What is leptospirosis?

Leptospirosis is a transmissible disease of animals and humans caused by infection with the spirochete *Leptospira*. Leptospirosis is probably the most widespread zoonosis of global importance and is now being recognized as a re-emerging infectious disease.

How do leptospires look like?

Leptospires are corkscrew-shaped bacteria which differ from other spirochaetes by the presence of end hooks. They are too thin, hence are to be observed under the dark-field microscope. All leptospires look alike with only minor differences. So differentiation between pathogenic and saprophytic leptospires or between the various pathogenic leptospires is difficult.

How leptospires are classified?

Leptospirae belong to the order *Spirochaetales,* family *Leptospiraceae*, genus *Leptospira*. Species are traditionally classified into 29 serogroups and over 300 serovars. Genetic methods like DNA-DNA hybridization studies have identified 20 *Leptospira* spp. to date. However, antigenically related serovars are classified in two or more different species and a serogroup is often found in several species of *Leptospira*. A certain serovar may develop a commensal or comparatively mild pathogenic relationship with certain animal host species. For instance, cattle are often associated with serovar hardjo, dogs with canicola and rats with icterohaemorrhagiae and copenhageni.

How can pathogenic leptospires be distinguished from saprophytic leptospires?

Several tests based on culture conditions and on antigenic and genetic properties can be used to differentiate between pathogenic and saprophytic leptospires. Growth at 13°C in the presence of 8-azaguanine and conversion to spherical forms in 1M NaCl suggests that leptospires are saprophytes.

Do pathogenic leptospires always cause disease?

Certain vertebrate animal species have a commensal relationship with leptospires, in which they are the natural hosts for pathogenic leptospires that live in their kidneys. Such leptospires do little or no detectable harm to these hosts but they maintain the infection and are therefore known as natural maintenance hosts. If other animals that are not natural maintenance hosts (including humans) are infected by the same pathogenic leptospires, they often become ill. In addition, if a maintenance host for a particular leptospire is infected with another serovar, it may develop symptoms and signs of leptospirosis.

How and when leptospirosis spreads?

Leptospirosis has a worldwide distribution and is more spread in tropical regions than in temperate countries. This is attributed mainly to longer survival of leptospires in warm and humid environments. A pattern of disease seasonality has been described with a peak incidence occurring in summer or fall in temperate regions and during rainy seasons (due to water logging conditions and contaminations of environment with urine of carrier animals) in warm-climate regions.

Direct transmission can occur by contact with an animal or human host either by ingestion or skin contact, especially with mucosal surfaces. Indirect transmission is the most common mode of transmission and occurs with contaminated water or soil.

How leptospirosis is significant in public health ?

The significance of the disease in public health aspects acquires more importance, especially in countries like India because of large livestock, rodent and wild life populations, poor sanitary conditions and animal health practices, and close association between man and animals, providing a congenial environment for the spread of the disease.

Various factors influencing animal activity, suitability of the environment for the survival of the organism and behavioral and occupational habits of human beings can be the determinants of incidence and prevalence of the disease. The disease was considered inconsequential till recently, but it is emerging as an important public health problem during the last decade or so due to sudden upsurge in the number of reported cases and outbreaks.

When leptospirosis can be suspected?

Human: Abrupt onset of high fever, sore throat, headache, myalagia, conjunctivitis, abdominal pain, albuminuria, jaundice, skin rashes, superficial lymph node enlargement etc.

Cattle: Pyrexia, anorexia, malaise, haemorrhages, anaemia, jaundice, haemoglobinuria, abortion, mastitis etc.

Sheep and Goats: Pyrexia, conjunctivitis, jaundice, anaemia, anuria, hemoglobinuria, diarrhoea, mastitis, haemoagalactia, abortion etc.

Pigs: Pyrexia, weakness, depression, haemoglobinuria, periodic opthalmia, jaundice etc.

Dogs: Pyrexia, weakness, depression, conjunctivitis, vomition, convulsion, anaemia, haemorrhages, jaundice etc.

What are the samples to be collected from suspected individuals or animals?

Blood: During first phase of illness (upto 10 days), blood in anticoagulant preferably heparin, for culture isolation.

Urine, CSF, Milk: To be collected aseptically in sterile containers. Midstream urine in equal quantity of sterile phosphate buffer saline (PBS).

Post Mortem samples: A piece of kidney, liver and spleen in sterile PBS.

Samples are to be sent to the laboratory as soon as possible (immediately for DFM or culture) in duly sealed ice pack.

What are the commonly available techniques for diagnosis?

Dark field microscopy (DFM)

- Simple and rapid.
- Serum proteins and fibrin strands in blood may resemble leptospires and requires technical expertise to differentiate.

Microscopic agglutination test (MAT)

- Relatively serovar / serogroup specific and test of choice for sero-epidemiologic studies.
- Second serum sample is essential and false negativity may occur in the early course of the disease.

Isolation

- Confirmatory proof of infection.
- Slow growth rate may hinder quicker diagnosis.

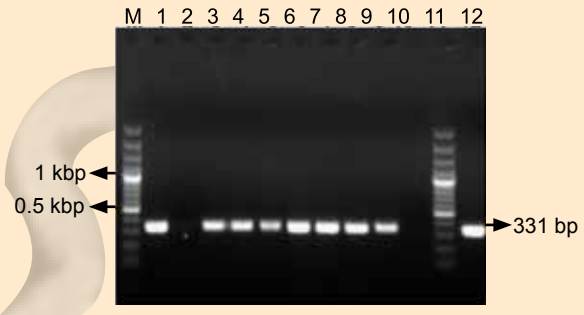
Aborted fetuses of Goats and Cattle from which pathogenic leptospirae have been isolated

Enzyme - linked immunosorbent assay (ELISA)

- Allows rapid processing of large number of samples.
- Comparatively less specific.

Polymerase Chain Reaction (PCR)

- Gives relatively quick results in the early stage of the infection.
- Expensive and sophisticated equipment is needed.



Leptospira genus-specific PCR

How leptospirosis can be treated?

Human: Severe cases of leptospirosis should be treated with high doses of intravenous penicillin. Jarisch-Herxheimer reactions may occur after penicillin treatment. Less severe cases can be treated with oral antibiotics such as amoxycillin, ampicillin, doxycycline or erythromycin. Third-generation cephalosporins, such as ceftriaxone and cefotaxime, and quinolone antibiotics also appear to be effective.

Animals: Tetracycline and oxytetracycline, erythromycin, enrofloxacin, tiamulin, and tylosin have been reported to be successful in acute cases. Oxytetracycline, amoxicillin, and enrofloxacin may be useful to treat chronic infections.

How leptospirosis can be prevented?

Effective prevention and control measures can be achieved through proper diagnostic and prophylactic aids to curtail further spread as in most of the zoonotic diseases.

Improved sanitary conditions including proper treatment and disposal of human waste, higher standards for public water supplies, improved personal hygiene procedures and sanitary food preparation are vital to strengthen the control measures.

We can minimize the risk to humans by avoiding contact of water with animal urine, control of rodents and ensuring the proper vaccination of pets.

Annual vaccinations, confinement rearing, and chemoprophylaxis are to be employed for animals. Selecting replacement stock from herds that are seronegative for leptospirosis, chemoprophylaxis and vaccination of replacement stock are important.

Leptospira Research laboratory-Highlights

The research activities in leptospirosis since inception of PD_ADMAS has led to

- Isolation of *Leptospira* spp. from diverse animal and human hosts and its maintenance in the repository
- Development of a simple *Leptospira* staining kit and transport medium
- Recording of the *Leptospira* abortions in bovines and other animal species
- Typing of leptospiral isolates to species level by molecular based approaches. Salient observations are as follows :
  - rpoB gene based phylogenetic analysis identified the prevalence of *Leptospira inadai* subspecies in animals and humans in India
  - Prevalence of *Leptospira* species namely *L. borgpetersenii* ; *L. interrogans* ; *L. krischneri* and *L. inadai* sub species was observed in India based on rpoB gene based phylogenetic analysis of 300 isolates of *leptospira*
  - In non-clinical cases, most of the *Leptospira* isolates were *L. inadai* subgroup or subspecies
  - In clinical and abortion cases of livestock, most common *Leptospira* isolates were *L. borgpetersenii* and *L. interrogans*
- Imparting training program or "hands-on" training to the research scholars, medical or research officers / personnel in the *leptospira* research area

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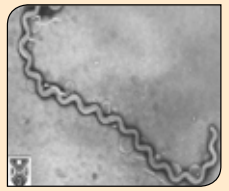

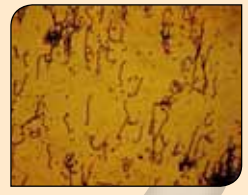

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