Disease in focus: Leptospirosis

DISCONTOOLS Project Management Board meeting

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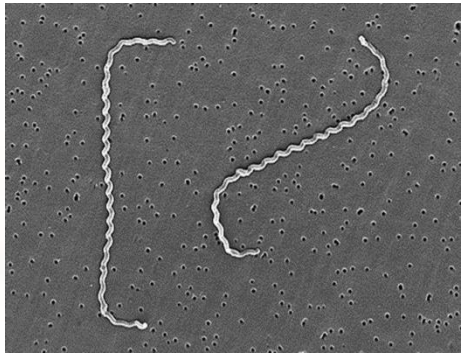
Leptospirosis



•Infectious disease (Weil 1886)

•Pathogenic bacteria: **leptospires**

•Zoonotic disease affecting humans, livestock, and companion animals around the world

•Leptospires can be directly or indirectly transmitted to incidental hosts

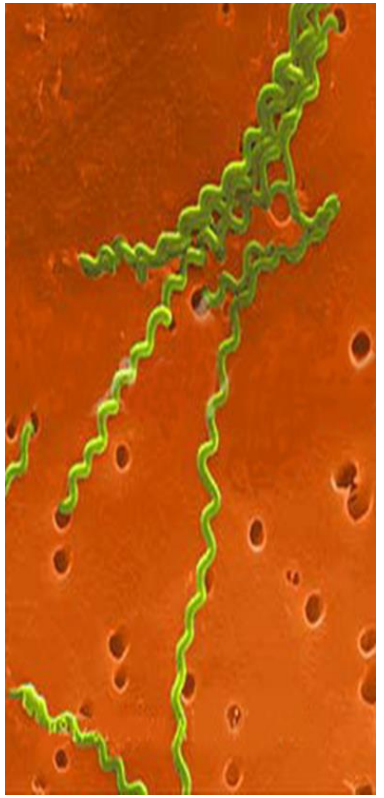
•In a maintenance host, leptospires can colonize the proximal tubules of the kidney where they chronically persist in reservoir hosts and be subsequently shed in the urine.


Leptospira are excreted via the urine


Leptospiren enter via damaged skin and mucosal membranes

Titel

Leptospira



- Bacteria: Spirochaetes, corkscrew shaped
- size 6-20 µm x 0,1 µm
- Aerobic, 28-30 °C, generation time 6-8 hours

- ~300 serovars in 26 serogroups

- Species, sensu lato: 2 species
  - *Leptospira interrogans* (pathogenic, >250 serovars)
  - *Leptospira biflexa* (sapropytic, >60 serovars)

- Species, sensu stricto: 64 species (pathogenic, 17 species)
  (intermediate, 21 species)
  (nonpathogenic, 26 species)

Leptospira serovars

Associated with natural host and geographical distribution:

• Icterohaemorrhagiae & Copenhageni	**rats**	→ Weil's syndroom
• Grippotyphosa	**mice, muskrats**	→ mud fever
• Hardjo	**cattle**	→ dairy fever
• Poi, Ballum	**mice**	
• Mozdok	**voles**	
• Canicola	**dogs**	
• Pomona	**pigs**	



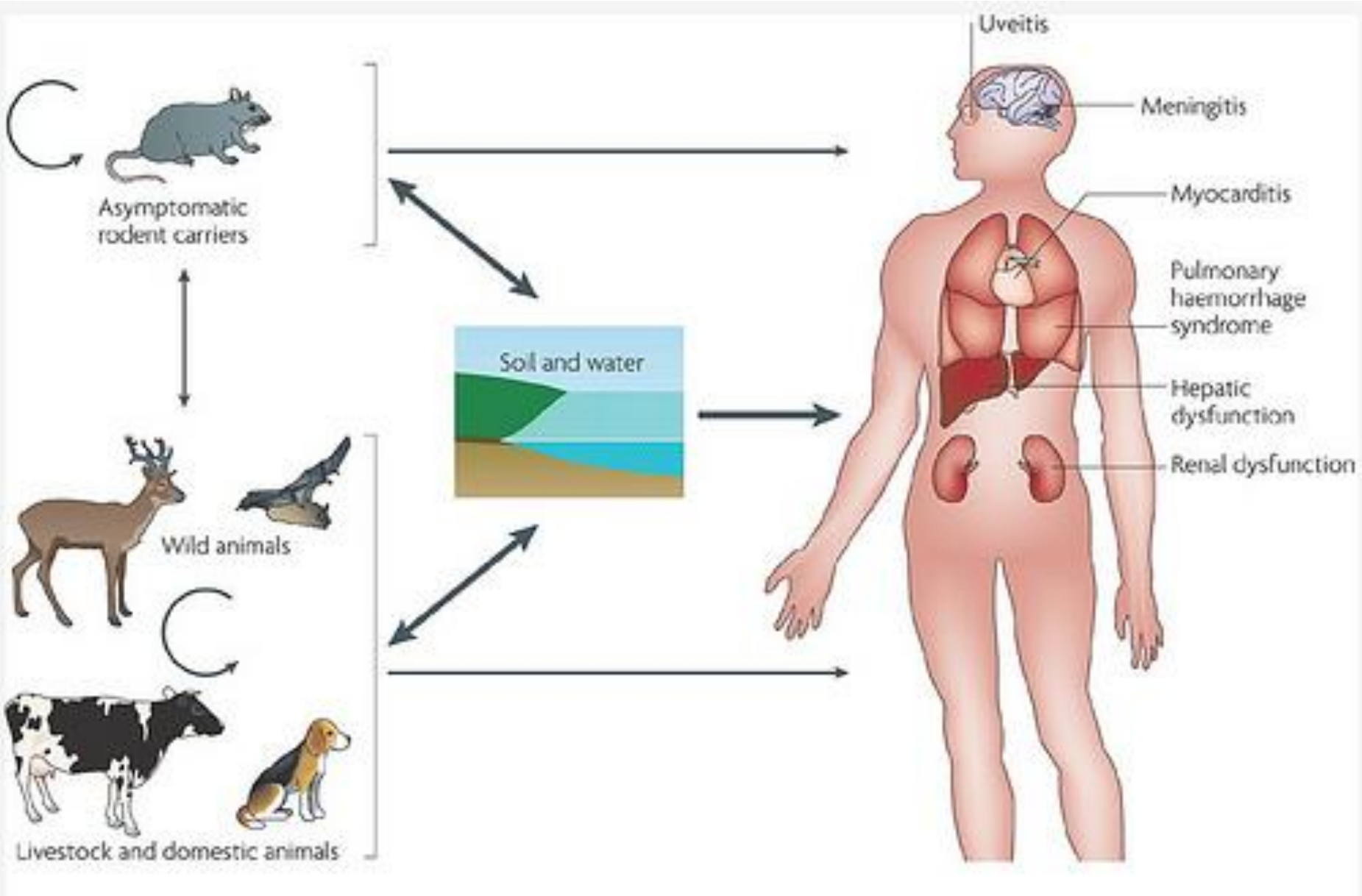

Survival in the environment

Pathogenic leptospires:

1. via urine into the environment

2. Can survive for months under favorable conditions:
   - Humid
   - Temperature 13 – 30 °C
   - pH neutral – slightly alkaline (pH 6.5 – 8.5)

3. Do not survive:
   - freezing
   - drying
   - UV (sun)
   - heat (>40 °C)
   - desinfectants



Adapted from: Ko AI, Goarant C, Picardeau M. Leptospira: the dawn of the molecular genetics era for an emerging zoonotic pathogen. Nat Rev Microbiol 2009; 7(10): 736-47

Human leptospirosis

- Acute undifferentiated fever with possible headache, muscle pain, chills, jaundice, renal failure

Animal leptospirosis

- Acute: agalactia, jaundice, haemoglobinuria, meningitis, acute renal failure, abortion
- Chronic: leptospires may persist in kidney or reproductive tracts

Laboratory diagnosis

- Detection of leptospiral antibodies (e.g ELISA, Microscopic Agglutination Test)
- Detecting leptospiral antigen (PCR)
- Culture

Treatment

Human

- broad range of antibiotics including the beta-lactam antibiotics, cephalosporins, aminoglycosides and macrolides
- (but not to: vancomycin, rifampicin, metronidazole and chloramphenicol)

Animal

- Tetracyclines, Penicillin/Ampicillin, dihydrostreptomycin, streptomycin, fluoroquinolones

Vaccins

- Whole cell cultures
- Serovar specific

DISCONTOOLS expert group for Leptospirosis

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Main findings

Diagnostics

- Lack of validated tests (rapid, low costs, geographical area, cut-off titres)
- Serovar specific ELISA needed for Pomona in cattle and Hardjo in sheep
- No tests to differentiate between vaccinated and infected animals
- Lack of internationally validated guidelines on diagnosis of *Leptospira* associated abortions in livestock

Vaccine

- No human vaccin which protects across continents
- In EU no vaccine for dogs against serovar Pomona
- Knowledge needed about circulating serovars
- Challenge to develop genetic tools for vector technology in order to develop vaccines which could induce a longer duration of immunity than 1 year

Main findings

Treatment

- Clear guidance needed on chemoprofylaxis for animals (consequences for milk or meat production)

Pathogen

- Mapping of maintenance host in different geographic areas for source of infection and control intervention
- Support isolation of local strains
- Survival factors in the environment: temperature, soil type, moisture, pH

Main findings

Carrier animal

Gap in knowledge on dynamics of leptospirosis in rodent carriers

- Interactions of rodents with other animal hosts in spreading serovars
- Correlation of rodent population dynamics (seasonality, breeding, migration) with leptospirosis incidence
- Other animals than rodents involved in disease transmission
- Effect of climate changes

Main findings

Surveillance

- Lack of international system to support reporting of leptospirosis outbreaks hinders disease surveillance in animals
- Human: mandatory notification only in some countries