

### Serosurveillance of Hantavirus Antibodies in Rodents at Port of Taichung, 2011–2016

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#### Abstract

Serosurveillance of hantavirus antibodies in rodents was conducted at Port of Taichung from 2011 to 2016. A total of 221 rodents were trapped alive and 3 species were identified. *Rattus norvegicus* was the dominant species (61.1%), followed by *Suncus murinus* (26.7%) and *Rattus losea* (12.2%). All serum samples from rodents were tested for hantavirus antibodies. The average hantavirus seropositive rate in rodents was 5.9% and hantavirus antibodies were only detected in *Rattus norvegicus* trapped from 5 out of the 20 sites. The results suggested that hantavirus was circulating in *Rattus norvegicus*. We notified stakeholders near the 2 sites with higher seropositive rates to carry out rodent control measures. No human case of hantavirus hemorrhagic fever had been reported at Port of Taichung during the study period. We recommend that stakeholders eliminate or minimize contact with rodents in order to prevent hantavirus infections.

**Keywords:** Hantavirus, serosurveillance, *Rattus norvegicus*

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# Hantavirus Surveillance And Control of Rodent Populations at Kaohsiung International Port, Taiwan, 2014–2017

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## Abstract

Hantavirus syndrome, a zoonosis transmitted by rodents, is a category II notifiable disease in Taiwan. The vector surveillance for the hantavirus syndrome was conducted mainly at international ports. During 2014–2016, 223 rodents were captured at Kaohsiung International Port. The capture rate was the highest in Zhongdao container area (45.7%), followed by the 3rd container area (23.3%). The rodent poison bait consumption rate was the highest in Zhongdao container region and the consumption occurred mostly during June and August to October, especially in September. Among rodents, the hantavirus seropositive rate was 11.2%. To further reduce the infection risk of hantavirus to people, a special project responding to high vector hantavirus seropositive rate has been implemented since 2017 to urge the harbor authorities to enhance prevention and control measures against rodents. We suggested that the authorities at international ports should increase empowerment of rodent control, strengthen port sanitation control, and enhance the information feedback and intersectorial communications to reduce the rodent density and protect the health of workers in port areas.

**Keywords:** Port sanitation, Hantavirus, project management

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

Case diagnosis year		Week 50★		Week 1–50			
Classification	Disease Diagnosed	2019	2018	2019		2018	
				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
	Acute Flaccid Paralysis	0	2	59	1	70	0
Category II	Acute Viral Hepatitis type A	5	3	100	25	86	31
	Amoebiasis	5	11	332	173	326	157
	Anthrax	0	0	0	0	0	0
	Chikungunya Fever	0	1	114	93	7	6
	Cholera	0	0	0	0	7	0
	Dengue Fever	4	11	626	522	504	310
	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	2	1	1	0
	Malaria	1	0	8	7	6	6
	Measles	2	1	137	55	37	9
	Meningococcal Meningitis	0	1	7	0	6	1
	Paratyphoid Fever	0	0	7	6	8	7
	Poliomyelitis	0	0	0	0	0	0
	Rubella	0	0	24	17	10	9
	Shigellosis	2	5	137	41	163	49
	Typhoid fever	0	0	24	20	14	10
	West Nile Fever	0	0	0	0	0	0
Zika virus infection	0	0	4	4	3	3	
Category III	Acute Viral Hepatitis type B	3	3	109	4	138	10
	Acute Viral Hepatitis type C	21	18	602	3	468	6
	Acute Viral Hepatitis type D	0	0	0	0	0	0
	Acute Viral Hepatitis type E	0	0	9	4	7	0
	Congenital Syphilis	0	0	0	0	0	0
	Congenital Rubella Syndrome	0	0	0	0	0	0
	Enteroviruses Infection with Severe Complications	1	0	65	1	38	0
	Haemophilus Influenza type b Infection	1	0	3	0	5	0
	Japanese Encephalitis	0	0	21	0	37	0
	Legionellosis	7	4	257	16	203	10
	Mumps	9	11	566	8	582	10
	Neonatal Tetanus	0	0	0	0	0	0
	Pertussis	2	0	28	0	30	2
Tetanus	1	0	5	1	5	0	
Category IV	Botulism	0	0	0	0	0	0
	Brucellosis	0	0	0	0	0	0
	Complicated Varicella	0	1	57	1	53	0
	Endemic Typhus Fever	1	0	29	3	23	1
	Herpesvirus B Infection	0	0	0	0	0	0
	Invasive Pneumococcal Disease	44	24	2133	8	1142	5
	Leptospirosis	13	9	422	2	440	0
	Listeriosis	1	2	115	1	95	1
	Lyme Disease	1	5	165	1	162	1
	Melioidosis	0	0	1	1	2	2
	Q Fever	0	1	46	1	25	1
	Scrub Typhus	0	0	23	5	20	2
	Severe Complicated Influenza	7	9	450	6	359	2
	Toxoplasmosis	0	1	17	4	15	1
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	0	0
	Rift Valley Fever	0	0	0	0	0	0
Yellow Fever	0	0	0	0	0	0	

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

### Suspected Clusters

- Thirty-five clusters were reported during week 50, including 6 tuberculosis clusters, 6 diarrhea clusters, 5 upper respiratory tract infection clusters, 13 influenza-like illness clusters, 5 varicella clusters.

### Imported Infectious Diseases

- There were 15 imported cases from 6 countries during week 50 of 2019.

Countries Diseases	Vietnam	Philippines	Indonesia	India	Ethiopia	Sri Lanka	Total
Dengue Fever	6	3		1		1	11
Amoebiasis		1	2				3
Malaria					1		1
Total	6	4	2	1	1	1	15

- There are 1,033 imported cases from 40 different countries in 2019. The top 3 countries are Indonesia (269), Vietnam (168), and the Philippines (125).
- Top 3 imported diseases are Dengue Fever (526), Amoebiasis (175), and Chikungunya Fever (93).

### Summary of Epidemic

- **Influenza** : The level of influenza activity is close to the national baseline, and is expected to increase.

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

Case diagnosis year		Week 51★		Week 1–51			
Classification	Disease Diagnosed	2019	2018	2019		2018	
				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	3	59	1	68	0
	Acute Viral Hepatitis type A	0	3	95	25	83	31
	Amoebiasis	8	9	327	169	315	157
	Anthrax	0	0	0	0	0	0
	Chikungunya Fever	1	0	114	93	6	6
	Cholera	0	0	0	0	7	0
	Dengue Fever	10	12	622	522	493	310
	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	2	0	1	0
	Malaria	0	0	7	7	6	6
	Measles	0	0	135	55	36	9
	Meningococcal Meningitis	0	0	7	0	5	1
	Paratyphoid Fever	0	0	7	6	8	7
	Poliomyelitis	0	0	0	0	0	0
	Rubella	1	0	24	17	10	9
Shigellosis	3	3	135	39	158	49	
Typhoid fever	0	0	24	20	14	10	
West Nile Fever	0	0	0	0	0	0	
Zika virus infection	0	1	4	4	3	3	
Category III	Acute Viral Hepatitis type B	1	3	106	4	135	10
	Acute Viral Hepatitis type C	14	20	583	3	450	6
	Acute Viral Hepatitis type D	0	0	0	0	0	0
	Acute Viral Hepatitis type E	0	0	9	4	7	0
	Congenital Syphilis	0	0	0	0	0	0
	Congenital Rubella Syndrome	0	0	0	0	0	0
	Enteroviruses Infection with Severe Complications	0	1	64	1	38	0
	Haemophilus Influenza type b Infection	1	0	2	0	5	0
	Japanese Encephalitis	0	1	21	0	37	0
	Legionellosis	4	11	250	15	199	10
	Mumps	8	10	557	8	571	10
	Neonatal Tetanus	0	0	0	0	0	0
Pertussis	1	0	26	0	30	2	
Tetanus	0	0	4	1	5	0	
Category IV	Botulism	0	0	0	0	0	0
	Brucellosis	0	0	0	0	0	0
	Complicated Varicella	0	0	57	1	52	0
	Endemic Typhus Fever	0	0	28	3	23	1
	Herpesvirus B Infection	0	0	0	0	0	0
	Invasive Pneumococcal Disease	38	10	2089	8	1118	5
	Leptospirosis	6	6	409	2	431	0
	Listeriosis	1	2	114	1	93	1
	Lyme Disease	3	2	164	1	157	1
	Melioidosis	0	0	1	1	2	2
	Q Fever	1	0	46	1	24	1
	Scrub Typhus	0	1	23	5	20	2
	Severe Complicated Influenza	4	5	443	6	350	2
Toxoplasmosis	1	0	17	4	14	1	
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	0	0
	Rift Valley Fever	0	0	0	0	0	0
Yellow Fever	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

- Sixty-four clusters were reported during week 51, including 8 tuberculosis clusters, 18 diarrhea clusters, 11 upper respiratory tract infection clusters, 22 influenza-like illness clusters, 4 varicella clusters, and 1 fever of unknown origin cluster.

## Imported Infectious Diseases

- There were 16 imported cases from 10 countries during week 51 of 2019.

Diseases \ Countries	Indonesia	Myanmar	Vietnam	Philippines	Thailand	India	Cambodia	Maldives	Japan	Malaysia	Total
Dengue Fever		2	1	1	1	1	1	1		1	9
Amoebiasis	3										3
Rubella				1							1
Measles					1						1
Acute Hepatitis C			1								1
Acute Hepatitis A									1		1
Total	3	2	2	2	2	1	1	1	1	1	16

- There are 1,049 imported cases from 40 different countries in 2019. The top 3 countries are Indonesia (272), Vietnam (170), and the Philippines (127).
- Top 3 imported diseases are Dengue Fever (535), Amoebiasis (178), and Chikungunya Fever (93).

## Summary of Epidemic

- **Influenza** : As the recent temperature has fluctuated drastically, influenza activity is expected to increase slowly.

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

Case diagnosis year		Week 52★		Week 1–52			
Classification	Disease Diagnosed	2019	2018	2019		2018	
				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	2	0	62	1	71	0
	Acute Viral Hepatitis type A	1	4	105	26	91	34
	Amoebiasis	5	8	345	185	342	174
	Anthrax	0	0	0	0	0	0
	Chikungunya Fever	2	0	116	95	7	7
	Cholera	0	0	0	0	7	0
	Dengue Fever	10	10	645	545	523	340
	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	2	1	1	0
	Malaria	0	0	8	8	6	6
	Measles	2	2	140	58	40	11
	Meningococcal Meningitis	0	0	7	0	6	1
	Paratyphoid Fever	0	0	8	6	8	7
	Poliomyelitis	0	0	0	0	0	0
	Rubella	0	0	25	18	10	9
Shigellosis	2	4	143	42	173	60	
Typhoid fever	0	0	24	20	14	10	
West Nile Fever	0	0	0	0	0	0	
Zika virus infection	0	0	4	4	3	3	
Category III	Acute Viral Hepatitis type B	1	5	112	4	144	10
	Acute Viral Hepatitis type C	20	13	630	4	496	7
	Acute Viral Hepatitis type D	0	0	0	0	0	0
	Acute Viral Hepatitis type E	0	0	9	4	7	0
	Congenital Syphilis	0	0	0	0	0	0
	Congenital Rubella Syndrome	0	0	0	0	0	0
	Enteroviruses Infection with Severe Complications	0	0	67	1	40	0
	Haemophilus Influenza type b Infection	0	0	3	0	5	0
	Japanese Encephalitis	0	0	21	1	37	0
	Legionellosis	11	3	277	16	209	10
	Mumps	13	10	591	9	601	10
	Neonatal Tetanus	0	0	0	0	0	0
Pertussis	0	0	28	0	30	2	
Tetanus	0	0	6	1	5	0	
Category IV	Botulism	0	0	0	0	0	0
	Brucellosis	0	0	0	0	0	0
	Complicated Varicella	1	0	58	1	53	0
	Endemic Typhus Fever	0	0	30	3	23	1
	Herpesvirus B Infection	0	0	0	0	0	0
	Invasive Pneumococcal Disease	62	20	2251	8	1182	5
	Leptospirosis	15	13	448	2	455	0
	Listeriosis	1	0	116	1	95	1
	Lyme Disease	0	2	169	1	164	1
	Melioidosis	0	0	1	1	2	2
	Q Fever	0	1	46	1	26	2
	Scrub Typhus	0	0	23	5	20	2
	Severe Complicated Influenza	5	6	459	6	372	2
Toxoplasmosis	1	1	19	4	17	1	
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	0	0
	Rift Valley Fever	0	0	0	0	0	0
Yellow Fever	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-five clusters were reported during week 52, including 11 tuberculosis clusters, 11 diarrhea clusters, 3 upper respiratory tract infection clusters, 15 influenza-like illness clusters, 5 varicella clusters.

## Imported Infectious Diseases

- There were 23 imported cases from 9 countries during week 52 of 2019.

Diseases \ Countries	Indonesia	Vietnam	Philippines	Cambodia	China	Thailand	Myanmar	Marshall Islands	Malaysia	Total
Dengue Fever	2	4		2				1	1	10
Amoebiasis	5		2							7
Measles			1			1				2
Chikungunya Fever						1	1			2
JE					1					1
Shigellosis					1					1
Total	7	4	3	2	2	2	1	1	1	23

- There are 1,072 imported cases from 41 different countries in 2019. The top 3 countries are Indonesia (279), Vietnam (174), and the Philippines (130).
- Top 3 imported diseases are Dengue Fever (545), Amoebiasis (185), and Chikungunya Fever (95).

## Summary of Epidemic

- **Influenza** : Because some the outpatient services will be closed on Jan 1, the number of medical visits in next week might be similar to this week. The influenza activity is expected to gradually increase.

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