Spirochetes

Spirochetes are-

Thin ,elongated,spirally coiled helical bacilli

Most of them are saprophytes

Three of them are major human pathogens

A)Treponema

B)Borellia

C)Leptospira

Structure-

Cell wall of spirochetes is similar to GNB but differs by bearing endoflagella.

:outer membrane

:Periplasmic space containing flagella

:Peptidoglycan layer

:Cytoplasmic membrane

Flagella are internal present in periplasmic space between outer membrane and peptidoglycan layer

Flagella attaches to membrane at only one pole

Flagella numbers varies from species to species

Responsible for motility

Motility can be corkscrew ,flexion extension or

Translatory type

Pathogenic –

Leptospira

Treponema

Borellia

They vary in size,spirals,number of endoflagella,

Disease potential,mode of transmission

Staining-Borrelia gram negative but others stained by silver impregnation method,dark ground microscopy and IF

Treponema-

Slender with fine spirals with pointed ends

Most commensals in mouth and genitalia few pathogenic in men are

T.Pallidum sub sp pallidum

T.Pallidum sub sp pertenue

T.Pallidum sub sp endemicum

T.carateum

Treponema pallidum(cause syphilis)

Agent of STD syphilis

Pallidum pale staining

Extremely thin

Flexible spirally coiled 6-14 spirals

All types of motility with bending at right angle

3-4 endoflagella also antigenic

Only under dark ground or phase contrast microscopy

Staining

Cultivation-rabbit testis(nichols strain)

Non pathogenic can be grown in smith noguchi medium

Atigens-

Group specific ag-all trponemes,ab against it detected

Species specific ag-Polysaccharide

Non specific ag-heterophile ag,ab detected by non treponemal tests

Pathogenesis-

Mode of transmission

Spread

Incubation period-9 to 90 days and inversely proportional to organisms number

Clinical manifestations-

30% of patients with sexual exposure develop syphilis

4 stages

a)Primary-Chancre,inguinal lyphadenopathy,

b)Secondary-4 to 8 wks of healing of primary lesion,skin rashes,condylomata lata,mucosal erosions,generalized lyphadenopathy

c)Latent-absence of clinical manifestations with positive serology and normal csf picture

d)Tertiary or late-sevsral decades after untraeated patients develops tertiary with gumma,neurosyphilis,cardiovascular(aortic aneurysm)

Congenital syphilis-Transmission occurs at any stage but fetal damage occurs after 4 mths

Antenatal screening very important

Early manifestations – rhinitis,hepatosplenomegaly ,lymphadenopathy

Late congenital syphilis-non infectious,deafness,

Keratitis etc

Lab diagnosis-

Microscopy

Dark ground microscopy-sensitivity approaches

80% with detection limit of 10000bacilli/ml

3 consecutive days before giving negative

Direct flourscent ab staining for TP-bacteria appears as apple green flourscent colour bacilli,100%sensitive

Silver impregnation staining

Levaditi stain (tissue section)

Fontana stain (smear)

Serology-

Non treponemal tests-detects non specific reagin antibody by using cardiolipin ag derived from bovine heart

Treonemal tests-detects species specific ab by using T.pallidum ag

NT or NST or STS for syphilis-

Detects ab in sera by using cardiolipin derived from beef heart

Reagin ab IgG rarely IgM

Examples-wassermann and Kahn test not done now

VDRL,RPR,USR(unheated serumreagin),TRUST

(toluidine red unheated serum test)

VDRL

RPR-similar to VDRL with few differences

USR-similar to VDRL except EDTA is used as ag stabilizer hence daily preperation of ag not required

TRUST-Modified RPR toluidine red pigment used instead of carbon particles

Advantages of NTT-

Monitor response to treatment

VDRL for CSF ab

Senstivity 75% primary stage,100% secondary stage,95% latent stage

Reagin ab appears after 7-10 days in primary chancre

Disadvantages-

Biological false positive reactions seen as positive test in NTS and negative in TS

Due to unrelated disease

BFP ab is IgM

Senstivity low in late stages

Screening tests as confirmed by treponemal tests

- Treponemal or specific tests-

Treponemal immobilization test(TPI) uses live T.Pallidum,used in past but not now

Flourescent Treponemal antibody absorption test(FTA-ABS) using killed treponema.pallidum

IgM FTA-ABS congenital syphilis

Highly sensitive and specific,first serological test to be positive after infection and can be used for CSF

Tests using extract of T.pallidum

T.Pallidum haemagglutination assay(TPHA)

Easy to perform,can be done on CSF and standard confirmatory world wide

TPPA(Gelatin particles instead of tanned RBCs)

Elisa(IgM elisa better than IgG FTA-ABS for congenital syphilis

Western blotting

Molecular methods-congenital and neurosyphilis

Congenital syphilis

- Treatment-Pencillin and tetracycline for allergy to pencillin
- VDRL and RPR for monitoring response after treatment 3mths interval for year
- Prevention –
- Treatment of cases and contacts
- Contraceptives barrier and safe sex practices

Borellia-

Ultrastructure similar to treponema except larger size with lesser spirals but wide more endoflagella but attached subterminally to pole

Poorly gram stained

Most commensal in buccal and genital mucosa few pathogenic such as-

B.recurrentis-epidemic relapsing fever

B.burgdorferi-lyme disease

B.vincentii-vincent angina

Relapsing fever-

Fever and nonspecific symptoms following exposure to insect vector

It is of 2 types-

Epidemic RF-b.recurrentis and transmitted by louse

Endemic RF-Tick borne

Pathogenesis-

Epidemic RF by body louse (pediculus humanus)

Crushing of louse –deposition of hemolymph-

Traansmission through abraded skin and mucous membrane

Endemic RF by tick

Antigenic variation leading to recurrent febrile episodes

Lab diagnosis-
Microscopy-PBF by wright or giemsa
DFA
DGM
QBC
Poorly gram stained
Culture
Animal pathogenicity
Serology-Elisa and IFA
Glpq immunoblot assay most reliable
PCR
doxycycline

Lyme disease-

Caused by 3 genomospecies of Borrelia

B.Burgdorferi sensu stricto

B.Garinii

B.Afzelli

Rodents and deers reservoirs

Seen in USA but also from other parts of world

Transmission-

spirochete express OspA in tick gut required for

survival-in salivary gland of tick it expresses OspC bind to salivary gland protien –crucial for transmission

Tick attachment required for 24 hrs

Clinical manifestations-erythema migrans,neurological complications ,lymes arthritis

Lab diagnosis-

Isolation by culturing skin lesions,blood or csf on barbour stoenner kelly medium(BSK)

After incubation observed under dark firld microscopy for weekly for 2 mths

PCR,PCR-RFLP

Serology with clinical picture commonest method.,western blot.

Elisa if positive confirmed by western blot recommended

Treatment-dooxycycline except cns and cvs for which is ceftriaxone