

Leptospirosis: a zoonotic disease that surges in the monsoon season

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Definition

- Leptospirosis is an acute or chronic or clinical infection with multiorgan failure in humans, characterized by fever, icterus/conjunctivitis and myalgia. Leptospirosis causes septicemia, haemolytic anaemia, interstitial nephritis, and causing abortion in most species of animals, and mastitis in cattle.

Synonyms

- Weil's disease, Haemorrhagic jaundice, Rice-field fever, Sugarcane-cutter's fever, Swamp fever
- In animals, leptospirosis is known as Stuttgart disease

Brief history

- In 1886, **Adolf Weil** in Heidelberg observed the disease.
- In 1907, **Stimson** used silver impregnation staining to the pathogen causing Weil's disease.
- In 1915, **Inada** (Japan) demonstrated the etiology and isolated the *Leptospira*.

Etiology

- Pathogenic *Leptospira* belong to the species *Leptospira interrogans*, which is subdivided into more than 200 serovars in to 23 serogroups.
- Non-pathogenic or saprophytic *Leptospira* belong to the species *Leptospira biflexa*.
- In Dogs: *L.canicola*
- In Cattle: *L.hardjo*
- In Swine: *L.pomona*
- In Rats: *L.icterohaemorrhagiae*

Reservoir and incidence

- Humans are susceptible to all serovars, and they are mostly accidental or incidental hosts.
- Host susceptibility may vary with different serovars, and act as primary maintenance host. Example: pigs and cattle are principle hosts for *L.pomona*, cattle for *L.hardjo* and dogs for *L.canicola*.
- The rat, particularly, *Rattus norvegicus*, is the chief reservoir host.
- Mice, bandicoots, guinea pigs, gerbils, squirrels, rabbits, hamsters, reptiles, nonhuman primates, livestock and dogs are also reservoirs of *Leptospires*.
- Rats and mice are common animal hosts for *L.ballum*. Infection in mice is inapparent and can persist for the animal's lifetime.
- Rodents are the only major animal species that can shed *Leptospires* throughout their life-span without clinical manifestations.
- High prevalence of leptospirosis recorded in tropical countries with high rain fall and neutral or alkaline soils, and abundance of rats.
- Rodents and pigs are important reservoir hosts and potential spreaders, also agricultural animals and mongoose.
- Outbreaks of leptospirosis by exposure to water contaminated by urine of infected animals.
- Waling on bare foot on the contaminated water during rainy season reflects higher incidence of leptospirosis in humans.
- Survival of *Leptospires* depends on soil and water condition.
- It is the number one occupational disease in many parts of the country.
- **Occupational hazards to**
 - Veterinarians
 - Paddy field workers
 - Recreational activity - Swimming and water sports
 - Sugarcane cutters
 - Swine handlers
 - Dairy workers
 - Slaughter house workers
 - Butchers
 - Sewer workers
 - Miners



- Cave explorers

Source of infection

- Urine is the chief source of infection.
- Dogs and rodents are the common source of infection for man.
- Milk from acutely infected cows.
- Genital excretions from cattle and swine.
- Leptospiuria state varies from species to species
 - Man : 7 days - 1 month
 - Rodents : Throughout life
 - Dogs : 700 days
 - Pigs : Upto 1 year / throughout life
 - Cattle : 120 - 700 da

Transmission

- Direct contact and ingestion are the common mode of transmission.
- The organism is often transmitted to humans by handling affected animals or urine of the reservoir host.
- The organism may also enter through minor skin lesions and probably via the conjunctiva.
- Many infections have followed bathing or swimming in infected waters.
- Ingestion of urine contaminated food and water.

Disease in Human

- Incubation period ranges from 2 days to 10 days
- Two phases of infection have been recognized, viz. bacteremic phase (leptosiraemic phase) for 7 to 10 days and leptospiruric phase for a week to months.
- Two clinical forms are icteric form and anicteric form.

(a). Icteric form or hepatonephritic form or Weil's disease:	(b). Anicteric form:
<ul style="list-style-type: none"> • Sudden fever, headache, myalgia, conjunctivitis, nausea, vomiting and diarrhoea or constipation. • Severe prostration. • Petichae on the skin, haemorrhages in the GI tract and proteinuria. 	<ul style="list-style-type: none"> • It is the mild form of leptospirosis • Leptospiuria for several months. • Ranges from inapparent infection to severe infection and death. Biphasic Illness



- Hepatomegaly and jaundice.
- Renal insufficiency with oliguria or anuria, azotemia and electrolyte imbalance with the disappearance of leptospiremia and fever.
- Convalescence lasts one or two months, during which time general malaise and myalgia may reappear for few days.
- Uveitis (conjunctivitis).
- Weakness, headache, myalgia, malaise, chills and fever.
- Leukocytosis, painful orchitis (testes not usually enlarged), conjunctival effusion and rash.
- Icteric leptospirosis (Weil's syndrome-usually caused by *L.icterohaemorrhagiae*) is the most severe form of the disease, characterized by impaired renal and hepatic function, abnormal mental status, hypotension, and a 5-10% mortality rate. Signs and symptoms are continuous and not biphasic.
- Non- suppurative meningitis.

Disease in animals

- **In cattle**

- It may be acute or subacute or chronic infection.
- *L.pomona* and *L.hardjo* are the important pathogens in cattle, causing abortion.
- Clinically, fever and anorexia occur with rapid decline in milk yield and atypical mastitis / milk drop syndrome or haemorrhagic mastitis, haemoglobinuria. Also, mild jaundice and severe haemolytic anaemia occurs with enlarged liver and swollen kidneys will be observed.
- **Pregnant cows abort (at third trimester of pregnancy)** with retention of the placenta (Storms of abortion).

- **In pigs**

- Subclinical infection is common, though it can cause abortion and birth of weak piglets, and infertility.

- **In dogs and cats**

- Gastroenteritis, jaundice and nephritis may occur.
- Acute haemorrhagic form, icteric form and uremic form (Stuttgart's disease) have been recognized.
- *L.cnicola* and *L.icterohaemorrhagiae* are the important pathogens of dogs.

- **In horses**

- *L.pomona* causes abortion and still births
- Periodic ophthalmia (moon blindness, iridocyclitis)



- **In sheep and goats**
 - Acute septicemia

Diagnosis

- History and clinical signs.
- **Dark field microscopy examination** of urine or serum (examined immediately after collection, sample should not be placed under ice cool condition, because, it affects the motility of the organism) at early stage of the disease.
- **Microscopic agglutination test:** It is a 'gold standard test' as per OIE. **Positive titre is 1:100.**
- Culture and identification in **EMJH (Ellinghausen McCullough Johnson and Harris)** medium. On semisolid or liquid medium, the growth of *Leptospires* is described as **Dinger's ring**. Other media that can also be used are, Korthof's medium, Stuart's medium, Fletcher's medium and Vervoort's medium.
- Culture is difficult and requires several weeks.
- Molecular diagnosis by PCR.
- Antibody detection in serum and aqueous humor.
- A rapid diagnosis is made with the Dot-ELISA test.
- IgM antibody detection ELISA is most useful for early diagnosis of clinical leptospirosis.
- **Silver impregnation staining (Fondana's staining and Levaditi's staining)** can be used to stain *Leptospires* in tissue section.
- Haematology
 - Haemolytic anaemia.
 - Haemoglobinuria.
 - Increased BUN, bilirubin, leucocytic count and erythrocytic fragility.

Treatment

- Antibiotics such as penicillin or tetracycline or doxycycline can be used.
- Early diagnosis and clinical management are very important in treating a case of leptospirosis.

Prevention and control

- Vaccination of animals, particularly cattle, dogs and swine.
- Chemoprophylaxis of animals with dihydrostreptomycin @ 25 mg/kg body weight.
- Rodent control.
- Avoid swimming in or drinking from potentially contaminated water.



- Avoid walking bare foot in contaminated or stagnant water.
- Protect workers by providing boots and gloves.
- Doxycycline chemoprophylaxis for persons at high exposure.
- Mass education to create awareness.

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