

## **Leptospirosis in the Northern Mariana Islands**

### **Introduction**

The Commonwealth of the Northern Mariana Islands (CNMI) comprises 16 islands (all the Mariana group except the U.S. Territory of Guam) lying in the western Pacific Ocean. The land area is 460 sq. km and is situated 5,300 km west of Hawaii and 2,300 km south of Japan. Its nearest neighbours to the south are Guam and the Federated States of Micronesia.

Leptospirosis is a disease that is endemic to the CNMI and elsewhere in the Pacific Basin. Recently, a number of cases of symptomatic leptospirosis have been treated at the Commonwealth Health Center in the CNMI. The purpose of this paper is to review the cases seen in the CNMI and summarise the CNMI's multidisciplinary public health response.

From June 2000 to August 2001, physicians working in the CNMI have diagnosed ten cases of symptomatic leptospirosis. Eight of these cases required hospitalisation; three resulted in death. A chart review for this time period found two additional cases highly suspicious for leptospirosis, which resulted in deaths due to renal failure. No lab testing for leptospirosis was sent on these two cases, since leptospirosis was not considered during their hospitalisation.

The CNMI's Department of Public Health (DPH) responded to the need for enhanced leptospirosis diagnosis and treatment, and sought the assistance of the Secretariat of the Pacific Community (SPC). This report highlights four of the leptospirosis cases on Saipan and describes the actions taken by DPH under the direction of the CNMI's Secretary of Health.

### **Case review**

#### **Case 1**

A 53-year-old American lawyer presented to the emergency room with weakness, shortness of breath and headache. He had fever, tachycardia and mild acute renal failure. Within 24 hours of admission, he became profoundly hypoxic and was transferred into the intensive care unit (ICU). He was found to have bilateral pneumonia and became hypotensive. He was treated with high-dose penicillin for suspected leptospirosis, and recovered.

Upon review, he recalled that he cut his leg on a bush while searching for an errant golf ball on one of the local courses. Inspection of his home by a team of environmental health inspectors revealed a well-kept area around a modern house. The setting is rural with an abundance of fruit trees near the house, and Pacific jungle rats are frequently seen near areas of trash storage. In addition, he had recently power-washed his garage to remove accumulated debris.



## Case 2

A 35-year-old man employed as a public works maintenance man presented to the Emergency Department with leg pain and fever for more than one week. He was found to have jaundice, rhabdomyolysis and acute renal failure. He quickly developed sepsis and a coagulopathy and died within 18 hours of admission.

Upon review, he lived in an urban area on Saipan in a family compound. Possible means by which he contracted leptospirosis include the slaughtering of pigs for family funerals. He also was involved in cleaning out roadside sewers after a tropical storm two weeks prior to the onset of his illness.

## Case 3

A 20-year-old Japanese male presented to the hospital with headache, fever and myalgia. He was diagnosed with viral syndrome and sent home. He returned three days later with jaundice, rhabdomyolysis and acute renal failure. He was hospitalised in the ICU, but his course was complicated by acidosis and cardiac problems. He succumbed four days after admission.

Upon review, he spent a lot of time outdoors, frequently swimming in the major Saipan freshwater stream and waterfalls area. His home is near a wetland area and has an overgrowth of vegetation.

## Case 4

A 35-year-old Filipino man presented to the Emergency Department with three days of fever, myalgia and delirium. He was found to be in acute renal failure and had severe thrombocytopenia. He was admitted to the ICU and treated with doxycycline for possible leptospirosis. He required massive fluid resuscitation but was stabilised and transferred to a tertiary care centre in Manila, Philippines. He required dialysis but eventually recovered kidney function and returned to Saipan.

Upon review, the patient was employed as a gardener and grounds keeper by a local hotel. This appears to be the means by which he contracted his disease.

## Diagnostic summary

The actual incidence of leptospirosis in the CNMI is unknown. Recent information from serology in the Republic of Palau indicates that up to 8 per cent of "viral syndrome" cases (fever of unknown origin in an adult) are due to acute leptospirosis. Many of these cases resolve without antibiotics, but others advance to the more severe forms of leptospirosis.

Currently, there are very few clues to assist medical providers in distinguishing this disease from other endemic illnesses in the Pacific Basin. Cases can present anywhere along the spectrum of typical upper respiratory infection (URI) symptoms to advanced hepato-renal failure. Leptospirosis can be easily mistaken by medical



providers for dengue fever, malaria, influenza or other URIs. We suspect that the vast majority of cases of leptospirosis in the CNMI are undiagnosed, self-limited illnesses that are considered viral infections.

The following table briefly summarises the last ten cases of leptospirosis diagnosed in Saipan. Demographic information is also provided, as well as the means of diagnosis (serum or tissue samples) and the eventual clinical outcome. In most of these hospital cases, leptospirosis was suspected and treatment was provided according to the World Health Organization's guidelines for Weil's disease. In none of the cases, however, was laboratory diagnosis available to the medical staff until weeks after patient was hospitalised or died.

Table 1: Leptospirosis Cases in the CNMI, June 2000 to November 2001

Date	Age	Gender	Ethnicity	Acute serology	Convalescent serology	Outcome
Jun 2000	32	M	American	+		Hospitalised
Oct 2000	32	F	American	+		Hospitalised
Nov 2000	53	M	American	-	+	Hospitalised
Nov 2000	20	M	Japanese	+		Deceased
Nov 2000	35	M	Carolinian	+		Deceased
Dec 2000	11	M	American	+/-	+/-	Outpatient
Dec 2000	13	F	Chamorro		+	Outpatient
Jan 2001	27	M	Chuukese	+/-		Hospitalised
Jul 2001	35	M	Filipino	-	+	Hospitalised
Aug 2001	42	M	Filipino	-	-*	Deceased

\*Renal PCR positive for Leptospira

## Public Health Action

For three of these cases, a public health team consisting of the Medical Director, Public Health Epidemiologist, and staff of the Bureau of Environmental Health performed on-site inspections to assess possible mechanisms for leptospirosis transmission. Many environmental samples were taken, particularly in the area around the freshwater falls on Saipan where at least two of the patients had recently been. Watershed areas were inspected, particularly in areas where domestic animals were kept. Many sources of potential contamination were identified. Fecal coliform contamination was detected at a number of sites, indicating animal waste runoff into the stream. As expected, none of the environmental samples revealed the presence of Leptospira.

Besides environmental inspections, the Department of Public Health took several steps in response to the increase in diagnosed cases of leptospirosis. Initially, the Secretary of Public Health created a Multidisciplinary Leptospirosis Task Force to address this disease in the CNMI. Included in this working group were the Secretary of Health, the Deputy Secretary for Public Health Administration, DPH Special Assistant, Public Health Medical Director, Public Health Epidemiologist, the Secretary for the Department of Land and Natural Resources; the CNMI Veterinarian, and representatives from the CNMI Bureau of Environmental Health.



The team recognised the need for outside expertise and requested the assistance of the SPC Veterinarian based in Suva, Dr Peter Saville, as well as the Noumea-based SPC Epidemiologist Dr Yvan Souarès and Dr Philippe Pérolat, Director of 'Institut Pasteur', Noumea, New Caledonia<sup>1</sup>. Additional consultation was arranged via telephone with the Hawaii Department of Public Health.

Site trips were arranged by SPC/PPHSN personnel, who arrived in September 2001. The team met with the Leptospirosis Task Force, reviewed case records, performed interviews, repeated site investigations, and presented a leptospirosis update for the public health staff as well as Saipan's medical providers. Finally, the visiting SPC/PPHSN staff created a list of recommendations that addressed the specific needs of the CNMI.

## **Recommendations<sup>2</sup>**

After a review of the leptospirosis cases on Saipan, the PPHSN team made the following broad recommendations:

- Saipan inhabitants are exposed to multiple sources of potential contamination. The freshwater falls on Saipan were a potential source, but exposure to other sources is more likely.
- The best prevention measure for leptospirosis is to improve overall hygiene and sanitation, particularly in the urban areas.
- DPH must continue to increase awareness among physicians and health personnel about leptospirosis in the CNMI.
- CNMI should improve and expand surveillance for symptomatic leptospirosis.
- CNMI should improve timely diagnosis and treatment for leptospirosis.
- CNMI needs improved access to more timely and accurate laboratory diagnosis.

## **Future directions**

Further study will include a review of cases from previous years to better assess the burden of symptomatic leptospirosis. Already, there has been an increase in the index of suspicion for leptospirosis for patients needing urgent and emergent care.

Future directions include:

- increasing surveillance through the Emergency Department and urgent-care centres throughout the CNMI;

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<sup>1</sup> Editor's note: such team was arranged under the PPHSN umbrella.

<sup>2</sup> Editor's note: The recommendations listed in the paper are the broad recommendations. They have been further developed in the SPC/PPHSN technical assistance report.



- closer contact with the Guam Public Health Laboratory for rapid and accurate diagnostic testing;
- consideration for a cohort study in the CNMI to better characterise the number of true cases of leptospirosis infection in the CNMI.

The CNMI will continue to work with representatives from SPC/PPHSN to provide training and technical assistance to the CNMI. In addition, the CNMI Department of Public Health will continue to advance its own internal expertise, in order to improve its ability to recognise and treat this endemic and elusive disease.

Joseph Kevin Villagomez, MA  
CNMI Secretary of Public Health

Dr. Richard Brostrom, MD-MSPH  
Medical Director, Division of Public Health

Edward P. Diaz, MPH  
CNMI Epidemiologist

John Tagabuel  
Environmental Health Officer

Farhana Habib, MD  
Former Medical Director,  
Division of Public Health