

Bordetella

Bordetella gram negative coccobacillus

Highly fastidious

Non fermenter

Bordet and Gengou 1906

Comprises several species

A) *Bordetella pertussis*-causes whooping cough in children ,highly contagious vaccine preventable bacterial disease cough ending in inspiratory sound as whoop

B) *B. parapertussis*-Milder form of whooping cough

Bordetella pertussis

Causes whooping cough or 100 days fever

Toxins-

a) Pertussis toxin (PT)-

Most important virulence factor only in
B. pertussis

Mechanism – PT similar to cholera toxin in
structure and composed of A and B subunits

B subunit-Responsible for binding to target cells and inserting A subunit into cytoplasm

A subunit-Active subunit causes ADP ribosylation of G protein activates adenyl cyclase increasing cAMP producing variety of biological effects such as-

T cell mitogenicity

Hemagglutination

Adhesion to respiratory ciliated cells

Leukocytosis

Inhibition of neutrophil oxidative burst

Tracheal cytotoxin-Damage to cilia of respiratory epithelial cells ,part of cell wall peptidoglycan

Adenylate cyclase toxin-Activates cyclic AMP which impairs host immune function

Dermonecrotic toxin-Respiratory mucosal damage

Endotoxin

Adhesins-Filamentous hemagglutinin,pertactin,

BrkA(Bordetella resistance to killing protein mediates serum resistance and adhesion)

Clinical manifestations

3 stages

a) Catarrhal phase-highly infectious, culture positive

b) Paroxysmal phase-less infectious, culture may become negative

c) Convalescent stage-Ab appear in serum

Differential diagnosis-

Mycoplasma pneumoniae

Adenovirus

Influenza virus

Chlamydia pneumoniae

GERD

Epidemiology

Human disease ,no animal reservoir

Source-Early cases,no carrier state

Age-Preschool children below 5 yrs,maternal ab not protective infants most vulnerable

Shift-Shifted from infants to older children in countries of high vaccination,indicates immunizations not provide life long immunity

Spread by droplet infection

India marked decline after UIP

Lab diagnosis-

Specimen collection-

Nasopharyngeal swab(best) and perinasal swab

Type of swabs-For culture alginate or dacron

For PCR dacron or rayon

Cotton swabs not satisfactory

Charcoal impregnated cotton swabs may be used

Collect atleast 6 swabs at 1-2 days interval

Transport-Immediately ,if delay charcoal based medium to be used(Amies)

Direct detection-DIFT but low sensitivity and specificity

Culture-

Nasopharyngeal gold standard

Fastidious organism requires complex media such as-Regan Lowe medium (of choice) and Bordet gengou glycerine potato blood agar used in past

Colonies appear as greyish white convex 3-5 days as mercury drops or bisected pearls appearance

Culture positive in first 3 weeks of infection

Culture negative after 5 days of start of antibiotics

Culture smear-gram negative coccobacilli as thumb print appearance

Metachromatic granules on staining with toluidine blue

Detection of serum antibodies-

EIA using purified ag such as PT,FHA,pertactin

Rise of IgG in paired sera

Detection of IgA and IgM

Molecular methods-PCR.targeted genes includes

Is481 and PT promoter region genes

MALDI-TOF- MS

NGS

Typing of B.pertussis

For outbreak investigation to find
epidemiological link between isolates

Serotyping-based on 2 fimbrial ag (2,3) and one
lipooligosachharide ag(1) of B.pertussis.

Eg 123,12,13,1. Only 123 serotype infects
humans

Genotyping-Gene sequencing and PFGE

Treatment-

Antibiotics less effective as pertussis due to toxin

Cough suppressants less effective

Macrolides drug of choice

Prevention

Chemoprophylaxis-erythromycin for household contacts

Vaccine

Whole cell pertussis vaccine-Efficacy 85%

Given as DPT

Pertussis component acts as adjuvant and increases immunogenicity

Adverse effects-

Fever,pain,irritability,swelling

Encephalitis

Contraindications-

Children above 5-6 yrs of age

Hypersensitvity previously

Neurological conditons

Acellular pertussis vaccine-Composed of pertussi toxoid and
FHA,Pertactin or fimbriae

Less side effects than whole cell and can be given above 5-6
yrs of age,and has same efficiacy as whole cell vaccine.