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Website:

Lecture title: **Leptospirosis**

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Summary:

Etiology *Leptospira interrogans* (many distinct serovars) and *L. borgpetersenii* (many distinct serovars) are found.

Leptospires, which are spirochetes pertaining to the family Leptospiraceae are the causative agents of leptospirosis.

They are motile, gram-negative, obligate aerobe microorganisms with an optimal growth temperature of 28°C to 30°C. The organism is characterized by its distinctive hooked ends.

- The genus *Leptospira* was initially divided into two species: *L. interrogans* sensu lato, which comprised the pathogenic strains, and *L. biflexa* sensu lato, comprising all saprophytic strains of the organism.
- Currently over 250 pathogenic serovars and 24 pathogenic serogroups are recognized.

EPIDEMIOLOGY

Animal Risk Factors

The epidemiology of leptospirosis is most easily understood by classifying the disease
into two broad categories: **host-adapted** and **non–host-adapted** leptospirosis. An animal infected with a host-adapted species of the organism, is a **"maintenance"** or **"reservoir"** host. Exposure of susceptible animals to non– host-adapted serovars results in **accidental** or **incidental disease**.

❖ A **maintenance host** is characterized by:

• A high susceptibility to infection
• Relatively low pathogenicity for its host
• A tendency to cause chronic rather than acute disease.
• Persistence of the strain in the kidney

❖ **Incidental host** is characterized by

• Relatively low susceptibility to infection but high pathogenicity for the host
• A tendency to cause acute, severe rather than chronic disease
• A short kidney phase

Pathogen Risk Factors

Leptospires are phagocytosed by macrophages and neutrophils in the presence of specific antibody and complement but are resistant to complement and killing in nonimmune hosts.

Virulent strains possess an antiphagocytic component.

The outer membrane of the organism contains a **lipopolysaccharide** (**LPS** or endotoxin).

Environmental risk factors:

Leptospira spp. Can survive for prolonged periods in a moist environment at warm temperatures (optimal around 28°C and neutral or mildly stagnant water) Stagnant waters have been incriminated as a possible source of infection in pastured animals in tropical regions.

Exposure of humans, pets, or livestock to rodents and rats that are adapted hosts for certain serovars (e.g., *Icterohaemorrhagiae* or *Grippotyphosa*) has been shown to be an important risk factor for infection in many species.

Certain management factors can pose risks of *Leptospira spp.* infection being introduced into dairy herds:

• Purchase of infected cattle
• Common grazing with infected cattle or sheep
• Purchase or loan of an infected bull
• Access of cattle to contaminated water supplies such as streams, rivers, flood, or drainage water

Occurrence and Prevalence of Infection

Leptospirosis is a disease affecting most animal species, including humans, and has a worldwide occurrence.

Leptospirosis has a higher prevalence in tropical and subtropical regions with seasonal occurrence. Peaks in disease incidence are observed during the warm months of the year in temperate climates and during the rainy season in the tropics.

Source of infection:

The source of infection is an infected animal that contaminates pasture, drinking water, and feed by infective urine, aborted fetuses, and uterine discharges. Also, carrier animals, wildlife, dogs and cats, and environmental sources such as water supplies.

Methods of Transmission

Entrance of the organism into the body occurs most probably through cutaneous or mucosal abrasions.

PATHOGENESIS

Leptospirosis can occur as an acute and severe disease caused by septicemia with evidence of endotoxemia such as hemorrhages, hepatitis, nephritis, meningitis. Also, as a subacute moderately severe disease with nephritis, hepatitis, agalactia, and meningitis; or as a chronic disease characterized by abortion, stillbirth, and infertility.
In the occult form, there is no clinical illness.

Acute Form

After penetration of the skin or mucosa, the organisms multiply in the liver and migrate to the peripheral blood for several days until the accompanying fever subsides.

- **Septicemia, Capillary Damage, Hemolysis, and Interstitial Nephritis**

During the early period of septicemia, sufficient hemolysin may be produced to cause
overt hemoglobinuria as a result of extensive intravascular hemolysis.

- **Abortion**

Following systemic invasion, abortion may occur because of fetal death, with or without placental degeneration. Abortion occurs most often in the second half of pregnancy.

- **Encephalitis**

Localization of leptospirae in nervous tissue is common in sheep and goats and may result in the appearance of signs of encephalitis.

Subacute and Occult Forms

It is the common form usually found in adult cattle and horses.

Periodic Ophthalmia (Recurrent Uveitis) in the Horse

It occurs due to immunological reaction of infected hosts to leptospiral proteins.

CLINICAL FINDINGS:

Acute Leptospirosis Associated with *Pomona:*

1. Infertility and milk drop syndrome occurs only in pregnant or lactating cows
2. Abortion, *L. interrogans* serovar *Pomona* is a major cause of abortions and stillbirths in the equine population.
3. Periodic Ophthalmia Recurrent uveitis in horses (periodic ophthalmia, moon blindness, or recurrent iridocyclitis) is a late complication of systemic leptospirosis in horses
4. The disease is rare in sheep and goats.

However, most affected animals are found dead, apparently from septicemia. Lambs, especially those in poor condition, are most susceptible.

5. In Acute, subacute, and chronic forms; there is fever, acute hemolytic anemia, changes in milk, stillbirths, abortion in all species, weak neonates, infertility, and milk drop syndrome

Necropsy Findings:

- Jaundice and yellow coloration of internal organs
- Abomasal ulcer
- Pulmonary edema and emphysema
- Small white area that appear on the renal cortex and kidney become enlarge, hemorrhagic and edema
- Serous hemorrhages, autolysis of aborted fetuses, and fetal hepatitis

Clinical Pathology:

- Culture or detection of leptospires or leptospiral DNA in blood or body fluids and detection and measurement of antibody in blood and body fluids such as urine, CSF, and cervicovaginal mucus.
- The microscopic agglutination ***test*** (MAT) is the most common serologic test for the diagnosis of leptospirosis
- Examination of urine using dark-field microscopy or fluorescent antibody test are useful tests.

Differential Diagnosis:

1- Diseases that cause hemoglobinuria, include: Babesiosis, Anaplasmosis, Postparturient hemoglobinuria, and bacillary hemoglobinuria, and Chronic copper poisoning.

2- Diseases that cause abortion, include: infectious bovine rhinotracheitis and protozoal abortion (*Sarcocystis sp.*, *Toxoplasma gondii*, and *Neospora caninum*). Less common causes are brucellosis, bovine viral diarrhea, mycotic placentitis, campylobacter, and possibly Mycoplasma.

Treatment:

- Antimicrobial Therapy

Leptospires are highly susceptible to ampicillin, amoxicillin, penicillin G, cefotaxime, erythromycin, and fluoroquinolone ciprofloxacin and have a good susceptibility to streptomycin, tylosin, and tetracyclines.

Control:

- Biosecurity and Biocontainment

The first step in control is to identify the source of the original source of infection
and to interrupt disease transmission

- Vaccination is one strategy that can diminish all of the disease risk factors.