

A Preliminary Study on The Risk Factors for Imported Malaria, Taiwan, 2006–2016

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Abstract

The development of international travel has made it difficult to avoid the risk of imported malaria in Taiwan. Imported malaria may cause secondary local transmission, which could lead to the re-establishment of endemic malaria, undermining the achievement of malaria elimination in Taiwan. Therefore, the purpose of this study is to analyze the imported malaria case-related data, to provide deeper understanding of the risk associated with imported malaria cases in Taiwan and to formulate policies for the prevention and control of malaria.

We collected data including sex, age, nationality, malaria species, travel purpose and country visited for each imported malaria case reported to the Taiwan National Notifiable Disease Surveillance System during 2006 to 2016 and carried out descriptive analysis. Furthermore, we combined the data of malaria species detected and travel purpose with the data of country visited to find risks associated with acquiring malaria while traveling abroad.

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Of the 172 imported malaria cases reported during 2006 to 2016, we found that Taiwanese entrepreneurs and people dispatched overseas to Africa and Southeast Asia might be the main source of imported malaria cases. Also, the predominant malaria species of imported malaria cases from Africa was *Plasmodium falciparum*, whereas from Southeast Asia was *Plasmodium vivax*. As a result, we recommend strengthening health education regarding use of chemoprophylaxis and personal protective measures for all travelers, especially Taiwanese entrepreneurs and people dispatched overseas to Africa and Southeast Asia, to effectively prevent the importation of malaria.

Finally, we can apply the method of this study to other imported vector-borne diseases for formulating epidemic prevention and control policies.

Keywords: Malaria, imported case, geography, travel purpose, chemoprophylaxis

Seroepidemiological Investigation of Hantavirus Hemorrhagic Fever Cases and Murine, Kaohsiung, 2016

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Abstract

Hantaviruses, the etiological agents of hemorrhagic fever with renal syndrome (HFRS) and hantavirus pulmonary syndrome (HPS), are transmitted worldwide primarily by rodent reservoirs. Four HFRS cases were confirmed in Kaohsiung City in 2016, of which, 2 cases lived at Linhua Li and 1 case at Guanghai Li of Lingya District and 1 case resided at Xingren Li of Fengshan District. To investigate the outbreak and assess the risk of disease, 35 small mammals collected from residence and nearby markets of cases were tested for hantavirus infection. The seropositive rate was 25.7% (9/35), and all seropositive rodents were *Rattus norvegicus*. In-house indirect hantavirus IgG ELISA demonstrated that 8 rats were infected with Seoul virus, while one rat was infected with Sin Nombre virus (SNV)-related hantavirus. In addition, 4 human cases were infected with Seoul virus. Serological surveillance of hantavirus in small mammals captured at national and international harbors indicated that hantavirus antibody-positive small mammals were found in several harbors in Taiwan including Kaohsiung Harbor. The results demonstrated that the positive rate was the highest (11.8%, n = 144) in *Rattus norvegicus*. In this study, we demonstrated that hantavirus infection is endemic in Taiwan. Results from a survey of major rodent-borne diseases in the five metropolitan areas of Taiwan in 2011 showed that all of the detected serum antibodies against Hantavirus were Seoul (SEOV). The number of positive rats in Kaohsiung Harbor in November and March was high, which coincided with the appearance of positive cases of HFRS over the years. Therefore, it is suggested that in addition to the regular implementation of harbor monitoring of rodents, the monitoring of rodents in metropolitan areas of Kaohsiung should be strengthened, to prevent possible outbreaks and expansion of epidemic.

Keywords: *Rattus norvegicus*, hantavirus hemorrhagic fever, serological monitoring

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

Case diagnosis year		Week 27★		Week 1–27			
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	1	45	0	18	0
	Acute Viral Hepatitis type A	1	3	48	21	293	29
	Amoebiasis	2	5	152	62	185	106
	Anthrax	0	0	0	0	0	0
	Chikungunya Fever	0	1	2	2	7	7
	Cholera	0	0	0	0	0	0
	Dengue Fever	7	7	101	100	121	121
	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	1	1	1	1	3	3
	Measles	0	0	30	12	5	5
	Meningococcal Meningitis	0	0	5	1	6	0
	Paratyphoid Fever	0	0	2	1	3	3
	Poliomyelitis	0	0	0	0	0	0
	Rubella	0	0	5	4	1	1
Shigellosis	4	1	84	23	99	36	
Typhoid fever	0	0	7	5	11	10	
West Nile Fever	0	0	0	0	0	0	
Category III	Acute Viral Hepatitis type B	2	8	61	4	86	3
	Acute Viral Hepatitis type C	10	8	235	2	145	1
	Acute Viral Hepatitis type D	0	0	0	0	1	0
	Acute Viral Hepatitis type E	0	1	4	0	10	3
	Acute Viral Hepatitis untype	0	0	0	0	0	0
	Congenital Rubella Syndrome	0	0	0	0	0	0
	Enteroviruses Infection with Severe Complications	1	0	23	0	4	0
	Haemophilus Influenza type b Infection	0	0	4	0	2	0
	Japanese Encephalitis	4	5	22	0	12	0
	Legionellosis	9	8	85	1	86	10
	Mumps	14	7	310	3	346	4
	Neonatal Tetanus	0	0	0	0	0	0
	Pertussis	0	0	13	0	17	0
	Tetanus	0	0	4	0	6	0
	Category IV	Botulism	0	0	0	0	0
Brucellosis		0	0	0	0	0	0
Complicated Influenza		0	1	24	0	12	1
Complicated Varicella		1	2	15	0	23	1
Endemic Typhus Fever		0	0	0	0	0	0
Herpesvirus B Infection		4	7	278	0	266	2
Invasive Pneumococcal Disease		2	3	23	0	38	1
Leptospirosis		5	0	88	0	0	0
Lyme Disease		0	0	0	0	0	0
Melioidosis		0	0	6	0	9	0
Q Fever		0	1	8	1	10	0
Scrub Typhus		8	13	155	0	194	0
Toxoplasmosis		11	124	731	5	739	5
Tularremia		1	0	11	1	8	0
Category V	Ebola Virus Disease	0	0	0	0	0	0
	Marburg Hemorrhagic Fever	0	0	0	0	0	0
	Novel Influenza A Virus Infections	0	0	0	0	0	0
	Lassa Fever	0	0	0	0	0	0
	Rift Valley Fever	0	0	0	0	0	0
	Middle East Respiratory Syndrome Coronavirus	0	0	0	0	1	1
	Yellow Fever	0	0	0	0	0	0
	Zika Virus Infection	0	0	0	0	0	0

- ★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

- Seventeen clusters were reported, including 9 tuberculosis clusters, 2 diarrhea clusters, 3 upper respiratory tract infection clusters, and 3 influenza-like illness clusters.

Imported Infectious Diseases

- There were 9 confirmed imported cases from 6 countries during week 27 of 2018.

Country Disease	Cambodia	Vietnam	Myanmar	India	Indonesia	Thailand	Total
DF	3	1	1			1	6
Amoebiasis		1			1		2
Malaria				1			1
Total	3	2	1	1	1	1	9

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

- There are 245 confirmed imported cases from 24 different countries in 2018. The top 3 countries are Indonesia (73), Philippines (31), and Thailand (25).
- Top 3 imported diseases are Dengue Fever (100), Amoebiasis (62), and Shigellosis (22).

Summary of Epidemic

- **Enterovirus:** Taiwan is in the midst of enterovirus season. Most reported cases experienced mild symptoms. The epidemic activity is decreasing slowly. In addition, Echo11 and EV71 are still circulating in the community.
- **Dengue Fever:** The epidemics of Dengue in Southeast Asia are increasing. There has been one confirmed indigenous dengue case in Southern Taiwan. As the temperature and rainfall increases, the risk of dengue fever for both imported and indigenous cases is expected to be higher.
- **Japanese Encephalitis:** Taiwan is in the midst of Japanese encephalitis season. New cases are primarily in central and southern Taiwan.
- **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 28★		Week 1-28			
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	2	46	0	20	0
	Acute Viral Hepatitis type A	2	7	50	21	300	30
	Amoebiasis	8	7	160	65	192	110
	Anthrax	0	0	0	0	0	0
	Chikungunya Fever	0	0	2	2	7	7
	Cholera	0	0	0	0	0	0
	Dengue Fever	8	9	109	107	130	130
	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	1	1	3	3
	Measles	0	0	30	12	5	5
	Meningococcal Meningitis	0	0	5	1	6	0
	Paratyphoid Fever	0	0	2	1	3	3
	Poliomyelitis	0	0	0	0	0	0
	Rubella	0	0	5	4	1	1
	Shigellosis	3	2	87	24	101	36
	Typhoid fever	0	0	7	5	11	10
West Nile Fever	0	0	0	0	0	0	
Category III	Acute Viral Hepatitis type B	3	5	64	4	91	3
	Acute Viral Hepatitis type C	10	6	245	2	151	1
	Acute Viral Hepatitis type D	0	0	0	0	1	0
	Acute Viral Hepatitis type E	0	1	4	0	11	3
	Acute Viral Hepatitis untype	0	0	0	0	0	0
	Congenital Rubella Syndrome	0	0	0	0	0	0
	Enteroviruses Infection with Severe Complications	0	1	23	0	5	0
	Haemophilus Influenza type b Infection	0	0	4	0	2	0
	Japanese Encephalitis	4	2	26	0	14	0
	Legionellosis	4	1	89	1	87	10
	Mumps	6	18	316	3	364	5
	Neonatal Tetanus	0	0	0	0	0	0
	Pertussis	0	1	13	0	18	0
	Tetanus	0	0	4	0	6	0
	Category IV	Botulism	0	0	0	0	0
Brucellosis		0	0	0	0	0	0
Complicated Influenza		1	0	25	0	12	1
Complicated Varicella		1	1	16	0	24	1
Endemic Typhus Fever		0	0	0	0	0	0
Herpesvirus B Infection		10	8	288	0	274	2
Invasive Pneumococcal Disease		2	2	25	0	40	1
Leptospirosis		4	0	92	0	0	0
Lyme Disease		0	0	0	0	0	0
Melioidosis		2	2	8	1	11	0
Q Fever		0	0	8	1	10	0
Scrub Typhus		6	10	161	0	204	0
Toxoplasmosis		24	106	755	5	845	5
Tularremia		0	0	11	1	8	0
Category V	Ebola Virus Disease	0	0	0	0	0	0
	Marburg Hemorrhagic Fever	0	0	0	0	0	0
	Novel Influenza A Virus Infections	0	0	0	0	0	0
	Lassa Fever	0	0	0	0	0	0
	Rift Valley Fever	0	0	0	0	0	0
	Middle East Respiratory Syndrome Coronavirus	0	0	0	0	1	1
	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. The following chronic diseases are excluded from the table: MDR-TB, Tuberculosis, Syphilis, Gonorrhea, 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

- Eighteen clusters were reported, including 5 tuberculosis clusters, 3 diarrhea clusters, 4 upper respiratory tract infection clusters, 5 influenza-like illness clusters, and 1 varicella cluster.

Imported Infectious Diseases

- There were 12 confirmed imported cases from 5 countries during week 28 of 2018.

Disease \ Country	Indonesia	Thailand	Malaysia	Philippines	Maldives	Total
DF		2	2	2	1	7
Shigellosis	2					2
Amoebiasis	2					2
Melioidosis		1				1
Total	4	3	2	2	1	12

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

- There are 257 confirmed imported cases from 24 different countries in 2018. The top 3 countries are Indonesia (77), Philippines (33), and Thailand (28).
- Top 3 imported diseases are Dengue Fever (107), Amoebiasis (64), and Shigellosis (24).

Summary of Epidemic

- **Enterovirus:** Taiwan is in the midst of enterovirus season. However, the epidemic activity has been declining gradually and most reported cases experienced mild symptoms. In addition, cases with EV71 infection are increasing in the community, we should stay alert against enterovirus infection.
- **Dengue Fever:** The dengue activities in Southeast Asia are increasing and there have been confirmed indigenous dengue cases in Taiwan. As the temperature and rainfall increases, the risk of dengue fever for both imported and indigenous cases is expected to be higher.
- **Japanese Encephalitis:** Taiwan is in the midst of Japanese encephalitis season. New cases are primarily in central and southern Taiwan.
- **Scrub Typhus:** Taiwan is in the midst of scrub typhus season. The current primarily affected areas include Hualien County and Taitung County.

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