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Original Article

The Survey of Rodent-Borne Infectious Diseases in Orchid Island, 2019

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Abstract

Orchid Island, located in the southeastern sea region of Taiwan, is a subtropical climate island, suitable for propagating a variety of rodent-borne pathogens, resulting in many scrub typhus cases each year. For the purpose of epidemic surveillance and public health concern, we carried out the rodent-borne infectious diseases survey in this region in April 2019. We conducted mice trapping in the field, collected rodent's serum, tissue, urine and ectoparasites. Latex agglutination (LA) test, indirect immunofluorescence analysis (IFA) and polymerase chain reaction (PCR) were used to detect *Yesinia pestis*, *Orientia tsutsugamushi*, Q fever pathogen, and Leptospires in our laboratory. The mouse capture rate was 16.0% (41/262), the tissue pathologic lesion rate was 56% (23/41), the leptotrombidium mite ectoparasitic rate was 100% (41/41) and the leptotrombidium mite index was 202 (8,300/41) in this study. The collected murine sera were assayed for presenting antibody to Q-fever (3%, or 1/29) and to *Orientia tsutsugamushi* (76%, or 31/41). PCR assay positive rates were 10% (1/10), 40% (4/10), and 66% (27/41) for pathogens of Q-fever, Leptospires and *Orientia tsutsugamushi*, respectively. Our results indicated that Q-fever, Leptospires and *Orientia tsutsugamushi*

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were found in Orchid Island. This result of investigation could be a worthy reference for the public health department to determine strategies of epidemic prevention, such as rodent control, travel health guidance, and educating people to protect from infection during outdoor field activity and seek for a doctor if suspected symptoms develope.

Keywords: Orchid Island, *Yersinia pestis*, Q fever pathogen, Leptospires, *Orientia tsutsugamushi*

week 16-17(Apr. 18-May. 1, 2021)

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

Disease Diagnosed 2021 2020 2020 2020 2020 2020 2020		Casa diagnosis year	Mod	164		Wool	, 1 16	
Classification Disease Diagnosed 2021 2020 Total Cases ★ Total Cases ★ Cases		Case diagnosis year	wee	K TO *	2021			0
Plague 0 0 0 0 0 0 0 0 0	cı :c: .:	D: D: I	2024	2020	2021		202	
Piggue	Classification	Disease Diagnosed	2021	2020	Total cases★		Total cases★	
Rabies		Diagua	0	_				
SARS 0 0 0 0 0 0 0 0 0			-					
Smallpox	Category I							
Acute Flacid Paralysis					-			-
Acute Viral Hepatitis type A 5 0 24 0 28 7 7 Amnebiasis 5 5 5 72 28 78 43 Anthrax 0 0 0 0 0 0 0 0 0								
Amoebiasis Anthrax Ant			-			-		_
Anthrax Chikungunya Fever Cholera Cholera Cholera Cholera Cholera Dengue Ferer Diphtheria Enterohemorrhagic E. coli Infection Enterohemorrhagic Ever with Renal Syndrome Hemorrhagic Fever								
Chikungunya Fever Cholera Dengue Fever Diphtheria Enterohemorrhagic E. coli Infection Dengue Fever Diphtheria Enterohemorrhagic E. coli Infection Infection Enterohemorrhagic E. coli Infection Infection Enterohemorrhagic E. coli Infection In								
Cholera					_		-	
Dengue Fever 1			-					
Diphtheria Coll Infection O O O O O O O O O			_		-	-	-	
Enterohemorrhagic E. coli Infection								
Epidemic Typhus Fever			-		-	-	-	-
Hantavirus Pulmonary Syndrome								
Hemorrhagic Fever with Renal Syndrome			_		_			
Malaria	Category II		-		-	-	-	_
Measles			_					
Meningococcal Meningitis			_					
Paratyphoid Fever			-		-	-		
Poliomyelitis		Meningococcal Meningitis	0	0	0			0
Rubella 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0			0	0	1	0	0	0
Shigellosis 4 3 3 65 0 555 21 Typhoid fever 0 0 0 1 1 0 0 55 21 Typhoid fever 0 0 0 0 1 0 0 0 0 0 0 0 0 0 0 0 0 0 0		Poliomyelitis	0	0	0	0	0	0
Typhoid fever		Rubella	0	0	0	0	0	0
West Nile Fever		Shigellosis	4	3	65	0	55	21
Zika virus infection		Typhoid fever	0	0	1	0	5	3
Acute Viral Hepatitis type B 4			0	0	0	0	0	0
Acute Viral Hepatitis type B		Zika virus infection	0	0	0	0	2	2
Acute Viral Hepatitis type C Acute Viral Hepatitis type D Acute Viral Hepatitis type E Congenital Syphilis Congenital Syphilis Congenital Rubella Syndrome Enteroviruses Infection with Severe Complications Haemophilus Influenza type b Infection Japanese Encephalitis Legionnaires' Disease Neonatal Tetanus Pertussis Tetanus Botulism Botulism Botulism Botulism Botulism Botulism Botulism Botulism Botulism Complicated Varicella Endemic Typhus Fever Herpesvirus B Infection Influenza Case with Severe Complications Influenza Case w		Acute Viral Hepatitis type B	4	1	42	1	28	2
Acute Viral Hepatitis type D Acute Viral Hepatitis type E Congenital Syphilis Congenital Syphilis Congenital Syphilis Congenital Syndrome Enteroviruses Infection with Severe Complications Haemophilus Influenza type b Infection Japanese Encephalitis Legionnaires' Disease Solution Pertussis Neonatal Tetanus Neona			12	16	202	0	201	2
Acute Viral Hepatitis type E								
Category III Congenital Syphilis Congenital Rubella Syphrome Enteroviruses Infection with Severe Complications Interoviruses Infection Interoviruses Infection Influenza Case with Severe Complications Introviruses Infection Influenza Case with Severe Complications Introvirus Infection Influenza Case with Severe Complications Introvirus Interovirus Interctions Introvirus Infections Introvirus Infections Introvirus Infections Introvirus								-
Congenital Rubella Syndrome 0	Ì							
Enteroviruses Infection with Severe Complications 0			_		_	-		
Haemophilus Influenza type b Infection			_		_	-	-	
Japanese Encephalitis	Category III		_			-		-
Legionnaires' Disease						_		
Mumps 8			-		_	-	-	
Neonatal Tetanus								
Pertussis 0 0 0 0 0 0 0 8 0 0 0 0 0 0		·						
Tetanus					_			-
Botulism 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0			_					
Brucellosis 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0		Tetanus	0	1	2	0	4	0
Complicated Varicella		Botulism	0	0	0	0	0	0
Endemic Typhus Fever		Brucellosis	0	0	0	0	0	0
Herpesvirus B Infection		Complicated Varicella	4	0	18	0	16	0
Herpesvirus B Infection		Endemic Typhus Fever	1	0	9	0	3	0
Influenza Case with Severe Complications 0	Category IV		0		0	0		
Invasive Pneumococcal Disease		· ·	_		_	_	_	_
Category IV Leptospirosis Listeriosis Listeriosis Lyme Disease Lyme Disease Lyme Disease Definition of the property of the pro			_			_		_
Listeriosis					_			_
Lyme Disease			_	_		-		_
Melioidosis								
Q Fever Scrub Typhus 4 0 58 0 60 1 Toxoplasmosis Tularemia 1 0 6 0 0 0 Tularemia 0 0 0 0 0 0 Ebola Virus Disease Lassa Fever Marburg Hemorrhagic Fever Marburg Hemorrhagic Fever Modidle East Respiratory Syndrome Coronavirus Infections Novel Influenza A Virus Infections Novel Influenza A Virus Infections Rift Valley Fever Severe Pneumonia with Novel Pathogens 0			_		_	_		_
Scrub Typhus								
Toxoplasmosis		Q Fever	0	0	0	0	1	0
Tularemia			4	0	58	0	60	1
Tularemia		Toxoplasmosis	1	0	6	0	0	0
Ebola Virus Disease			0	0	0	0	0	0
Lassa Fever								
Marburg Hemorrhagic Fever			_				_	
Middle East Respiratory Syndrome Coronavirus Infections Novel Influenza A Virus Infections 0 0 0 0 0 0 Rift Valley Fever Severe Pneumonia with Novel Pathogens 0 0 0 0 0 0 0 343 0 <			_					
Category V Coronavirus Infections			U	U	U	U	U	U
Coronavirus Infections	Catogory	ivildale East Respiratory Syndrome	0	0	0	0	0	0
Rift Valley Fever 0 0 0 0 0 Severe Pneumonia with Novel Pathogens 25 13 289 267 398 343	Category v		_					
Severe Pneumonia with Novel Pathogens 25 13 289 267 398 343			_		_	-	-	-
			-		-	-	-	_
Yellow Fever								
		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, Gonorrhea, 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 2020/1/15, "Severe Pneumonia with Novel Pathogens" was listed as a Notifiable Infectious Disease.

Suspected Clusters

●Twenty-two clusters related to diarrhea (13), varicella (5), tuberculosis (3) and enterovirus (1) were reported during week 16.

Imported Infectious Diseases

There were 20 imported cases from 7 countries during week 16.

Countries Diseases	Philippines	Indonesia	India	Slovakia	Kazakhstan	USA	Belgium	Total
Severe Pneumonia with Novel Pathogens		4	2	1	1	1	1	19
Dengue Fever		1						1
Total		5	2	1	1	1	1	20

- ●During week 1-16, there were 302 imported cases from 42 countries. The top three countries are Philippines (86), the Indonesia (78), and USA (37).
- During week 1-16, the three notifiable diseases with the highest number of imported cases are Severe Pneumonia with Novel Pathogens (266), Amoebiasis (28), and Dengue Fever (5).

Summary of Epidemic

●Severe Pneumonia with Novel Pathogens: COVID-19 cases among the pilots were reported, and the event is under investigation. The global COVID-19 pandemic continues to be critical. The locally-acquired and imported cases might increase.

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

	Case diagnosis year	vveek	(17★	2021	Week	2020)
Classification	Disease Diagnosed	2021	2020	Total cases★	Imported cases	Total cases★	Imported cases
	Plague	0	0	0	0	0	0
	Rabies	0	0	0	0	0	0
	SARS	0	0	0	0	0	0
	Smallpox Asuto Floorid Paralysis	0	0	0	0	0	0
	Acute Flaccid Paralysis Acute Viral Hepatitis type A	0 1	1 0	11 25	0 0	12 28	0 7
	Amoebiasis	8	5	80	31	26 83	46
	Anthrax	0	0	0	0	0	0
	Chikungunya Fever	0	0	1	1	2	2
	Cholera	0	0	0	0	0	0
	Dengue Fever	0	0	5	5	55	55
	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	4	0	3	0
	Malaria Measles	0	0	1 0	1 0	1 2	1 2
	Meningococcal Meningitis	0	1	0	0	4	0
	Paratyphoid Fever	0	0	1	0	0	0
	Poliomyelitis	0	0	0	0	0	0
	Rubella	0	0	0	0	0	0
	Shigellosis	2	5	67	0	60	21
	Typhoid fever	0	0	1	0	5	3
	West Nile Fever	0	0	0	0	0	0
	Zika virus infection	0	0	0	0	2	2
	Acute Viral Hepatitis type B	9	2	51	2	30	2
	Acute Viral Hepatitis type C	8	6	210	0	207	2
	Acute Viral Hepatitis type D	0	0	0	0	0	0
	Acute Viral Hepatitis type E Congenital Syphilis	0	1 0	4 0	0	6 0	0
	Congenital Syphins Congenital Rubella Syndrome	0	0	0	0	0	0
	Enteroviruses Infection with Severe Complications	0	0	1	0	7	0
(ategory III	Haemophilus Influenza type b Infection	0	0	1	0	2	0
	Japanese Encephalitis	0	0	0	0	0	0
	Legionnaires' Disease	8	6	112	0	83	7
	Mumps	12	6	161	1	144	6
	Neonatal Tetanus	0	0	0	0	0	0
	Pertussis	0	0	0	0	8	0
	Tetanus Botulism	0	0	0	0	0	0
	Brucellosis	0	0	0	0	0	0
	Complicated Varicella	4	0	22	0	16	0
	Endemic Typhus Fever	0	0	9	0	3	0
Category IV	Herpesvirus B Infection	0	0	0	0	0	0
	Influenza Case with Severe Complications	0	0	1	0	546	6
	Invasive Pneumococcal Disease	6	4	107	0	134	0
	Leptospirosis	2	2	13	0	15	0
	Listeriosis	6	3	62	0	37	0
	Lyme Disease	0	0	0	0	0	0
	Melioidosis	0	0	6	0	4	1
	Q Fever	5	1	5	0	2	0
	Scrub Typhus Toxoplasmosis	3 0	7 0	61 6	0 0	67 0	1 0
	Tularemia	0	0	0	0	0	0
	Ebola Virus Disease	0	0	0	0	0	0
	Lassa Fever	0	0	Ö	0	Ö	0
	Marburg Hemorrhagic Fever	0	0	0	0	0	0
	Middle East Respiratory Syndrome Coronavirus Infections	0	0	0	0	0	0
Category V	Novel Influenza A Virus Infections	0	0	0	0	0	0
	Rift Valley Fever	0	0	0	0	0	0
	INIT VALLEY LEVEL						
	Severe Pneumonia with Novel Pathogens	35	31	324	292	429	374

 [★]The weekly and cumulative total numbers include indigenous and imported cases of notifiable infectious diseases.
 MDR-TB, Tuberculosis, Syphilis, Gonorrhea, 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 2020/1/15, "Severe Pneumonia with Novel Pathogens" was listed as a Notifiable Infectious Disease.

Suspected Clusters

Sixteen clusters related to diarrhea (9), tuberculosis (4), varicella (2) and upper respiratory tract infection (1) were reported during week 17.

Imported Infectious Diseases

There were 28 imported cases from 10 countries during week 17.

Countries Diseases	Indonesia	Philippines	Netherlands	India	Uzbek	Egypt	USA	Kazakhstan	Canada	Vietnam	Total
Severe Pneumonia with Novel Pathogens		8	2	2	1	1	1	1	1		24
Amoebiasis											3
Acute Hepatitis B										1	1
Total	10	8	2	2	1	1	1	1	1	1	28

- ●During week 1-17, there were 330 imported cases from 43 countries. The top three countries are the Philippines (94), Indonesia (88), and USA (38).
- ●During week 1-17, the three notifiable diseases with the highest number of imported cases are Severe Pneumonia with Novel Pathogens (290), Amoebiasis (31), and Dengue Fever (5).

Summary of Epidemic

●Severe Pneumonia with Novel Pathogens: There have been new cases linked to the airline company COVID-19 cluster. It is worrisome that some cases have visited public spaces while they were infectious. The situation of global COVID-19 pandemic continues to be critical. The risk of acquiring SARS-CoV-2 infection in Taiwan is expected to raise.

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