Brucella

Brucella obligate aerobic,fastidious,nonsporing,

Non motile,non capsulated small gncb

Highly contagious febrile illness brucellosis

Brucellosis or undulant fever zoonotic disease

Of domestic animals sheep,goat or cattle

Human gets infection due to occupational or domestic exposure to infected animals or their products

Named after British army physician David bruce

Isolated from Malta island italy hence Malta fever

Nomen system of classification-

DNA hybridization studies reveal closely related and represents variants of single species

However for convenience classified into Nomen species on various properties such as-

-Preference of animal host

-CO_2 requirement

-H_2S production

-Genetic composition

-Bacteriophage susceptibility

-Agglutination

Nomen species-

a)B.melitensis

b)B.abortus

c)B.suis

d)B.canis

e)B.ovis

f)B.neotomae

Anitgenic structure-

2 major LPS M and A

They are present in varying proportion in three major species of Brucella one of them is present in each species

B.Melitensis M ag predominant

B.Abortus A ag predominant

B.Suis M or A ag

Virulent colonies smooth due to LPS but rough on repeated subculture

Pathogenesis-

B.Melitensis most pathogenic followed by B.abortus and B.suis

Transmission-

Direct contact

Food borne

Air borne

Spread-Initial site-lymphatic vessels-lymph glands-bloodstream-organs

Organs involved-

As intracellular reticuloendothelial system involved rich in macrophages and monocytes

Special prediliction for placenta due to erythritol

Musculoskeletal and genitourinary systems involved

Intracellular survival and virulence-

Cell wall LPS provide resistance to phagocytosis and complement

Suppressing phagosome lysosome fusion

Pyrogenic

Type IV secretion system regulates intracellular survival in phagosomes and trafficking

Cu-Zn superoxide dismutase

Host immune response-

Activation of T helper 1 cells leading to macrophage activation and killing of bacteria

Activation of T helper 2 cells stimulating humoral immunity

Ab play minor role

Clinical manifestations-

Incubation period 1 week

Classic triad fever with night sweats,arthritis and hepatosplenomegaly

Typhoid like illness but less acute,undulating pattern of fever and more musculoskeletal symptoms

Undulating fever,vertebral osteomyelitis,septic arthritis,depression ,meningitis,endocarditis,salpingitis,prostatitis,pyelonephritis

Epidemiology-

Endemic area

Prevalance

Sources of infection-Animals
urine,milk,placenta,vaginal discharge,dairy products

People at risk

Lab diagnosis-

Specimens-blood,bone marrow,csf,joint fluid ,tissues

Blood during febrile period

2-3 times a day over 3 cosecutive days

Bone marrow better than blood

Culture conditions-obligate aerobe but growth promoted by 5-10%CO_2 with several weeks incubation

Culture media-

Biphasic media(castaneda)

Brain heart infusion agar/broth

Biphasic media less contamination rate

Automated systems Bactec and BacT/alert result within 7 days

On blood agar and chocolate agar repeated subcultures made

Culture smear and motility testing-

Coonies nonhemolytic and smooth ,non motile

Non sporing ,non capsulated

Biochemical tests-

Oxidase positive

Non fermenter

Catalse positive

Nitrate reduced to nitrite and urease variable

Serological tests(antibody detection)-

SAT(standard agglutination test)

ELISA

Complement fixation test

SAT-Gold standard test

Tube agglutination test

Titer of more than 1:160 in non endemic area significant

In endemic area rising titer after 2-4 weeks reliable

SAT detects ab against smooth LPS of B.abortus,melitensis,suis but not canis

Acute igM appear early followed by IgG and IgA

SAT doesnot differentiate between different antibodies

IgG avidity testing done

False negative SAT-Prozone phenomenon,blocking antibodies

False positive SAT-cross reaction with other bacterias

Serology for IgG ab-

2 mercaptoethanol agglutination test(2ME)

CFT detects both IgG and IgM

ELISA both IgG and IgM

If Elisa is positive to be confirmed by agglutination test

Molecular methods-rrs-rrl gene,omp2 ,IS711

Brucella skin test

Guinea pig inoculation

Brucella from animals-

Culture of cows milk

Milk ring test

Rose bengal test

Whe agglutination test

Treatment-

Gold standard-streptomycin and doxycycline

Ceftriaxone for CNS involvement added to other regimens

Prevention-(animals)

Test and slaughter

Vaccine-Live attenuated vaccine using B.abortus 19 strain for cattle available

Prevention humans-

Properly cooked food,pasteurized milk

Vaccine-Live attenuated vaccine B.abortus 19 Ba available but provide short term protection