

FLOODS and DISEASES
MEET THE EXPERTS
PIDSP CONVENTION
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Various places in the Philippines suffer from floods during the rainy season brought about by typhoons and even monsoon rains - Typhoon Ondoy in 2009, Typhoon Sendong in CDO, in December 2011 and the Habagat last August 2012

Philippine Situationer



Children swimming and playing in flood waters



Wading in floods



Forced to stay in evacuation centers



Continuous exposure to flood waters with homes flooded for months

Philippine Situationer



Crowded conditions



Poor sanitation



Lack of clean water



Forecast of continuous rains



DISEASE OUTBREAKS



Leptospirosis is highly endemic to the Philippines. Outbreaks usually occur during the typhoon season (July–October)

NEWS ALERT

- After typhoon Ondoy in September 2009, an outbreak of leptospirosis occurred in Metro Manila, the Philippines;
- 471 patients were hospitalized and 51 (10.8%) died.
- A hospital-based investigation found risk factors associated with fatal infection to be older age, hemoptysis, anuria, jaundice, and delayed treatment with antimicrobial drugs.



Questions:

- When will you suspect leptospirosis?
- What serological tests are available in the country?
- Can doxycycline be used in children for prophylaxis? What prophylaxis is best for continuous exposure to floods?

Leptospirosis

What to do during a disaster?



Cecilia C. Maramba-Lazarte, MD, MScID
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PIDSP Convention

Leptospirosis outbreak due to 'complacency'

By Michael Andrew W. Yu

Tuesday, January 3, 2012

CAGAYAN DE ORO – The increasing number of people infected with leptospirosis could be associated to complacency or indifference of people to take prescribed medicine, a Health official said Tuesday. The Department of Health (DOH) in Northern Mindanao declared Monday an outbreak of leptospirosis in Cagayan de Oro City after 5 persons died while more than 200 were infected with the disease. The DOH said confirmatory tests on 128 patients out of the suspected 200 cases proved to be positive.

The outbreak was spurred by flash floods that ravaged villages in the city last December 17 due to Tropical Storm Sendong (international codename: Washi). The DOH said many of those affected by the flash floods received Doxycycline, a prophylactic medicine and antibiotic against leptospirosis, but did not take it. Dr. David Mendoza, head of the DOH's Regional Epidemiology, Surveillance and Disaster Response Unit, said Doxycycline is always available in clinics set up by the DOH and the City Health Office (CHO) at the evacuation centers. But it seems the people failed to take the medicine because of "inadequacy and insufficient information" on leptospirosis, Mendoza said.



CAGAYAN DE ORO. Nurses at the Northern Mindanao Medical Center (NMMC) are busy attending patients suffering from leptospirosis. There are more than 200 individuals confined at the government hospital and most of them are victims of Tropical Storm Sendong last December 17. (Joey P. Nacalaban)

“Many people, especially those living outside the evacuation centers, came only for food and relief goods, but not for medical consultations,” he said. At the Northern Mindanao Medical Center (NMMC), 122 children are confined while more than a hundred adults are also hospitalized due to leptospirosis, some of whom are already staying in hallways and in open spaces due to the lack of available rooms.

Transmission and Pathogenesis of Leptospirosis

- Leptospire enter the body through cuts and abrasions, mucous membranes or conjunctivae, or aerosol inhalation of microscopic droplets.
- Swallowing contaminated water
- Widespread hematogenous dissemination, penetration of tissue barriers including CNS and aqueous humor (eye)
- a systemic vasculitis-broad spectrum of clinical illness
- Philippines – in the top 30 countries with highest prevalence

Leptospirosis among Rats in the Philippines

- survey was conducted in Metro Manila and Laguna found that **92%** of rat serum samples were positive for anti- *Leptospira* antibodies;
- most common infecting serovars were *Manilae*, *Hebdomadis*, and *Losbanos*.
- Rats -most important reservoirs in urban – do not die but are chronically infected for >7 mos

Villanueva S, et al. Serologic and Molecular Studies of *Leptospira* and Leptospirosis among Rats in the Philippines
Am J Trop Med Hyg, 2010; 82(5): 889-898.



Frequently asked questions

- When will you suspect leptospirosis?

Clinical Manifestations of Leptospirosis

	Anicteric		Icteric	
	1 st Stage 3-7 days Septicemic	2 nd Stage 0-30 days (Immune)	1 st Stage 3-7 days Septicemic	2 nd Stage 0-30 days (Immune)
Clinical Findings	Fever, myalgia, headache, conjunctival suffusion, abdominal pain, vomiting	Meningitis, uvetis, rash, fever	High fever, jaundice, hemorrhages, renal failure Multi-organ failure	
Leptospire present	Blood, CSF	Urine	Blood, CSF	Urine

Dhutta TK, Christopher M, Leptospirosis- An Overview. J Assoc Phys India 2005; 53: 545-551.

When to suspect leptospirosis?

- acute febrile illness of at least 2 days
 - residing in a flooded area or has high-risk exposure
 - with at least 2 symptoms:
 - myalgia, calf tenderness, conjunctival suffusion, chills, abdominal pain, headache, jaundice, or oliguria [Grade A]
- *personal recommendation- no other identifiable source of infection

Which patient will need hospital admission?

MILD LEPTOSPIROSIS- Any suspected case of leptospirosis

BUT with stable vital signs, anicteric sclerae, with good urine output, and no evidence of meningismus/ meningeal irritation, sepsis / septic shock, difficulty of breathing nor jaundice and can

- take oral medications is considered
- **OUT-PATIENT SETTING, give oral antibiotics**
- [Grade A]

Which patient will need hospital admission?

MODERATE – SEVERE LEPTOSPIROSIS

- Any suspected case associated with unstable vital signs, jaundice/icteric sclerae, abdominal pain, nausea, vomiting and diarrhea, oliguria/anuria, meningismus / meningeal irritation, sepsis / septic shock, altered mental states or difficulty of breathing and hemoptysis

- ADMIT TO **HOSPITAL**

- [Grade A]

FAQs

- What serological tests are available in the Philippines?

Table 5. Local guidelines for collection and transport of specimens for leptospirosis

Laboratory test	Specimen to be collected	Best time to collect the specimen	Transport requirements	Running days	Turn-around time	Where to send the specimen
Culture for leptospira	Blood in EDTA (purple top) Citratd blood (green top) CSF Urine	Blood, CSF within 7 days of illness Urine 2 nd week to 4 th week of illness	Blood, CSF – room temperature Urine - within 1 hr (protect from excessive heat or cold)	Daily except Saturday Sunday and holidays	6 weeks	1. Philippine General Hospital (PGH) Medical Research Laboratory (MRL) receiving counter 2 nd floor, ER complex 2. Research Institute for Tropical Medicine (RITM) Microbiology Dept 9002 Research Drive, Filinvest Corporate City Alabang, Muntinlupa
PCR for Leptospira	Blood in EDTA (purple top) Whole blood or serum (red top) CSF Urine	Blood, CSF within 7 days of illness Urine 2 nd to 4 th week	Chilled or with cold packs	Daily except Saturday Sunday and holidays	24-48 hours	RITM Microbiology Dept 9002 Research Drive, Filinvest Corporate City Alabang, Muntinlupa
Microscopic agglutination test (MAT for leptospirosis)	Blood or serum preferably collected twice at an interval of 10 days	> 1 week of illness	With ice if serum Room temperature if newly collected blood	Thursday	Thursday 3 pm	PGH-MRL receiving counter 2 nd floor, ER complex
Lepto (IgM) card kit/Dridot®	Whole blood, serum or plasma	≥ 1 week of illness	With ice	Daily Cutoff time: 3 pm	4 hours	The Medical City Pathology Laboratory
BioRad® macroscopic agglutination test	Serum	≥ 1 week of illness	With ice	Daily	2 minutes	St Luke's Medical Center Pathology Laboratory

FAQs

- Can doxycycline be used in children for prophylaxis?
- What prophylaxis is best for continuous exposure to floods?

Prevention of leptospirosis includes the following:

- Avoid wading or swimming in flood waters.
- If exposure to flood waters is unavoidable, protective gear such as boots, goggles, overalls, and rubber gloves should be used.
- All food and drinking water should be protected against contamination. Fresh vegetables and fruit should be washed in previously boiled or clean water and then cooked or peeled.
- Boil drinking water for at least 10-15 minutes. Physical filtration through ceramic or charcoal filters is not adequate for leptospirosis.
- Food should be protected against rodent attack or contamination.

Prophylaxis

- Consult with physician required
- Pre-exposure prophylaxis not routinely recommended
- Those who intend to visit highly endemic areas or are likely to get exposed:
 - Doxycycline 200 mg once weekly 1-2 days before exposure and continue throughout the period of exposure
 - Not for pregnant and lactating women

Chua M, et al. Leptospirosis Clinical Practice guideline 2010, convened by the Phil Society of Microbiology and Infectious Diseases

Post Exposure Prophylaxis in children

DRUG OF CHOICE

	Dose (oral)	Comments
Doxycycline	4 mg/kg single dose, max dose: 200mg	Proven efficacy for preventing clinical disease Adverse effects are similar to other tetracyclines; in children below 8 years of age, doxycycline is unlikely to cause dental staining at the dose and duration recommended to treat serious infections Avoid milk, dairy products, iron and antacids 1 hour before and 2 hours after administration; may be given with food to avoid stomach upset

Post disaster interim advice on the prevention of Leptospirosis in children. PIDSP Journal 2012; 13 (2) :37-38.

Use of Doxycycline in Children

- AEs include nausea, diarrhea, rash, and photosensitivity
- Discoloration of teeth and bone due to deposition of the complex formed from chelation of tetracyclines to calcium.
- Doxycycline-preferred over other tetracyclines -less strongly bound to Ca,produce fewer adverse effects
- Lochary - retrospective study of children given doxycycline for RMSF over a 7 year period; no significant difference in tooth enamel staining in children who received a single course of doxycycline compared to matched controls. (Lochary *Pediatr Infect Dis J* 1998;17:429-31.)

Administration of doxycycline

- Doxycycline- higher bioavailability than other tetracyclines
- Interactions-Antacids, milk or other dairy products, infant formula, and iron supplements should be given 1 hr before or at least 2 hrs after a dose
- may be given with other foods to reduce gastric upset.
- Because the bitterness of doxycycline is not masked by water, the USFDA recommends crushing doxycycline tablets and mixing them with a soft food or drink. Researchers at USFDA have conducted stability and palatability studies -doxycycline/milk mixtures were stable for 24 hrs at rm temp
- doxycycline/chocolate milk mixture was found to be stable for at least 6 days when refrigerated.

Post Exposure Prophylaxis in children

	Dose (oral)	Comments
Azithromycin	10 mg/kg single dose, max dose: 500 mg	Efficacy for prevention of leptospirosis was seen in in vitro and animal models
Amoxicillin	50 mg/kg/day q 6 hrs. for 3-5days Max dose: 500 mg q 6 hrs	No clinical trial for prevention of leptospirosis, but amoxicillin is a known alternative for the treatment of disease Dose is for 3-5 days due to the very short half-life

Post disaster interim advice on the prevention of Leptospirosis in children. PIDSP Journal 2012; 13 (2) :37-38



It's more fun in the
Philippines





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“Many people... came only for
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At the Northern Mind... are confined while
more than a hundred adults... leptospirosis, some of whom
are already staying in hallways and in open spaces due to the lack of available rooms.



Floods can be a potential source of many water-borne diseases such as typhoid fever and diarrheal diseases

Questions:

- Is it cost-effective to vaccinate people with the typhoid vaccine in evacuation centers
- Is chloramphenicol still effective as first line treatment for Typhoid in disaster situations

Typhoid Fever

Typhoid is a potentially fatal infectious disease caused by the bacterium *Salmonella typhi*. It should be distinguished from:

- paratyphoid, which can have a similar clinical profile but is caused by other members of the *Salmonella* family, *S. paratyphi*
- typhus, which like typhoid (and paratyphoid) causes headache, fever, mental torpor, stupor and delirium, is a completely distinct illness caused by Rickettsiae bacteria following a flea or tick bite

Typhoid is caused by the bacterium *Salmonella typhi*:

- Gram-negative
- size 2-3 μm x 0.4-0.6 μm
- single flagellum
- highly motile
- member of the *Salmonella* genus
- part of the wider *Enterobacteriaceae* family



S. typhi:

- enters the body orally, passing to the small intestine
- is a systemic infectious disease, not an infection of the intestines alone
- causes its main complications following re-entry to the intestines through the bile duct, after systemic infection has developed

Clinical course

the incubation period may last from 8 days to 3 weeks, depending on:

- the dose of organisms ingested
- the virulence
- the host resistance

symptoms only appear after the infection has become disseminated throughout the body

the onset of symptoms is insidious but frequently there are two recognisable waves of onset, one typically at about 8 days and one about 18 days after infection; this pattern of onset is determined by:

- growth in the population of bacteria (first peak)
- breakdown in cellular defence and containment mechanisms (second peak)

the full course of typhoid in the absence of antibiotic therapy runs over 4-5 weeks, and is followed by a month of convalescence

Transmission

Typhoid is transmitted by food or water that has been contaminated by an acutely affected individual, a patient in convalescence, or a carrier of typhoid.

- fecal material is the most common contaminant
- others include saliva, vomitus or other body fluids
- human hands or flies may spread the contaminated material

Chloramphenicol

	mortality*	relapse	chronic carrier	fever
no therapy	>10%	5-10%	1-3%	14-28 days
chloramphenicol	1%	10-25%	1-3%	3-5 days

*mortality may be much higher in developing countries

Miller et al, 1995.

Alternatives to chloramphenicol include:

- ampicillin
- trimethoprim-sulfamethoxazole
- third generation cephalosporins
- quinolones (not in children or pregnancy)

Preventive measures

Endemic typhoid can only be prevented by:

- adequate sanitation, effective sewage disposal and safe water supply
- public health regulations to prevent the contamination of food and drink and effective public health education
- personal hygiene and hand-washing

[Intervention Review]

Vaccines for preventing typhoid fever

Abigail Fraser¹, Elad Goldberg², Camilo J Acosta³, Mical Paul⁴, Leonard Leibovici²

Vi polysaccharide vaccine (1 dose) provided protection in year one, and year two but not in year three. The 3 year cumulative efficacy was 55%. Compared with placebo, there was no significant difference in the incidence of fever or erythema, but local swelling was more common with the vaccine

Ty21a vaccine (3 doses) given orally provided statistically significant protection in each of the first 3 years. Compared with placebo, this vaccine was not associated with an increased rate of fever, vomiting, diarrhea, nausea or abdominal pain, headache or rash.

Questions:

- What types of diarrheal diseases are common in evacuation centers
- Is it appropriate to start an antimicrobial in disaster situations since documenting etiologic agents are not feasible at that time?
- What infection control measures are appropriate in evacuation centers to prevent diarrheal diseases

Diarrhea after the FLOOD

Prevention and Treatment

- WHO recommends that immunization with currently available cholera vaccines be used in conjunction with the usually recommended control measures in areas where cholera is endemic as well as in areas at risk of outbreaks.
- Vaccines provide a short term effect while longer term activities like improving water and sanitation are put in place.

WHO response

- Through the WHO Global Task Force on Cholera Control, WHO works to:
 - provide technical advice and support for cholera control and prevention at country level
 - train health professionals at national, regional and international levels in prevention, preparedness and response of diarrhoeal disease outbreaks
 - disseminate information and guidelines on cholera and other epidemic-prone enteric diseases to health professionals and the general public.

INFECTION CONTROL MEASURES TO PREVENT THE SPREAD OF DIARRHEAL DISEASES

GENERAL MEASURES FOR ALL STAFF AND EVACUATION CENTER RESIDENTS

- **WASH HANDS REGULARLY WITH SOAP AND WATER.**
 - **ALCOHOL HAND GELS ARE AN ADEQUATE SUBSTITUTE WHEN SOAP AND CLEAN WATER ARE NOT READILY AVAILABLE.**
- **MAINTAIN A CLEAN LIVING ENVIRONMENT.**
- **MAINTAIN GOOD PERSONAL HYGIENE INCLUDING THE FOLLOWING:**
 - **FOLLOW GOOD HYGIENIC PRACTICES DURING FOOD PREPARATION.**
 - **DO NOT SHARE EATING UTENSILS OR DRINKING CONTAINERS.**
 - **DO NOT SHARE PERSONAL TOILET ARTICLES SUCH AS TOOTHBRUSHES OR TOWELS WITH ANYONE ELSE.**
- **FACILITIES SHOULD BE ADEQUATE TO ALLOW RESIDENTS TO BATHE AT LEAST TWICE WEEKLY.**
- **LAUNDRY FACILITIES SHOULD BE AVAILABLE TO ALLOW APPROPRIATE LAUNDERING OF CLOTHES AND BED LINENS.**

1) WIPING UP AREAS SOILED WITH VOMIT OR STOOL

- WEAR DISPOSABLE GLOVES DURING CLEANING. IF YOU EXPECT THAT LIQUID MAY SPLASH, WEAR A DISPOSABLE MASK AND COVER GOWN OR APRON, IF AVAILABLE.

2) DISINFECTING SURFACES (BOTH ROUTINE AND AFTER CLEANING A SOILED AREA)

■ *HARD SURFACES*

- SOME GERMS CAN PERSIST ON HARD SURFACES SUCH AS DOOR KNOBS AND HAND RAILS,
 - SHOULD BE DISINFECTED AT LEAST 3-4 TIMES A DAY, IF POSSIBLE.
- WEAR GLOVES
 - USE DILUTED HOUSEHOLD BLEACH (1000 PPM SODIUM HYPOCHLORITE OR 5 TABLESPOONS OF 6% HOUSEHOLD BLEACH TO 1 GALLON OF WATER).**

PUBLIC RESTROOMS

- **CLEAN RESTROOMS FREQUENTLY; RESTROOMS USED BY SICK PEOPLE SHOULD BE CLEANED HOURLY, IF POSSIBLE.**
- **CLEAN ALL FIXTURES OF VISIBLE SOIL AS NECESSARY.**
- **WIPE SURFACES WITH A DISINFECTANT SUCH AS DILUTED HOUSEHOLD BLEACH (1000 PPM SODIUM HYPOCHLORITE OR 5 TABLESPOONS OF 6% HOUSEHOLD BLEACH TO 1 GALLON OF WATER) ***
- **PAY PARTICULAR ATTENTION TO DOORKNOBS, TOILET SEATS, TAPS, ETC.**
- **ALLOW SURFACES TO REMAIN WET FOR 10 MINUTES, IF POSSIBLE.**
- **ALLOW TO AIR DRY.**
- **REMOVE GLOVES AND DISCARD IN PLASTIC BAG.**
- **WASH HANDS WITH SOAP AND WATER OR USE ALCOHOL HAND GEL IMMEDIATELY AFTER REMOVING GLOVES.**

MEASURES FOR SICK PERSONS

- IF PERSONS IN THE EVACUATION CENTER ARE SICK WITH DIARRHEAL DISEASES, EVACUATION CENTER STAFF SHOULD:
 - PROVIDE RESIDENTS WITH INFORMATION ABOUT GASTROENTERITIS. ASK SICK PERSONS ABOUT THE TYPE AND FREQUENCY OF SYMPTOMS (INCLUDING WHETHER THEY HAVE FEVER OR BLOODY DIARRHEA) TO DETERMINE IF MEDICAL CARE IS NECESSARY.
 - SEPARATE SICK PERSONS FROM OTHER RESIDENTS UNTIL 24 HOURS AFTER DIARRHEA AND VOMITING STOP.
- DESIGNATE TOILETS FOR USE ONLY BY PERSONS WHO ARE SICK.
- SERVE FOOD TO ILL PERSONS AWAY FROM PERSONS WHO ARE NOT SICK, IF POSSIBLE.
- PROVIDE RESIDENTS WITH PLASTIC BAGS (E.G., SMALL BATHROOM TRASH CAN LINERS) TO CONTAIN VOMIT AND TO DISPOSE OF DIAPERS.
- PROVIDE RESIDENTS WITH SUPPLIES TO CLEAN UP SPILLS, ESPECIALLY VOMIT AND STOOL.

Key points

- A natural disaster is a catastrophic event defined as a disruption of human ecology that exceeds the community's capacity to adjust, so that the outside assistance is needed.
- No certain risk of an infectious disease epidemic occurring in the short-term period after a disaster has been well documented.
- Infectious diseases transmission or outbreaks may be seen days, weeks or even months after the onset of the disaster
 - massive population displacement and exacerbation of risk factors for disease transmission
 - unplanned and overcrowded shelters or camps
 - lack of food, safe water and functioning latrines
 - poor personal hygiene and nutritional status
 - low level of immunity to vaccine-preventable diseases.

Key points

- The potential infectious diseases resulting from natural disasters include diarrheal diseases, leptospirosis, hepatitis fever, typhoid fever, acute respiratory infection, measles, meningitis, TB, malaria, dengue fever, tetanus and cutaneous mucormycosis.
- **Flooding is the most common natural disaster described with an increase in cases or outbreaks of infectious diseases including diarrhea, malaria and leptospirosis.**
- Ideal prevention and control measures
 - strong disaster preparedness plan
 - surveillance systems for early case detection and treatment
 - appropriate management of water and sanitation systems
 - adequate food supplies and storage
 - strong vector control and vaccination programs

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