

Overview of The Pandemic Influenza Vaccine Stockpiling Strategies

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Abstract

According to the World Health Organization, more and more confirmed human cases of H5N1 infections have been reported all over the world since 2003. Facing pandemic influenza threats, Taiwan has been stockpiling pre-pandemic influenza vaccines since 2006. International stockpile strategies for pandemic influenza vaccine include storage of pre-pandemic influenza vaccines, bulk vaccine antigen, adjuvants and the signing advanced purchase agreements (APA) with manufacturers. Because APA leads to a reduction in the manufacturing of pre-pandemic influenza vaccines, it became a trend worldwide in recent years. We re-examined and evaluated our national strategy for stockpile of vaccines, antigens, adjuvants and APA.

In comparison with the present various stocking strategies, APA is a more appropriate strategy that ensures that the health authority has the priority to obtain vaccines matching the virus strains in circulation of a pandemic. In addition, since the virus strain causing the next influenza pandemic is highly uncertain, APA saves annual cost of pre-pandemic vaccine procurement and avoid the risk of stockpiling a pre-pandemic influenza vaccine with unmatched pandemic virus strains.

Keywords: Pandemic Influenza, H5N1, pre-pandemic vaccine, pandemic vaccine, Advanced Purchase Agreement (APA)

week 36–37, 2019 (Sep. 1–Sep. 14, 2019)

DOI: 10.6525/TEB.201909_35(18).0002

Weekly Data of Notifiable Infectious Diseases (by week of diagnosis)

Case diagnosis year		Week36★		Week 1–36			
Classification	Disease Diagnosed	2019	2018	2018		2017	
				Total cases★	Imported cases	Total cases★	Imported cases
Category I	Plague	0	0	0	0	0	0
	Rabies	0	0	0	0	0	0
	SARS	0	0	0	0	0	0
	Smallpox	0	0	0	0	0	0
Category II	Acute Flaccid Paralysis	1	0	43	0	52	0
	Acute Viral Hepatitis type A	3	1	68	18	67	28
	Amoebiasis	6	6	227	111	214	104
	Anthrax	0	0	0	0	0	0
	Chikungunya Fever	14	0	68	64	4	4
	Cholera	0	0	0	0	5	0
	Dengue Fever	26	52	462	381	288	186
	Diphtheria	0	0	0	0	0	0
	Enterohemorrhagic E. coli Infection	0	0	1	0	0	0
	Epidemic Typhus Fever	0	0	0	0	0	0
	Hantavirus Pulmonary Syndrome	0	0	0	0	0	0
	Hemorrhagic Fever with Renal Syndrome	0	0	1	0	1	0
	Malaria	0	1	3	3	3	3
	Measles	2	0	125	48	33	8
	Meningococcal Meningitis	1	0	4	0	5	1
	Paratyphoid Fever	0	1	5	4	6	5
	Poliomyelitis	0	0	0	0	0	0
	Rubella	0	0	20	16	9	8
Shigellosis	1	3	97	32	111	39	
Typhoid fever	3	3	21	17	11	9	
West Nile Fever	0	0	0	0	0	0	
Category III	Acute Viral Hepatitis type B	0	0	3	3	1	1
	Acute Viral Hepatitis type C	1	4	74	1	94	8
	Acute Viral Hepatitis type D	15	7	422	2	323	3
	Acute Viral Hepatitis type E	0	0	0	0	0	0
	Congenital Syphilis	0	0	7	2	5	0
	Congenital Rubella Syndrome	0	0	0	0	0	0
	Enteroviruses Infection with Severe Complications	0	0	0	0	0	0
	Haemophilus Influenza type b Infection	2	0	36	1	32	0
	Japanese Encephalitis	0	1	1	0	5	0
	Legionellosis	0	0	20	0	35	0
	Mumps	1	11	184	12	134	3
	Neonatal Tetanus	12	16	411	6	408	7
	Pertussis	0	0	0	0	0	0
Tetanus	0	5	23	0	23	2	
Category IV	Botulism	0	0	1	0	5	0
	Brucellosis	0	0	0	0	0	0
	Complicated Varicella	0	0	0	0	0	0
	Endemic Typhus Fever	3	0	45	1	37	0
	Herpesvirus B Infection	1	0	16	1	19	0
	Invasive Pneumococcal Disease	0	0	0	0	0	0
	Leptospirosis	9	5	303	2	342	0
	Listeriosis	3	3	62	0	44	0
	Lyme Disease	3	6	134	1	122	1
	Melioidosis	0	0	1	1	1	1
	Q Fever	6	2	30	0	14	1
	Scrub Typhus	0	2	16	3	12	1
	Severe Complicated Influenza	12	12	323	3	256	0
Toxoplasmosis	56	19	1585	6	941	5	
Tularemia	0	0	12	2	12	1	
Category V	Ebola Virus Disease	0	0	0	0	0	0
	Lassa Fever	0	0	0	0	0	0
	Marburg Hemorrhagic Fever	0	0	0	0	0	0
	Middle East Respiratory Syndrome Coronavirus	0	0	0	0	0	0
	Novel Influenza A Virus Infections	0	0	0	0	0	0
	Rift Valley Fever	0	0	0	0	0	0
	Yellow Fever	0	0	0	0	0	0
Zika virus infection	0	0	0	0	0	0	

1. ★The weekly and cumulative total numbers include indigenous and imported cases of notifiable infectious diseases.
2. MDR-TB, Tuberculosis, Syphilis, Gonorrhoea, HIV Infection, AIDS, Hansen's Disease and Creutzfeldt-Jakob Disease are excluded from the table.
3. Numbers of mumps and tetanus cases are summed up by the week of report.
4. Since 2018/1/1, "Listeriosis" was listed as a Notifiable Infectious Disease.

Suspected Clusters

- Fifty-two clusters were reported during week 36, including 4 tuberculosis clusters, 9 diarrhea clusters, 15 upper respiratory tract infection clusters, 17 influenza-like illness clusters, 3 enterovirus clusters, and 4 varicella clusters.

Imported Infectious Diseases

- There were 39 imported cases from 10 countries during week 36 of 2019.

Countries \ Diseases	Myanmar	Philippines	Thailand	Vietnam	Indonesia	Korea	China	Malaysia	India	Cambodia	Total
Dengue Fever	2	9	4	3			1	1		1	21
Chikungunya Fever	10		2								12
Typhoid fever					2				1		3
Amoebiasis				2							2
Acute Hepatitis A						1					1
Total	12	9	6	5	2	1	1	1	1	1	39

Note: The table summarized the number of imported cases that were either **confirmed** or **updated** in the given week.

- There are 736 imported cases from 30 different countries in 2019. The top 3 countries are Indonesia (205), Vietnam (108), and the Philippines (97).
- Top 3 imported diseases are Dengue Fever (381), Amoebiasis (111), and Chikungunya Fever (64).

Summary of Epidemic

- **Enterovirus** : The epidemic is in the peak period. EV71 is still circulating in the community. The risk of enterovirus transmission increases slowly.
- **Influenza** : Influenza A/H1N1 is the predominant virus in the community. The influenza activity increases slowly.
- **Dengue Fever and Chikungunya Fever** : There are indigenous clusters in Taiwan, and the vector indices rises, therefore the risk of epidemic increases.

Weekly Data of Notifiable Infectious Diseases (by week of diagnosis)

Case diagnosis year		Week 37★		Week 1-37			
Classification	Disease Diagnosed	2019	2018	2018		2017	
				Total cases★	Imported cases	Total cases★	Imported cases
Category I	Plague	0	0	0	0	0	0
	Rabies	0	0	0	0	0	0
	SARS	0	0	0	0	0	0
	Smallpox	0	0	0	0	0	0
Category II	Acute Flaccid Paralysis	1	1	44	0	53	0
	Acute Viral Hepatitis type A	1	1	69	18	68	28
	Amoebiasis	11	7	238	124	221	110
	Anthrax	0	0	0	0	0	0
	Chikungunya Fever	7	0	75	66	4	4
	Cholera	0	1	0	0	6	0
	Dengue Fever	12	18	474	390	306	189
	Diphtheria	0	0	0	0	0	0
	Enterohemorrhagic E. coli Infection	0	0	1	0	0	0
	Epidemic Typhus Fever	0	0	0	0	0	0
	Hantavirus Pulmonary Syndrome	0	0	0	0	0	0
	Hemorrhagic Fever with Renal Syndrome	0	0	1	0	1	0
	Malaria	0	0	3	3	3	3
	Measles	3	2	128	50	35	9
	Meningococcal Meningitis	0	0	4	0	5	1
	Paratyphoid Fever	0	0	5	4	6	5
	Poliomyelitis	0	0	0	0	0	0
Rubella	1	0	21	17	9	8	
Shigellosis	0	5	97	32	116	40	
Typhoid fever	0	1	21	17	12	10	
West Nile Fever	0	0	0	0	0	0	
Category III	Acute Viral Hepatitis type B	0	0	3	3	1	1
	Acute Viral Hepatitis type C	3	4	77	1	98	8
	Acute Viral Hepatitis type D	9	9	431	2	332	3
	Acute Viral Hepatitis type E	0	0	0	0	0	0
	Congenital Syphilis	1	1	8	3	6	0
	Congenital Rubella Syndrome	0	0	0	0	0	0
	Enteroviruses Infection with Severe Complications	0	0	0	0	0	0
	Haemophilus Influenza type b Infection	0	0	36	1	32	0
	Japanese Encephalitis	0	0	1	0	5	0
	Legionellosis	0	0	20	0	35	0
	Mumps	5	6	189	12	140	3
	Neonatal Tetanus	11	15	422	6	423	7
	Pertussis	0	0	0	0	0	0
Tetanus	0	0	23	0	23	2	
Category IV	Botulism	0	0	1	0	5	0
	Brucellosis	0	0	0	0	0	0
	Complicated Varicella	0	0	0	0	0	0
	Endemic Typhus Fever	1	2	46	1	39	0
	Herpesvirus B Infection	1	1	17	2	20	1
	Invasive Pneumococcal Disease	0	0	0	0	0	0
	Leptospirosis	7	9	310	2	351	0
	Listeriosis	6	1	68	0	45	0
	Lyme Disease	0	0	134	1	122	1
	Melioidosis	0	0	1	1	1	1
	Q Fever	1	4	31	0	18	1
	Scrub Typhus	0	0	16	3	12	1
	Severe Complicated Influenza	5	5	328	4	261	0
Toxoplasmosis	50	20	1635	6	961	5	
Tularemia	0	0	12	2	12	1	
Category V	Ebola Virus Disease	0	0	0	0	0	0
	Lassa Fever	0	0	0	0	0	0
	Marburg Hemorrhagic Fever	0	0	0	0	0	0
	Middle East Respiratory Syndrome Coronavirus	0	0	0	0	0	0
	Novel Influenza A Virus Infections	0	0	0	0	0	0
	Rift Valley Fever	0	0	0	0	0	0
	Yellow Fever	0	0	0	0	0	0
Zika virus infection	0	0	0	0	0	0	

1. ★The weekly and cumulative total numbers include indigenous and imported cases of notifiable infectious diseases.
2. MDR-TB, Tuberculosis, Syphilis, Gonorrhoea, HIV Infection, AIDS, Hansen's Disease and Creutzfeldt-Jakob Disease are excluded from the table.
3. Numbers of mumps and tetanus cases are summed up by the week of report.
4. Since 2018/1/1, "Listeriosis" was listed as a Notifiable Infectious Disease.

Suspected Clusters

- Forty-nine clusters were reported during week 37, including 1 tuberculosis cluster, 8 diarrhea clusters, 16 upper respiratory tract infection clusters, 22 influenza-like illness clusters, and 2 varicella clusters.

Imported Infectious Diseases

- There were 29 imported cases from 10 countries during week 37 of 2019.

Countries \ Diseases	Indonesia	Myanmar	Vietnam	Thailand	China	Hong Kong	New Zealand	Cambodia	Malaysia	Philippines	Total
Amoebiasis	10			1	1						12
Dengue Fever		2	4	1				1		1	9
Chikungunya Fever		2									2
Measles				1			1				2
Rubella						1					1
Scrub Typhus					1						1
Acute Hepatitis E					1						1
Endemic Typhus Fever									1		1
Total	10	4	4	3	3	1	1	1	1	1	29

Note: The table summarized the number of imported cases that were either **confirmed** or **updated** in the given week.

- There are 764 imported cases from 32 different countries in 2019. The top 3 countries are Indonesia (214), Vietnam (112), and the Philippines (97).
- Top 3 imported diseases are Dengue Fever (390), Amoebiasis (123), and Chikungunya Fever (66).

Summary of Epidemic

- Enterovirus** : The epidemic is in the peak period. EV71 is still circulating in the community. The risk of enterovirus transmission increases slowly.
- Dengue and Chikungunya** : The indigenous clusters have geographically expanded in Taiwan, therefore the risk of epidemic is increasing.

The Taiwan Epidemiology Bulletin series of publications is published by Centers for Disease Control, Ministry of Health and Welfare, Taiwan (R.O.C.) since Dec. 15, 1984.

Publisher: Jih-Haw Chou

Editor-in-Chief: Yung-Ching Lin

Executive Editor: Hsueh-Ju Chen, Hsin-Lun Lee

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Telephone No: +886-2-2395-9825

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Suggested Citation:

[Author].[Article title].Taiwan Epidemiol Bull 2019;35:[inclusive page numbers]. [DOI]