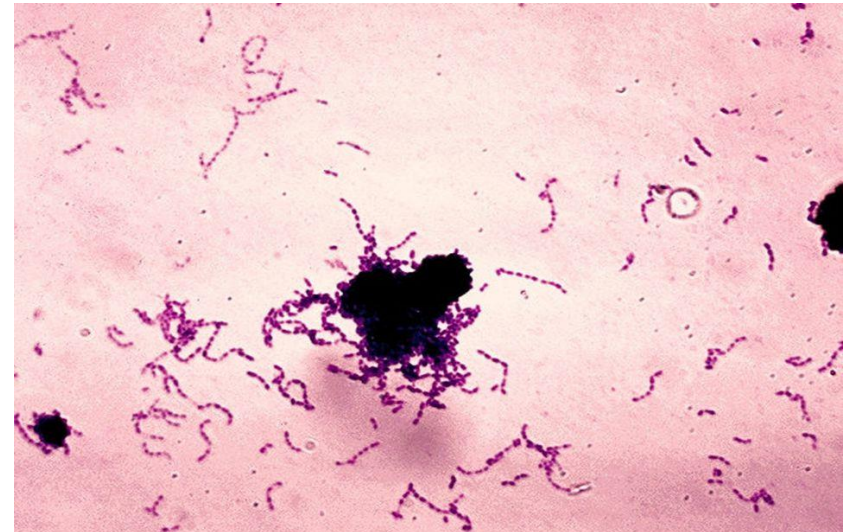
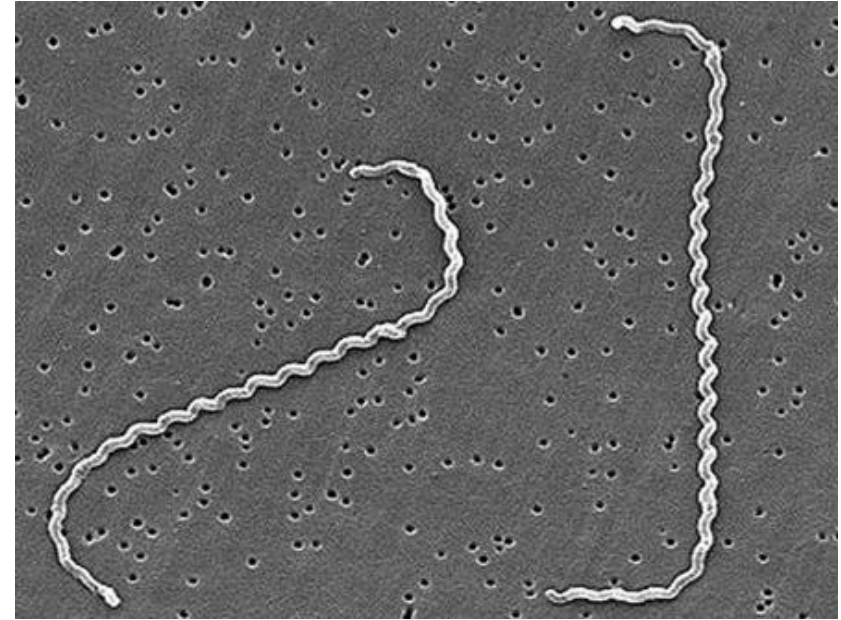


Spirochaetes

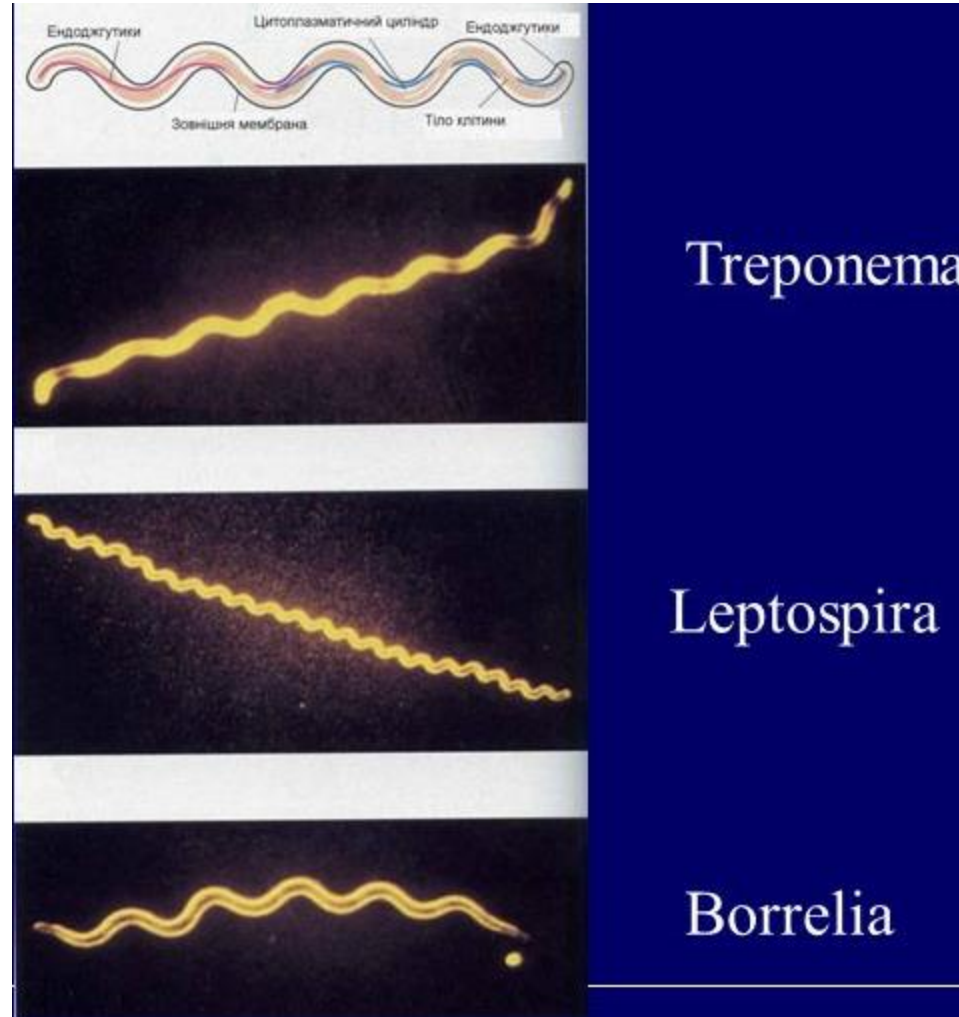
Spirochaetes

- Family of Spirochaetacea
- Long, motile and twisted spirally round a long axis
- Gram Negative
- Habitat: water, soil and decaying organic matter



Spirochaetes

Medically important Spirochaetes



Treponema

- Small, slender, flexible cork-screw shaped organisms
- Slow bending and rotating motility
- Not culturable



Classification of Human Treponema

■ Non-pathogenic

- T.denticola
- T.macrodenticum
- T. orale

■ Conditionally pathogenic

- T.vincentii

■ Pathogenic

- T.pallidum pallidum (syphilis)
- T.pallidum endemicum (bejel)
- T.pallidum pertenue (yaws)
- T.carateum (pinta)

Syphilis

Pathogenicity

- Organism is acquired sexually and congenitally
- Produce no important toxins or enzymes
- Multiplies at site of inoculation
- Spread widely via the blood stream
- Chronic and slowly progressive
- The normal untreated course of the disease occurs in several stages

Pathogenicity

Primary syphilis

- Following penetration of the skin or mucous membranes, a characteristic, painless local, non-tender ulcer (hard chancre) develops at the site of entry (genitalia) within 3 weeks.
- The chancre is highly contagious and filled with Treponemes
- Simultaneously the organism enters the lymphatics and becomes disseminated.
- The chancre heals without treatment in a few weeks due to local immunity, but by that time the organism has already disseminated.

Pathogenicity

Secondary syphilis

- 4-8 weeks after the primary stage
- Typically there are lesions (rich in spirochetes) throughout the body including the skin, mucous membranes, organs, and eyes.



Pathogenicity

Secondary syphilis

- Widespread multiplication and dissemination in blood
- Highly infectious
- Other symptoms : fever, malaise and general lymphadenopathy
- May last from 10 days to 1 year
- This also heals without treatment and the patient may either spontaneously get well or develop a latent infection

Pathogenicity

Latent infection

- Biological balance between the organism and the host
- No symptoms, but specific anti-treponemal antibodies are found
- Last 3-10 years
- 1/3 to 1/2 may eventually progress to the next stage

Pathogenicity

Tertiary syphilis (late phase)

- Caused by the body's **delayed hypersensitivity reaction** to remaining spirochetes
- Characterized by granulomatous lesions, called gummas, of the skin, internal organs, **CNS**, bones, eyes, and **cardiovascular system**



Pathogenicity

Tertiary syphilis (late phase)

- When lesions develop in the
CNS - called neurosyphilis
leads to paralysis
Eyes - blindness
Heart - aortic damage / aneurisms
- Treponemas are rarely seen, **noninfectious**

Congenital syphilis

- Infected mother transplacentally transmits the disease to the foetus during the fifth month
- Congenital syphilis may result in
 - Still birth (about 40% of cases)
 - Abortion
 - Child may be born with generalized syphilis
- Damage to mental development / other neurological symptoms of the child

Other treponemal infections

T. pallidum subsp. *pertenue*

- Causes yaws
- Endemic disease of tropical countries which is pathologically similar to syphilis but differs in its contagious and non-venereal nature
- It produces ulcerating papules on the skin

Other treponemal infections

T. carateum

- causes pinta
- a skin disease with hyperpigmentation in patches

Laboratory diagnosis

- Specimen: Serous fluid from lesion
- Blood (serum)

Laboratory diagnosis

- DG microscopy: Three consecutive specimens must be examined before reporting negative.
- Culture -This is not done
- Serology – mainstay in the diagnosis

Serology

Non-specific / Non-treponemal tests

Eg: Rapid plasma regain (RPR) test

Venereal diseases reference laboratory (VDRL) test

- Screening tests
- Detect reagin antibody / Wasserman antibodies (non specific antibody) using **cardiolipin antigens**
- Appears in a patient's serum in 10 -14 days after exposure

Laboratory diagnosis

Non-specific / Non-treponemal tests

- Very sensitive, but not specific
- Many diseases give positive results

Cross reaction with other treponemal species

Biological false positives (BFP)

certain infectious / non infectious conditions

malaria, mumps, hepatitis, rheumatoid arthritis

- Is inexpensive and easy to do

Laboratory diagnosis

Non-specific / Non-treponemal tests

- These tests are used to

Screen for active syphilis

As tests of cure

As an aid in diagnosing congenital syphilis

Laboratory diagnosis

Specific tests

Eg: fluorescent treponemal antibody absorption (FTA-ABS) test

T. pallidum haemagglutination (TPHA) tests

Treponema pallidum particle agglutination assay (TPPA test)

- Confirmatory
- Detect treponemal antibody using **treponemal antigens**

Laboratory diagnosis

Flourescent treponemal antibody-sorbent (FTA-ABS) test

The test uses antigen fixed on a slide

Diluted patient's serum is added on to the antigen

excess washed off and the smear treated with anti human
immunoglobulin conjugate

After incubating and washing, the slide is examined under the fluorescent
microscope

The test is most specific and sensitive though expensive.

It is **positive** for life

Laboratory diagnosis

Treponema pallidum haemagglutination (TPHA)

- similar to the FTA in sensitivity
- Antigen is coated with tanned turkey or chicken or sheep red blood cells
- In the presence of treponemal antibody, the treponemes adhere to the sensitized red cells and settle at the bottom of the micro titre plate well as orange to red layer.
- Easy to perform, fast and cheap
- It is positive for life

Laboratory diagnosis

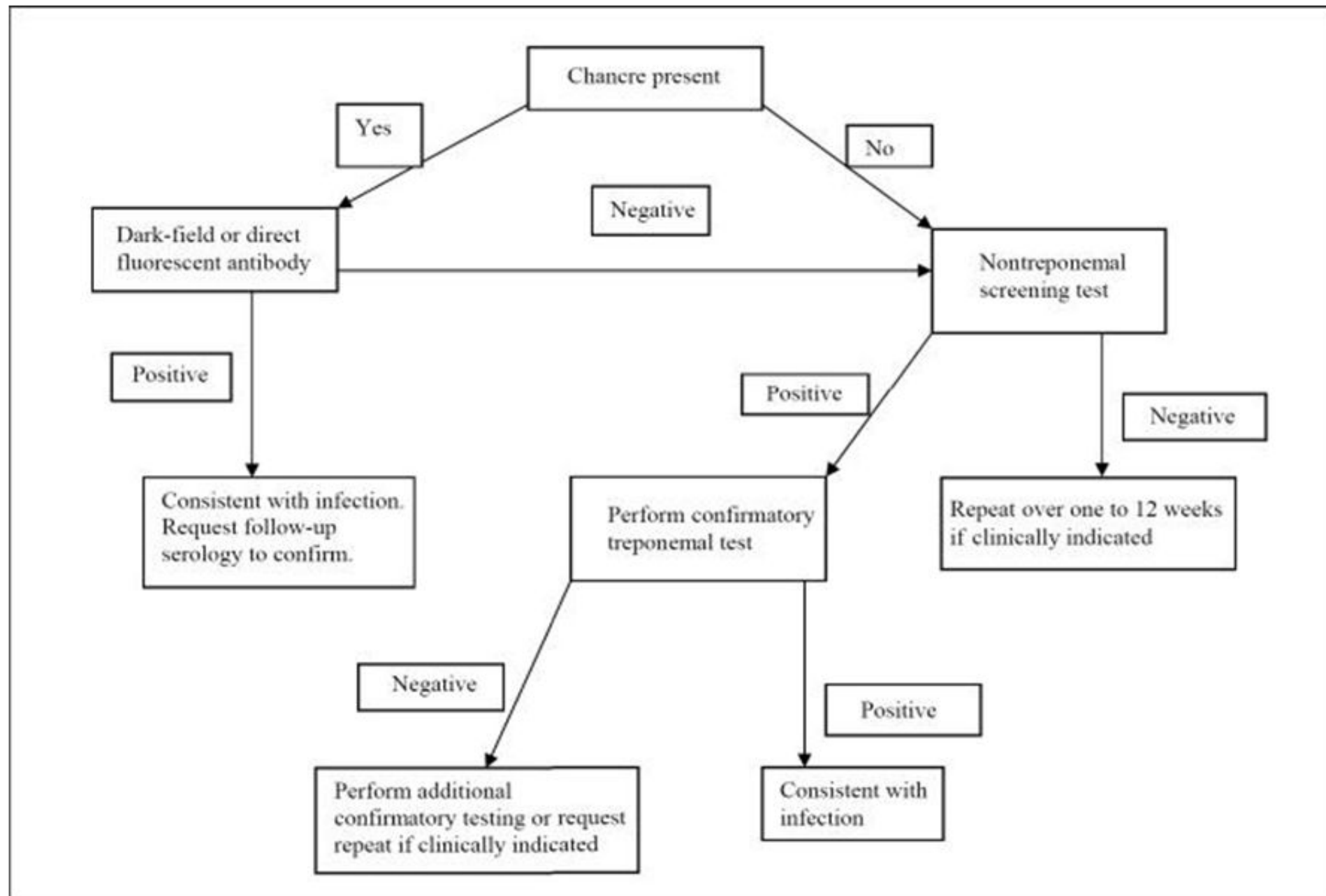
- **DNA probes e.g. (PCR)**

New diagnostic tools that are highly specific and sensitive

Very expensive

Not use routinely

Diagnostic Flow Chart



Prevention

- Source elimination

Treat the cases

- Prevent transmission
- Strengthening the susceptible host

No vaccine exists

Leptospira



Disease – **Leptospirosis**

- Leptospirosis is among the world's most common diseases transmitted to people from animals

Leptospira

Classification

- Non- pathogen – *L. biflexa* (found in water)
- Human pathogen – *L. interrogans*

Causes leptospirosis (Weil's disease)

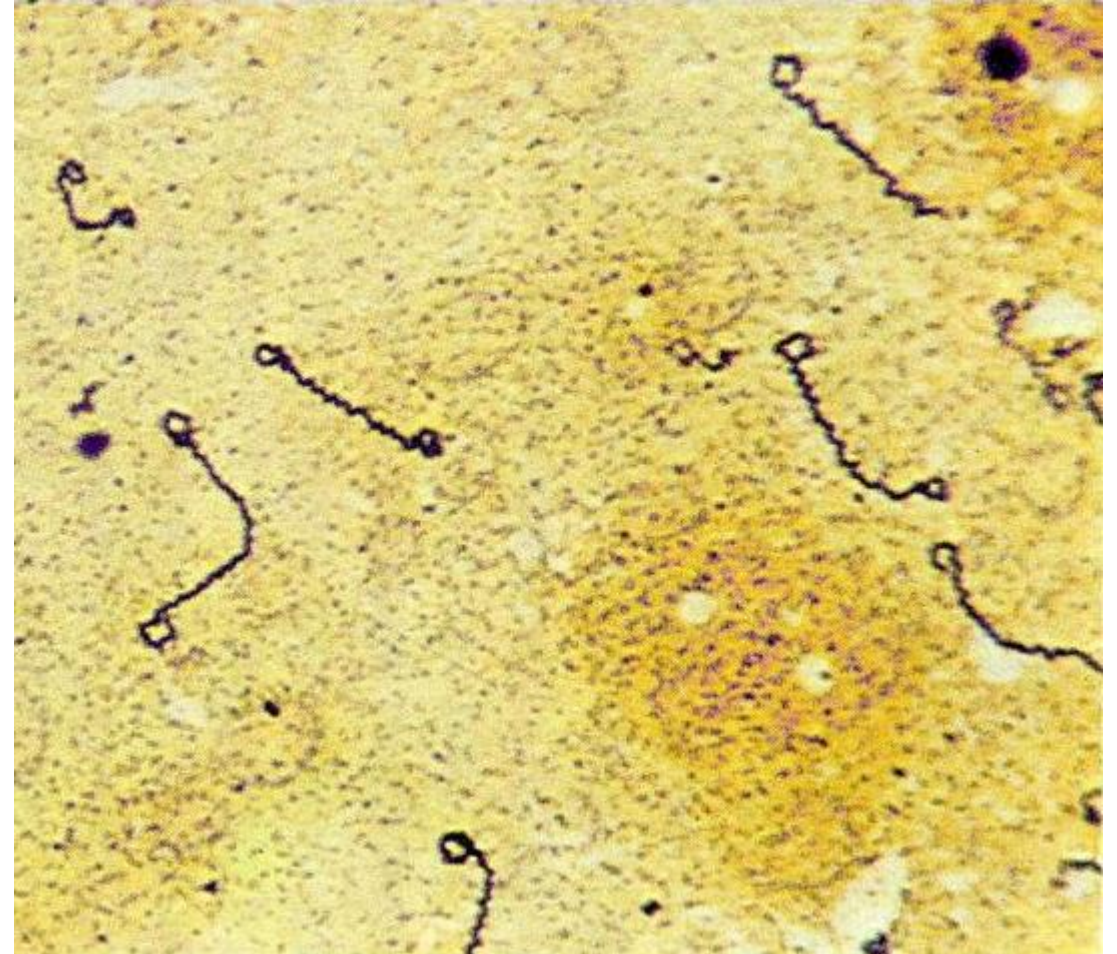
- *L. interrogans* serovar icterohaemorrhagiae causes

Icterohemorrhagic Leptospirosis



Leptospira

- **Tightly coiled**, fine spirochete
- Not stained properly
- Can be seen on **dark-field microscopy**
- **Grow** in bacteriologic media containing serum



Leptospira

- Habitat : rats, domestic livestock
- Transmission: via animal urine contaminated water and soil
- It infects humans as well as other animals
- human get the infection via contact of contaminated environment (water / soil) or ingestion of contaminated food or water.

Leptospirosis

Pathogenesis

- High risk population: Anybody who has risk of exposure to contaminated water (eg: farmers)
- Organism gain entry through breaches in skin, eyes or mucous membranes
- Circulate in the blood
- Multiply in various organs

Leptospirosis

- In most cases the incubation is 2-20 days followed by fever, chills, severe headache, myalgia, malaise, nausea and vomiting.
- Jaundice occurs in severe cases
- Death may occur due to renal failure

Leptospirosis

Clinical findings IBP - 2-20 days

Initial bacteremic phase

fever, chills, malaise, severe headache, myalgia, nausea, vomiting
conjunctival congestion

Immunopathologic phase

Meningitis (Stiff Neck)

Liver Damage (Jaundice)

Impaired kidney function (renal failure) - COD

Diagnosis

Specimen

Blood

Microorganism in blood - first 7 to 10 days

Urine

After 7 to 10 days the microorganism can be found in fresh urine

Diagnosis

Investigations

Culture

- Leptospira can be grown on semi-solid media
- Incubation – about 28 days
- Visualize using dark field microscopy

Diagnosis

Serology

- Detection of antibodies
- Two types of tests may be used
- Specific agglutination test
- Complement fixation test

look for 4-fold rise in titer in patient's antibodies against the organism

Rx

- Penicillin /
- Ceftriaxone
- Doxycycline
- Antibiotics (penicillin or erythromycin) are only effective if given during the **first 2-4 days** of illness
- Complicated or serious cases may need supportive care or treatment in a hospital intensive care unit (ICU)

Prevention

- Avoid areas of stagnant water, especially in tropical climates.
- If exposed to a high risk area, taking doxycycline or amoxicillin may decrease the risk of developing this disease.
- avoid contact with the contaminated environment
- vaccination of livestock and pets
- Rat control prevention

Other spirochetes

- Borrelia

B. recurrentis

Causes Relapsing fever

Transmitted by human **lice**

Relapses are because the organism has undergone antigenic variation

Other spirochetes

- *Borrelia burgdorferi* -

Causes Lyme disease

Transmitted by **ticks**

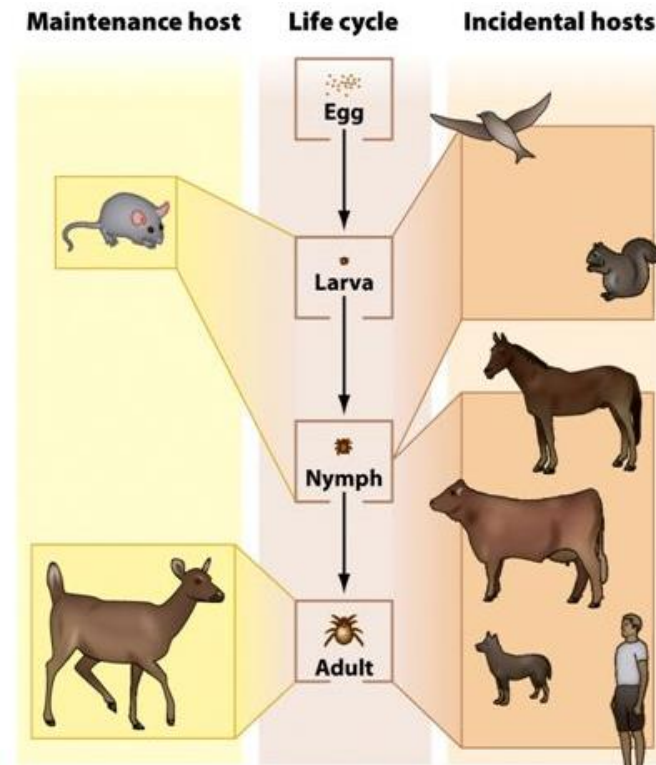


Figure 26.26c: Microbiology: An Evolving Science
David M. Phillips/Photo Researchers

Lyme disease

- Red skin lesion called erythema **chronicum migrans (ECM)** because the lesion expands in a circular manner



Other spirochetes - Antibiotic therapy /prevention

- Treponema – **penicillin**, tetracycline, or erythromycin
- Borrelia - for relapsing fever use tetracycline or erythromycin; for Lyme disease use amoxicillin or doxycycline
- Use protective clothing and repellents to prevent infection