Non-venereal diseases due to Treponema

- transmitted through person to person contact or via contaminated articles

1. bejel or non-venereal or endemic syphilis
   - caused by *T. pallidum* subspecies *endemicum*
   - usually begins in childhood as a small patch in the the mucous membranes
     - can involve the mouth
   - gradually develops into chronic inflammatory swellings on the limbs and trunk
     - including gummas which may develop on the skin bones and nasopharynx
   - encountered in tropical and subtropical areas of Africa and other continents

2. yaws

- causative agent is *T. palllidum pertenue*
  - infects through broken skin
- numerous manifestations which vary according to the stage of the illness include
  - painless papular nodules initially
  - later develops into destructive lesions involving
    a. skin may form ulcers
    b. lymph nodes
    c. bones and joints
    d. soft tissues
- encountered mostly in various areas of S. America Central Africa SE Asia

3. pinta

- causative agent is *Treponema carateum* or *T. pallidum carateum*
- primarily restricted to skin
- clinically characterized by
  - initial lesions as small pruritic papules
  - later lesions consist of enlarged plaques which persist for months to years
  - disseminated illness is characterized by recurrent hypopigmentation or depigmentation of skin lesions and extensive scar formation

Borrelia

- relatively broader than other spirochaetes
- some species are stainable although not readily and observable microscopically
  1. by modified Gram's stain as Gram negative cells
  2. on dried blood films by Giemsa or Wright's stain

Culture in the laboratory

- do not grow easily on cultures
- not requested for or performed routinely
- some species may grow in
  a. enriched media specially formulated to provide necessary nutritional requirements
  b. incubation under microaerophilic conditions

Species of Borrelia which infect humans

1. *Borrelia recurrentis*
   - causative agent of louse-borne relapsing fever or louse-borne borreliosis or epidemic relapsing fever
2. Borrelia transmitted by blood sucking ticks
   - several species include
     a. *Borrelia duttoni*
     b. Borrelia species with species name corresponding with that of the tick responsible for transmission
   - causative agents of tick-borne relapsing fever or tick-borne borreliosis or endemic relapsing fever

c. *Borrelia burgdorferi*

- isolated in some countries in the temperate regions
- transmitted by hard ticks from mammals including rodents
- causative agent of febrile illness with a wide spectrum of manifestations
  - illness referred to as Lyme disease

3. *Borrelia vincentii* normal flora in the mouth
   - significant as a causative agent of ulcerative lesions in the mouth in association with other abnormalities including a. trauma b. malnutrition
     c. other organisms in the mouth

Transmission of Borrelia species associated with relapsing fever

Borrelia recurrentis

- transmitted by lice from person to person
- infected humans with the organisms in the blood form the reservoir
  - lice acquire the organisms while feeding on infected human blood
- enters susceptible person through broken skin
- rubbing or crushing the infected lice releases fluid containing spirochaetes and facilitates entry
- over-crowding in places with scarce facilities for cleanliness favours transmission

Borrelia duttoni and related tick-borne species

- humans acquire the organisms through broken skin
  - from a tick bite or from crushed infected tick
- ticks
  - transmit the borreliae between animals and from animals to humans
  - infected animals involved in transmission include
    - a. rodents b. pigs c. armadillos d. porcupines
      - together with infected ticks constitute the reservoir
  - infection in ticks
    - a. persists throughout its life
    - [redacted] is passed on via the ova to next generations

Manifestations of relapsing fever

- louse-borne or tick-borne similar manifestations
  - characterized by febrile and afebrile periods
- febrile period
  - lasts approximately 3 to 5 days
  - spirochaetes are abundant in the blood
  - immune system responds by production of antibodies to specific antigenic components
  - together with other immune defense mechanisms antibodies recognize and act to eliminate the spirochaetes in the circulation at the time
  - overall effects
    - a. marked reduction of borreliae in the blood
    - b. fever to subsides

- fever recurs after 4 to10 days and spirochaetes reappear in the blood causing a relapse
- several recurrences or relapses occur
- during each febrile episode
  - few borreliae undergo mutation
    - acquire new antigenic determinants which differ structurally from the previous ones
  - phenomenon of antigenic variation
- organisms with new antigenic determinants
  - constitute a new strain which is not recognized by the circulating antibodies at the time and therefore are not eliminated
  - multiply and cause the subsequent relapse

Laboratory investigation of relapsing fever

1. detection of Borrelia species in peripheral blood
   - chances of detection are high during the febrile periods by
   a. direct microscopic examination for motile spiral organisms
   b. examination of dry smears stained by Giemsa or Wright's stain
   c. dark field or phase contrast microscopic examination for motile spiral organisms
      - more reliable procedure
2. other methods of investigation

Antibiotic susceptibility of Borrelia

- sensitive to several agents including penicillin

Leptospira

- narrower than other spirochaetes
  - possesses numerous closely set coils
- recognized by its characteristic vigorous motility
- visualized by dark field or phase contrast or electron microscopes
- stainable by special methods including fluorescent staining methods
- culturable in specifically formulated enriched media
  - liquid or semi-solid preparations as obligate aerobes
  - slow growth especially in primary isolation
    - may take 6 to 14 days or longer
- also capable of growing on embryonated eggs

Species of Leptospira

- composed of saprophytic organisms and potential pathogens
- two species morphologically indistinguishable
    - each species is composed of numerous serotypes

1. *L. interrogans*
    - one of the serotypes is a parasite of rodents and a potential human pathogen serotype *icterohaemorrhagiae*
2. *L. biflexa*
    - saprophytes in the environment

Leptospira interrogans serotype associated with human disease

- parasitic to small animals including rodents
  - found in their kidneys
- no disease manifestations in the animals
  - can also infect other animals including domestic animals
  - the infected small animals provide the reservoir
- passed out in the urine and contaminates the environment
  - saprophytes in water or damp soil
- transmission to humans is by accidental exposure through contact with infected urine of the animal

- directly or through contaminated soil or water

Clinical implication

- causative agent of human leptospirosis
  - entry is through broken skin or mucous membranes
  - infection is associated with invasion into the blood circulation and septicaemia
  - associated with haematogenous spread to various internal organs including the kidneys
    - may be excreted in urine
  - increased risk of exposure for people who work in damp places populated by rodents

Manifestations of human leptospirosis

- vary from asymptomatic to severe illness
- symptomatic leptospirosis
  - initially characterized by septicaemia constituting the septicaemic phase
    - manifestations include mild non-specific signs and symptoms including fever
  - may develop into a severe illness involving an internal organ
    - resulting in manifestations due to abnormal functions of the organ

Laboratory investigation of leptospirosis

- involves 1. detection of spirochaetes in specimens
  2. serological tests
- specimens include 1. blood 2. urine 3. tissue

procedures

1. culture
2. dark field microscopy
   - chances for positive results on blood are higher during the septicaemic phase
3. serology
   - detection and demonstration of rising antibody titre in serum
4. DNA detection and amplification in specimen

Antimicrobial susceptibility of *L. interrogans*

- effective antimicrobial agents include penicillin and tetracycline

Prevention and control of *L. interrogans* infection may involve

- reduction of infection in wild and domestic animals
- vaccination of domestic animals in areas where *L. interrogans* is detected
- protective clothing for those at higher risk of exposure