾; (2) in SE Asia, the number of reported cases does not fall much from the rainy season (June-October) to the dry season (December-April)¹⁾; (3) some variants of the virus have been isolated in SE Asia and in the Philippines several months prior to their isolation in Japan^{4)~6)}.

Influenza is, however, ubiquitous on the earth. In the late 20th century when the transportation system has been greatly developed, it would be myopic to visualize influenza virus movement as occurring only between Japan and SE Asia as well as the Tropical Western Pacific. The routes by which the virus can enter either area are multiple. In addition, Hope-Simpson⁷⁾ presented a hypothesis from the household surveillance in England that the initiating factor of influenza A epidemics is an activation of the latent virus in humans, though any direct evidence of the latent virus was not presented.

Thus, it is important to be aware of the kinds of isolates that are isolated throughout SE Asia, the Tropical Western Pacific and Japan so that hopefully some epidemiological and virological inferences can be drawn. In this study, 136 strains of influenza virus from patients in Thailand and Manila during the period of August, 1979-August 1981 were evaluated by HI test.

Materials and Methods

The Society for Medical Research in South-East Asia, Nippon Medical School, Tokyo, dispatched research teams to Thailand in August 1979, May and August 1980, December 1980-January 1981, and August 1981, and to Manila in May and August 1980 and January 1981. They collected 996 throat swab specimens from patients suspected of having influenza through the cooperation of the Faculty of Medicine, Chiang Mai University, the Siriraj Hospital, Mahidol University, and the Virus Research Institute, Bangkok, and the San Lazaro Hospital, Manila. The specimens were placed in nutrient broth and kept at -70°C on dry ice before being inoculated into developing hens' eggs in the laboratories of Nippon Medical School, and of the National Institute of Health, Tokyo.

Isolation of virus was performed with the amniotic inoculation of 0.2ml of the clinical specimen into 10 days old eggs, and the HI tests with chicken erythrocytes⁸⁾ were performed after 2 or less passages through the eggs. Reference, postinfection, ferret antisera were raised against the following strains: A/USSR/92/77, A/Brazil/11/78, A/Kumamoto/37/79, A/England/403/80, and A/Fukuoka/C-1/81 of H1N1; A/Kumamoto/22/76, A/Tokyo/1/77, A/Bangkok/1/79, A/Aichi/1/80, A/Bangkok/137/80, A/Bangkok/211/81, A/Kyoto/C-1/81, and A/Niigata/102/81 of H3N2; and B/Kanagawa/3/76, B/Sin-

Table 1 Isolation of influenza viruses in
Thailand and in Manila, August 1979-
August 1981

Date of collecting specimens	Areas	Viruses		
		AH1	AH3	B
Aug. 20-23, '79	Chiang Mai	6	2	0
Aug. -Sep. '79	Bangkok	0	2	0
May 13-20, '80	Chiang Mai	2	0	0
May 11-20, '80	Sakaeo	3	1	0
May 11-22, '80	Bangkok	1	7	0
May 27-30, '80	Manila	0	12	2
June-Aug. '80	Bangkok	0	25	1
Aug. 18-22, '80	Chiang Mai	0	14	2
Aug. -Sep. '80	Bangkok	0	17	1
Oct. '80	Bangkok	0	2	0
Jan. '81	Bangkok	2	1	0
June-Aug. '81	Bangkok	11	1	1
Aug. 17-25, '81	Chiang Mai	15	0	5
Subtotal		40	84	12
Total			136	

Virus strains comprised 78 isolated in Japanese laboratories from 996 throat swabs, and 58 isolated in the Siriraj Hospital and the Virus Research Institute, Bangkok

gapore/222/79, and B/Shiga/75/81 of type B.

Virus strains studied in this paper comprise 78 strains isolated in Japanese laboratories from aforesaid 996 throat swabs, and 58 strains isolated in the laboratories of the Virus Research Institute and of the Siriraj Hospital, Bangkok.

Results

Isolation of viruses. The virus strains isolated in this study are listed in Table 1. It is comprised of 40 strains of H1N1, 84 of H3N2 and 12 of type B virus. H3N2 seemed to prevail during the rainy season of 1980, and H1N1 during the rainy season of 1981.

H1N1 viruses isolated in Thailand. Forty strains of H1N1 virus were isolated in Thailand during the period of August, 1979-August, 1981. The H1N1 virus was not obtained from Manila. Antigenic properties of the 40 strains as determined with HI tests are summarized in Table 2. All 6 of the 1979 isolates were A/USSR/92/77-like viruses. Five out of 6 of the May, 1980 isolates were related to the A/Brazil/11/78 virus, while the sixth was not similar to any of the reference viruses. Three out of 13 isolates from Bangkok in 1981 were similar to A/Brazil/11/78, while the other 10 were intermediate between the Brazil-variant and A/England/403/80. Nine out of 15 strains isolated from Chiang Mai in August, 1981 were similar to the Brazil-variant, 5 were intermediate between Brazil and England-variants, and one was similar to the A/England/403/80. This data suggests that in Thailand the antigenic properties of H1N1 viruses drifted from USSR-like variant, through the Brazil-like variant, to the England-like variant during the period of August, 1979-August, 1981.

H3N2 viruses isolated in Thailand and in Manila. Eighty-four strains of H3N2 virus were isolated during the period of August, 1979-August, 1981, Table 3 summarizes the antigenic properties of 75 of these isolates studied with HI reactions. Two strains isolated in Chiang Mai in August, 1979 were similar to A/Tokyo/1/77 (equivalent to A/Texas/1/77), while 2 strains isolated in Bangkok in 1979 were A/Bangkok/1/79 and 2/79. Among 67 strains isolated from Thailand and Manila during the period of

Table 2 Antigenic properties of AH1 viruses isolated in Thailand.
August 1979–August 1981

Month of collecting specimens	Areas	Antigenic similarity					
		USSR ^{a)}	USSR-Brazil	Brazil ^{b)}	Brazil-England	England ^{c)}	?
Aug. '79	Chiang Mai	6	0	0	0	0	0
May '80	Thailand	0	2	3	0	0	1
Jan. '81	Bangkok	0	0	0	2	0	0
June-Aug. '81	Bangkok	0	0	3	8	0	0
Aug. '81	Chiang Mai	0	0	9	5	1	0

a) A/USSR/92/77. b) A/Brazil/11/78. c) A/England/403/80.

Table 3 Antigenic properties of AH3 viruses isolated in Thailand and Manila. August 1979–August 1981

Month of collecting specimens	Areas	Antigenic similarity				
		Tokyo ^{a)}	Tokyo-Bangkok	Bangkok ^{b)}	Kyoto ^{c)}	?
Aug.-Sep. '79	Thailand	2	0	1	0	1
May-Aug. '80	Thailand and Manila	16	29	14	2	6
Oct. '80-Jan. '81	Bangkok	0	0	2	1	0
Aug. '81	Bangkok	0	0	0	1	0

a) A/Tokyo/1/77. b) A/Bangkok/1/79. c) A/Kyoto/C-1/81.

May–August, 1980, 16 were similar to A/Tokyo/1/77, 29 were intermediate between A/Tokyo/1/77 and A/Bangkok/1/79, and 14 were similar to A/Bangkok/1/79. However, the other 8 strains were different from both of these reference viruses. Two strains isolated in October, 1980 were A/Bangkok/1/79-like viruses. Both of 2 strains isolated in January and August 1981 were different from both A/Tokyo/1/77 and A/Bangkok/1/79.

Type B influenza viruses isolated in Thailand and Manila. Twelve strains of type B virus were isolated after May, 1980 in this study, and 5 out of 12 were from Chiang Mai in August, 1981. All of the 12 strains were similar to either B/Kanagawa/3/76, B/Singapore/222/79, or B/Shiga/75/81. B/Shiga/75/81-like virus was isolated in Bangkok in August, 1981.

Discussion

In order to study prevailing viruses in SE Asia and the Tropical Western Pacific, and to know their relationship to Japanese isolates, we tested 136 influenza virus strains isolated from patients in Thailand and Manila during the period of August, 1979, to August, 1981. Hemagglutination inhibition (HI) reactions were determined, using post-infection ferret antisera, which had been raised to a number of reference strains.

In August, 1979, both of H1N1 and H3N2 viruses were isolated in Chiang Mai. During the period of October, 1978–September, 1979, the H3N2 virus was isolated only in a few countries in the world¹²⁾, and it was not reported in Japan¹³⁾. Isolation of H3N2 virus in Chiang Mai, and in Bangkok in August–September, 1979, is evidence of the smouldering of the subtype in Thailand.

H3N2 virus was prevalent in both Thailand and Manila in the rainy season of 1980, and H1N1 was prevalent in Thailand in the rainy season of 1981. In Japan, the influenza virus isolates were: H1N1 1420, H3N2 619 and B 279 in the winter of 1979–1980; and H1N1 718, H3N2 150, and B 232 in the winter of 1980–1981⁹⁾¹⁴⁾; and B was prevailing in 1981–1982. In USA, the influenza virus isolates were H1N1 24, H3N2 0, and B 1334 in the winter of 1979; and H3N2 was more prevalent than H1N1 in the winter of 1980–1981¹⁵⁾. Thus, different subtypes or types prevailed in the different parts of the world. However, the prevalence of a particular subtype or type was much greater in Thailand and in USA than in Japan.

This might reflect the difference of the vaccination policy. In Thailand, the vaccine is not given, and in the USA, it is recommended only to high risk groups. But in Japan, more than 50% of school children are immunized with trivalent (H1N1, H3N2, and B) vaccine. The immunity of people is a major factor in both of the direct spread-hypothesis and the latent virus-hypothesis⁷⁾ of influenza epidemics, as far as the selection of the prevailing virus concerns. If we have a casual speculation, development and spread of the prevailing virus may be inhibited by the level of immunity in school children, and any particular subtype or type of virus may not become exclusively prevalent in Japan. But in Thailand and USA, different subtype and type could prevail alternately in the successive year without the interference by the level of immunities raised by the large scale administration of the trivalent vaccine, where the immunity has been mainly acquired with the natural infection the year before.

In Japan, most H1N1 isolated in the winter of 1979-1980, and of 1980-1981, were similar to A/Brazil/11/78 or A/Kumamoto/37/79¹³⁾. Only the A/Fukuoka/C-1/81-like viruses, which have drifted more than A/England/403/80, were found after December, 1981. The H1N1 viruses isolated from Thailand in 1979 were the USSR-like viruses, 2 (from Sakaeo) out of 6 strains in 1980 were related to the USSR-variant, and 9 out of 15 isolates from Chiang Mai in 1981 were the Brazil-variants. These results suggest that the old USSR-variant and the Brazil-variant survived and circulated for a longer period in Thailand than in Japan. Studies of the recombinant H1N1 viruses that had received genes from the H3N2 variant¹⁶⁾¹⁷⁾ are not included in this report.

Isolation of antigenically drifted strains of H3N2 viruses in Thailand and Manila seemed more frequent than in case of H1N1. In addition, the study of H3N2 viruses isolated in Thailand gave this interesting result: that 2 strains of a new variant of A/Kyoto/C-1/81-like virus⁶⁾⁹⁾ appeared at Bangkok in August, 1980, 6 months prior to the isolation in Japan, and the variant viruses were again isolated in that city in January and August, 1981. Details of this story will be described in further reports¹⁰⁾¹¹⁾. It is not known, however, whether the new variant strains developed independently in Thailand and in Japan according to the latent virus-hypothesis⁷⁾, or traveled to and from the areas including SE Asia and Japan by the direct spread among people.

All of the 12 strains of type B virus isolated from Thailand and Manila since May, 1980 were not different from the viruses isolated in Japan during the same period. Isolation of the type B virus was frequent in Chiang Mai in the late stage of this study, because 25% of influenza virus strains in the area in August, 1981 were type B. One strain from Bangkok in August, 1981 was similar to the new variant, B/Shiga/75/81 which was first isolated in Japan in the early winter of 1981⁹⁾. Thus, the variant appeared in Japan prior to the isolation in Thailand.

Both of the new variants, A/Kyoto/C-1/81- and B/Shiga/75/81-like viruses, were isolated from Bangkok, but not from Chiang Mai. This might suggest a difference between Bangkok and Chiang Mai, as far as the apparent circulation of new variants in SE Asia and Japan concerns.

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1979年 8月～1981年 8月にタイ国および

マニラで分離されたインフルエンザウイルス

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1979年8月から1981年8月までにタイ国およびマニラの患者から分離された136株のインフルエンザウイルスの抗原分析を、感染フェレット血清を用いる HI 試験により行なった。1980年の雨季のタイおよびマニラでは、主に H3N2 が流行し、1981年のタイでは、主に H1N1 が流行した。A/USSR/92/77 および A/Brazil/11/78 様ウイルスは、タイでは日本より長期間存続した。N3N2 の新しい変異ウイルス、A/京都/C-1/81 様ウイルスは、日本より6ヶ月先立って、1980年8月にバンコックではじめて分離され、1981年1月および8月に再びバンコックで分離された。B型は、1980年以降にタイ国およびマニラで分離され、それらは同じ時期の日本分離株と同様であり、新しい変異ウイルス、B/志賀/75/81 様ウイルスは、タイ国では日本より約6ヶ月おくれて分離された。