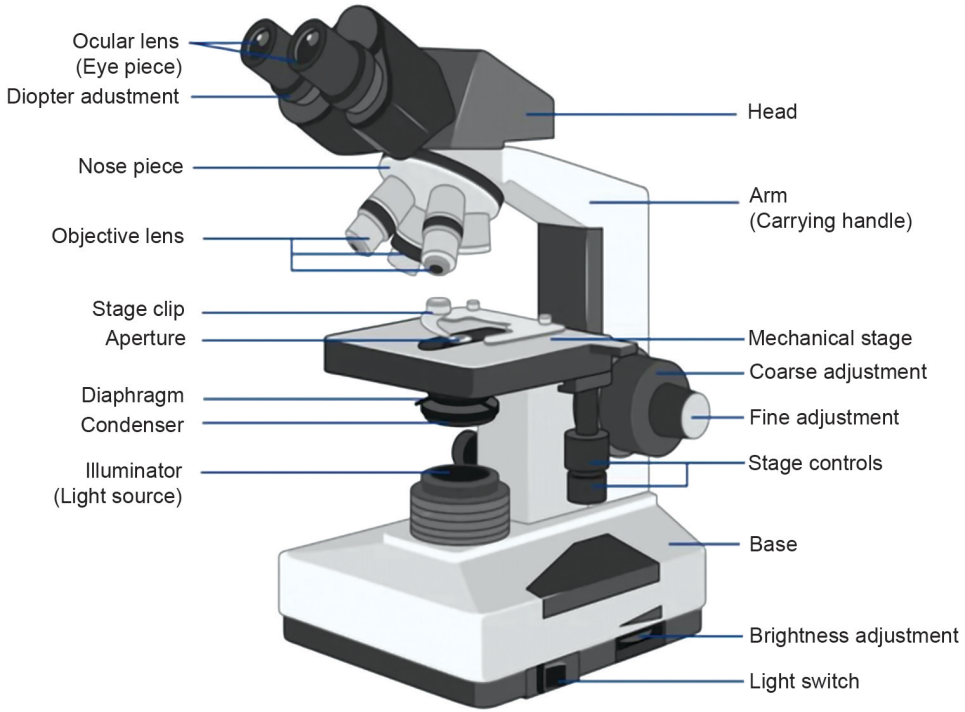
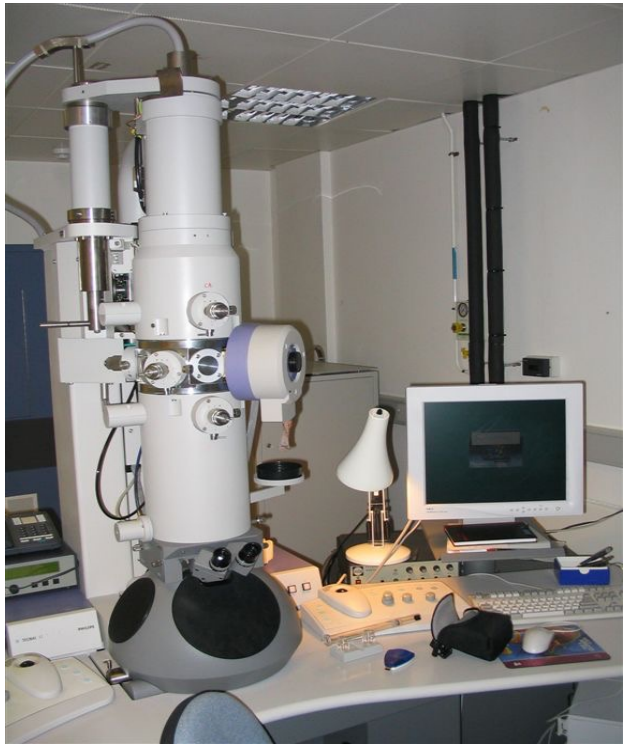
MICROBIOLOGY AND INTEGRATED INFECTIONS

MICROSCOPES



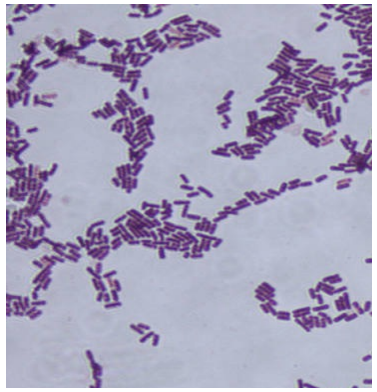


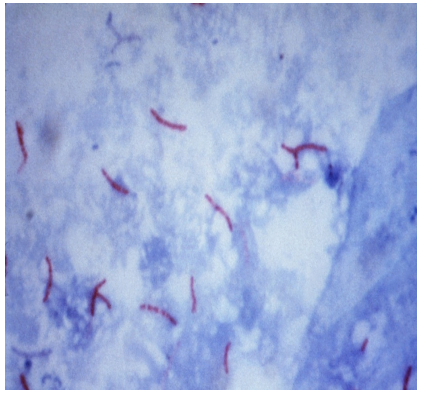
Fixative:
Slide:
Resolution:
Magnification: Eye piece:
Objective lens:

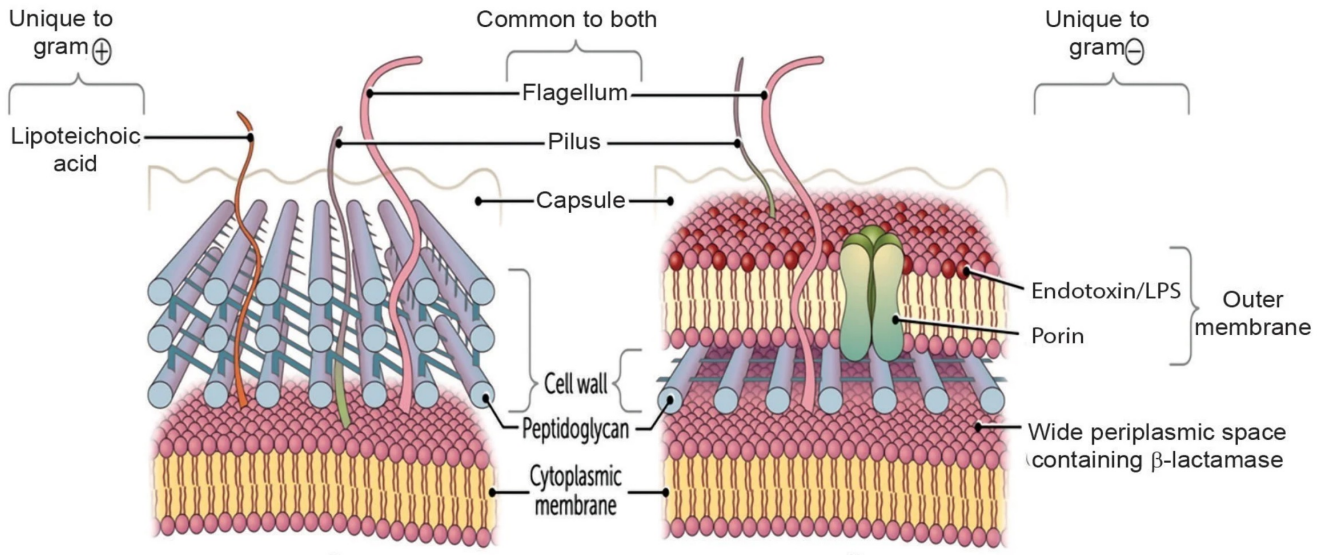
Max magnification:

Fixative:
Slide:
Resolution:
Internal structures:
3D image:

GENERAL BACTERIOLOGY







Primary:

Mordant:

Decoloriser:

Counterstain:

Diaminopimetic acid

Periplasm:

ACID FAST-
TB:
Leprosy:
Nocardia, Legionella:
Cryptosporidium/ Isospora/ Bacterial spores/ Head of sperm:
COLD:

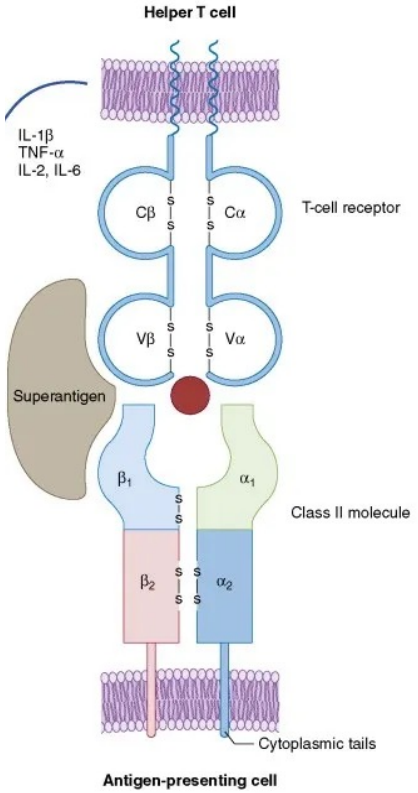
Endotoxin: Low antigenicity
CD14/TLR4
O
C
A
LOS:

Linulus amebocyte assay (LAL):

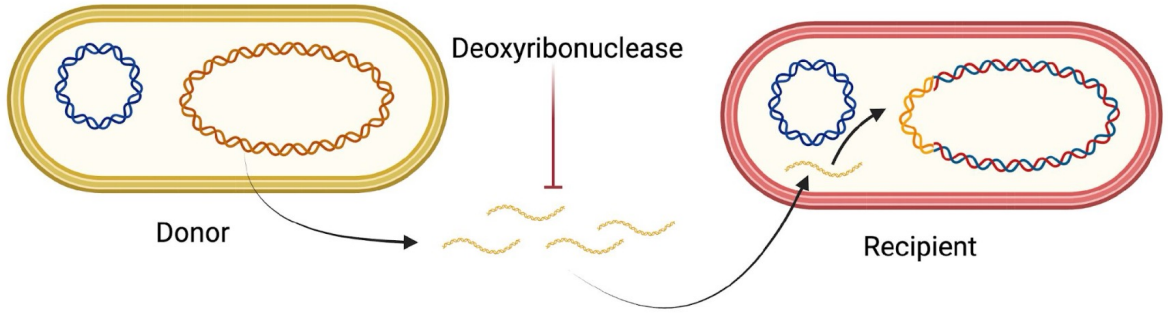
Toxins – A B

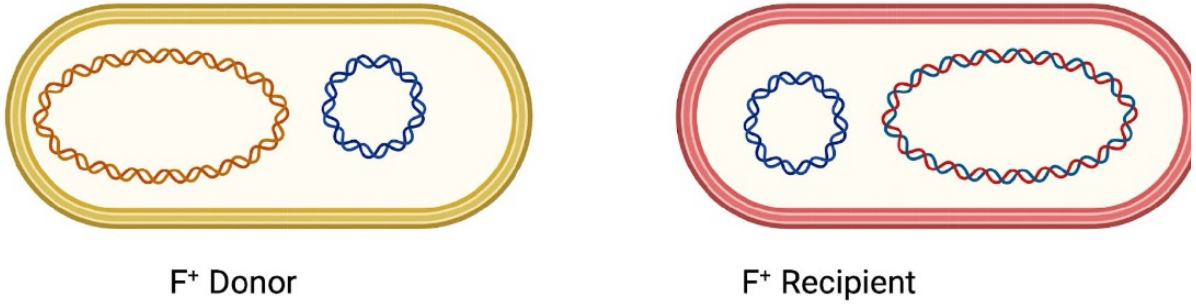
Inhibit Protein Synthesis	cAMP	cGMP	NT release	Superantigen
EF-2-				
60S -				

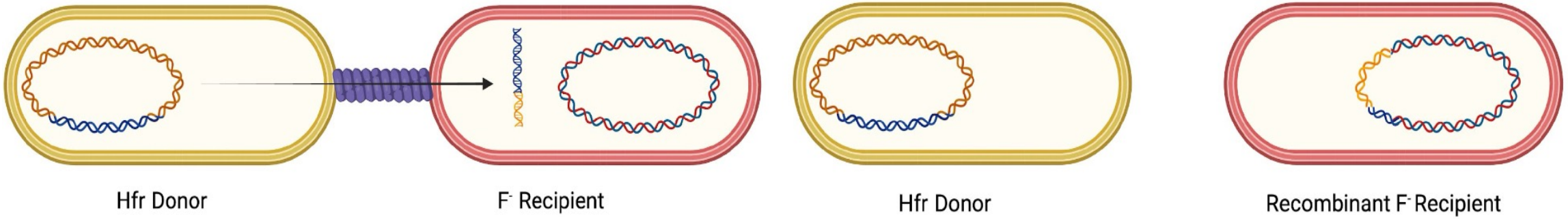
Canned Food:
Infant / wound:



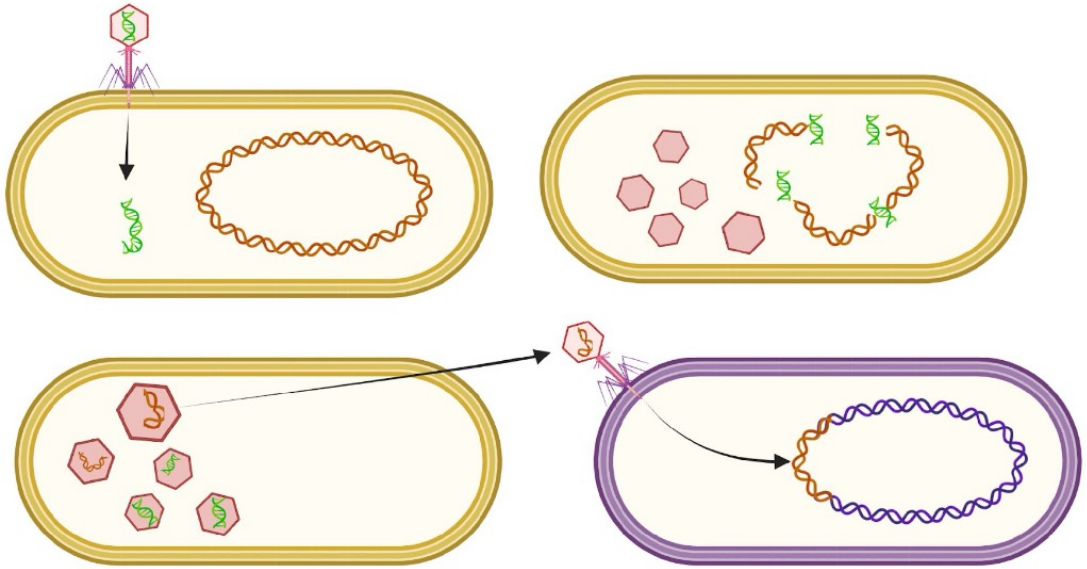
HORIZONTAL TRANSFER OF GENES

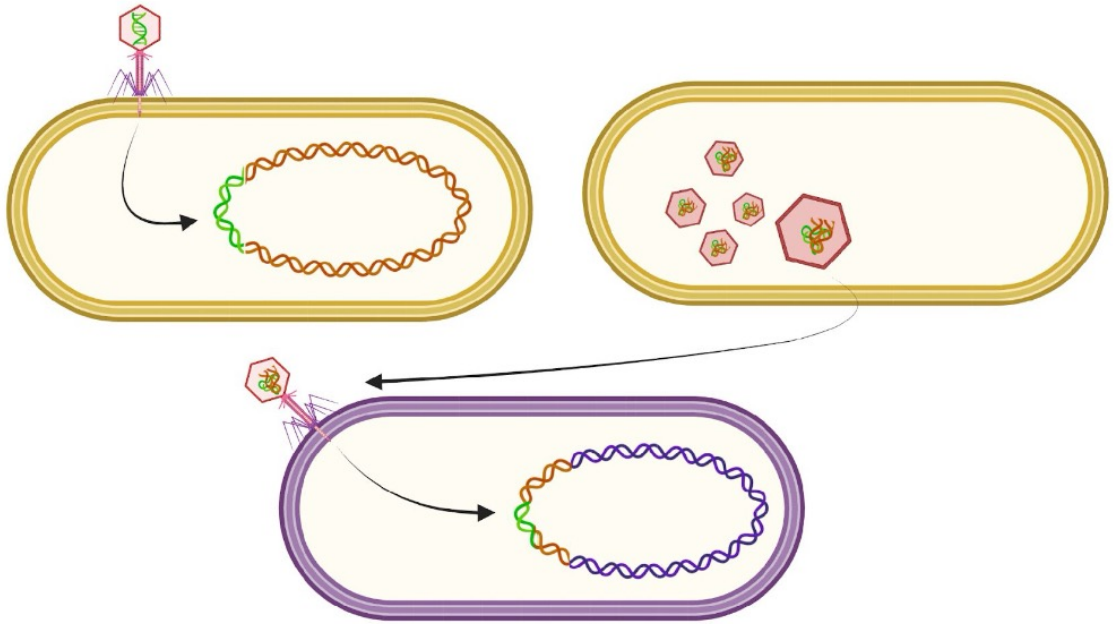






HORIZONTAL TRANSFER OF GENES

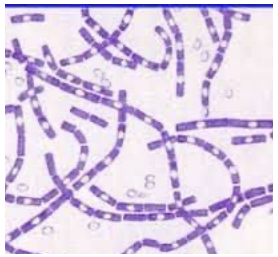


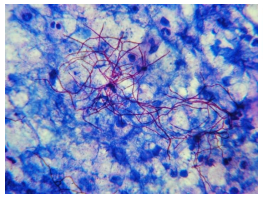


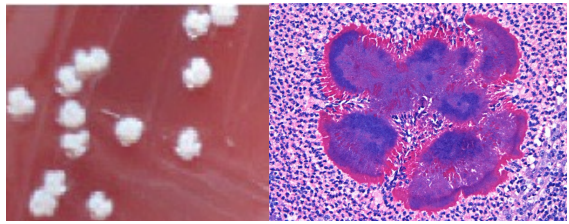
Toxins encoded in a lysogenic phage:

Barbara McClintock

GRAM POSITIVE BACTERIA







Gram ⊕ (purple/blue)

- Bacilli
  - Aerobic
  - Anaerobic
- Cocci
  - **Catalase**
    - ⊖ (Pairs or chains) ***Streptococcus***
      - **Hemolysis**
        - α (Partial hemolysis, green)
          - Optochin sensitivity and bile solubility
          - Inulin fermentation
        - β (Complete hemolysis, clear)
          - Bacitracin sensitivity and PYR status
        - γ (No hemolysis, grows in bile)
          - Growth in 6.5% NaCl and PYR Status
    - ⊕ (Clusters) ***Staphylococcus***
      - **Coagulase**
        - Novobiocin sensitivity
- Branching filaments
  - Aerobic
  - Anaerobic

Lancefield grouping

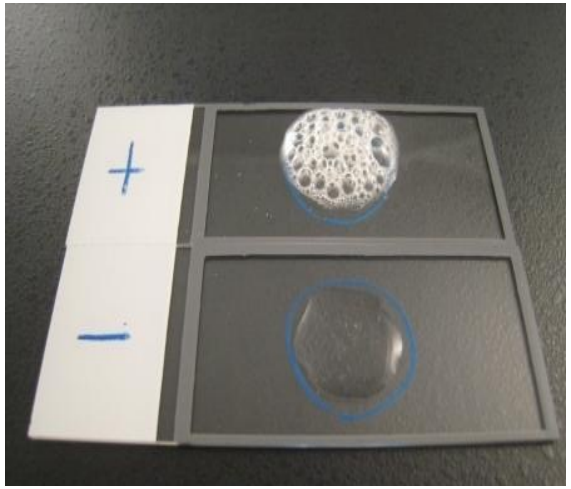
Mannitol salt, Ludlams agar
Protein A: Binds Fc region of IgG

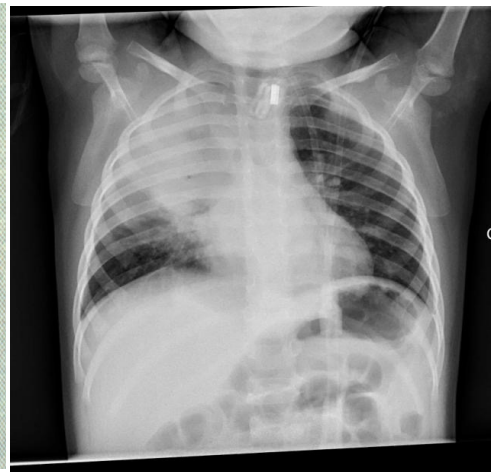
S. mutans, S. mitis, and S. sanguinis

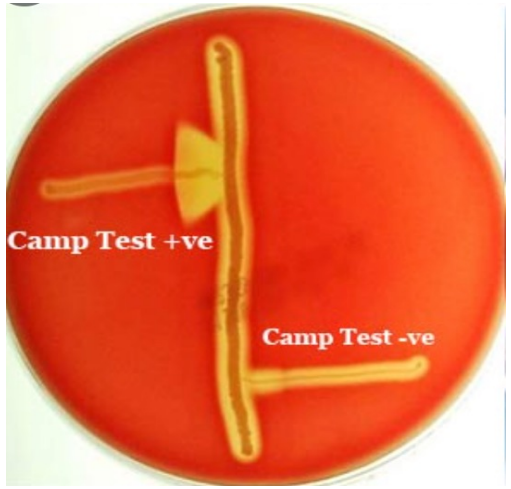
Pike (transport)
Crystal violet

Bile esculid agar

GRAM POSITIVE COCCI





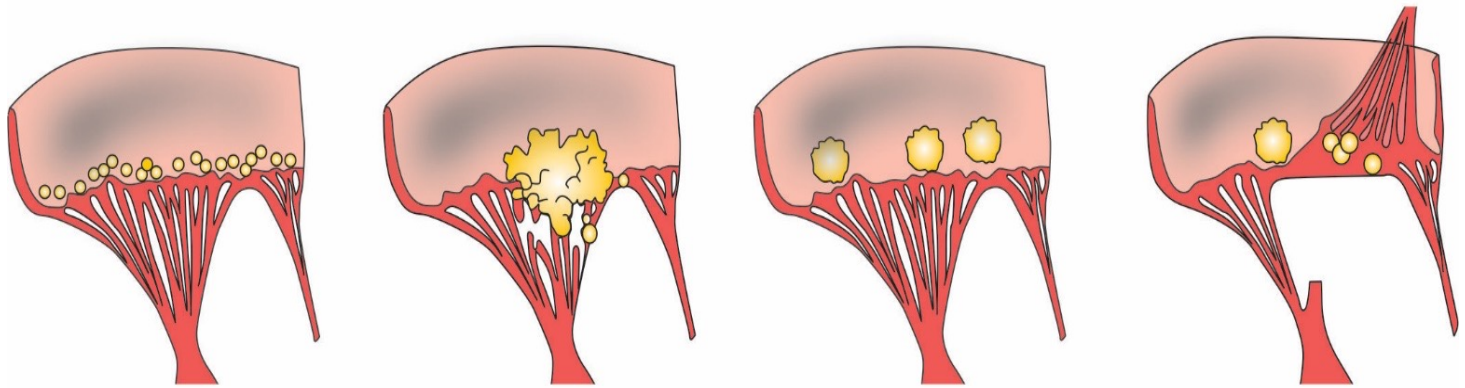


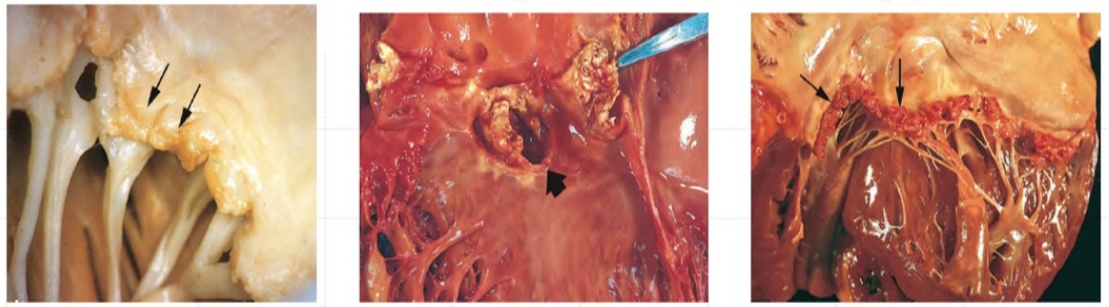
- Vaccine in splenectomy
- PPSV23: >2yrs
- PCV: 13 valent-<2yrs
- Meningococcus:A,C,Y,W
- Transformation
- IgA protease

Camp test:

Hippurate hydrolysis +
Red pigment on Islam media
Reverse camp test:

IE





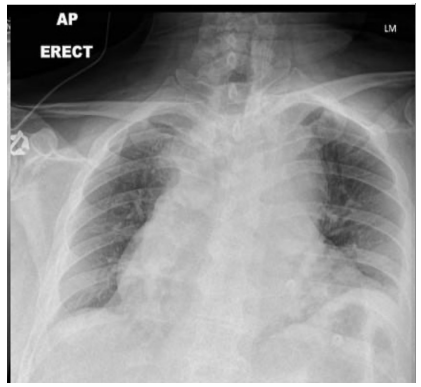
(1) Positive Blood Cultures

i. Microorganisms that commonly cause IE isolated from two or more separate blood culture sets, or
ii. Microorganisms that occasionally or rarely cause IE isolated from three or more separate blood culture sets
(2) Positive Laboratory Tests
i. Positive PCR or other nucleic acid–based technique for *Coxiella burnetiid Bartonella* species *Tropheryma whipplei*
ii. Coxiella burnetii antiphase IgG antibody titer, or isolated from a single blood culture, or
iii. Indirect immunofluorescence assay (IFA) for detection of IgM and IgG antibodies to *Bartonella henselae* or *Bartonella quintana*
(3) Echocardiography and Cardiac Computed Tomography Imaging
(4) 18F-FDG PET/CT Imaging
(5) Evidence of IE Documented by direct inspection

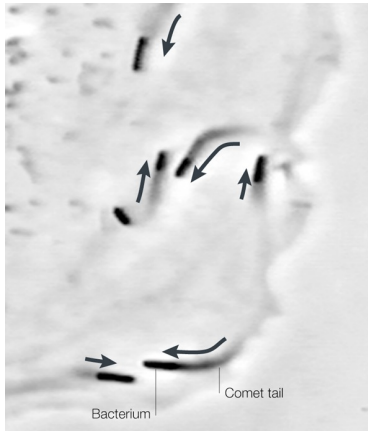
IE:
MCC in IVDU/ Hospital Acquired / Acute-
MCC in community acquired IE/ h/o dental procedure-
MCC in prosthetic value IE (<1yr)-
MCC in ca colon-
MCC in GI/GU procedure-

GRAM POSITIVE BACILLI

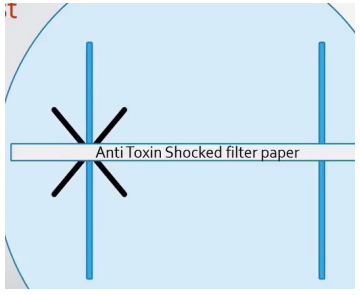
Polypeptide capsule
M'Fadyean test
Medussa head
Class A bioterrorism agent
Ring ppt: Ascoli test
Rx:
Raxibacumab/ Obiltoxaximab
PLET: MYPA:



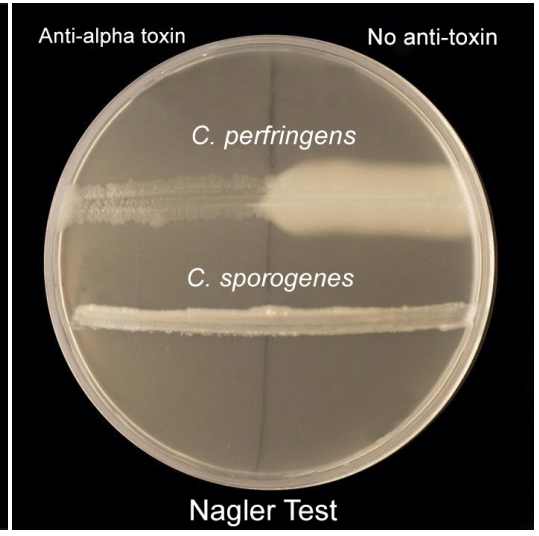
Cold, Tumbling motility
Differential: at 22 C, not 37 C
PALCAM
Actin polymerization: Rocket tails
Anton test
Unpasteurized milk products/ deli meats/transplacental
Meningitis in extremes of ages
DOC-

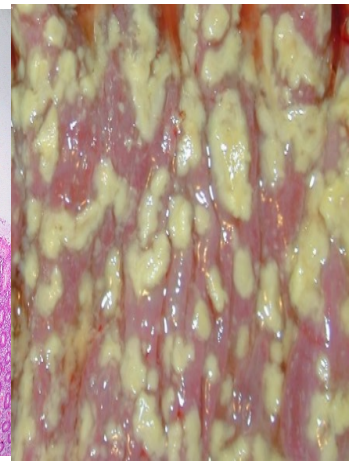


Chinese letter
K tellurite agar/ Loeffler slope/ McLeod
Shick test
Ponder, Loeffler's methylene blue, Albert, Neisser
Case: Isolation till 2 negative culture +
Macrolides + Antitoxin
Contact: Culture+ Antibiotic
Vaccine status: <3doses:
>3 doses: >5yrs- <5yrs



CLOSTRIDIUM





Target hemolysis
Reverse CAMP
Stormy clot
RCMB

MC subterminal
Terminal spores-
C.tertium-Tennis racquet
C.tetani-Drumstick

H/O antibiotic usage/PPI + Diarrhea
Toxin A:
Toxin B:
Glutamate deH assay
IOC:

DOC:
New: Bezlotoxumab

C.perfringes
C.butyricum

C.Perfringes
C.Tetani VI

Tetanus PEP

All wound receive surgical toilet

Wounds less then 6 hours old, clean, non-penetrating, & with negligible tissue damage

Immunity category
A: Nothing more required
B: Toxoid 1 dose
C: Toxoid 1 dose
D: Toxoid complete course

Other wounds

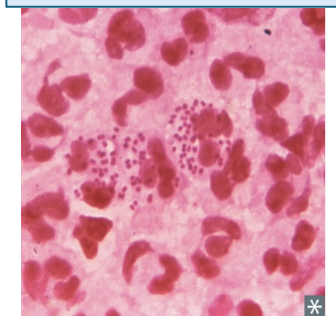
Immunity category
A: Nothing more required
B:Toxoid 1 dose
C: Toxoid 1 dose + human tetanus Ig.
D:Toxoid complete course + human tetanus Ig

- **A** – Has had a complete course of toxoid or a booster dose within the past **5 years**.
- **B** – Has had a complete course of toxoid or a booster dose **more than 5 years ago and less than 10 years ago**.
- **C** – Has had a complete course of toxoid or a booster dose **more than 10 years ago**.
- **D** – Has **not** had a complete course of toxoid or **immunity status unknown**.

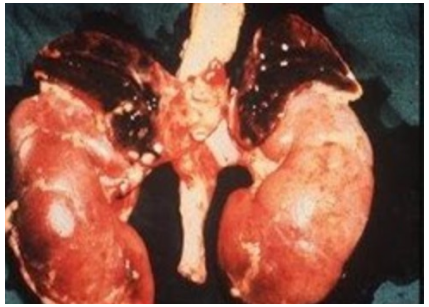
GRAM NEGATIVE BACTERIA

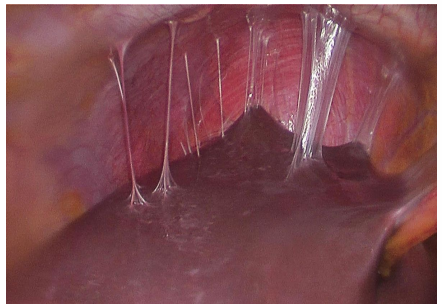
All are GPC except: “MaNVi”

Transport:
Culture:

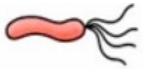


Polysaccharide capsule

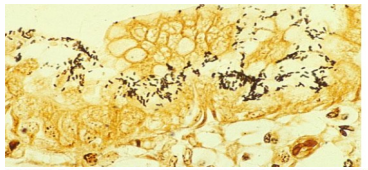




- Diplococci
  - Aerobic
  - Type IV pili
    - Maltose utilization: No / Yes
- Coccobacilli
  - *H. influenzae*
  - *B. pertussis*
  - *Pasteurella*
  - *Brucella*
  - *F. tularensis*
- Bacilli
  - Lactose fermenting: No / Yes
    - No → Oxidase: No / Yes
      - No → H_2S-producing: No / Yes
    - Yes → Slow / Fast
- Comma-shaped
  - Oxidase-positive
    - Grows in 42°C
    - Grows in alkaline media
    - Urease producing



Campy BAP,
Butzler, Skirrow



Darting motility
String test
Transport:

Culture:

Chick RBC agglutination
VP test + :
V.parahemolyticus-Shellfish
Capsulated
Kanagawa phenomenon
Wagatsuma agar
V.vulnificus-Sepsis

- Ecthyma gangrenosum

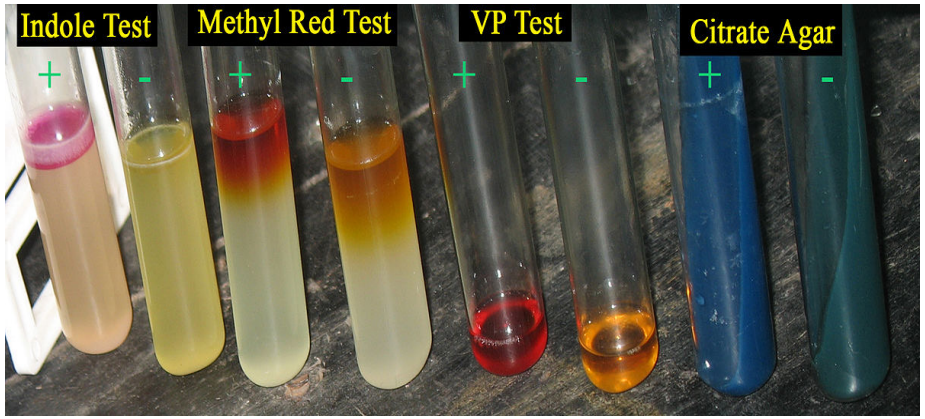
Vs Ecthyma contagiosum

- Malignant Otitis externa
- Burns
- CF

MC in young- MC in adults-

- Contact lens
- Shanghai fever
- Hot tub folliculitis
- Acute osteomyelitis-Nail / drug abusers

*MCC- Sickle cell-



Typhoid : Fever + bradycardia, Rose spots

Detection: “BASU”

EPEC

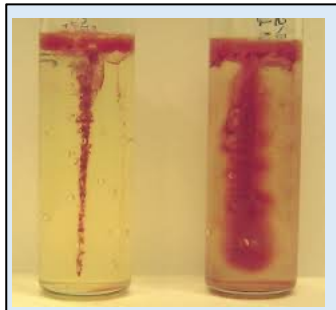
ETEC

EIEC-Sereny test

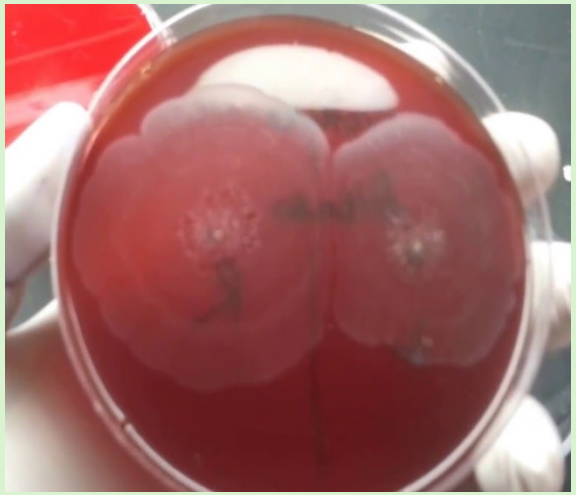
EHEC

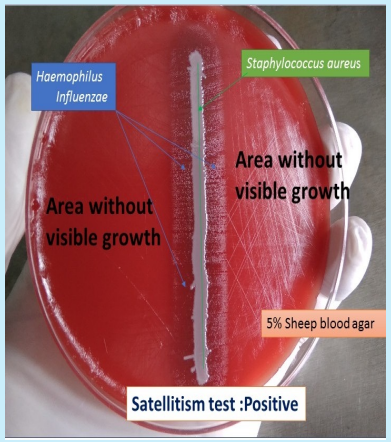
EAEC

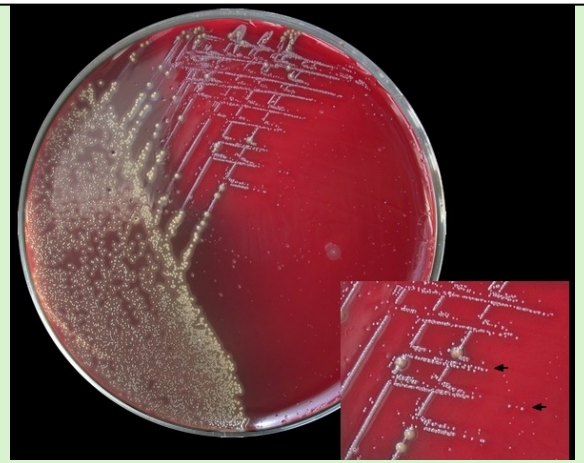
Stacked brick appearance on Hep2



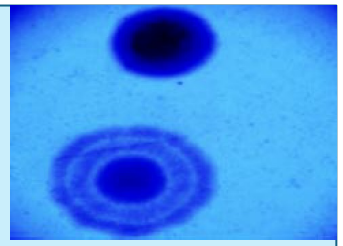
Wayson stain



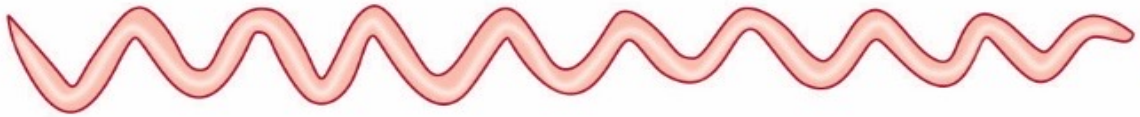




Diene staining
Fried egg
Eaton, PPLO agar
Walking pneumonia
Cold agglutinin
Joker
Mollicute
Not effective:
DOC:



Spirochetes

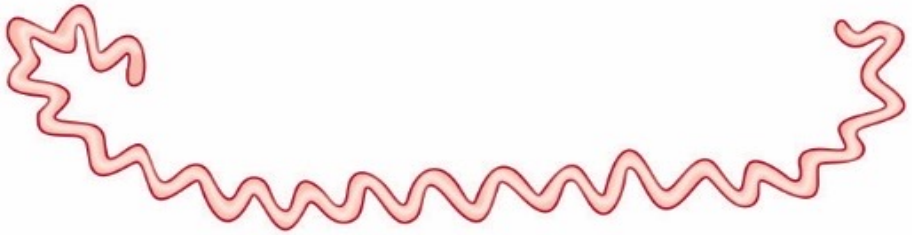


Corkscrew motility

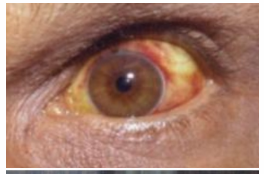
Levaditi-
Fontana-

Lashing motility

B.Burdgoferi-
B-Recurrentis-
- Epidemic: Louse
- Endemic: Soft Tick



Weil's disease
Rats
EMJH medium



MAT: MICROSCOPIC

CAT: COLD

SAT: STANDARD
Casteneda's biphasic agar
Rose Bengal test

Bartonella bacilliformis **henselae** **quintana**

Syphilis

CVS:

CNS:

Argyll Robertson pupil:

Coxsackie A24,
Enterovirus 70

Great imitator
No-
Characteristic LN:

CONDYLOMA LATA:

CONDYLOMA ACUMINATA:

Most specific- Most sensitive-
Best test to monitor response:
Congenital syphilis:
Early-
Late-

Culture Media

BCYE
(Water transmission, Diarrhea, Bradycardia, HypoNa, Pontiac disease)
CLED
EMB
Ashdown (Vietnamese time bomb)
Selenite F, Tetrathionate broth (enrichment), DCA, XLD agar
Wilson blair
Cetrimide agar
Cefoxitin agar
McCoy, HeLa cell lines
Reticular body: Replicative:
Elementary body (EB): inactive, extracellular, infectious

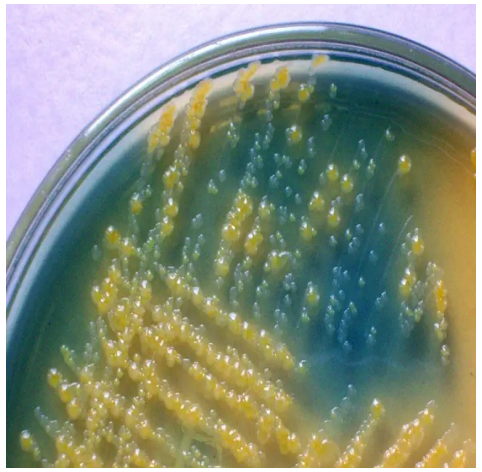
KASS criteria exception:
Suprapubic aspirate
Gram positive / candida
Antibiotics

Sucking mice:
Embryonated Egg (4 cavities)
•Chorioallantoic membrane:
•Yolk sac → Chlamydia, Arbovirus, Rickettsia
•Amniotic membrane → Influenza isolation
•Allantoic cavity → Yellow fever, vaccine (Influenza, Rabies)

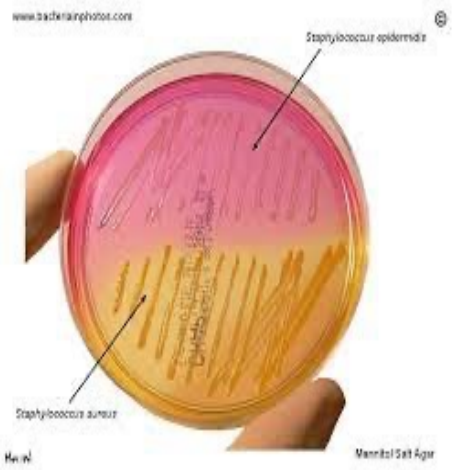
Cell Lines
•**Primary** (5–10 divisions): Rhesus kidney, Human amniotic, Chick embryo
•**Secondary** (10–50 divisions): Human fibroblast, MRC5, W138
•**Continuous** (infinite): HeLa, HEP-2, KB, McCoy, Vero, BHK

CULTURE MEDIA

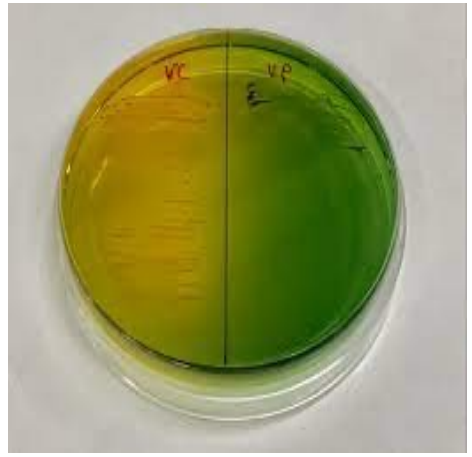
Indicator: Neutral red
LF: Pink



Indicator: BTB
LF: Yellow



Indicator: Phenol red
MF: Yellow



Indicator: BTB
SF: Yellow

Facts!

Actinomyces
Bacteroides
Clostridium

Helicobacter
Campylobacter

Pseudomonas
Burkholderia
Vibrio
Campylobacter
Helicobacter
Neisseria

Biofilm:
- S.epidermidis
- Pseudomonas aeruginosa
- Nontypeable H. influenzae
- Viridans streptococci

Chlamydia
Rickettsia /Coxiella

Proteus, Cryptococcus, H pylori, Ureaplasma, Nocardia, Klebsiella, S epidermidis,S saprophyticus

Polysaccharide: SHiN, Pseudomonas, E.coli, Salmonella, Klebsiella, Grp B Strep
Hyaluronic acid:
Polypeptide:

Bipolar staining:

Rickettsia

R. Prowazekii (Brill-Zinser)
R typhi(Neil-Mooser rxn)

OX-19 +

R. Ricketsii
R. Conori
R. Africae
Ehrilichia
Anaplasma

OX-19 +
OX-2 +

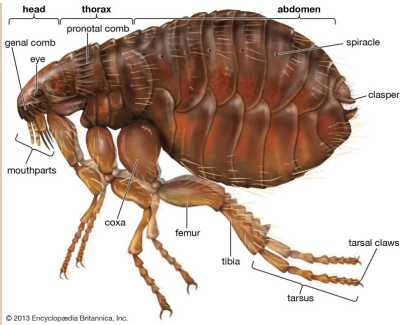
R. Akari
R. Tsutsugumashi

OX-K +

Coxiella

NO Giemsa stain, NOT killed on pasteurization
Only one culture positive for IE
Donut granuloma

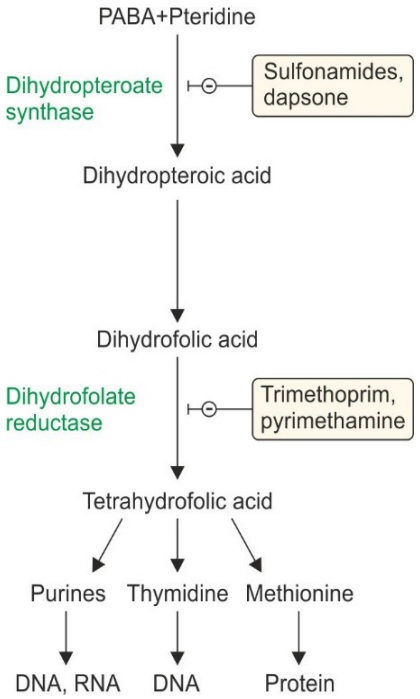
Entomology



Cheopsis index:

Transovarian transmission

Antimicrobials



FOLIC ACID SYNTHESIS AND REDUCTION (DNA methylation)

Sulfonamides
- Sulfamethoxazole
- Sulfisoxazole
- Sulfadiazine

Trimethoprim

MEMBRANE INTEGRITY

Daptomycin (gram ⊕)
Polymyxins (gram ⊖)

CELL WALL SYNTHESIS

PEPTIDOGLYCAN SYNTHESIS

Glycopeptides
- Vancomycin
- Bacitracin

PEPTIDOGLYCAN CROSS-LINKING

Penicillinase-sensitive penicillins
- Penicillin G, V
- Ampicillin
- Amoxicillin

Penicillinase-resistant penicillins
- Oxacillin
- Nafcillin
- Dicloxacillin

Antipseudomonal
- Piperacillin

Cephalosporins (I-V)
- 1st—Cefazolin, etc
- 2nd—Cefoxitin, etc
- 3rd—Ceftriaxone, etc
- 4th—Cefepime
- 5th—Ceftaroline

Carbapenems
- Imipenem
- Meropenem
- Ertapenem
- Doripenem

Monobactams
- Aztreonam

DNA INTEGRITY (via free radicals)

Metronidazole

mRNA SYNTHESIS (RNA polymerase)

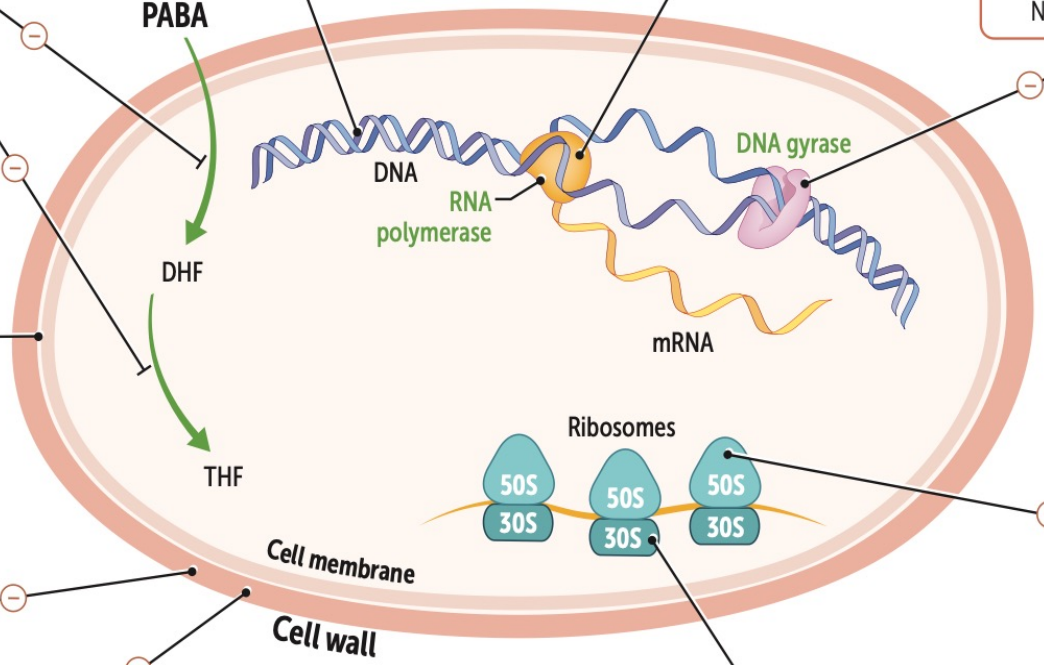
Rifampin

GYRASE

Fluoroquinolones
- Ciprofloxacin
- Levofloxacin, etc

Quinolone
- Nalidixic acid

Safe in renal failure:
PMT
Cyp inh, QT prolong, tendon rupture, seizure



PROTEIN SYNTHESIS

50S SUBUNIT
- Chloramphenicol
- Clindamycin
- Linezolid

Macrolides
- Azithromycin
- Clarithromycin
- Erythromycin

Streptogramins
- Quinupristin
- Dalfopristin

Cyp inh, QT prolong, Prokinetic, Jaundice

Thrombocytopenia, peripheral neuropathy, serotonin syndrome

30S SUBUNIT

Aminoglycosides
- Gentamicin
- Neomycin
- Amikacin
- Tobramycin
- Streptomycin

Glycylcycline
- Tigecycline

Tetracyclines
- Tetracycline
- Doxycycline
- Minocycline

Imipenem+ Cilastatin:

Fosfomycin:
Muramic acid
Cycloserine:
Pentapeptide (d-ALA)
Bacitracin:
BP transporter
Vancomycin:
Transglycosylase
B lactams:
Transpeptidase

No cross-reactivity:

DOC:

Plague, Tularemia
Ricketsia, Cholera
Atypical pneumonia, Legionella, Mycoplasma, Chlamydia, Pertussis, Diphtheria
Nocardia, PCP, Burkholderia, Stenotrophomonas, Cyclospora, Isospora
Meningococcal, Anthrax, UTI, Travelers diarrhea

TABLE OF DRUGS NOT EFFECTIVE AGAINST MICROORGANISMS		
Mycoplasma	Cell wall inhibitors (beta-lactams, vancomycin)	
Pseudomonas	Vancomycin, TMP-SMX	
Burkholderia	Aminoglycosides, Cephalosporin	
Stenotrophomonas	Aminoglycosides, Cephalosporin, Carbapenems	
Acinetobacter	Aminoglycosides, Cephalosporin, TMP-SMX	
Salmonella	Aminoglycosides	
Anaerobes	Aminoglycosides	
MRSA	Beta lactams (except fifth generation cephalosporins)	

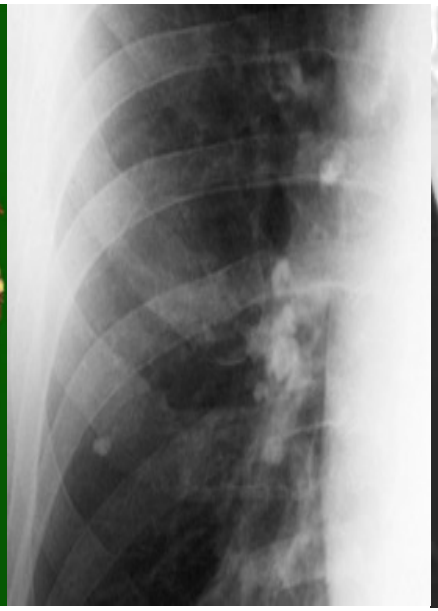
VRSA:
Linezolid Daptomycin Quinpristine-Dalfopristine Ceftarolin

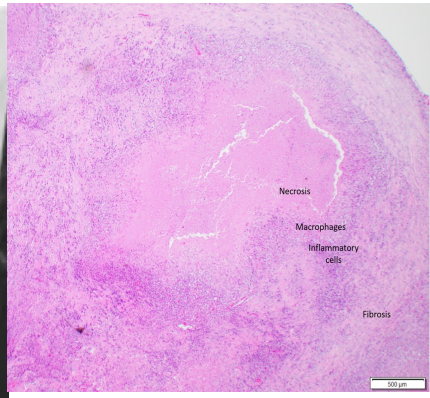
Cidal Drugs
BEVAFA STREPTOGRAMINS

Ceftriaxone, Cefoperazone: Bile excretion

TB

Ghon focus:
Ghon complex:
Ranke complex:
Simon focus:
Puhl focus:
Assman focus:
Simmond:
Rich:
Weigert:





Weakly gram +/ neutral
Cord factor, LAM (urine test)
Inhibits phagolysosome

Runyon Classification

Group 1: Photochromogens

Mycobacterium marinum, Mycobacterium simiae, Mycobacterium kansasii

Group 2: Scotochromogens

Mycobacterium gordonae, Mycobacterium scrofulaceum, Mycobacterium szulgai

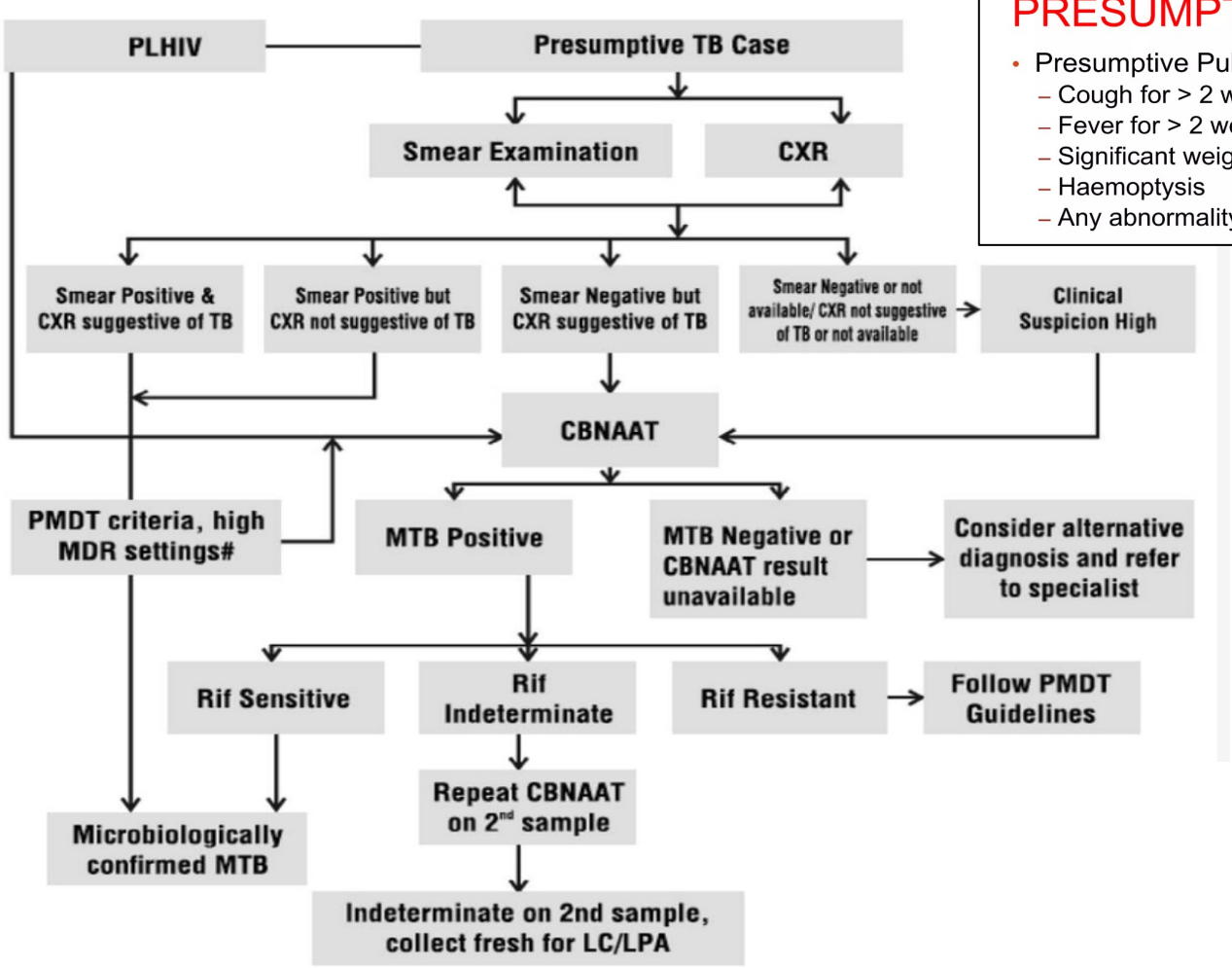
Group 3: Nonphotochromogens

Mycobacterium avium–intracellulare, Mycobacterium malmoense, Mycobacterium xenopi, M.indicus pranii

Group 4: Fast growers

Mycobacterium fortuitum, Mycobacterium chelonae, Mycobacterium abscessus

Diagnostic algorithm



PRESUMPTIVE TB CASES

- Presumptive Pulmonary TB –
  - Cough for > 2 weeks
  - Fever for > 2 weeks
  - Significant weight loss
  - Haemoptysis
  - Any abnormality in Chest Radiograph

No. of sputum samples:
Test within:
4% NaOH-concentration
Auramine/ Rhodamine

Mantoux/TST
Quantiferon GOLD (IGRA):
Distinguish active VS latent?
False + with vaccine?
Gene Xpert MTB/RIF
TruNAAT

LPA

LJ/ Middlebrook/ MGIT

High-priority TB-HIV district:

TB + HIV: Start f/b 2 weeks later (2mon if disseminated TB)

Avoid:

PROPHYLAXIS:
Rifapentin+INH x 3mon weekly
Household contacts >5yrs, immunosupressants, Dialysis, Silicosis, transplant (TST +ve, CBNAAT –ve)

ATT

Mycolic acid synthesis inhibitor, CYP inh, Hepatotoxic, Neuropathy, Sideroblastic anemia, Lupus

FA synthesis inhibitor, Hepatotoxic, Hyperuricemia, intracellular bacteria:

Arabinogalactan synthesis inhibitor, Red-green colour blindness:

Max cidal action, RNA pol inhibitor, inducer of enzymes, Pulmonary syndrome, orange urine:

Pseudojaundice, uveitis, min inducer of enzyme:

Hepatotoxic, Hypothyroidism:

Psychosis:

QT prolongation:

ATP synthase inhibitor:

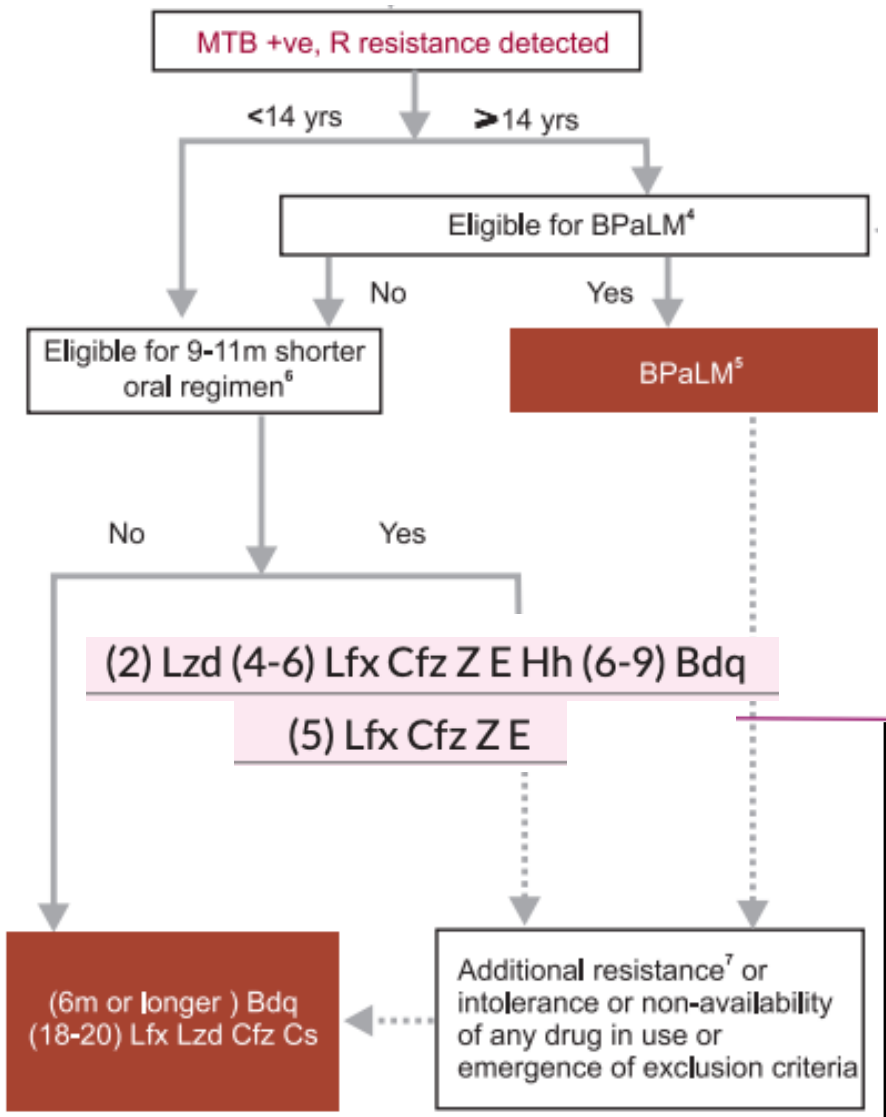
MDR-TB:

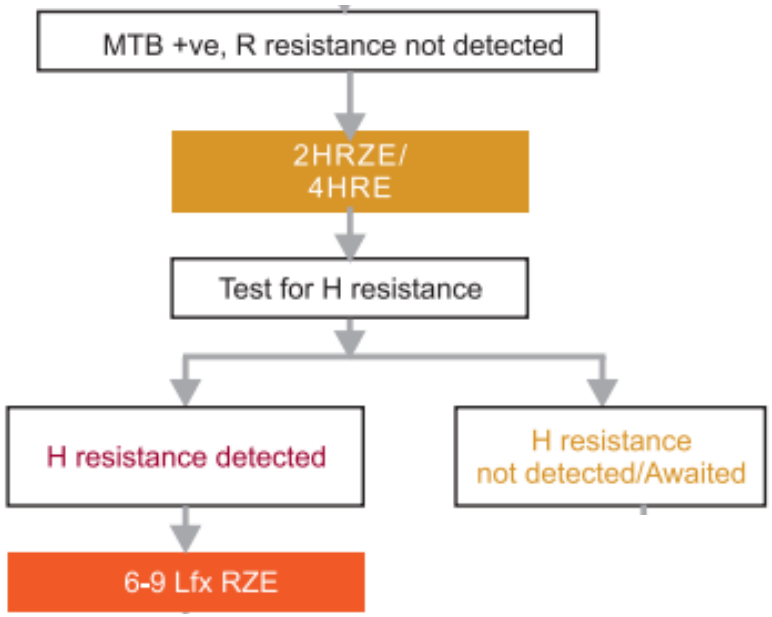
PRE-XDR TB:

XDR-TB: H+R / + FQ + Any Grp A drugs

CI in pregnancy:

Drug-resistant TB





The eligibility criteria for 9–11 month shorter oral MDR/RR-TB regimen

i. Rifampicin resistance detected.

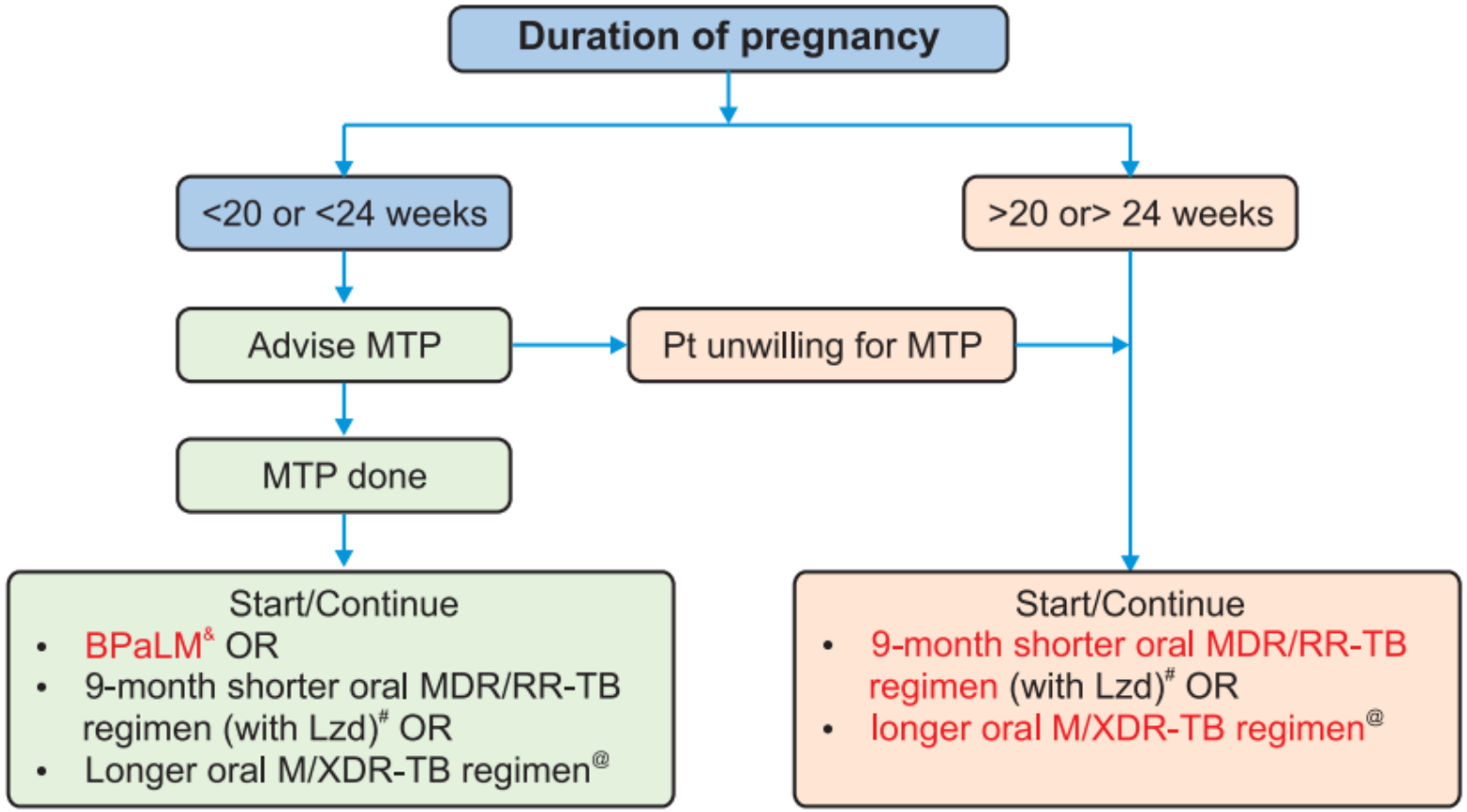
ii. MDR/RR-TB with FQ resistance not detected.

iii. No history of exposure to previous treatment with second-line medicines for more than one month

iv. No severe forms of extra-pulmonary MDR-TB like CNS TB, spinal/skeletal TB (miliary TB or TB with multiorgan involvement or disseminated TB).

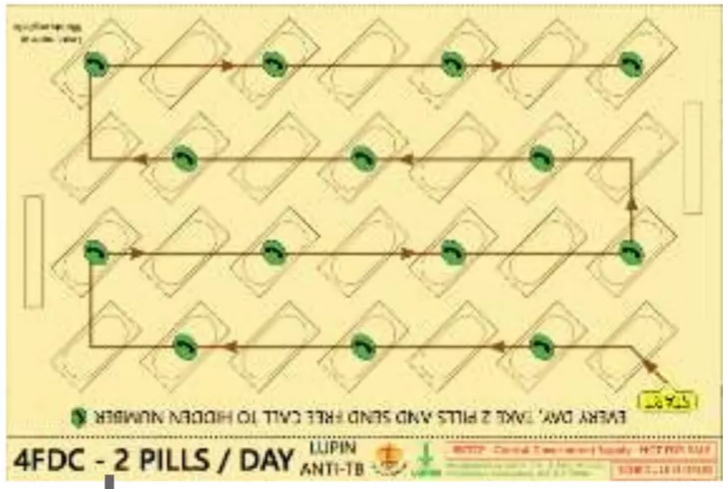
v. InhA mutation OR KatG mutation (not both)

TB in pregnancy



NTEP

GOALS-2025
No of TB deaths:
TB incidence:
Catastrophic costs:
World TB day:



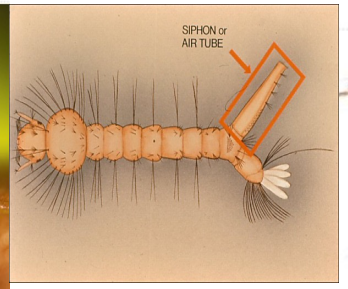
ICT-enabled adherence system

MOHFW
CENTRAL TB DIVISION
STATE TB CELL
DISTRICT TB CENTRE
TB UNIT: 1/2.5lakh
MO-TC
STS
STLS

NVBDCP








Clean water
5km
Single eggs –with floats
Larva parallel
Adult angle
Spotted wings

Artificial water collections
100m
Single eggs-No floats
Stripes on body and legs
Adult parallel

Dirty water
10km
Hunchback at rest
Larva with siphon tube
Raft eggs-No floats

With PISTIA plant

Malaria

Dengue
Chikungunya
YF
Zika
Rift valley

W. Bancrofti
JE
West Nile

Brugia malayi

Kala azar
Chandipura E
Oroya fever

Breteau index:

INTEGRATED VECTOR CONTROL

ANTI-LARVAL MEASURES

Chemical:
Paris green= Stomach poison
Temephos/Abate = Contact poison

Biological: Gambisia / Guppy
Bacillus thuringiensis

Environmental control

ANTI-ADULT MEASURES

Space spray: LOW API
Malathion
Cyphenothrin
Pyrethrum

Residual spray: HIGH API
DDT (2 rounds)
Malathion (3 rounds)
Deltamethrin (2 rounds)

PERSONAL PROTECTION

Deltamethrin

-ITBN: 6mon

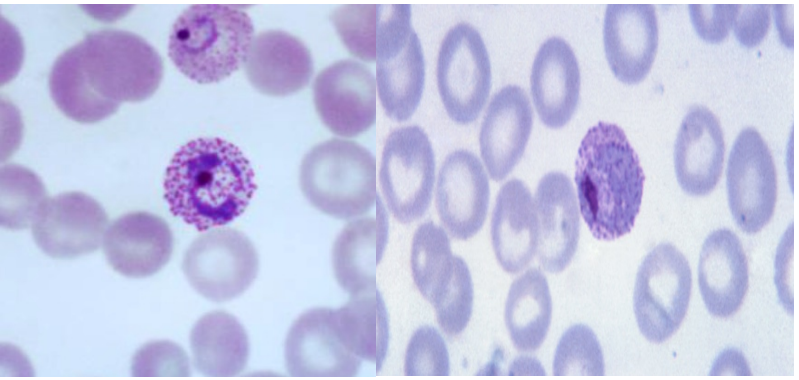
-LLIN:3yrs

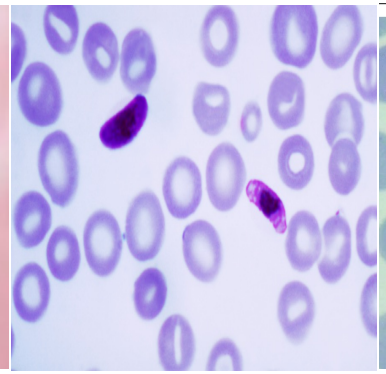
0.0475inch; >150 holes/ich

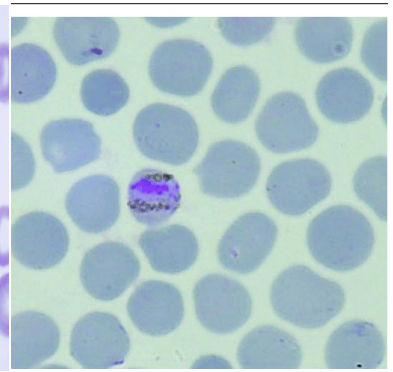
Malaria

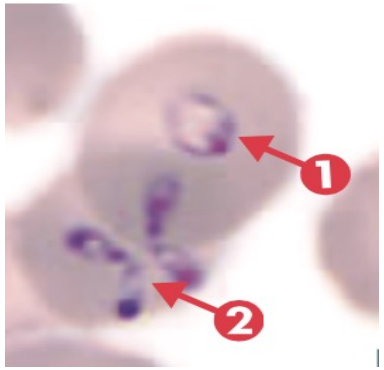
Peripheral smear stain-
Thin: Thick:
Fluorescent stain:
1 microscope:
Most important measure of malaria control:
Best indicator of operational efficiency:
Best during outbreak:
Absence of duffy Ag:
Mosquirix RTS, S/AS01
Mosquito bite: Transfusion:
Placental transfer:

Category 0: Prevention of re-establishment phase Zero indigeneous cases
Category 1: Elimination phase API < 1 case per 1000 population at risk
Category 2: Pre-elimination phase API < 1 case per 1000 population at risk, but some districts reporting an API ≥ 1
Category 3: Intensified control phase API ≥ 1 case per 1000 population at risk









Schiff-V
James-O

Maurier-F

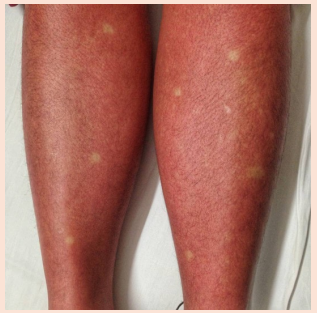
Ziemann-M

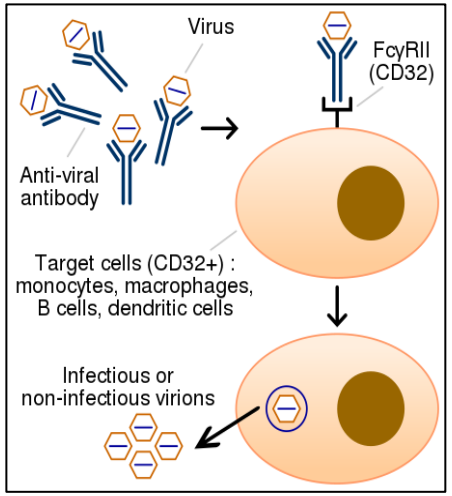
Malaria Rx

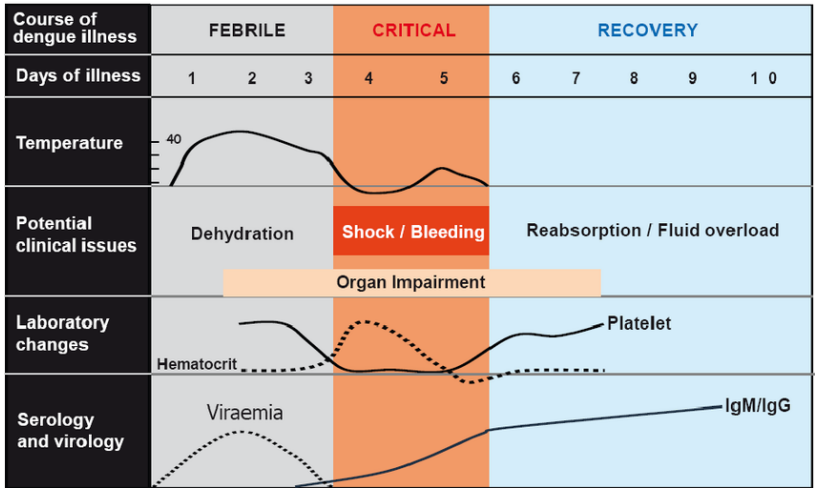
P. vivax/ovale	•**Chloroquine (CQ)** 25 mg/kg: DAY 1-3 + **Primaquine (PQ)** 0.25 mg/kg: DAY 1-14
P. falciparum/ malariae	All Indian States (except northeastern): ACT-SP •**Artesunate** 4 mg/kg: DAY 1-3 •**Sulfadoxine + Pyrimethamine**, 25 mg/kg + 1.25 mg/kg : ONLY DAY 1 •**Primaquine** 0.75 mg/kg: ONLY DAY 2 Northeastern States: ACT-AL •**Artemether + Lumefantrine:** DAY 1-3 •**Primaquine** 0.75 mg/kg: ONLY DAY 2
Mixed infections: Vivax + Falciparum	•**Aretsunate** 4 mg/kg: DAY 1-3 •**Sulfadoxine + Pyrimethamine,** 25 mg/kg + 1.25 mg/kg : ONLY DAY 1 •**Primaquine** 0.25 mg/kg: DAY 1-14
COMPLICATED MALARIA (Seizures, hypoglycemia, pulmonary edema and neurological deficits)	
P. falciparum (predominantly)	Initial Treatment: **IV/ IM Artesunate** at 2.4 mg/kg for 3 days or **IV/ IM Quinine** After stabilisation: State based **Oral Artemisinin-based Combination Therapy (ACT)** for 3 days.
Pregnancy	
Prophylaxis	2 weeks prior-4 weeks after 2 d prior-4 weeks after

DENGUE

Diagnosis:
<5days: NS1 Ag(ELISA), virus isolation, RT PCR
>5days: IgM
Management:
Platelet transfusion:
Criteria for discharge:







DENGUE WITHOUT WARNING SIGNS

Fever + any 2 of the following:

- Leukopenia
- Positive tourniquet test
- Rash
- Nausea, vomiting
- Aches and pains

SEVERE DENGUE

- Severe plasma leakage
  - Shock
  - Fluid accumulation
  - Respiratory distress
- Severe bleeding
- Severe organ impairment
  - AST / ALT > 1000
  - CNS involvement
  - Myocarditis

DENGUE WITH WARNING SIGNS

- Rapid fall in platelets
- Rising hematocrit
- Hepatomegaly > 2 cm
- Clinical fluid accumulation
- Mucosal bleed
- Abdominal pain
- Persistent vomiting
- Lethargy / restlessness

DF (Dengue Fever)	Fever of 2–7 days with two or more of the following: Headache, Retro-orbital pain, Myalgia, Arthralgia, Leukopenia, Thrombocytopenia
DHF-1	•Positive tourniquet test •Thrombocytopenia with platelet count <100,000/cu.mm. •Hematocrit (Hct) rise >20% over baseline.
DHF-2	Evidence of spontaneous bleeding in skin or other organs (black tarry stool, epistaxis, gum bleeds) and abdominal pain.
DHF-3 = DSS	Circulatory failure: Weak rapid pulse, Narrow pulse pressure (<20 mm Hg), Hypotension, Cold clammy skin, Restlessness
DHF-4 = Severe DSS	Profound shock with undetectable BP or pulse

Kala-azar

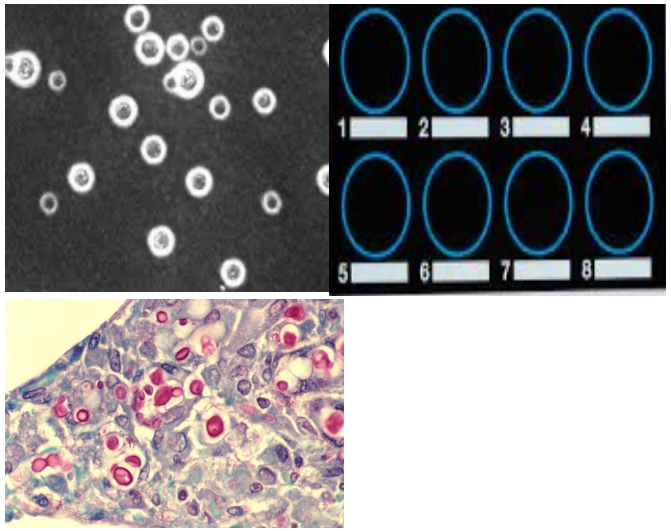
PUO+ HSM
Rk39 Ag Test
Napier's aldehyde test
Kinetoplast
Montenegro test
NNN medium
DOC:

Chikungunya

Chikungunya	Dengue
Acute onset 2–4 days	Gradual onset 5–7 days
Maculopapular rash	Petechiae, maculopapular
Arthralgia Leukopenia	Thrombocytopenia Haematocrit high Hypovolaemic shock

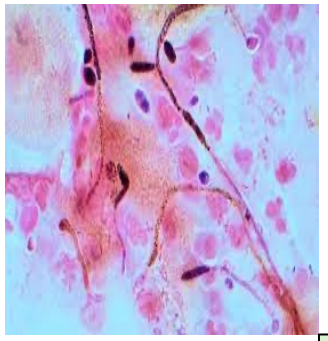
MYCOLOGY

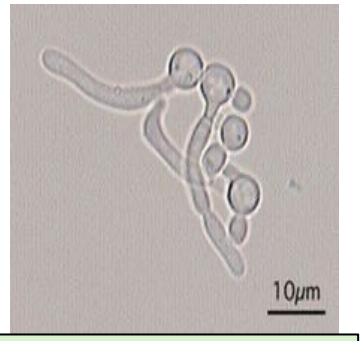
YEAST



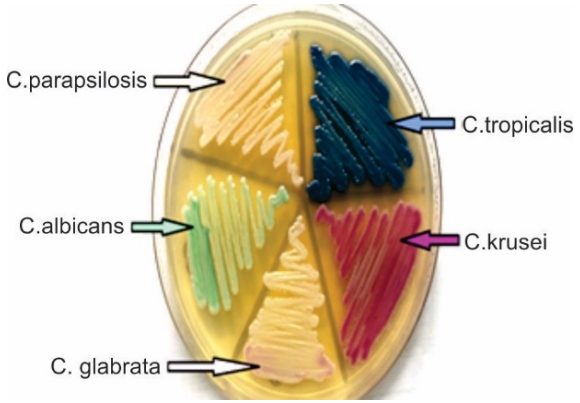
Pigeon dropping:
Soil around eucalyptus tree:
Bird/ Niger seed agar
Phenol oxidase/Laccase

YEAST - LIKE



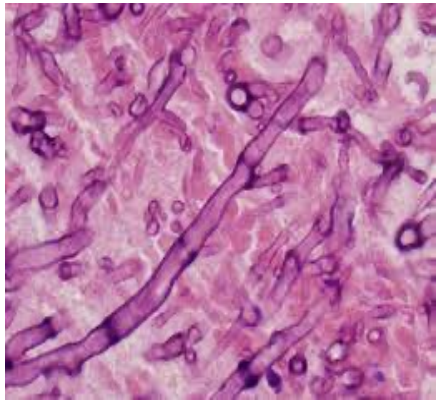


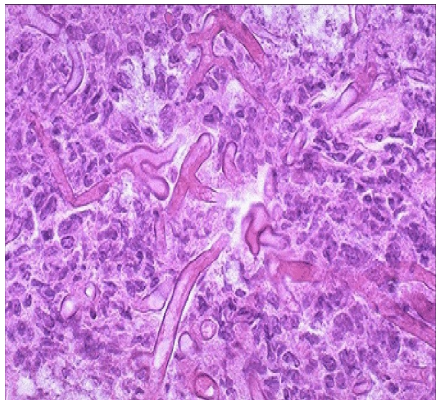
Chlamydospores on corn meal agar



SDA: pH 5.6, Cycloheximide, Gentamicin
B-Glucan + :
Galactomannan assay:

MOLD



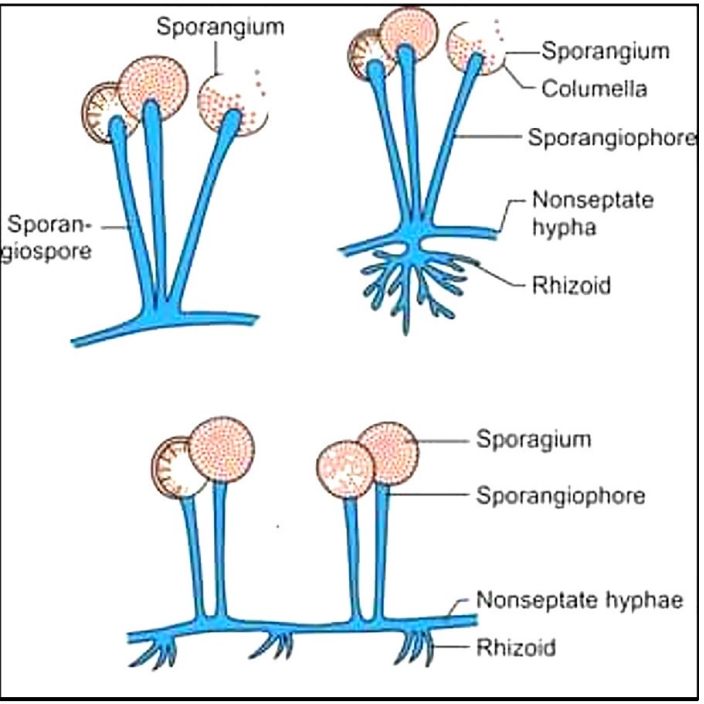


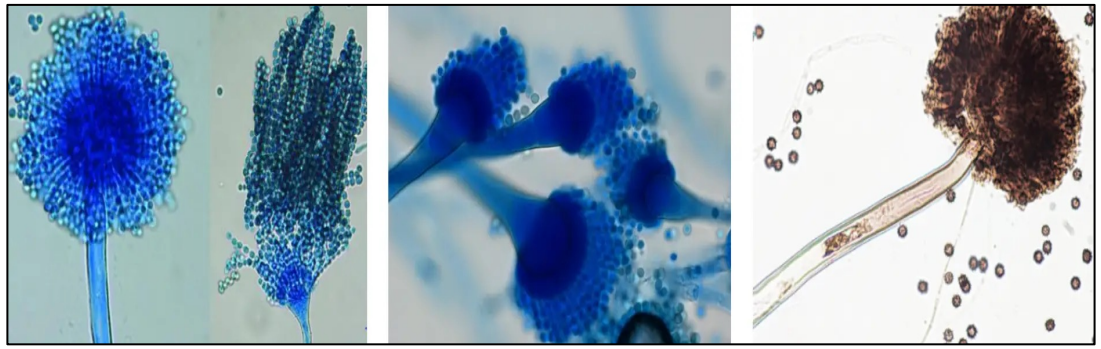
DIMORPHIC

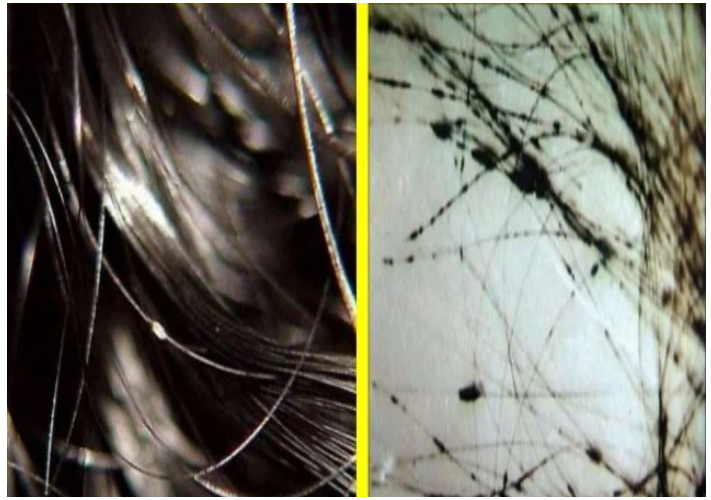
COLD-

HEAT-

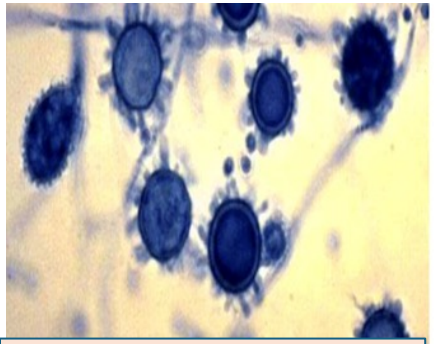
Histoplasma
Sporotrichosis
Blastomyces
Coccidiomycosis
Paracoccidiomycosis
Penicillium/Talaromyces marnefii


Sporangium
Sporangium
Columella
Sporangiophore
Sporan-
giospore
Nonseptate
hypha
Rhizoid
Sporagium
Sporangiophore
Nonseptate hyphae
Rhizoid

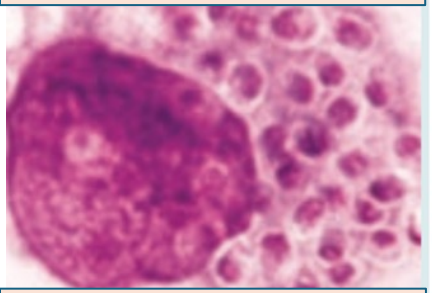




Endemic & Systemic Mycoses



Tuberculate macroconidia

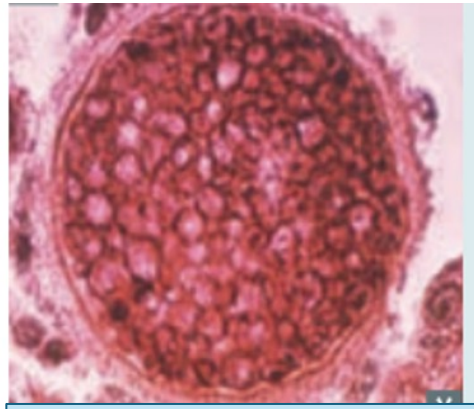


Intracellular yeasts

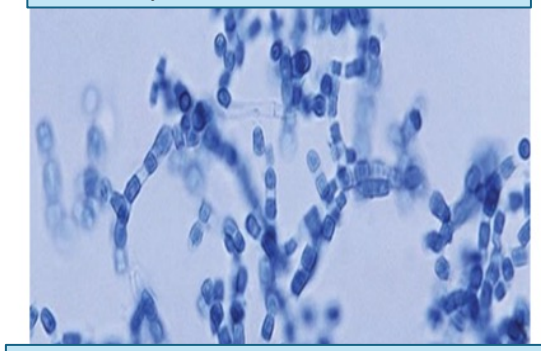
Ohio/ Mississippi/ Darling

Broad based budding

Chicago/ North American/ Gilchrist disease



Sporangium with endospores



Barrel shaped arthrospores

California/ Valley fever/ Desert rheumatism

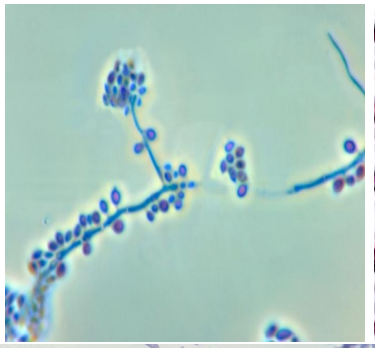
Mickey mouse/ Captain's wheel

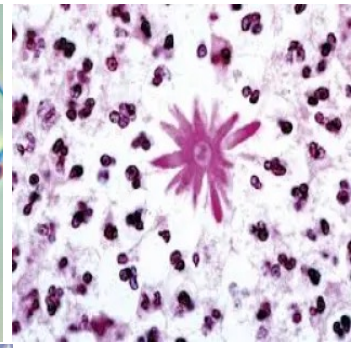
South American Disease

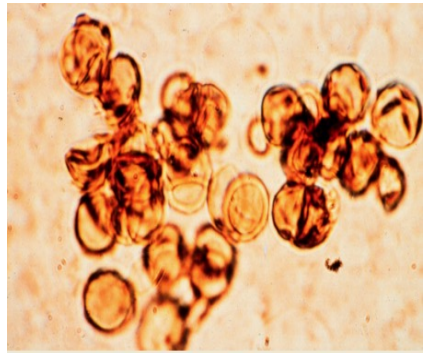
Broom brush

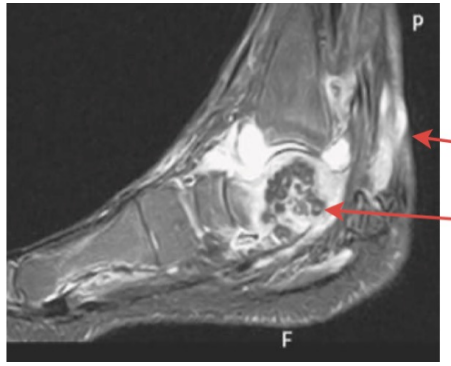
Bamboo Rats reservoir

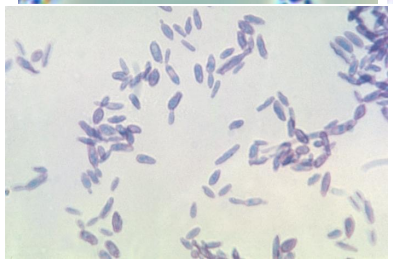
Pattern Approach





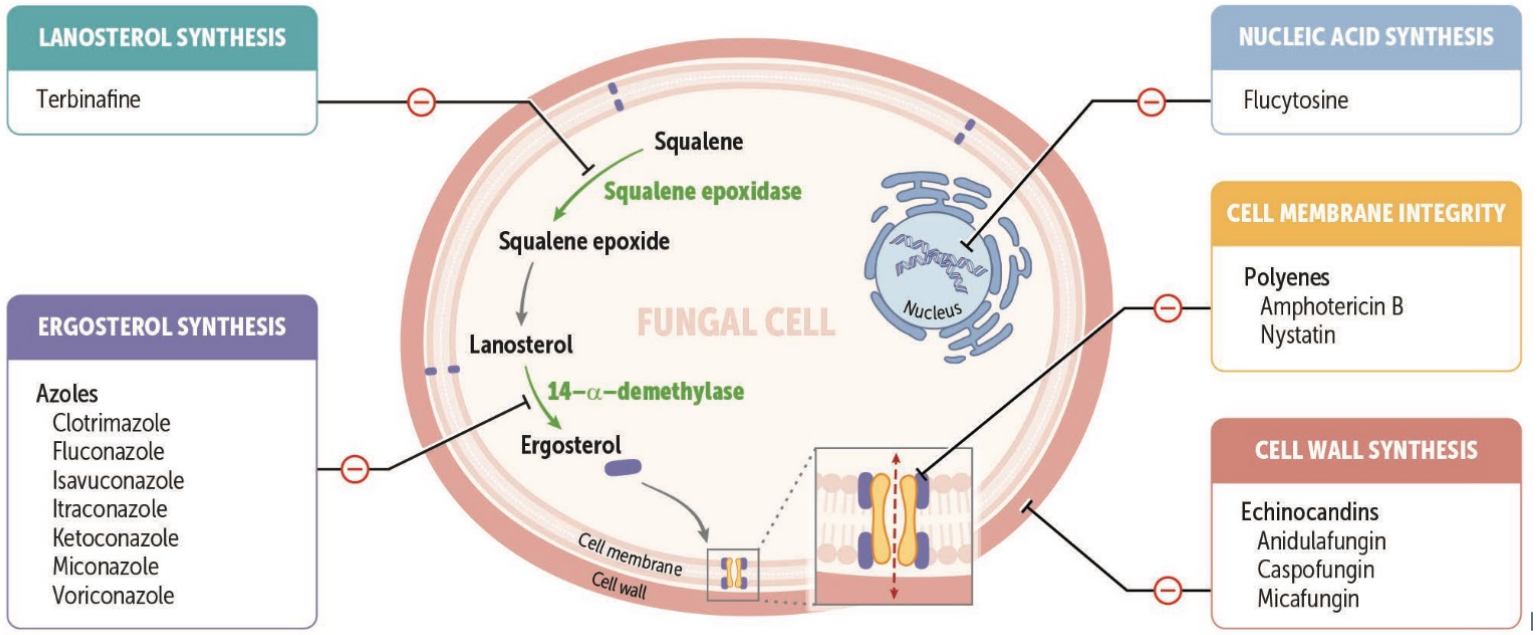






Phialophora
Cladosporium
Fonsacea

Anti-Fungals

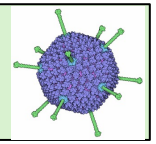


- Systemic severe infection, Mucor, Kalaazar DOC:
- Infusion reaction, Nephrotoxicity, RTA type 1, hypokalemia, BM supression:
- Cryptococcal DOC:
- Candida DOC, Max oral / CNS BA:
- Aspergillus DOC, Transient visual changes:
- Histoplasmosis, Sporothrix, Blastomyces DOC:
- Antifungal causing heart failure:
- Squamous cell carcinoma:
- Azole useful in mucor:
- Azole with antipruritic/ anti-inflammatory action:

VIROLOGY- DNA VIRUSES

dsDNA

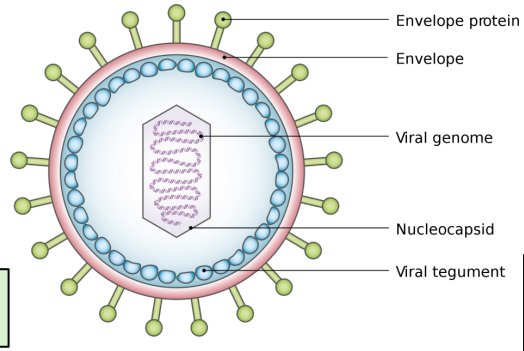
Nonenveloped



PAPOVA
Circular
- Polyoma
- Papilloma

HSV
1-
2-
3-
4-
5-
6-
7-
8-

Enveloped



- Replicates through RNA intermediate
- Circular

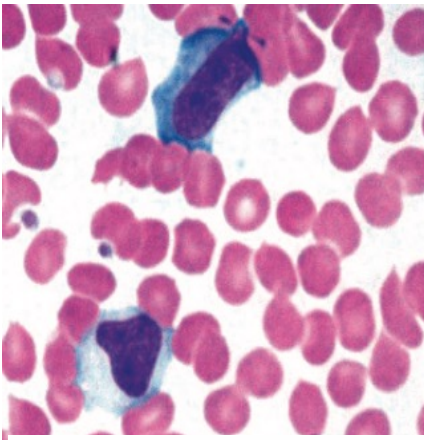
Largest Cytoplasm Complex

ssDNA

Nonenveloped
Smallest

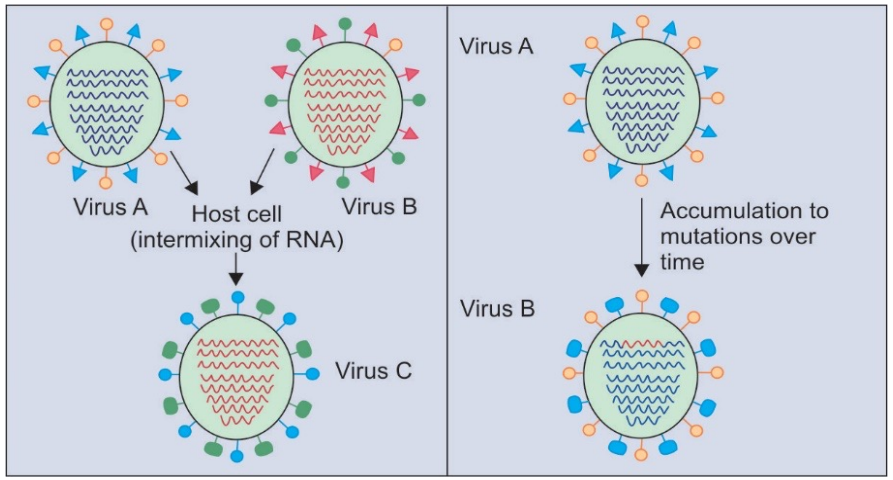
Nucleic acid replication
DNA **RNA**

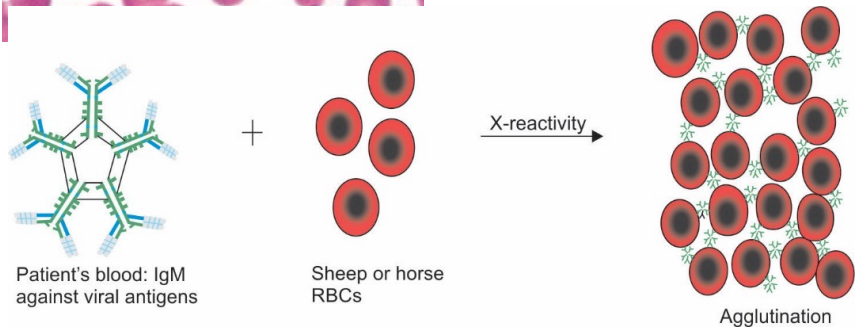
Viral Diseases



Fever + Cervical LN + HSM

LMP1, EBNA
Rx: Avoid contact sports
Avoid ampicillin





Burkitt lymphoma
DLBCL, HL,PTLD
Leiomyosarcoma
NP ca
Ca stomach
OHL

VIRUS	RECEPTORS
CMV	Integrins
EBV	CD21
Rabies	Nicotinic AChR
Rhinovirus	ICAM-I
COVID	ACE2, Type 2 Pneumocytes
Influenza	Sialic acid

ADENOVIRUS STRAINS	Serotypes
Pharyngoconjunctival fever	3, 4, 7
Acute follicular conjunctivitis	3, 4, 11
Epidemic conjunctivitis (Shipyard eye)	19, 37
Gastroenteritis and diarrhea	40, 41
Acute hemorrhagic cystitis	11, 21

VIROLOGY- RNA VIRUSES

ssRNA

Positive sense

Unenveloped

PEC

Norwalk virus
PERCH

Hep A, E:

Enveloped

- Flavi

HCV, YF, Dengue, Zika, WN, JE, KFD

- Toga "CREW"
- Retro (2 copies)
- Corona

Negative sense Enveloped

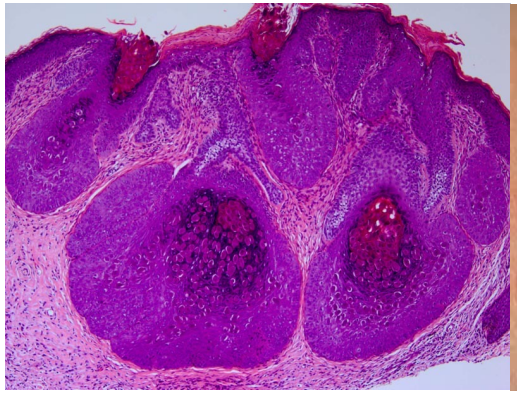
"MR-FAB Delta"

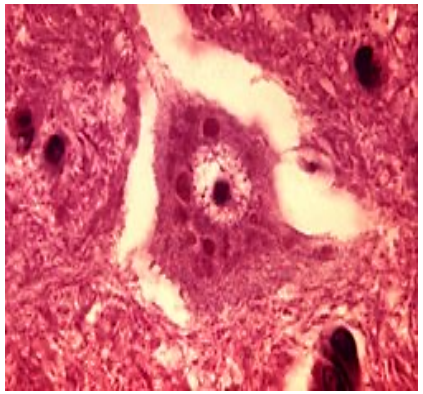
dsRNA

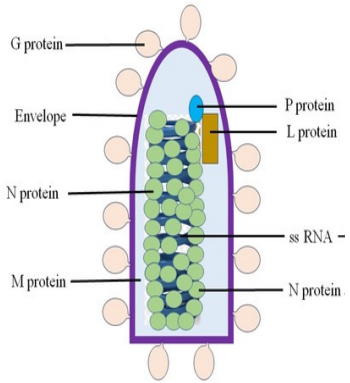
Nonenveloped
Wheel shaped
Villous atrophy
NSP4 toxin
IOC:

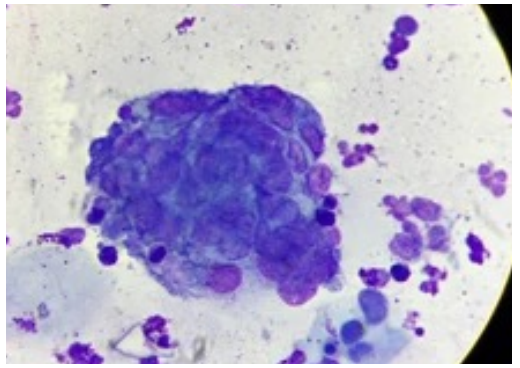
UNSEGMENTED except

CYTOPATHIC EFFECTS





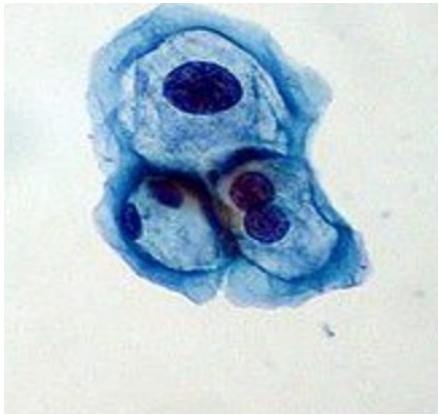


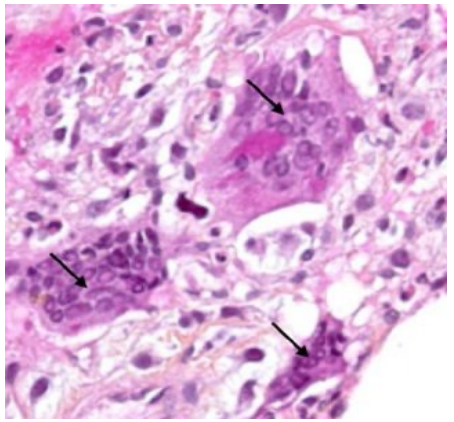


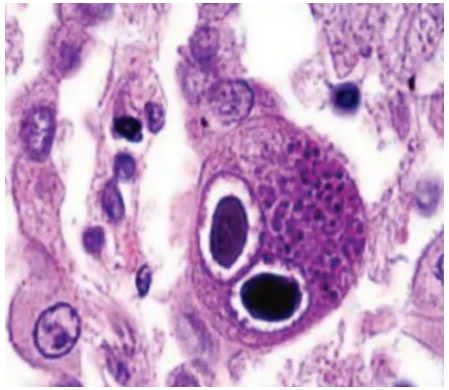
Lendrum's Phloxine Tartrazine

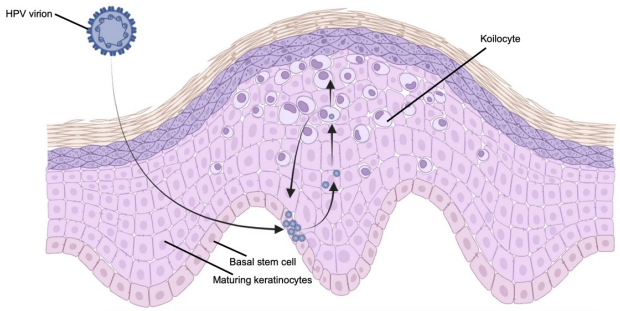
Cowdry A:
Lipshultz bodies (ballooning)-
Torres bodies-
Cowdry B:

Guarnieri bodies:
Paschen bodies:
Bollinger bodies:
Granular clumping:
Crenation:









Syncytium formation

PP65
Human fibroblast cell line

Rabies PEP

Categories of contact with suspect rabid animal	Post – exposure prophylaxis measures
Category I • Touching of feeding animals • Licks on intact skin	None
Category II • Nibbling of uncovered skin • Minor scratches or abrasions without bleeding	1. Immediate vaccination and 2. Local treatment of wound
Category III • Single or multiple transdermal bites or scratches • Licks on broken skin • Contamination of mucous membrane with saliva from licks • Contacts with bats	1. Immediate vaccination 2. Administration of rabies immunoglobulin 3. Local treatment of the wound

Re-exposure:

Pre-exposure:

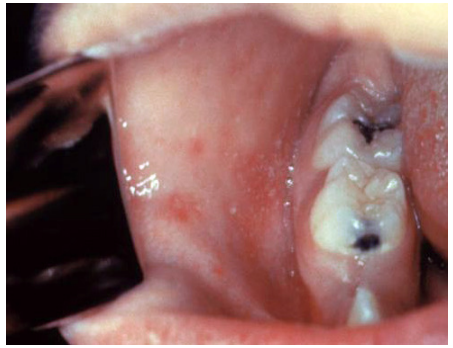
Post-exposure:
Modified Thai Cross:

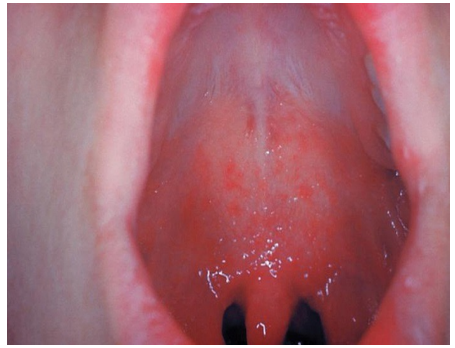
Essen:

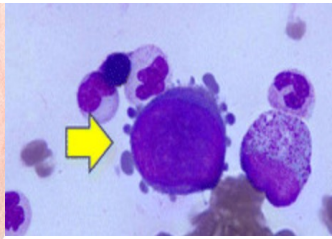
HRIG:
Equine IG:

VIRAL EXANTHEMS

First Disease	Measles (Rubeola) MC complication: MCC of death: Delayed complication: Vaccination in disaster IP: Communicable:
Second Disease	Scarlet Fever
Third Disease	Rubella
Fourth Disease	Duke's Disease
Fifth Disease	Erythema Infectiosum
Sixth Disease	Roseola Infantum



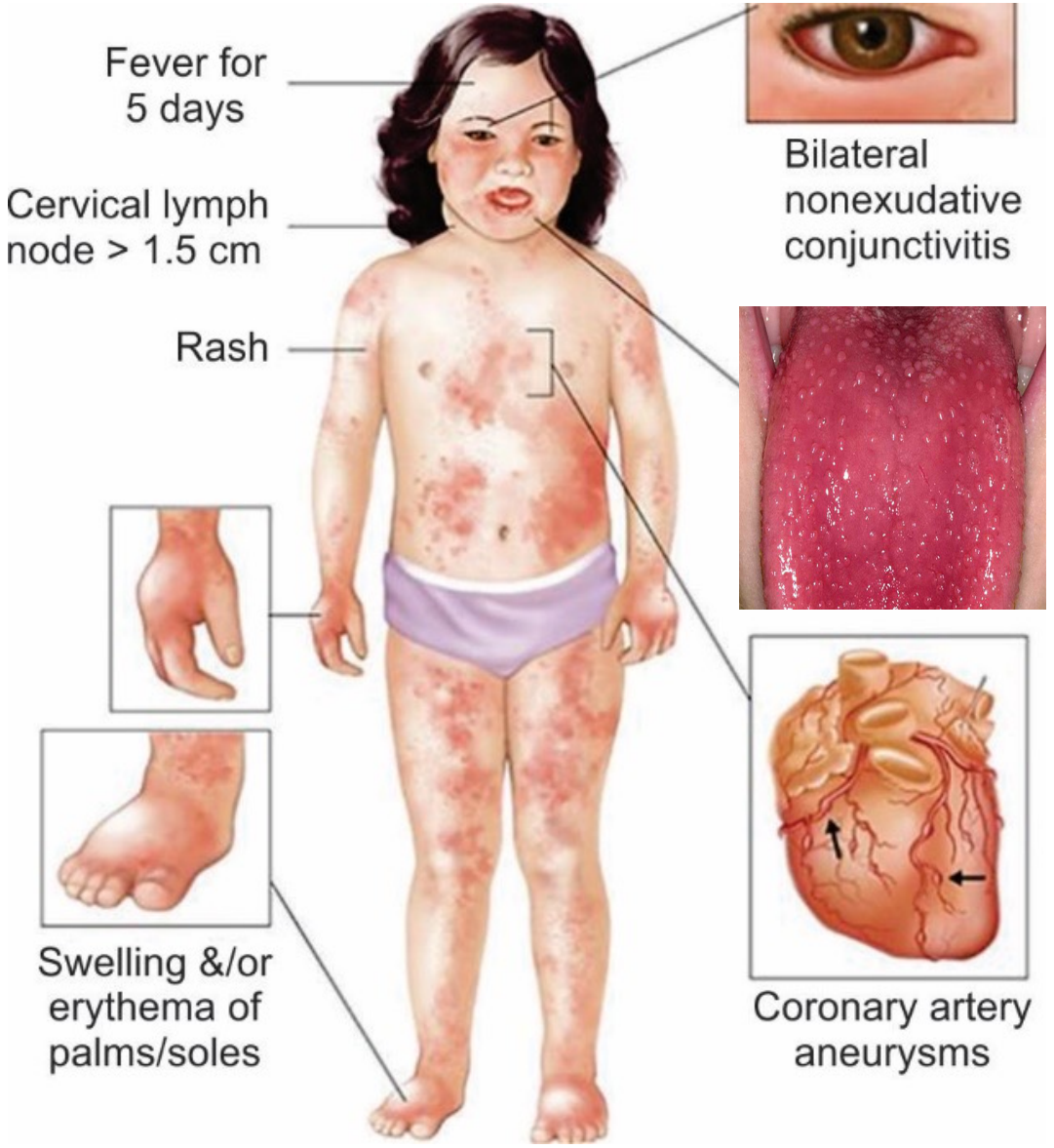




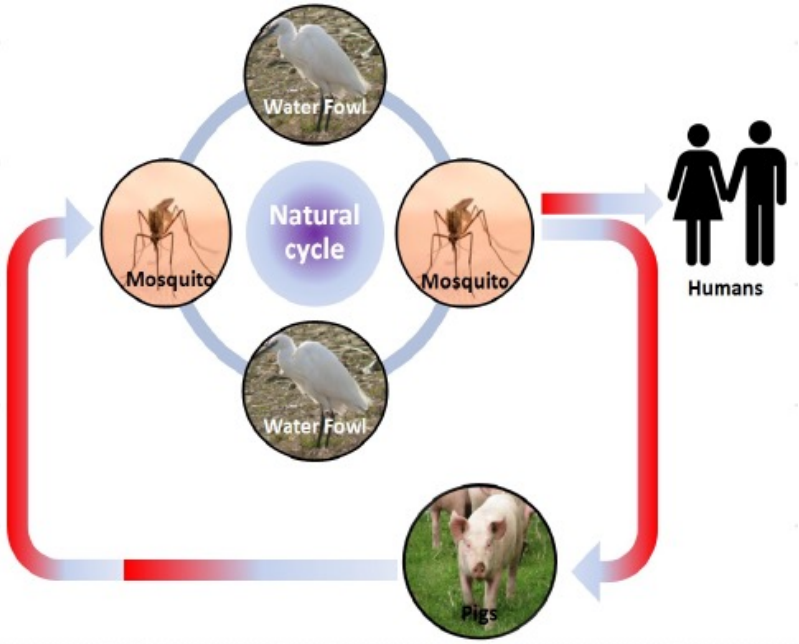
KAWASAKI DISEASE

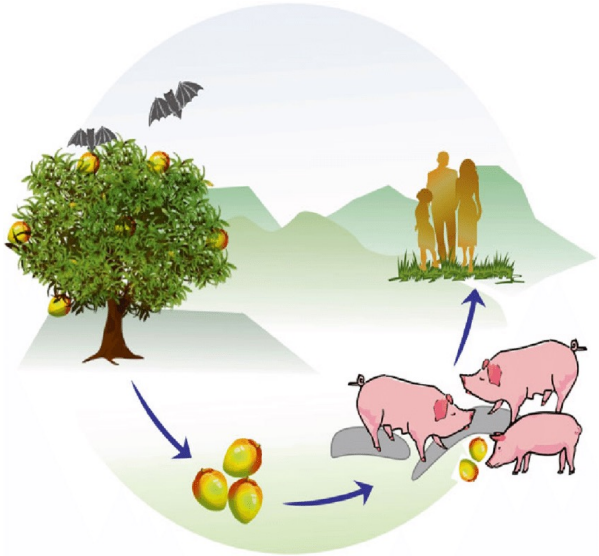
"Crash & Burn"
Conjunctivitis
Rash
Adenopathy
Strawberry tongue
Hands swelling
BURN (fever lasting > 5 days)
Rx:

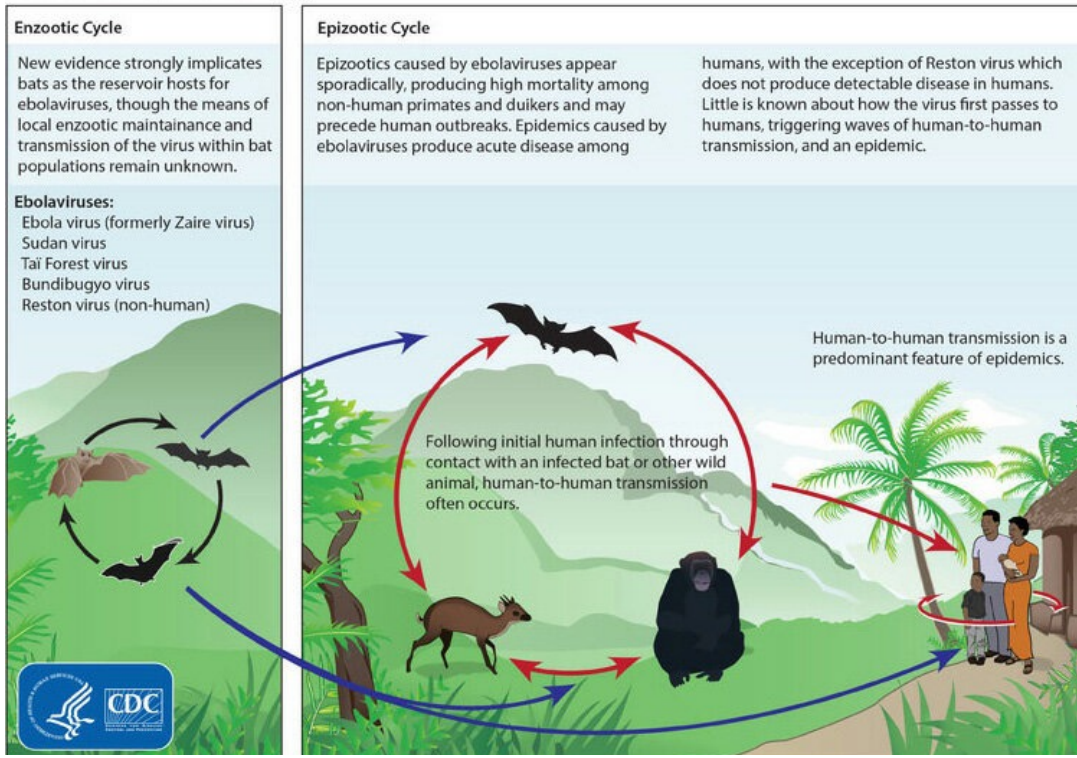
Reye syndrome:



LIFE CYCLES







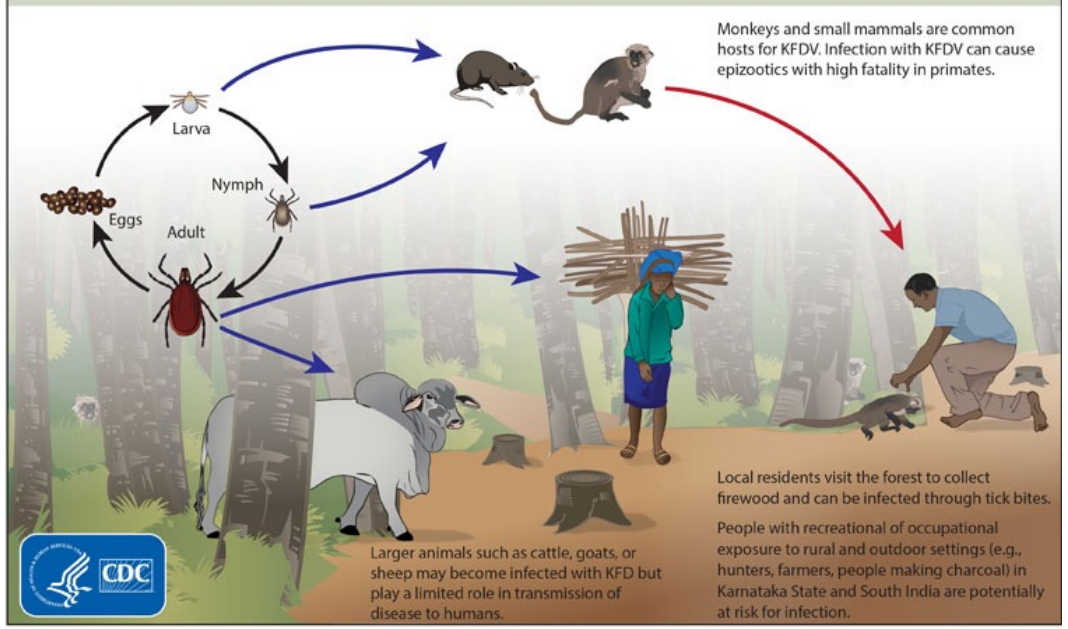
Most virulent:
Least virulent:

Kyasanur Forest Disease (KFD) Virus Ecology

The hard tick *Haemaphysalis spinagera* is the reservoir and vector of Kyasanur Forest Disease Virus (KFDV). Once infected, ticks remain so for life and are able to pass KFDV to offspring via the egg.

Transmission of KFDV to humans may occur after a tick bite or contact with an infected animal, most commonly a sick or recently dead monkey. No person-to-person transmission has been described.

Human cases occur more frequently in drier months (Nov-June) and in Southwest and South India.



Monkeys and small mammals are common hosts for KFDV. Infection with KFDV can cause epizootics with high fatality in primates.

Local residents visit the forest to collect firewood and can be infected through tick bites.

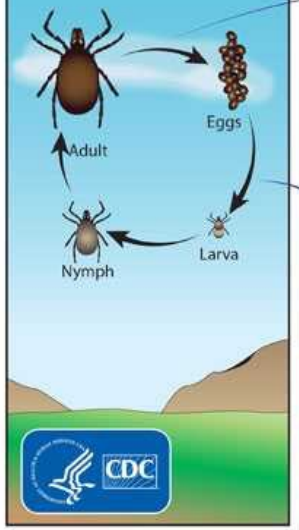
People with recreational of occupational exposure to rural and outdoor settings (e.g., hunters, farmers, people making charcoal) in Karnataka State and South India are potentially at risk for infection.

Larger animals such as cattle, goats, or sheep may become infected with KFD but play a limited role in transmission of disease to humans.

Enzootic Cycle

Ixodid (hard) ticks are both a reservoir and vector for the CCHF virus.

The virus is maintained in nature transovarially and transstadially.



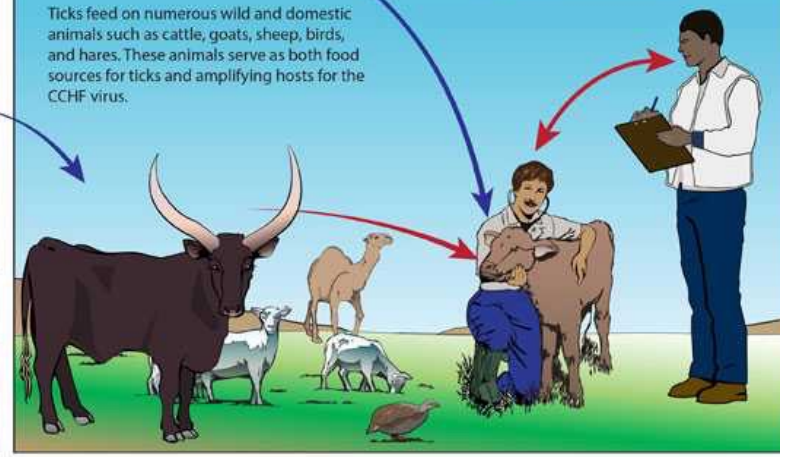
Epizootic-Epidemic Cycle

CCHF cases occur more during the warmer parts of the year, mostly the spring and summer. There are no cases during the winter.

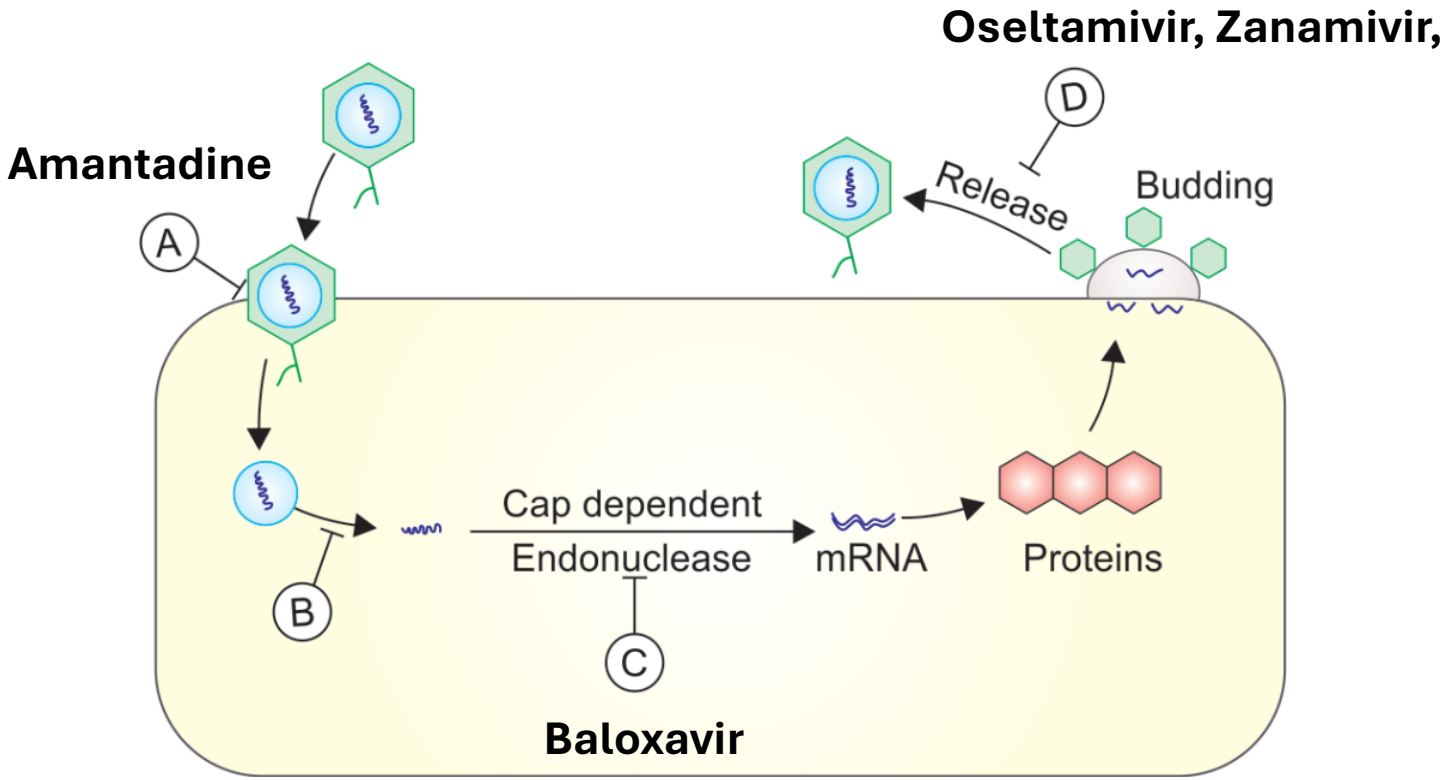
Humans become infected through tick bites and direct contact with infected animal blood or tissue

Transmission can occur while slaughtering infected animals, during veterinary procedures, and in hospital settings where proper protective equipment and appropriate disinfection procedures are lacking.

Ticks feed on numerous wild and domestic animals such as cattle, goats, sheep, birds, and hares. These animals serve as both food sources for ticks and amplifying hosts for the CCHF virus.

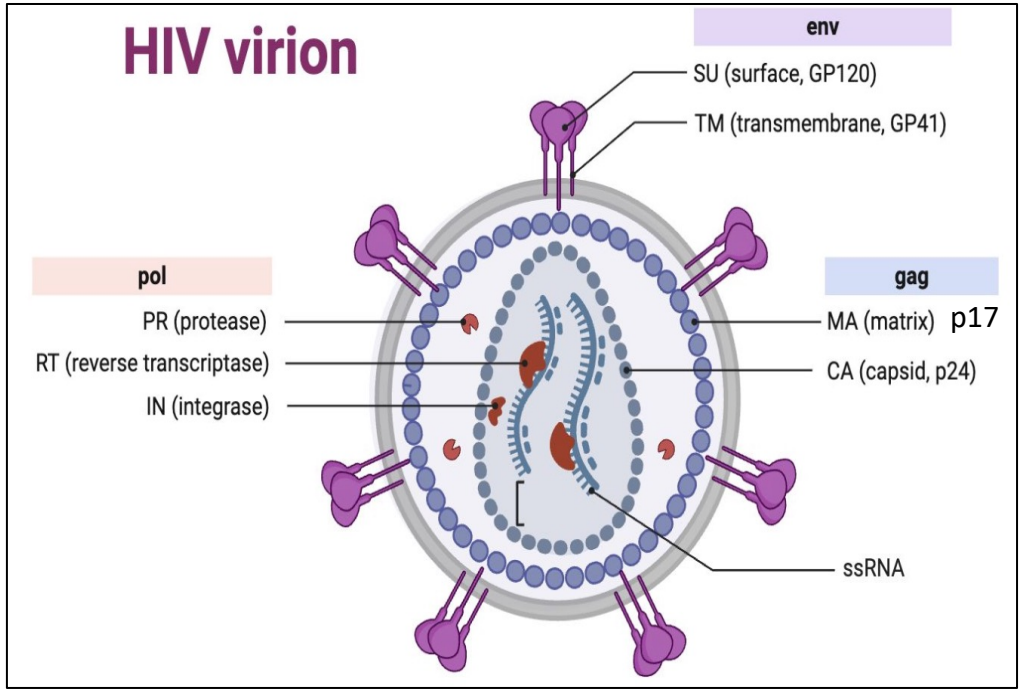


ANTIVIRALS



Inhibits viral RNA-dependent RNA polymerase in COVID-19:
Inhibit viral DNA polymerase in VZV/HSV (Viral thymidine kinase):
Inhibit viral DNA polymerase in CMV (Viral UL97 kinase):
Inhibit Pox p37 inhibiting exit from cell:

HIV/AIDS



IOC for viral load/ Rx response:
Screening:
Confirmation:
Blood donation:
Symptomatic:
Asymptomatic:

Mode	Efficiency/Risk
Sexual transmission	0.01-1%
Blood	90%
Needles	0.3%
Vertical	30% (max: during delivery)

Coreceptor: CCR5 on macrophages (early)
CXCR4 on T cells (late infection)
MC strain in india:

NACO: 95-95-95:
All in initiative:
Nirantar scheme:
SUNRISE project:

ANC-Opt
HIV + Pregnant female:
Delivery:
Most important prognostic factor:
Newborn of mother on ART:
High-risk newborn:
Early infant diagnosis:

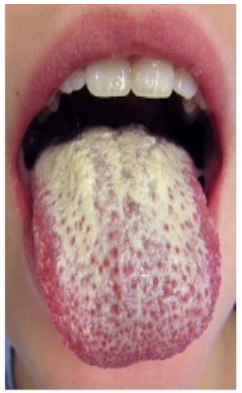
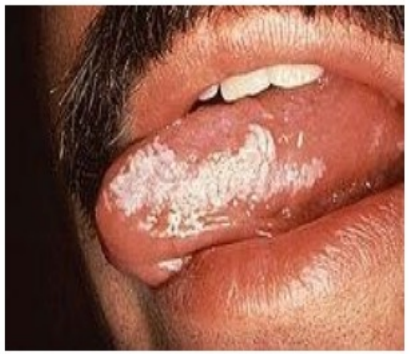
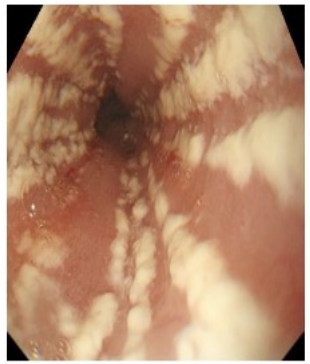
WHO HIV STAGING

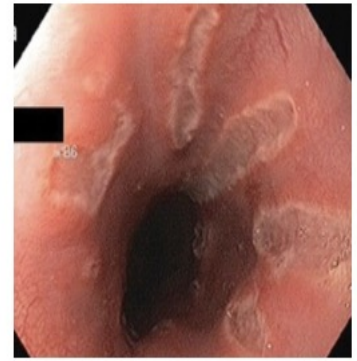
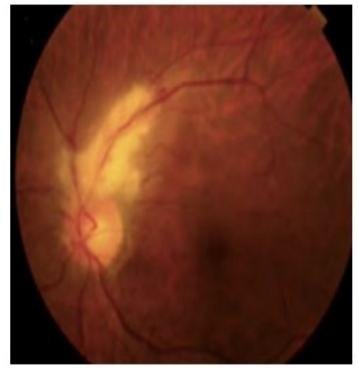
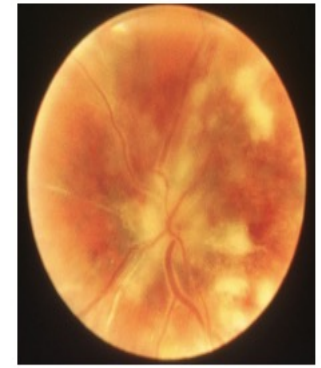
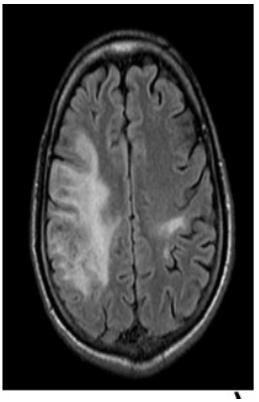
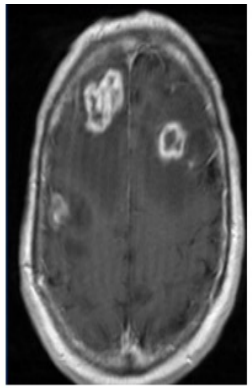
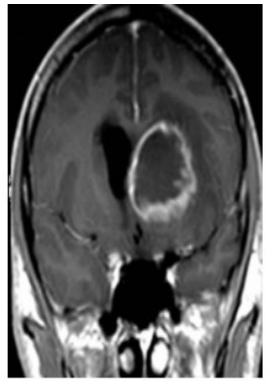
Stage 1 – Asymptomatic	Stage 2 – Mild disease	Stage 3 – Moderate disease	Stage 4 – Severe disease (AIDS)
Persistent generalized LN	Weight loss 5–10%	Weight loss >10%	HIV wasting syndrome
	• Angular cheilitis • Recurrent mouth ulcer	• Oral thrush • Acute necrotizing ulcerative gingivitis • Oral hairy leukoplakia	• Esophageal thrush • Herpes simplex ulceration >1 month
	• Recurrent URTI • Seborrhea • Herpes zoster	• Pneumonia • Pulmonary TB • TB lymphadenopathy	• Extrapulmonary TB
		• Unexplained fever >1 month • Diarrhea >1 month	• PCP • Cryptococcal meningitis • Toxoplasma brain abscess • Visceral leishmaniasis
			• Lymphoma • Kaposi sarcoma • Invasive cervical cancer

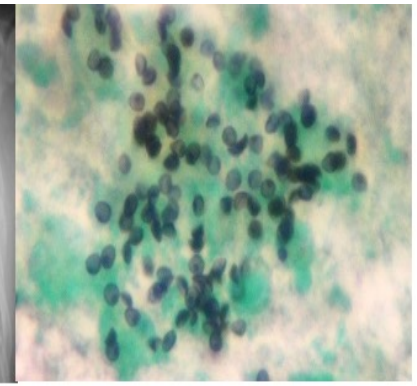
High risk group:
IVDU / MSM / CSW / TG
Bridge: LDT/ SMM

Proxy for general population:

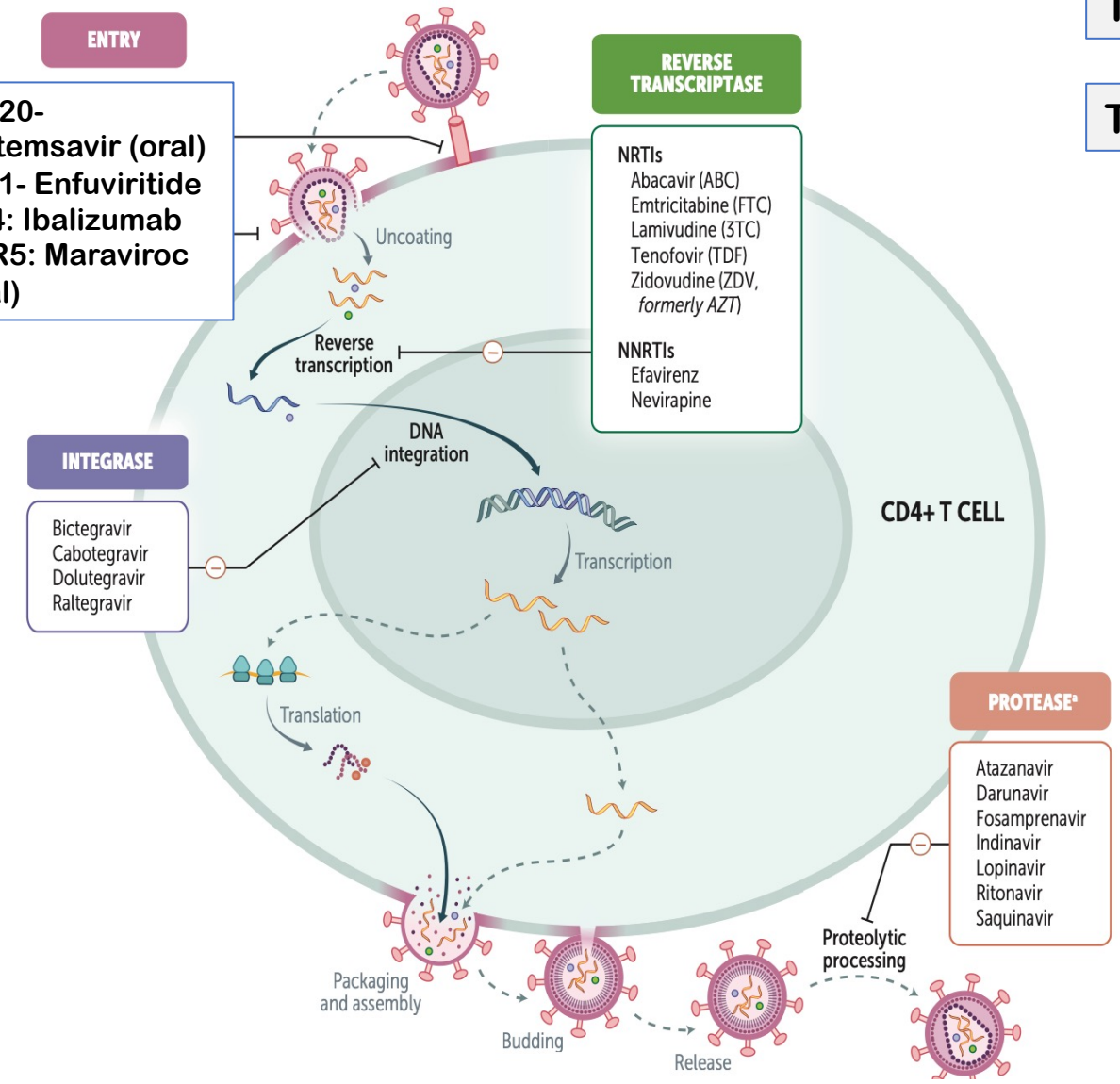
Prophylaxis:



ANTI-RETROVIRALS



Tenofovir 300 mg+ Lamivudine 300 mg + Dolutegravir 50 mg

Tenofovir + Emtricitabine: Pre-exposure Prophylaxis

Max neuropathy-
Max pancreatitis-
BM suppression, Hepatotoxic, mitochondrial myopathy-

Nephrotoxic-
MI, HLA-B*5701 Hysn-
Pigmentation in palms and soles-
Safest-
Hep B-

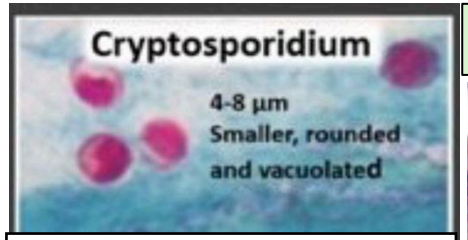
Best to prevent vertical transmission-
Teratogenic, Vivid dreams-

Min lipodystrophy-
Stones, hyperbilirubinemia-
Intracranial hemorrhage-

Myopathy-

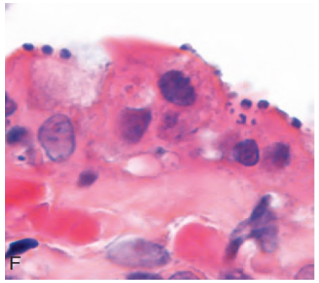
Parasitology- Protozoa

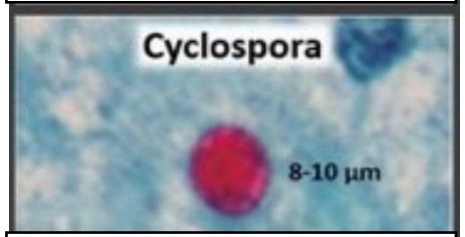
Sporozoa



Oocyst immediately infective in stool

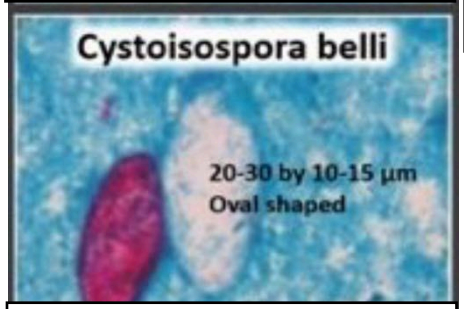
DOC-Nitazoxanide





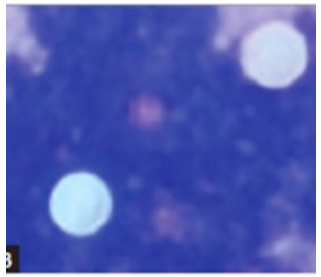
Raspberry
Auto-fluorescence

DOC-TMP-SMX

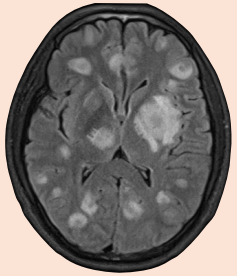


Auto-fluorescence

DOC-TMP-SMX

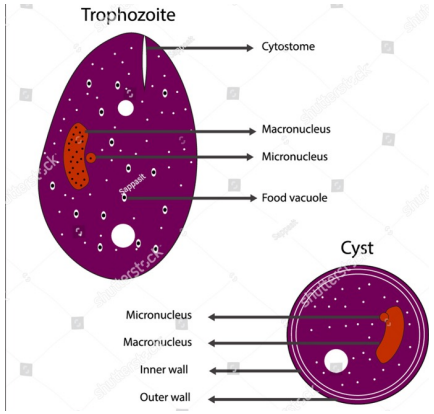


Ingestion-
Cat feces:
Meat:
Vertical:
Oocyst infective in stool?
Frenkel test
Sabin Feldman test
IgG avidity test:
High-
Low-
DOC:
DOC in Pregnancy:



Plasmodium
Babesiosis

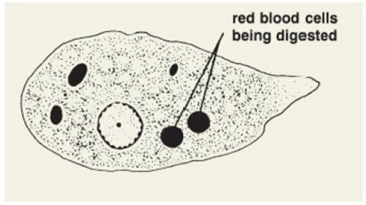
Ciliated

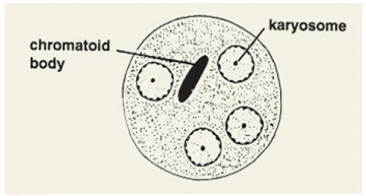


DOC: Doxycycline

Parasitology- Protozoa

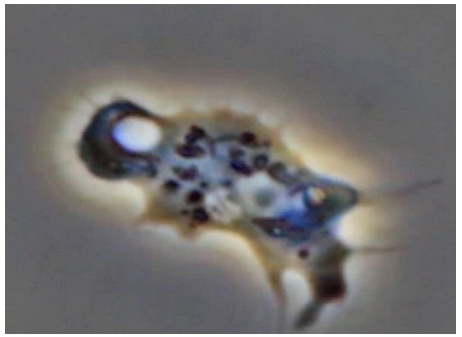
Amoeba





DOC: Metrogyl + Paromomycin

DOC: Amp B



DOC: Pentamidine

Non-nutrient agar with E.coli

Balmuthia
Sappnia

Flagellated

T.cruzi/American trypanosomiasis

DOC-Benznidazole

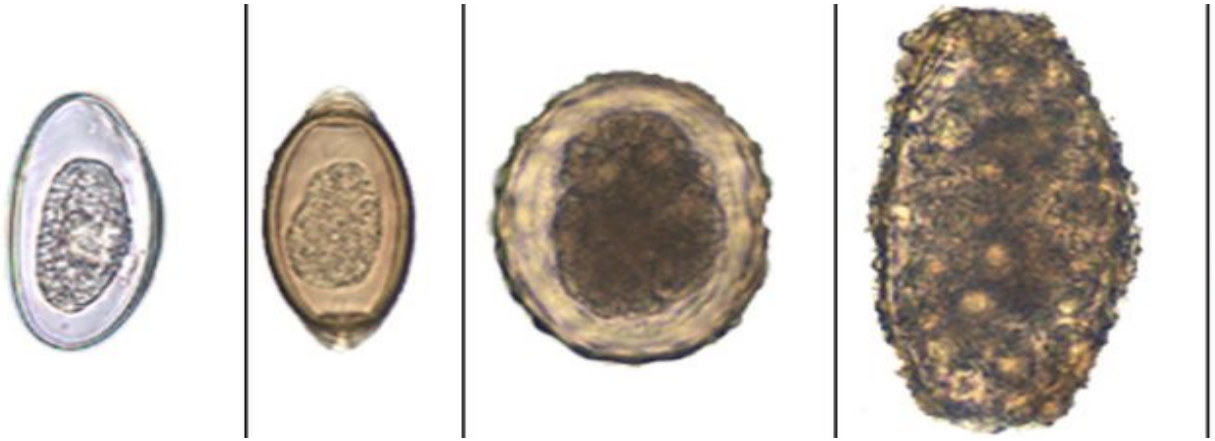
T.brucei/African trypanosomiasis

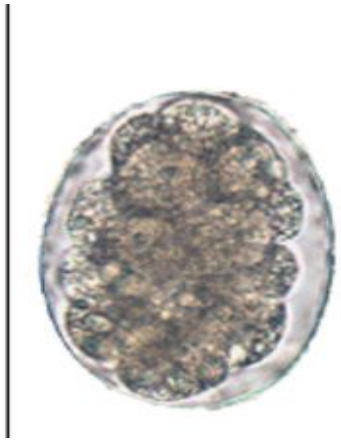
DOC-Suramin
NNN medium

DOC: Metrogyl

DOC: Metrogyl

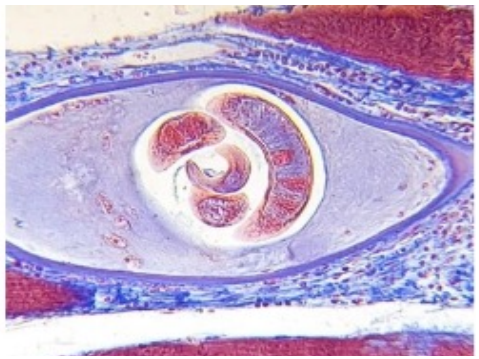
Parasitology- Nematodes





Chandler's index

Parthenogenesis
Fullborne test
Smallest

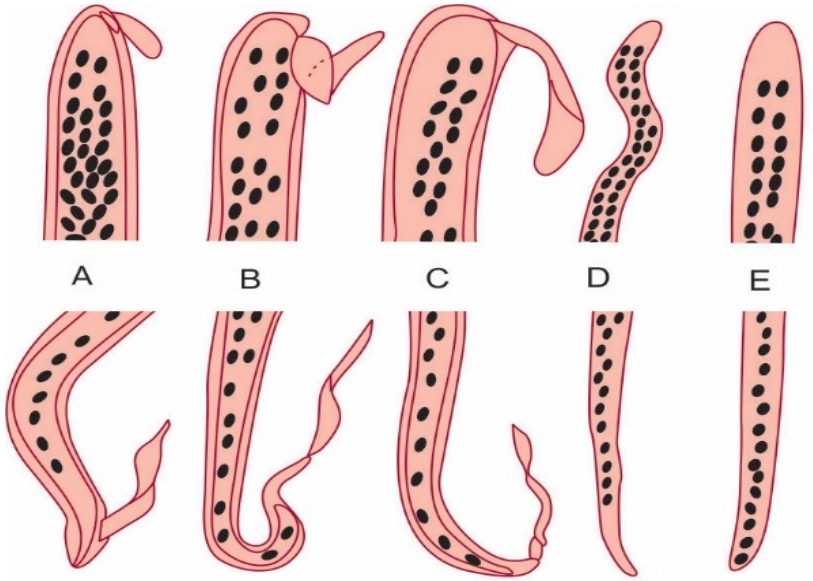


Bachmann test

Ingested—Enterobius, Ascaris, Trichuris, Trichinella, Toxocara
Cutaneous—Strongyloides, Hookworm
Bites—Loa loa, Onchocerca volvulus, Wuchereria bancrofti

Nematodes- Filarial worms

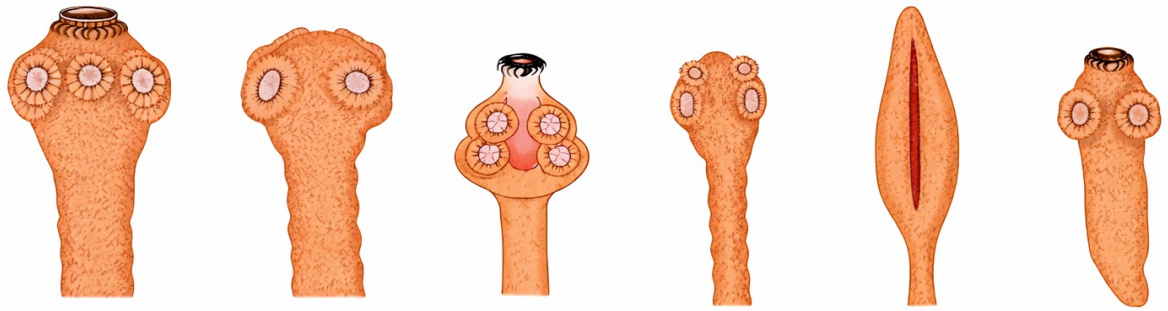
A. Wuchereria bancrofti
B. Brugia malayi
C. Loa loa (calabar swelling-deerfly-Chrysops)
D. Onchocerca volvulus
(river blindness-Blackfly/Simulium
Mazzoti test)
E. Mansonella perstans



Transmission assessment survey
IOC:
DEC Provocation test
Concentration: Membrane filtration / Knott method (2% formalin)
DOC:

Parasitology- Cestodes

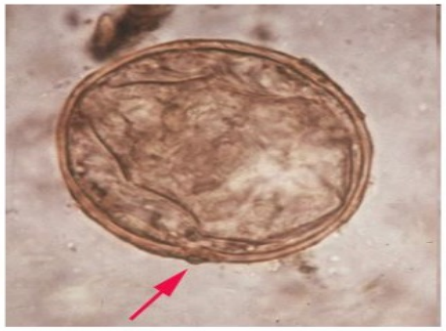
Casoni test

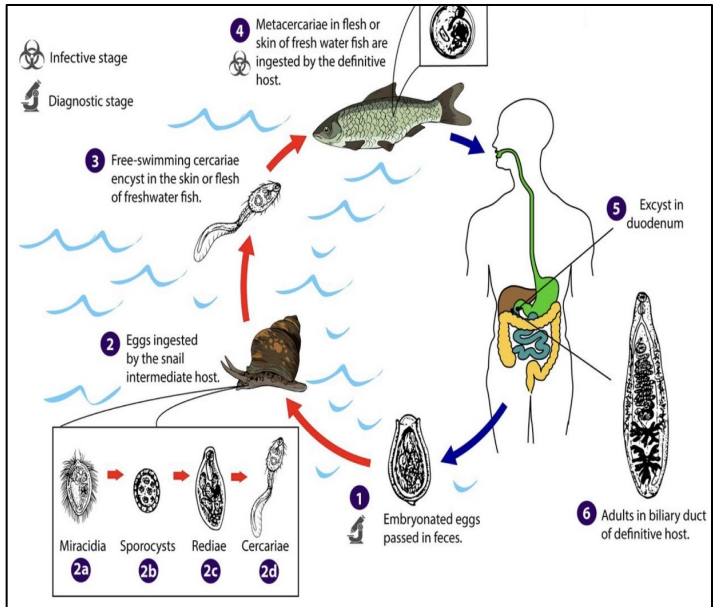


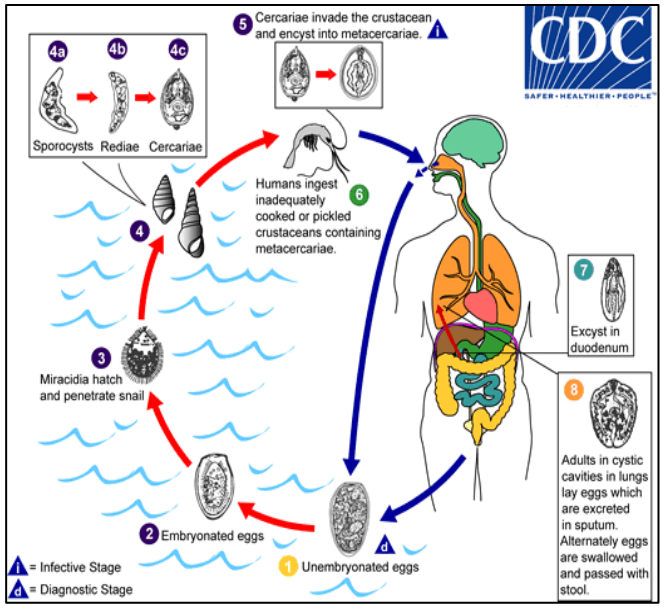
4 suckers 2 rows of hooks	4 suckers No hooks	4 suckers single row of 20–30 hooks	4 suckers No hooks	2 Suctorial grooves or bothria, no suckers, No hooks	4 suckers 2 rows of hooks

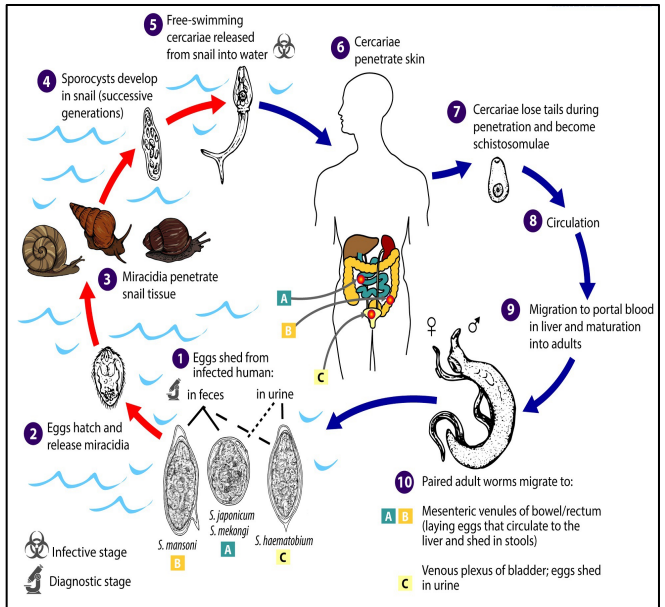
Parasitology- Trematodes

Infective form: S-
Transmission: S-
Sexes- S-
Eggs- S-
Definitive host-
Primary Intermediate-
Second Intermediate-
Paragonimus -
Opisthorchis/ Clonorchis-
Fasciola-

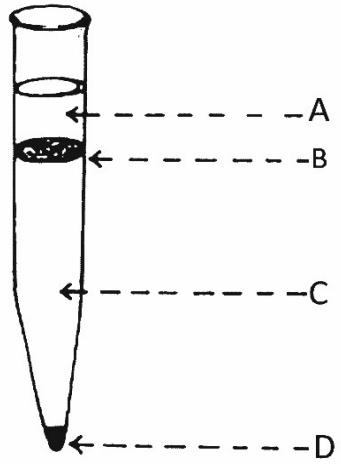








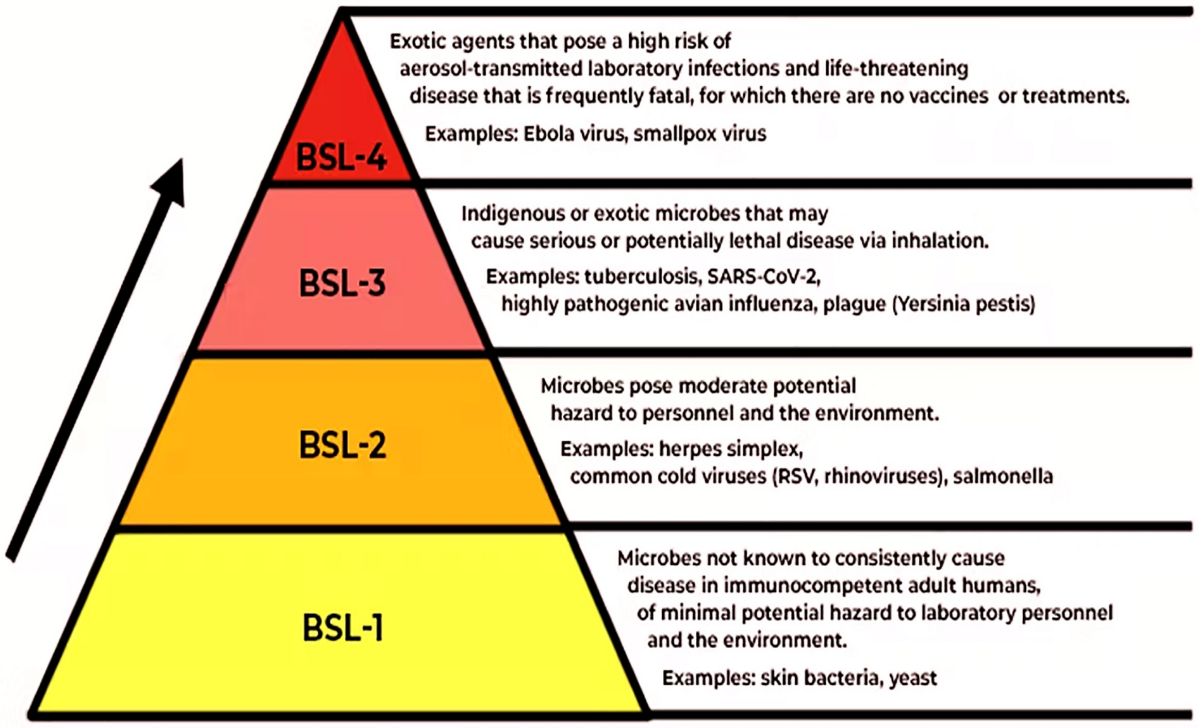
Non Bile-Stained	Don’t Float	Autoinfection



DOC: Cestodes, Trematodes-
Liver Fluke-
Hydatid, NCC, Nematodes-
Filaria, Loa, Loa-
Onchocerca, Strongyloides-

General Microbiology

Bio Safety Levels

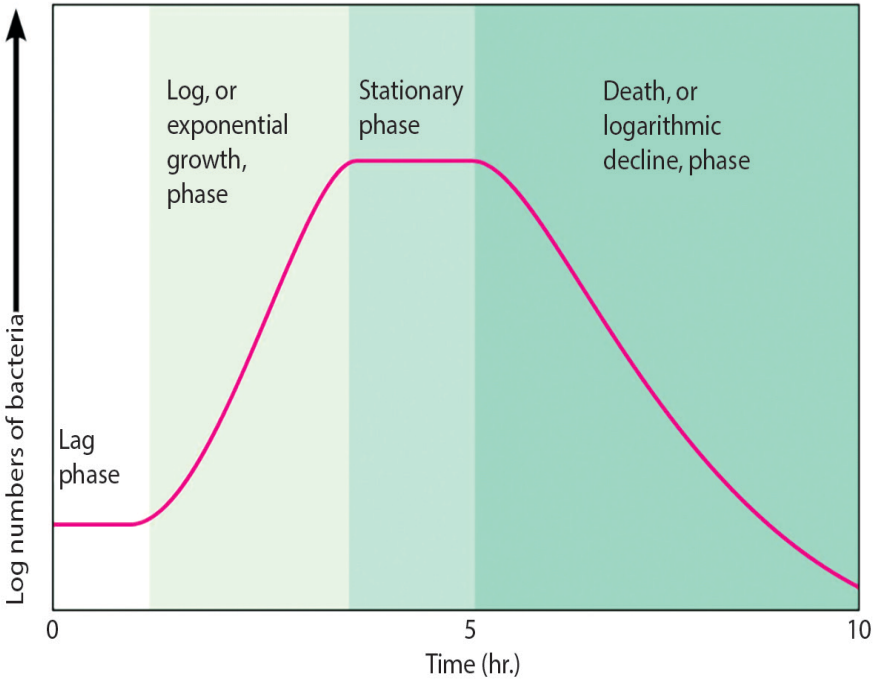


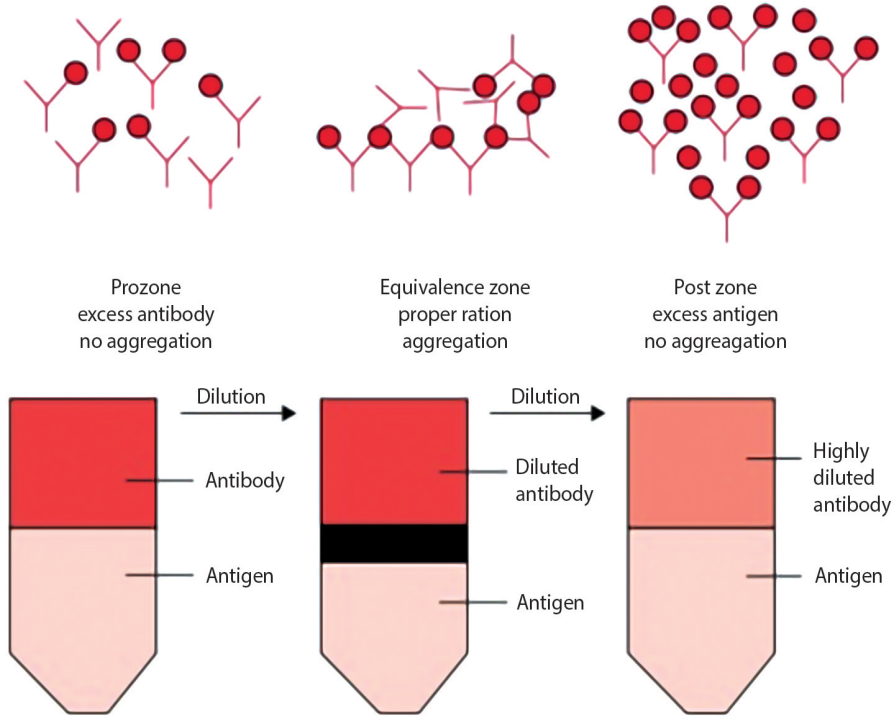
Bioterrorism Agents

Category A: Smallpox, Anthrax, Botulism, Plague, tularemia, viral hemorrhagic fever (yellow fever, KFD, Ebola, Marburg, Lassa)

Category B: Brucella, C. perfringens (epsilon toxin), Salmonella, Shigella, E. coli O157: H7, Staphylococcus (enterotoxin-B),V. cholerae, Q fever, Typhus, fever, psittacosis, glanders, Melioidosis

Category C: Emerging infections like Nipah, Hanta virus, SARS corona virus





Keratinlike coat, dipicolinic acid, peptidoglycan, DNA
Stain: Schaeffer/ Ashby

Ag-Ab tests

Precipitation/ Flocculation

- Ring test: Ascoli Lancefield
- Slide: VDRL
- Tube: Kahn
- Immunodiffusion/ Gel: Elek test
- Rocket electrophoresis: Quantitative

	Single dimension Tube	Double dimension Slide
Single diffusion Ag moving	Oudin	Mancini
Double diffusion Ag + AB moving	Oakley-Fulthrope	Ouchterlony

Agglutination

- Slide: Blood grouping, Rose Bengal
- Tube: Widal Weil Felix Paul-Bunnel CAT SAT MAT

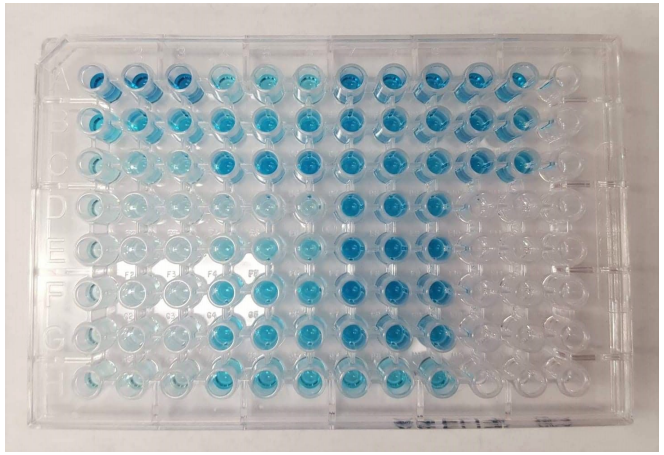
- Coombs test
- Indirect/Passive agglutination:
- Latex-ASO, CRP, RF, HCG
- Heme-Rose Waaler test

WIDAL TEST	TO	TH	AH	BH
S. typhi				
S. paratyphi A				
S. paratyphi B				
Early infection				
Late infection				
Vaccinated (Vi)				

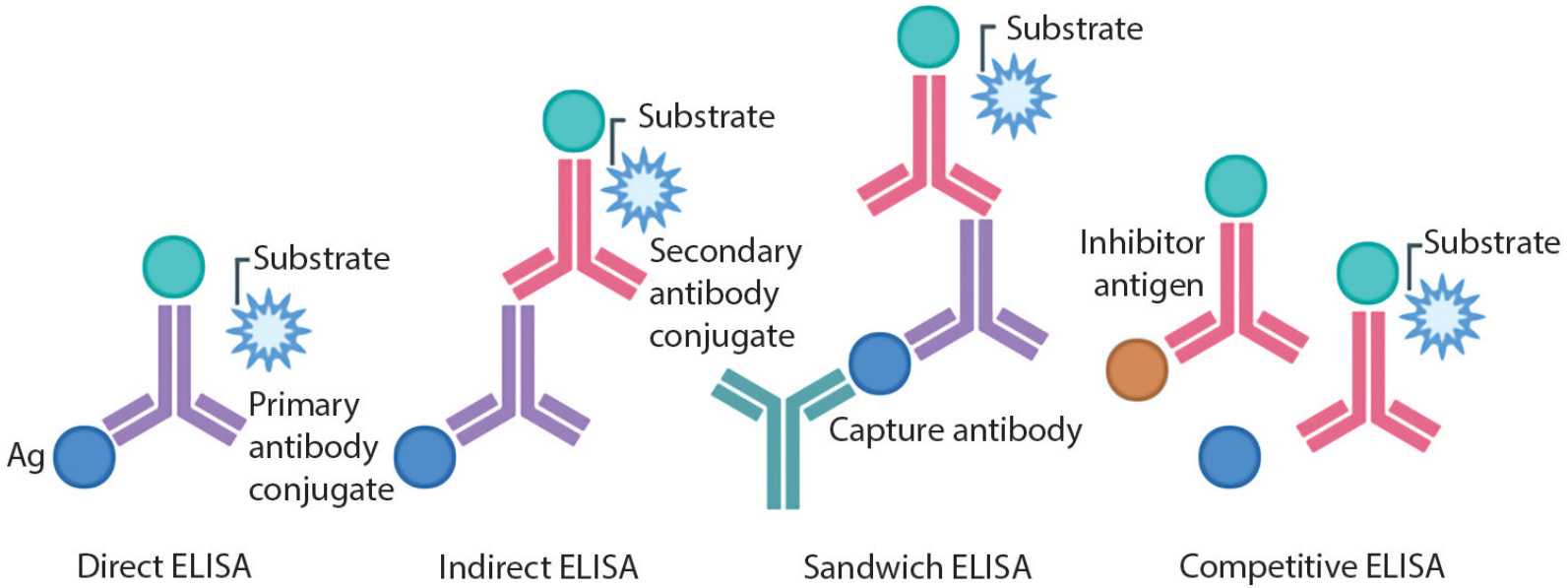
Complement fixation

Wassermann, TPI
Sabin Feldman

ELISA



Enzyme: Horseradish peroxidase
Substrate: H_2O_2
Chromogen: Tetramethylbenzidine(TMB)



Sterilisation (Joseph Lister)

Autoclave 121 x 15min x 15psi	Hot Air Oven 160 X 2HR	H_2O_2 = Plasma	Ethylene Oxide	Radiation: Gamma rays	Aldehydes: Glutaraldehyde 2%	Membrane filtration

Hypochlorite 5%

Milk Pasteurisation: Non-sporicidal

- 63º x 30 min
- 72º x 15 sec
- 125º x 3 sec

- Coliform, Standard plate, Phosphatase test

Microbiological Controls

B.subtilis:

B.stearothermophilus:

B.pumilis:

B.globigi:

Spaulding classification

Critical :

Semi-critical:

Non-critical: