—Preliminary Notes—

Antigenic analysis of influenza viruses isolated in Thailand, June ~ August 1981

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During June to August 1981, 33 strains of influenza viruses were isolated from patients in Thailand¹⁾. This report describes results of the antigenic analysis with the hemagglutination inhibition (HI) test of the 33 strains, as well as of 2 strains isolated in January 1981 (A/Bangkok/1/81 and 13/81) and of 2 strains isolated in October 1980 (A/Bangkok/39/80 and 40/80). HI tests were conducted with postinfection ferret antisera raised to A/USSR/92/77, A/Brazil/11/78, A/Kumamoto/37/79²⁾, A/England/403/80 and A/Fukuoka/C-9/81³⁾ of H1N1 viruses; A/Tokyo/1/77, A/Bangkok/1/79, A/Aichi/1/80, A/Bangkok/211/81⁴⁾ and A/Kyoto/C-1/81⁵⁾ of H3N2 viruses; and B/Kanagawa/3/76, B/Singapore/222/79, B/Yokohama/1/80¹⁾, B/Sendai/46/80²⁾ and B/Shiga/75/81⁵⁾ of type B viruses. Methods of the HI test with microplates using chicken erythrocytes were described elsewhere^{4, 6)}.

Results of HI tests with 5 references and 28 Thai strains of the H1N1 subtype are described in **Table 1**. Strain, A/Kumamoto/37/79, isolated in September 1979, is antigenically similar to A/Brazil/11/79 with a minor difference, and all H1N1 strains isolated in Japan during January to March 1980 were similar to the A/Brazil or A/Kumamoto strain²⁾. Strain, A/England 403/80 is antigenically similar to the A/Kumamoto strain, and a CDC report says A/England-like viruses accounted for 10% of all H1N1 isolates in the USA³⁾. Strain, A/Fukushima/C-9/81, isolated in the early winter of 1981, is a representative strain of the antigenic variants which accounted for about 10% of the H1N1 isolates in Japan in the season and had undergone some antigenic drift(s) from the A/Kumamoto or A/England strain³⁾. All the H1N1 isolates in Japan in December

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Table 1 Hemagglutination-inhibition reactions of influenza A (H1N1) viruses

Antigens	ferret antisera				
	A/USSR/ 92/77	A/Brazil/ 11/78	A/Kumamoto/ 37/79	A/England/ 403/80	A/Fukuoka/ C-9/81
A/USSR/92/77	256	128	128	128	512
A/Brazil/11/78	64	256	256	128	512
A/Kumamoto/37/79	32	128	256	128	128
A/England/403/80	<32	64	128	256	256
A/Fukuoka/C-9/81	<32	64	32	64	256
A/Chiang Mai/11/81	32	256	128	256	512
A/Chiang Mai/12/81	64	128	128	256	1,024
A/Chiang Mai/13/81	64	256	256	256	1,024
A/Chiang Mai/14/81	64	256	256	128	512
A/Chiang Mai/21/81	32	128	128	256	512
A/Chiang Mai/22/81	32	128	128	256	512
A/Chiang Mai/23/81	32	64	128	256	512
A/Chiang Mai/24/81	64	256	128	256	1,024
A/Chiang Mai/41/81	64	256	256	256	1,024
A/Chiang Mai/42/81	64	256	256	256	512
A/Chiang Mai/43/81	64	256	256	256	1,024
A/Chiang Mai/44/81	64	128	128	256	512
A/Chiang Mai/41-1/81	ND	256	ND	ND	512
A/Chiang Mai/51/81	ND	256	ND	ND	512
A/Chiang Mai/52/81	ND	128	ND	ND	256
A/Bangkok/1/81	32	128	128	256	512
A/Bangkok/2/81	32	128	128	256	512
A/Bangkok/3/81	64	256	256	256	512
A/Bangkok/4/81	64	128	256	256	512
A/Bangkok/5/81	64	128	128	256	512
A/Bangkok/6/81	32	128	128	256	512
A/Bangkok/7/81	32	128	256	256	512
A/Bangkok/8/81	32	128	128	256	512
A/Bangkok/9/81	32	128	128	256	512
A/Bangkok/10/81	32	128	128	256	256
A/Bangkok/11/81	32	128	128	256	512
A/Bangkok/12/81	32	128	128	128	512
A/Bangkok/13/81	32	128	128	128	512

ND, not done

1981 belonged to the A/Fukuoka variant (unpublished data). Among 28 H1N1 isolates from Thailand, 12 strains (9 from Chiang Mai and 3 from Bangkok) were A/Brazil/11/78-like viruses, 12 were intermediate between A/Brazil and A/England variants, and one was similar to A/England. The antigenic drift to A/Fukuoka variant was not observed among Thai-isolates, which suggests that the antigenic drift of H1N1 subtype occurs a few years later in Thailand than in Japan as noted in further reports^{1,4,7).}

Table 2 shows results of HI tests with 6 references, 2 Japanese and 3 Thai isolates of the H3N2 subtype. In this experiment, strains, A/Bangkok/137/80, 212/81, and A/Kyoto/C-1/81, appeared to be similar to A/Tokyo/1/77. However, in other experiments with different stock antigens and antisera of the same strains, strains, A/Bangkok/137 and A/Kyoto/C-1 gave similar HI reactions which were different from those of A/Tokyo/1/77

Table 2 Hemagglutination-inhibition reactions of influenza A (H3N2) and B viruses

Antigens	ferret antisera					
	A/Tokyo/ 1/77	A/Bangkok/ 1/79	A/Bangkok/ 137/80	A/Aichi/ 1/80	A/Bangkok/ 211/81	A/Kyoto/ C-1/81
A/Tokyo/1/77	1,024	256	256	256	256	1,024
A/Bangkok/1/79	2,048	1,024	1,024	1,024	512	2,048
A/Bangkok/137/80	1,024	256	256	128	256	2,048
A/Aichi/1/80	1,024	1,024	512	1,024	256	2,048
A/Bangkok/211/81	128	64	64	64	512	256
A/Kyoto/C-1/81	512	128	256	128	256	2,048
A/Bangkok/39/80	1,024	512	1,024	1,024	128	1,024
A/Bangkok/40/80	1,024	1,024	1,024	1,024	512	2,048
A/Bangkok/212/81	512	128	256	128	256	2,048
A/Niigata/102/81	128	64	64	128	512	512
A/Tokyo/135/81	1,024	1,024	512	512	256	2,048

Antigens	ferret antisera				
	B/Kanagawa/ 3/76	B/Singapore/ 222/79	B/Yokohama/ 1/80	B/Sendai/ 46/80	B/Shiga/ 75/81
B/Kanagawa/3/76	256	64	256	128	128
B/Singapore/222/79	32	64	128	32	128
B/Yokohama/1/80	64	64	256	64	128
B/Sendai/46/80	256	128	512	512	256
B/Shiga/75/81	64	64	128	128	256
B/Chiang Mai/1/81	64	32	128	32	128
B/Chiang Mai/2/81	64	32	128	32	128
B/Chiang Mai/11/81	32	64	128	32	128
B/Chiang Mai/12/81	128	64	256	64	128
B/Chiang Mai/41/81	256	64	512	256	256
B/Bangkok/101/81	128	64	256	128	512

or A/Bangkok/1/79^{4,5,7)}. Quantitative variation of the antigenicity revealed with the HI test has been experienced during the passage of type B influenza virus⁸⁾. Strains, A/Bangkok/211/81 and A/Niigata/102/81 gave similar HI reactions in this experiment. In our further reports, the antigenic similarities have been observed among strains, A/Bangkok/137/80, 138/80, A/Kyoto/C-1/81, A/Niigata/102/81 and A/Bangkok/211/81 which were different from A/Tokyo/1/77 or A/Bangkok/1/79^{4,7)}. All of the 6 strains of the H3N2 subtype isolated in Japan in December 1981 were similar to A/Kyoto or A/Niigata strain⁹⁾. A/Tokyo/135/81, isolated in January 1981, and A/Bangkok/39/80 and 40/80, isolated in October 1980, were similar to A/Bangkok/1/79 or A/Aichi/1/80. From these data, it could be assumed that the following antigenic drifts occurred in Thailand and in Japan as far as the HI reactions concern: [A/Tokyo/1/77]—[A/Bangkok/137/80, 138/80 (Aug), A/Kyoto/C-1/81 (Feb), A/Bangkok/212/81 (Aug)]—[A/Bangkok/211/81 (Jan), A/Niigata/102/81 (Mar)]. Consequently, it will be concluded that, on the H3N2 subtype, the A/Tokyo/1/77-like virus underwent common antigenic drifts in Thailand and in Japan during August 1980 to December 1981 and cocirculated with A/Bangkok/1/79-like viruses. It is not known whether the antigenic drift(s) occurred in Thailand and in Japan independently

or it occurred in one area and spread to the other area.

Results with type B viruses are described in **Table 2**. Four out of 5 isolates from Chiang Mai were similar to B/Singapore/222/79 or B/Yokohama/1/80, one (Chiang Mai/41) was intermediate between B/Kanagawa and B/Sendai, and one from Bangkok was similar to B/Shiga/75/81 which was isolated in the early winter of 1981⁵⁾. In the winter of 1981 to 1982, type B was prevalent in Japan, and most of the type B viruses isolated in the late winter of 1981 were similar or related to the B/Shiga strain (unpublished data).

REFERENCES

- 1) Takeuchi, Y., Satsuta, K., Yamazi, Y., Yoshikawa, I., Nagata, M., Yunoki, H., Watari, E., Suzuki, H., Suprasert, S., Pongprote, B., Vithayasai, V., Supawadee, J., Damronsack, D., Prathnadi, P., Tuchinda, P., Chearskul, S., Thongcharoen, P., Chatiyononda, K., and Kupradinunt, S. : J. Nippon Med. Sch., **49**, 438, 1982.
- 2) Takeuchi, Y. : Publ. Health Information, **10**, 7, 1980.
- 3) Takeuchi, Y. : Rec. of 19~20th Meeting of Soc. Influenza Vaccine Res., p. 188, Assoc. Biol. Manufact. Japan, Tokyo, 1981.
- 4) Yamazi, Y., Takeuchi, Y., Satsuta, K., Sugiyama, T., Takahashi, M., Yoshikawa, I., Shimizu, Y., Nagata, M., Oya, A., Noriki, H., Vithayasai, V., Damronsack, D., Thongcharoen, P., Chatiyononda, K., and Tuchinda, P. : J. Nippon Med. Sch., **49**, in press, 1982.
- 5) Takeuchi, Y., Oya, A., and Satsuta, K. : J. Japan Assoc. Inf. Dis., **56**, 182, 1982.
- 6) Sever, J.L. : J. Immunol., **88**, 320, 1962.
- 7) Yamazi, Y., Takeuchi, Y., Satsuta, K., Noriki, H., and Chatiyononda, K. : Influenza in South-East Asia. Internatl. Seminar on Viral Dis. in South-East Asia and the West. Pacific, 1982.
- 8) Kaji, T., Onishi, H., and Kimura, N. : Clin. Virol., **5**, 333, 1977.

(Received for publication, April 26, 1982)