

### Challenges for Laboratory Diagnosis of Measles in Measles Elimination Phase

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#### Abstract

Measles is a highly contagious disease. The number of measles cases in Taiwan decreased significantly after the national routine immunization program has been launched since 1978. Most of the cases confirmed after year 2000 were unvaccinated with measles-containing vaccine. In a 2002 school outbreak, some measles vaccinated cases developed milder symptoms, and had different levels of antibodies compared with classic measles cases. In addition to serological tests, the new molecular method can detect virus gene rapidly from clinical specimens, although challenges remains given the variable viral loads, divergent measles viruses sequences, and seropositivity in measles-vaccinated persons with atypical presentations. We summarized laboratory investigations of reported measles cases after 2005 in Taiwan.

**Keywords:** Measles, Susceptible case, Elimination

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## Cluster of Measles Cases, Central Taiwan, 2015

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### Abstract

In June 2015, measles was confirmed in a 1-year-old boy from central Taiwan who had not received measles immunization. The source of measles infection was not identified. Contact investigations showed another measles case in an 18-year-old female healthcare worker who had received 3 doses of measles/measles, mumps, and rubella (MMR) vaccine and contacted the index case during his hospitalization. She presented with mild symptoms and atypical laboratory results. Although measles incidence is low in Taiwan, health care workers should take measles into consideration in face of individuals with skin eruption. Individuals with previous history of measles immunization may develop mild and atypical presentations after measles infection. Our report underscores the significance of measles breakthrough infection and provides the experience in measles case investigation and management.

**Keywords:** Measles, Nosocomial infection, Outbreak

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Numbers of New Cases and Cumulative Cases of Notifiable Infectious Diseases  
(by week of diagnosis)

Case diagnosis week		Week 14		Week 1–14	
Classification	Disease Diagnosed <sup>1</sup>	2016	2015	2016	2015
Category I	Plague	0	0	0	0
	Rabies	0	0	0	0
	SARS	0	0	0	0
	Smallpox	0	0	0	0
Category II	Acute Flaccid Paralysis	0	1	9	5
	Acute Viral Hepatitis type A	18	1	167	24
	Amoebiasis	3	7	72	103
	Anthrax	0	0	0	0
	Chikungunya Fever	0	0	3	3
	Cholera	0	0	0	0
	Dengue Fever	2	9	508	183
	Diphtheria	0	0	0	0
	Enterohemorrhagic E. coli Infection	0	0	0	0
	Epidemic Typhus Fever	0	0	0	0
	Hantavirus Pulmonary Syndrome	0	0	0	0
	Hemorrhagic Fever with Renal Syndrome	0	0	2	0
	Malaria	1	0	4	3
	Measles	0	0	1	1
	Meningococcal Meningitis	0	0	2	1
	Paratyphoid Fever	0	0	0	3
	Poliomyelitis	0	0	0	0
	Rubella	0	1	3	3
	Shigellosis	8	3	58	65
	Typhoid fever	0	2	1	12
West Nile Fever	0	0	0	0	
Category III	Acute Viral Hepatitis type B	2	4	23	30
	Acute Viral Hepatitis type C <sup>5</sup>	3	6	48	53
	Acute Viral Hepatitis type D	0	0	1	1
	Acute Viral Hepatitis type E	0	0	4	1
	Acute Viral Hepatitis untype	0	0	0	0
	Congenital Rubella Syndrome	0	0	0	0
	Enteroviruses Infection with Severe Complications	0	0	2	1
	Haemophilus Influenza type b Infection	0	0	2	1
	Japanese Encephalitis	0	0	0	0
	Legionellosis	1	1	29	48
	Mumps <sup>2</sup>	13	15	150	190
	Neonatal Tetanus	0	0	0	0
	Pertussis	0	0	2	41
	Tetanus <sup>2</sup>	0	0	2	1
Category IV	Botulism	0	0	1	1
	Brucellosis	0	0	0	0
	Complicated Influenza	24	26	1753	270
	Complicated Varicella <sup>4</sup>	1	0	12	19
	Endemic Typhus Fever	0	0	3	0
	Herpesvirus B Infection	0	0	0	0
	Invasive Pneumococcal Disease	10	12	229	200
	Leptospirosis	1	0	12	16
	Lyme Disease	0	0	0	0
	Melioidosis	0	1	3	10
	Q Fever	0	0	8	9
	Scrub Typhus	0	2	70	95
	Toxoplasmosis	0	1	3	1
Tularremia	0	0	0	0	
Category V	Ebola Virus Disease	0	0	0	0
	Ebola-Marburg Hemorrhagic Fever	0	0	0	0
	Novel Influenza A Virus Infections <sup>6</sup>	0	0	0	0
	Lassa Fever	0	0	0	0
	Rift Valley Fever	0	0	0	0
	Middle East Respiratory Syndrome Coronavirus	0	0	0	0
Yellow Fever	0	0	0	0	

1. The following 8 chronic diseases are excluded from the table: MDR-TB, Tuberculosis, Syphilis, Gonorrhea, HIV Infection, AIDS, Hansen Disease and Creutzfeldt-Jakob Disease.  
2. Reported cases.  
3. Since 2014/1/1, "Varicella" was modified to "Complicated Varicella".  
4. Since 2014/3/6, the case definition for confirmed Acute hepatitis C was changed from "meet the clinical and laboratory conditions" to "meet the clinical or laboratory conditions".  
5. Since 2014/7/1, various subtypes of human cases of avian influenza are reported as "novel influenza A virus infections", a Category V Notifiable Infectious Disease. The original "H5N1 flu" and "H7N9 flu", which were respectively listed as a Category I Notifiable Infectious Disease and a Category V Notifiable Infectious Disease were removed from the list on the same day.

### Suspected Clusters

- Eighteen clusters were reported, including 11 diarrhea clusters, 4 tuberculosis clusters, and 3 upper respiratory tract infection clusters.

### Imported Infectious Diseases

- 13 confirmed cases were imported from 5 countries during Week 14 of 2016.

Country Disease	Indonesia	Angola	Vietnam	China	Malaysia	Total
Shigellosis	6					6
Dengue Fever	2		1		1	4
Malaria		1				1
Hepatitis A				1		1
Amoebiasis	1					1
<b>Total</b>	9	1	1	1	1	13

Note: The statistics listed in this table include imported cases that were either confirmed or updated\* in the previous week.

- A total of 169 confirmed cases were imported from 19 countries in 2016.
- Top 3 imported diseases : Dengue fever (77), Amoebiasis (29), Shigellosis (26).
- Top 3 countries responsible for most imported cases : Indonesia (77), Philippines (18), Vietnam (15).

### Summary of Epidemic

- **Influenza** : The epidemic of influenza has slowed down. The peak of epidemic season will soon be over. Influenza virus type B is currently the dominant strains circulating in the community.
- **Acute Hepatitis A** : As compared to the same period in the past years, an increase in hepatitis A activity has been observed. The epidemic of HIV and hepatitis A co-infection has continued to persist. On the other hand, the number of non-HIV-infected cases reported this year has also increased.
- **Diarrhea** : During Week 14, the numbers of visits and the consultation rate to outpatient services and ER for diarrhea were higher than that during Week 13. Norovirus is currently the dominant strains circulating in the community.
- **Enterovirus** : During Week 14, 2 cases infected by enterovirus 71 have been confirmed. The public is urged to enhance personal hygiene and stay vigilant for suspicious symptoms of enterovirus infection with severe complications in infants.
- **Zika Virus Infection** : Taiwan CDC has issued a travel notice of Level 2: Alert for Zika virus for Saint Lucia.

### Numbers of New Cases and Cumulative Cases of Notifiable Infectious Diseases (by week of diagnosis)

Case diagnosis week		Week 15		Week 1—15	
Classification	Disease Diagnosed <sup>1</sup>	2016	2015	2016	2015
Category I	Plague	0	0	0	0
	Rabies	0	0	0	0
	SARS	0	0	0	0
	Smallpox	0	0	0	0
Category II	Acute Flaccid Paralysis	0	1	9	6
	Acute Viral Hepatitis type A	24	0	191	24
	Amoebiasis	4	4	76	107
	Anthrax	0	0	0	0
	Chikungunya Fever	0	0	3	3
	Cholera	0	0	0	0
	Dengue Fever	7	4	515	187
	Diphtheria	0	0	0	0
	Enterohemorrhagic E. coli Infection	0	0	0	0
	Epidemic Typhus Fever	0	0	0	0
	Hantavirus Pulmonary Syndrome	0	0	0	0
	Hemorrhagic Fever with Renal Syndrome	0	0	2	0
	Malaria	0	0	4	3
	Measles	0	0	1	1
	Meningococcal Meningitis	0	0	2	1
	Paratyphoid Fever	0	0	0	3
	Poliomyelitis	0	0	0	0
	Rubella	0	0	3	3
	Shigellosis	3	3	61	68
Typhoid fever	0	0	1	12	
West Nile Fever	0	0	0	0	
Category III	Acute Viral Hepatitis type B	2	2	25	32
	Acute Viral Hepatitis type C <sup>5</sup>	4	5	52	58
	Acute Viral Hepatitis type D	0	0	1	1
	Acute Viral Hepatitis type E	0	0	4	1
	Acute Viral Hepatitis untype	0	0	0	0
	Congenital Rubella Syndrome	0	0	0	0
	Enteroviruses Infection with Severe Complications	1	0	3	1
	Haemophilus Influenza type b Infection	0	0	2	1
	Japanese Encephalitis	0	0	0	0
	Legionellosis	2	2	31	50
	Mumps <sup>2</sup>	5	21	155	211
	Neonatal Tetanus	0	0	0	0
	Pertussis	0	3	2	44
	Tetanus <sup>2</sup>	0	0	2	1
Category IV	Botulism	0	0	1	1
	Brucellosis	0	0	0	0
	Complicated Influenza	23	27	1775	297
	Complicated Varicella <sup>4</sup>	1	1	13	20
	Endemic Typhus Fever	0	1	3	1
	Herpesvirus B Infection	0	0	0	0
	Invasive Pneumococcal Disease	14	8	243	208
	Leptospirosis	0	1	12	17
	Lyme Disease	0	0	0	0
	Melioidosis	1	0	4	10
	Q Fever	0	1	8	10
	Scrub Typhus	0	3	70	98
Toxoplasmosis	2	0	5	1	
Tularremia	0	0	0	0	
Category V	Ebola Virus Disease	0	0	0	0
	Ebola-Marburg Hemorrhagic Fever	0	0	0	0
	Novel Influenza A Virus Infections <sup>6</sup>	0	0	0	0
	Lassa Fever	0	0	0	0
	Rift Valley Fever	0	0	0	0
	Middle East Respiratory Syndrome Coronavirus	0	0	0	0
Yellow Fever	0	0	0	0	

1. The following 8 chronic diseases are excluded from the table: MDR-TB, Tuberculosis, Syphilis, Gonorrhoea, HIV Infection, AIDS, Hansen Disease and Creutzfeldt-Jakob Disease.
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5. Since 2014/7/1, various subtypes of human cases of avian influenza are reported as "novel influenza A virus infections", a Category V Notifiable Infectious Disease. The original "H5N1 flu" and "H7N9 flu", which were respectively listed as a Category I Notifiable Infectious Disease and a Category V Notifiable Infectious Disease were removed from the list on the same day.

## Suspected Clusters

- Sixteen clusters were reported, including 9 diarrhea clusters, 5 tuberculosis clusters, and 2 varicella clusters.

## Imported Infectious Diseases

- 12 confirmed cases were imported from 3 countries during Week 15 of 2016.

Disease \ Country	Indonesia	Philippines	Thailand	Total
Dengue Fever	5		1	6
Amoebiasis	2	1		3
Shigellosis	2			2
Hepatitis A		1		1
<b>Total</b>	9	2	1	12

Note: The statistics listed in this table include imported cases that were either confirmed or updated\* the previous week.

- A total of 180 confirmed cases were imported from 19 countries in 2016.
- Top 3 imported diseases : Dengue fever (83), Amoebiasis (32), Shigellosis (28).
- Top 3 countries responsible for most imported cases : Indonesia (85), Philippines (20), Vietnam (15).

## Summary of Epidemic

- **Influenza** : Influenza activity has slowed down. The peak of epidemic season is over. Influenza virus type B is currently the dominant strain circulating in the community. Thus far, none of the viruses identified has shown drug resistance.
- **Diarrhea** : During Week 15, the consultation rates to outpatient services and ER for diarrhea were lower than that during Week 14. Norovirus is currently the dominant strain circulating in the community.
- **Enterovirus** : Although the total number of visits to outpatient services and ER for enterovirus infection was lower than the epidemic threshold, the overall epidemic has been increasing rapidly. During Week 15, 1 case of enterovirus 71 infection with severe complications has been confirmed. The public is urged to enhance personal hygiene and stay vigilant for suspicious symptoms of enterovirus infection with severe complications in infants.

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