

### Investigation of Human Exposure and Rabies Postexposure Treatment to Gem-Faced Civets And Ferret-Badgers in Taiwan, 2014

Lin-Ching Huang<sup>1</sup>, Hoa-Hsin Wu<sup>2\*</sup>, Wan-Ting Huang<sup>1</sup>, Hsueh Ju Chen<sup>1</sup>,  
Hsin-Yi Wei<sup>3</sup>, Ming-Ching Liu<sup>3</sup>, Chin-Sheng Chi<sup>4</sup>

#### Abstract

Gem-faced civets was first tested positive for rabies in Taiwan on December 24, 2014, while ferret-badger had been known for carrying rabies since 2012. This report compares patients' post exposure to either a rabies-carrying gem-faced civet or ferret-badger and identifies the characteristics of patients and their exposure conditions. In 2014, patients who had received >1 dose of vaccine for rabies were then followed up with a questionnaire and interviewed by telephone. A total of 57 patients completed the interviews, of which 38 (67%) were male. The median age was 51 years of age (age range 17-82). A significantly higher of respondents were exposed to a ferret-badger (n=33, 58%) than exposed to a gem-faced civet (n=24, 42%) and in latter case, most were male (22 or 92%) and younger. The wounds mostly located on the upper limbs and were caused by attacks due to provocation. Respondents who had been in contact with a gem-faced civet were less likely to develop rabies-like symptoms than injured by a ferret-badger. Prevention effort should be focused on warning people from approaching gem-faced civets and ferret-badgers. Attacks caused by provocation was the leading cause of possible exposure to rabies, however, appropriate wound management after exposure could reduce the risk of being infected.

**Keywords:** Rabies, post-exposure prevention (PEP), gem-faced civets, ferret-badgers

<sup>1</sup>Office of Preventive Medicine, Centers for Disease Control, Ministry of Health and Welfare, Taiwan

<sup>2</sup>Division of Infection Control and Biosafety, Centers for Disease Control, Ministry of Health and Welfare, Taiwan

<sup>3</sup>Taipei Regional Center, Centers for Disease Control, Ministry of Health and Welfare, Taiwan

<sup>4</sup>Southern Regional Center, Centers for Disease Control, Ministry of Health and Welfare, Taiwan

Corresponding author: Hoa-Hsin Wu<sup>2\*</sup>

E-mail: wuhaushing@cdc.gov.tw

Received: Mar. 05, 2018

Accepted: Jul. 23, 2018

DOI: 10.6525/TEB.201810\_34(19).0001

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

Case diagnosis year		Week 37★		Week 1-37			
Classification	Disease Diagnosed	2018	2017	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	53	0	23	0
	Acute Viral Hepatitis type A	1	4	68	27	332	40
	Amoebiasis	7	13	221	98	265	142
	Anthrax	0	0	0	0	0	0
	Chikungunya Fever	0	0	4	4	10	10
	Cholera	1	0	6	0	0	0
	Dengue Fever	18	4	306	189	231	228
	Diphtheria	0	0	0	0	0	0
	Enterohemorrhagic E. coli Infection	0	0	0	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	4	4
	Measles	2	0	35	14	5	5
	Meningococcal Meningitis	0	0	5	1	11	0
	Paratyphoid Fever	0	1	6	5	4	3
	Poliomyelitis	0	0	0	0	0	0
	Rubella	0	0	9	8	3	2
Shigellosis	5	4	116	38	121	44	
Typhoid fever	1	0	12	10	14	13	
West Nile Fever	0	0	0	0	0	0	
Category III	Acute Viral Hepatitis type B	4	5	98	8	117	6
	Acute Viral Hepatitis type C	9	7	332	3	210	1
	Acute Viral Hepatitis type D	0	0	0	0	1	0
	Acute Viral Hepatitis type E	1	0	6	0	13	3
	Congenital Syphilis	0	0	0	0	0	0
	Congenital Rubella Syndrome	0	0	0	0	0	0
	Enteroviruses Infection with Severe Complications	0	0	32	0	9	0
	Haemophilus Influenza type b Infection	0	0	5	0	3	0
	Japanese Encephalitis	0	0	35	0	22	0
	Legionellosis	6	1	140	3	115	12
	Mumps	15	11	423	6	471	7
	Neonatal Tetanus	0	0	0	0	0	0
	Pertussis	0	1	23	2	27	0
Tetanus	0	0	5	0	7	0	
Category IV	Botulism	0	0	0	0	0	0
	Brucellosis	0	0	0	0	0	0
	Complicated Varicella	2	0	39	0	20	1
	Endemic Typhus Fever	1	1	20	0	32	1
	Herpesvirus B Infection	0	0	0	0	0	0
	Invasive Pneumococcal Disease	9	8	351	0	345	2
	Leptospirosis	1	4	45	0	66	1
	Listeriosis	0	0	122	1	0	0
	Lyme Disease	0	0	1	1	0	0
	Melioidosis	4	0	18	1	20	0
	Q Fever	0	0	12	1	12	0
	Scrub Typhus	5	12	261	0	319	0
	Severe Complicated Influenza	20	19	961	5	1223	6
Toxoplasmosis	0	0	12	1	13	0	
Tularemia	0	0	0	0	0	0	
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	1	1
	Rift Valley Fever	0	0	0	0	0	0
	Yellow Fever	0	0	0	0	0	0
Zika virus infection	0	0	1	1	3	3	

- ★The weekly and cumulative total numbers include indigenous and imported cases of notifiable infectious diseases.
- The following chronic diseases are excluded from the table: MDR-TB, Tuberculosis, Syphilis, Gonorrhoea, HIV Infection, AIDS, Hansen Disease and Creutzfeldt-Jakob Disease.
- Numbers of mumps, neonatal tetanus and tetanus cases are summed up by the week of report.
- Since 2016/1/22, "Zika Virus Infection" was listed as a Notifiable Infectious Disease.
- Since 2018/1/1, "Listeriosis" was listed as a Notifiable Infectious Disease.

## Suspected Clusters

- Thirty-seven clusters were reported, including 2 tuberculosis clusters, 7 diarrhea clusters, 17 upper respiratory tract infection clusters, 8 influenza-like illness clusters, 1 fever of unknown origin cluster, and 2 varicella clusters.

## Imported Infectious Diseases

- There were 17 confirmed imported cases from 7 countries during week 37 of 2018.

Country Disease	Indonesia	Thailand	China	Hong Kong	Philippines	India	Vietnam	Total
DF		4			1	1	1	7
Amoebiasis	3		1	1				5
Shigellosis	3							3
Measles		1						1
Typhoid fever	1							1
Total	7	5	1	1	1	1	1	17

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

- There are 425 confirmed imported cases from 28 different countries in 2018. The top 3 countries are Indonesia (131), Philippines (56), and Thailand (47).
- Top 3 imported diseases are Dengue Fever (193), Amoebiasis (97), and Shigellosis (37).

## Summary of Epidemic

- **Enterovirus:** Schools have started, the epidemic could increase by close contacts between individuals.
- **Dengue Fever:** The epidemic has been increasing in the nearby Asian countries; therefore, the potential risks of imported cases are still high in Taiwan. There have been dengue fever epidemic in several counties. In addition, accumulation of water after the heavy rain could create possible breeding sites for mosquitoes. The risk of indigenous epidemics remain elevated.
- **Scrub Typhus:** Taiwan is in the midst of scrub typhus season. The current primarily affected areas include Hualien County and Taitung County.

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

Case diagnosis year		Week 38★		Week 1-38			
Classification	Disease Diagnosed	2018	2017	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	0	2	53	0	25	0
	Acute Viral Hepatitis type A	1	3	69	27	335	41
	Amoebiasis	13	3	234	99	268	143
	Anthrax	0	0	0	0	0	0
	Chikungunya Fever	0	0	4	4	10	10
	Cholera	0	0	6	0	0	0
	Dengue Fever	28	5	334	205	236	233
	Diphtheria	0	0	0	0	0	0
	Enterohemorrhagic E. coli Infection	0	0	0	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	2	3	3	6	6
	Measles	0	0	35	9	5	5
	Meningococcal Meningitis	0	0	5	1	11	0
	Paratyphoid Fever	0	0	6	5	4	3
	Poliomyelitis	0	0	0	0	0	0
Rubella	0	0	9	8	3	2	
Shigellosis	5	5	121	38	126	46	
Typhoid fever	1	2	13	10	16	14	
West Nile Fever	0	0	0	0	0	0	
Category III	Acute Viral Hepatitis type B	6	1	104	8	118	6
	Acute Viral Hepatitis type C	7	6	339	3	216	1
	Acute Viral Hepatitis type D	0	0	0	0	1	0
	Acute Viral Hepatitis type E	0	0	6	0	13	3
	Congenital Syphilis	0	0	0	0	0	0
	Congenital Rubella Syndrome	0	0	0	0	0	0
	Enteroviruses Infection with Severe Complications	1	0	33	0	9	0
	Haemophilus Influenza type b Infection	0	1	5	0	4	0
	Japanese Encephalitis	0	1	35	0	23	0
	Legionellosis	7	2	147	3	117	12
	Mumps	15	16	438	6	487	8
	Neonatal Tetanus	0	0	0	0	0	0
	Pertussis	2	1	25	2	28	0
Tetanus	0	1	5	0	8	0	
Category IV	Botulism	0	0	0	0	0	0
	Brucellosis	0	0	0	0	0	0
	Complicated Varicella	0	1	39	0	21	1
	Endemic Typhus Fever	0	1	20	0	33	1
	Herpesvirus B Infection	0	0	0	0	0	0
	Invasive Pneumococcal Disease	8	6	359	0	351	2
	Leptospirosis	5	5	50	0	71	1
	Listeriosis	2	0	124	1	0	0
	Lyme Disease	0	0	1	1	0	0
	Melioidosis	0	0	18	1	20	0
	Q Fever	0	2	12	1	14	0
	Scrub Typhus	3	6	264	0	325	0
	Severe Complicated Influenza	24	14	985	5	1237	6
Toxoplasmosis	0	1	12	1	14	0	
Tularemia	0	0	0	0	0	0	
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	1	1
	Rift Valley Fever	0	0	0	0	0	0
	Yellow Fever	0	0	0	0	0	0
Zika virus infection	0	1	1	1	4	4	

1. The weekly and cumulative total numbers include indigenous and imported cases of notifiable infectious diseases.
2. The following chronic diseases are excluded from the table: MDR-TB, Tuberculosis, Syphilis, Gonorrhoea, HIV Infection, AIDS, Hansen Disease and Creutzfeldt-Jakob Disease.
3. Numbers of mumps, neonatal tetanus and tetanus cases are summed up by the week of report.
4. Since 2016/1/22, "Zika Virus Infection" was listed as a Notifiable Infectious Disease.
5. Since 2018/1/1, "Listeriosis" was listed as a Notifiable Infectious Disease.

## Suspected Clusters

- Forty-five clusters were reported, including 9 tuberculosis clusters, 14 diarrhea clusters, 10 upper respiratory tract infection clusters, 8 influenza-like illness clusters, and 4 varicella clusters.

## Imported Infectious Diseases

- There were 18 confirmed imported cases from 7 countries during week 38 of 2018.

Country Disease	Cambodia	Myanmar	Philippines	Indonesia	Vietnam	China	Thailand	Total
DF	5	2	2	1	2	1	1	14
Amoebiasis			1	1				2
Paratyphoid Fever		1						1
Shigellosis				1				1
Total	5	3	3	3	2	1	1	18

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

- There are 438 confirmed imported cases from 28 different countries in 2018. The top 3 countries are Indonesia (134), Philippines (59), and Thailand (46).
- Top 3 imported diseases are Dengue Fever (207), Amoebiasis (99), and Shigellosis (38).

## Summary of Epidemic

- **Enterovirus:** Schools have started, the epidemic could increase by close contact between individuals.
- **Dengue Fever:** The epidemic has been reached the peak in the nearby Asian countries; therefore, the potential risks of imported cases are still high in Taiwan. There have been indigenous dengue fever epidemics; in addition, rainy and unstable weather has been forecast for several counties which could create breeding sites for mosquitoes. The risk of indigenous epidemics remain elevated.
- **Scrub Typhus:** Taiwan is in the midst of scrub typhus season. The current primarily affected areas include Hualien County and Taitung County.

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

Case diagnosis year		Week 39★		Week 1-39			
Classification	Disease Diagnosed	2018	2017	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	54	0	25	0
	Acute Viral Hepatitis type A	0	3	69	27	338	42
	Amoebiasis	5	9	239	103	277	148
	Anthrax	0	0	0	0	0	0
	Chikungunya Fever	1	1	5	5	11	11
	Cholera	0	1	6	0	1	0
	Dengue Fever	19	10	353	214	246	241
	Diphtheria	0	0	0	0	0	0
	Enterohemorrhagic E. coli Infection	0	0	0	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	7	7
	Measles	0	0	35	9	5	5
	Meningococcal Meningitis	0	0	5	1	11	0
	Paratyphoid Fever	0	0	6	5	4	3
	Poliomyelitis	0	0	0	0	0	0
Rubella	0	0	9	8	3	2	
Shigellosis	5	1	126	41	127	46	
Typhoid fever	0	0	13	10	16	14	
West Nile Fever	0	0	0	0	0	0	
Category III	Acute Viral Hepatitis type B	6	1	109	8	119	6
	Acute Viral Hepatitis type C	6	3	345	3	219	1
	Acute Viral Hepatitis type D	0	0	0	0	1	0
	Acute Viral Hepatitis type E	0	0	6	0	13	3
	Congenital Syphilis	0	0	0	0	0	0
	Congenital Rubella Syndrome	0	0	0	0	0	0
	Enteroviruses Infection with Severe Complications	0	0	33	0	9	0
	Haemophilus Influenza type b Infection	0	0	5	0	4	0
	Japanese Encephalitis	0	0	35	0	23	0
	Legionellosis	3	3	150	4	120	12
	Mumps	16	16	454	6	503	8
	Neonatal Tetanus	0	0	0	0	0	0
	Pertussis	0	0	25	2	28	0
Tetanus	0	0	5	0	8	0	
Category IV	Botulism	0	0	0	0	0	0
	Brucellosis	0	0	0	0	0	0
	Complicated Varicella	3	1	42	0	22	1
	Endemic Typhus Fever	0	0	20	0	33	1
	Herpesvirus B Infection	0	0	0	0	0	0
	Invasive Pneumococcal Disease	6	7	365	0	358	2
	Leptospirosis	10	0	60	0	71	1
	Listeriosis	5	0	129	1	0	0
	Lyme Disease	0	0	1	1	0	0
	Melioidosis	2	1	20	1	21	0
	Q Fever	1	0	13	1	14	0
	Scrub Typhus	3	12	267	0	337	0
	Severe Complicated Influenza	21	13	1006	5	1250	6
Toxoplasmosis	0	1	12	1	15	0	
Tularemia	0	0	0	0	0	0	
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	1	1
	Rift Valley Fever	0	0	0	0	0	0
	Yellow Fever	0	0	0	0	0	0
Zika virus infection	0	0	1	1	4	4	

1. ★The weekly and cumulative total numbers include indigenous and imported cases of notifiable infectious diseases.  
2. The following chronic diseases are excluded from the table: MDR-TB, Tuberculosis, Syphilis, Gonorrhoea, HIV Infection, AIDS, Hansen Disease and Creutzfeldt-Jakob Disease.  
3. Numbers of mumps, neonatal tetanus and tetanus cases are summed up by the week of report.  
4. Since 2016/1/22, "Zika Virus Infection" was listed as a Notifiable Infectious Disease.  
5. Since 2018/1/1, "Listeriosis" was listed as a Notifiable Infectious Disease.

## Suspected Clusters

- Thirty-seven clusters were reported, including 6 tuberculosis clusters, 9 diarrhea clusters, 11 upper respiratory tract infection clusters, 7 influenza-like illness clusters, and 4 varicella clusters.

## Imported Infectious Diseases

- There were 17 confirmed imported cases from 7 countries during week 39 of 2018.

Country Disease	Indonesia	Vietnam	Cambodia	India	Myanmar	China	Philippines	Total
DF		2	3	1	1			7
Amoebiasis	3						1	4
Shigellosis	3							3
Chikungunya Fever				1				1
Zika virus infection		1						1
Legionellosis						1		1
Total	6	3	3	2	1	1	1	17

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

- There are 455 confirmed imported cases from 28 different countries in 2018. The top 3 countries are Indonesia (140), Philippines (60), and Cambodia (47).
- Top 3 imported diseases are Dengue Fever (214), Amoebiasis (103), and Shigellosis (41).

## Summary of Epidemic

- **Dengue Fever:** The epidemic is still high in the nearby Asian countries; therefore, the potential risks of imported cases remain elevated in Taiwan. There have been indigenous dengue fever epidemics; in addition, rainy weather created breeding sites for mosquitoes, the risk of indigenous epidemics remain high.
- **Enterovirus:** Schools have started, the epidemic could increase by close contact between individuals.
- **Influenza:** Schools have started, influenza clusters could increase by close contact between individuals. Influenza activity is expected to gradually increase due to large temperature differences between night and day during the fall season.

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

**Address:** No.6, Linsen S. Rd, Zhongjheng District, Taipei City 10050, Taiwan (R.O.C.)

**Telephone No:** +886-2-2395-9825

**Website:** <http://www.cdc.gov.tw/rwd/english>

**Suggested Citation:**

[Author].[Article title].Taiwan Epidemiol Bull 2018;34:[inclusive page numbers]. [DOI]