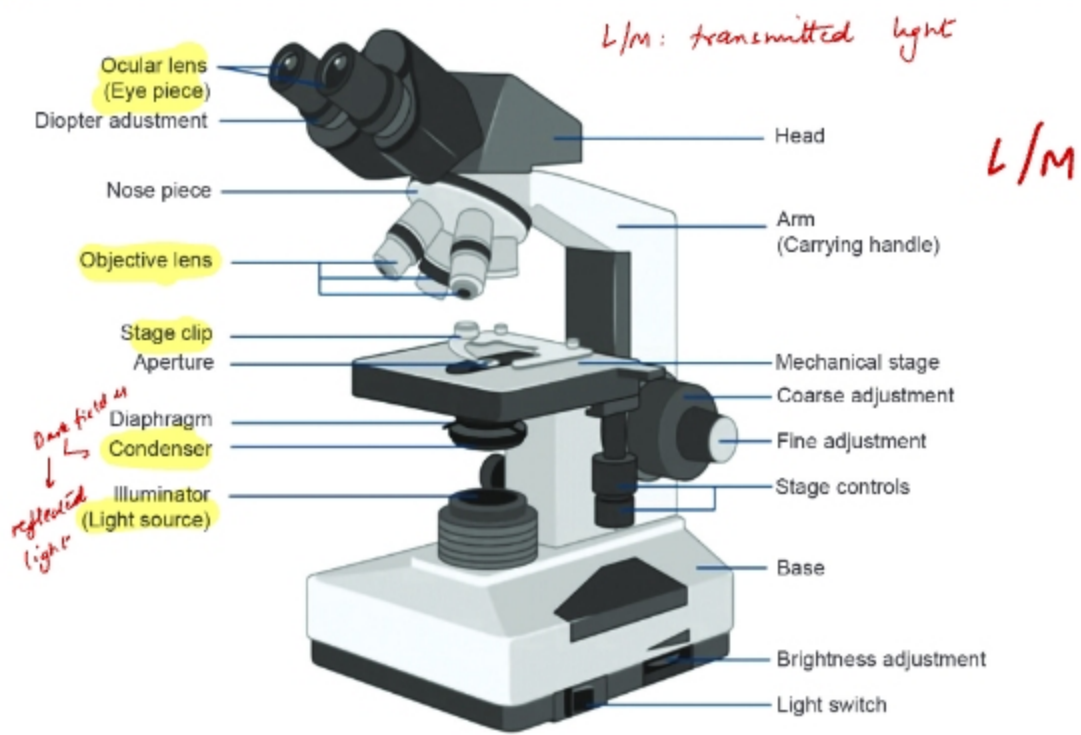


# **MICROBIOLOGY AND INTEGRATED INFECTIONS**

---

# MICROSCOPES



**Fixative:** 10% formalin

**Slide:** Glass

**Resolution:** 0.2  $\mu$ m

**Magnification:** Eye piece: 10x

**Objective lens:** 4x 10x 40x 100x  
 Scanner LIP HIP oil immersion

**Max magnification:** 1000x

Contact admin  
 Join our group

*E/M (vacuum)*

**Fixative:** 2.5% Glutaraldehyde

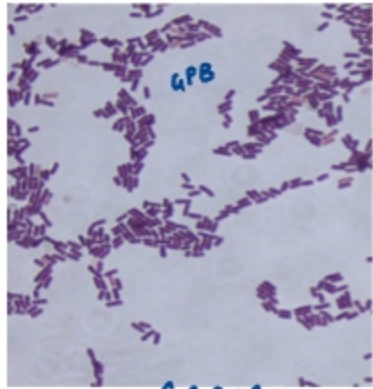
**Slide:** Cu

**Resolution:** 0.2 nm

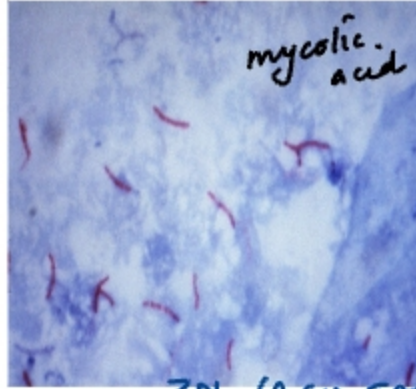
**Internal structures:** TEM

**3D image:** SEM

# GENERAL BACTERIOLOGY



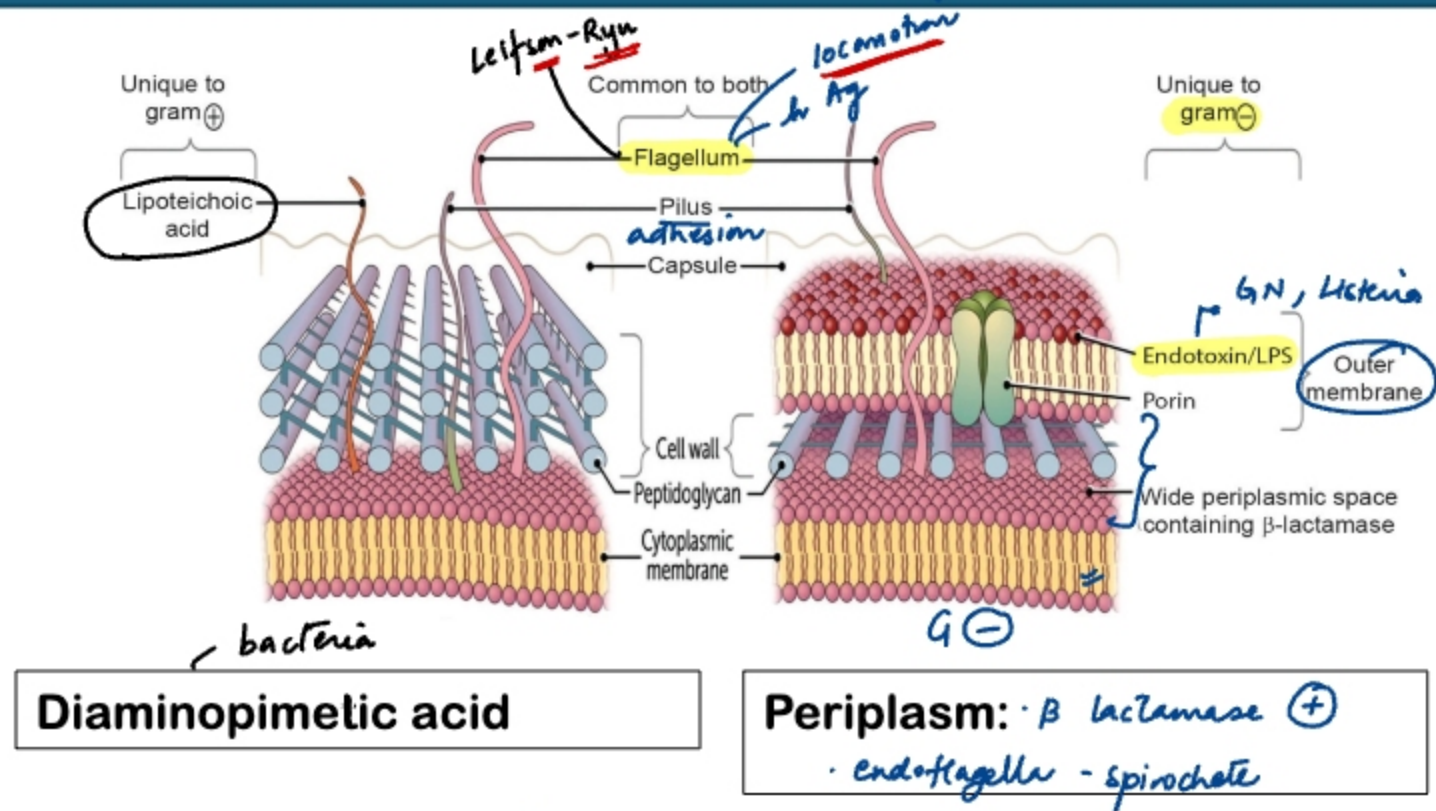
GRAM



ZN / ACID FAST

**Primary:** Crystal violet  
**Mordant:** Iodine  
**Decoloriser:** Acetone  
**Counterstain:** Safranin red

**Carbol fuchsin**  
 $\Delta$   
**Acid =  $H_2SO_4$**   
**Methylene blue**



**ACID FAST-  $H_2SO_4$**   
**TB:** 20%  
**Leprosy:** 5%  
**Nocardia, Legionella:** 1%  
**Cryptosporidium/ Isospora/ Bacterial spores/ Head of sperm:** 0.5%  
**COLD:** Kingan  $\uparrow \Delta x$  Mordant - Phenol *ops*

**Endotoxin: Low antigenicity**  
**CD14/TLR4**  
**O - O Ag**  
**C - Core polysaccharide**  
**A - Lipid A (most toxic)**  
**LOS: Neisseria / Hemophilus**

**Linulus amebocyte assay (LAL):** endotoxin

# Toxins - A B <sup>- Action</sup> <sup>- Binding</sup> (ADP Ribosyl<sup>m</sup>)<sub>2</sub>

## Inhibit Protein Synthesis

### EF-2-

- Diphtheria toxin <sup>AD</sup>
- Pseudomonas exotoxin A

### 60S -

- Shigella toxin
- SLT = VLT
- ↓ Vero line
- EHEC O157: H7 **Sorbitol x**
- ↓
- mcc of HUS
- Hemolytic uremic anemia
- Dysentery

## cAMP ↑

- C: COT = ZOT <sup>zonula occludens</sup>
- A: Anthrax <sup>α GM 1 ganglioside</sup>
- L: LT = ETEC
- P: Pertussis

## cGMP ↑

- ST: ETEC

## NT release ⊖

### SNARE ⊖

- ACh ⊖
- ↓
- flaccid paralysis
- Botulinium toxin
- Glycine ⊖
- GABA ⊖
- ↓
- spastic paralysis
- Tetanosparum <sup>pre-synaptic</sup>
- Strychnine <sup>post-synaptic</sup>
- Conscious in H/W

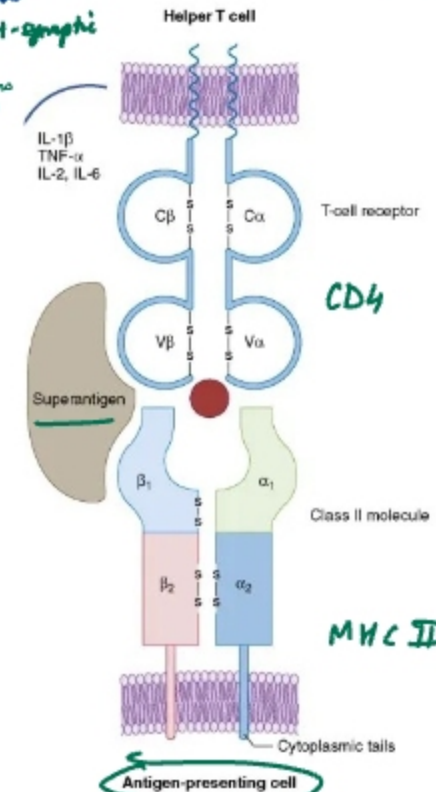
## Superantigen

TSS: Toxic shock C<sub>x</sub>

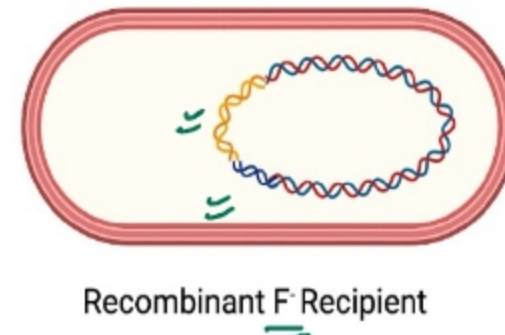
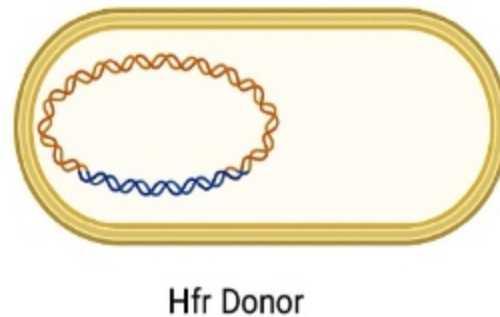
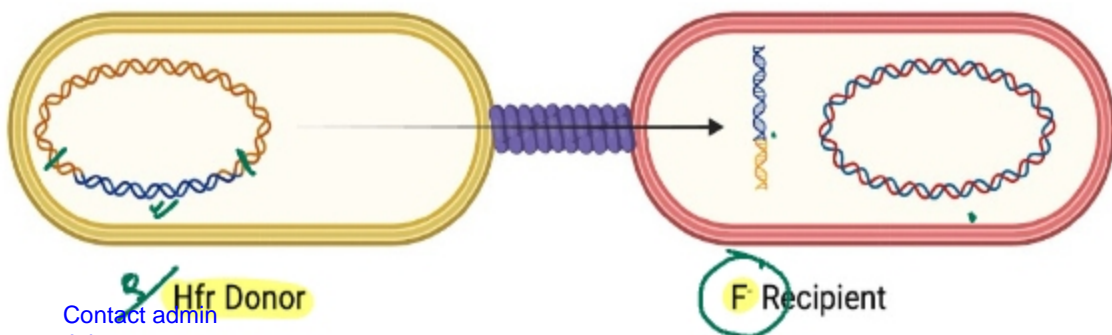
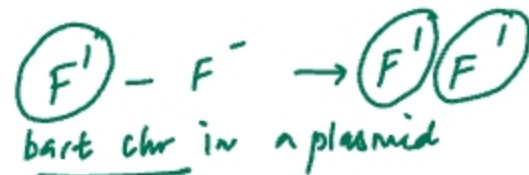
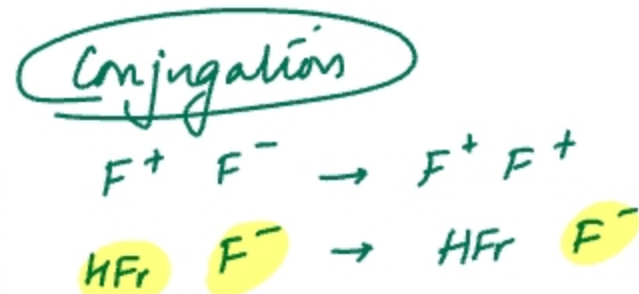
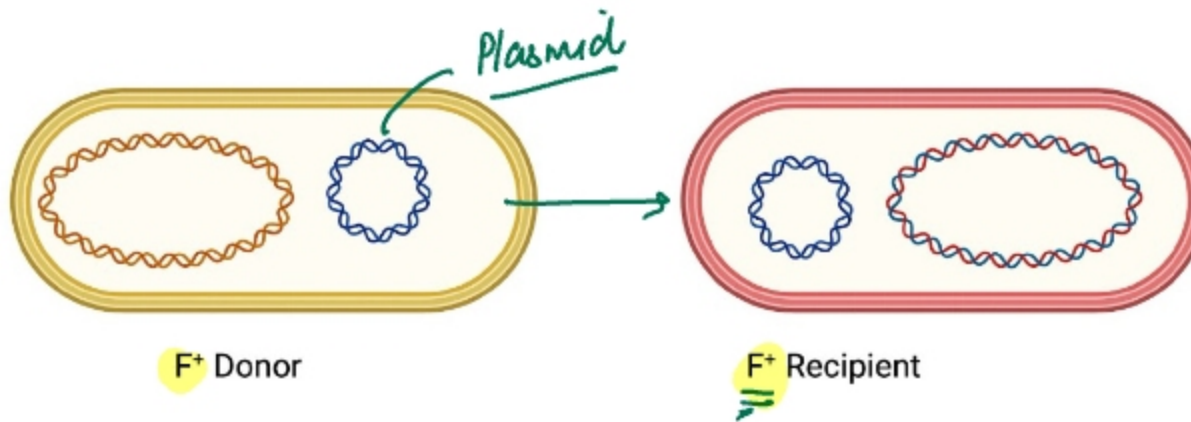
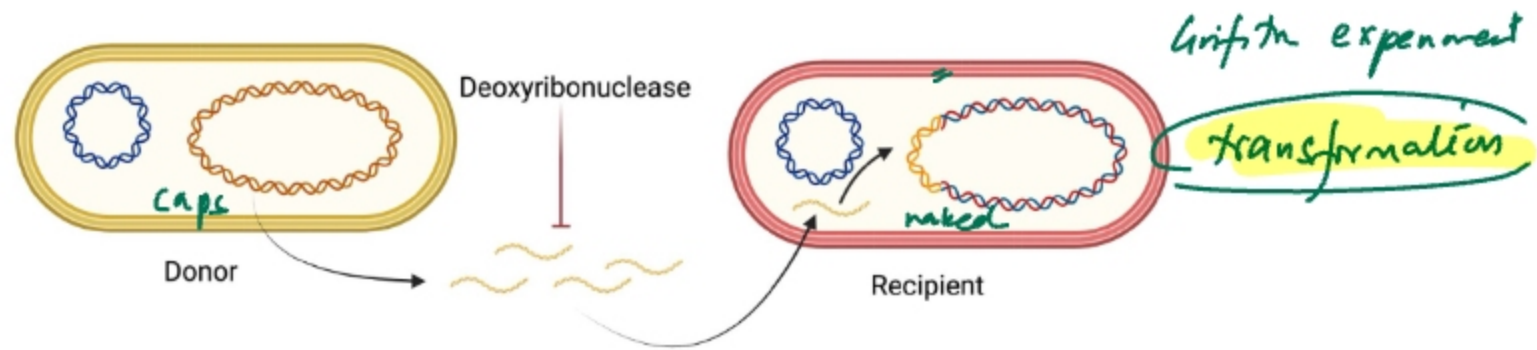
- S. pyogenes: SPE
- S. aureus: Entocotoxin F
- h/o retained tampon / nasal gauze



Canned Food: preformed toxin  
 Infant / wound: spores  
 ↳ Honey



# HORIZONTAL TRANSFER OF GENES

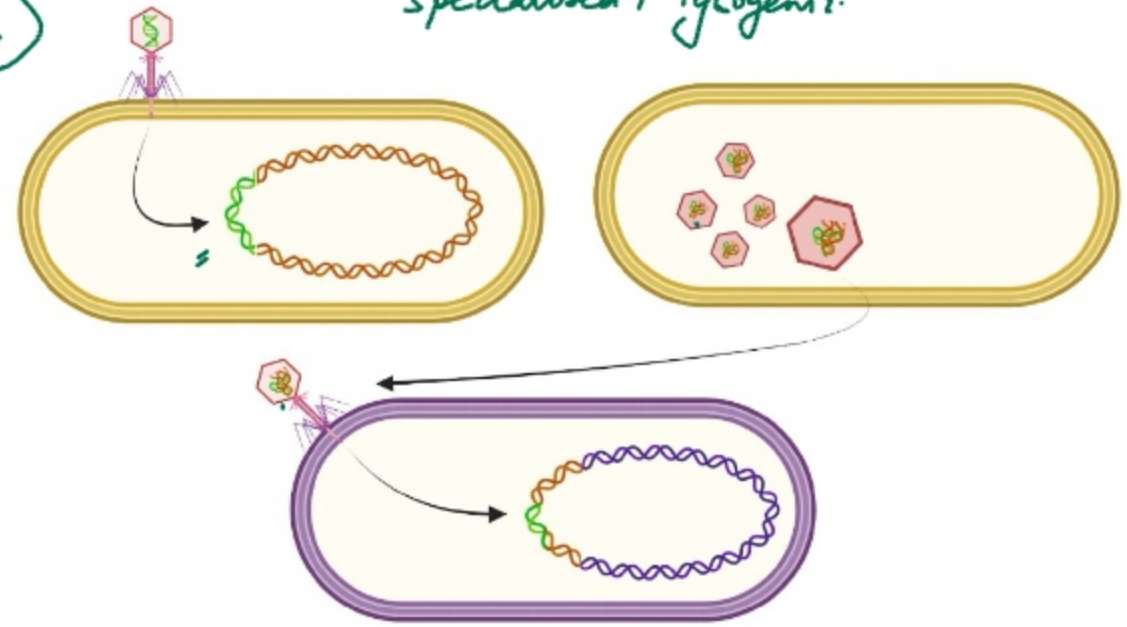
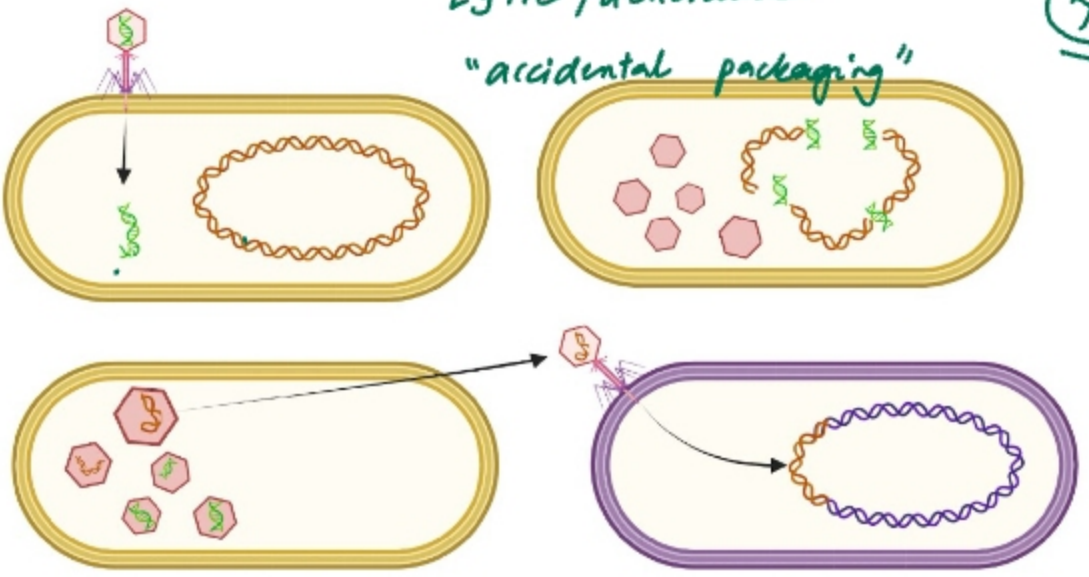


# HORIZONTAL TRANSFER OF GENES

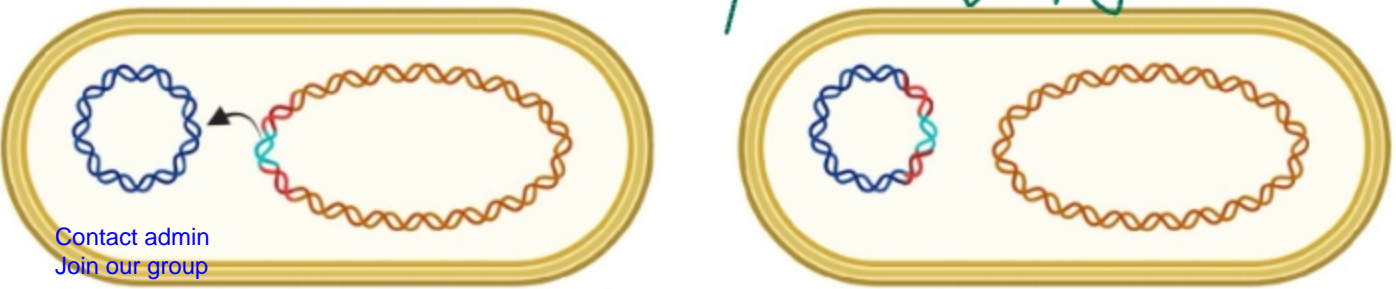
LYTIC / generalised  
"accidental packaging"

transduction

Specialised / lysogenic



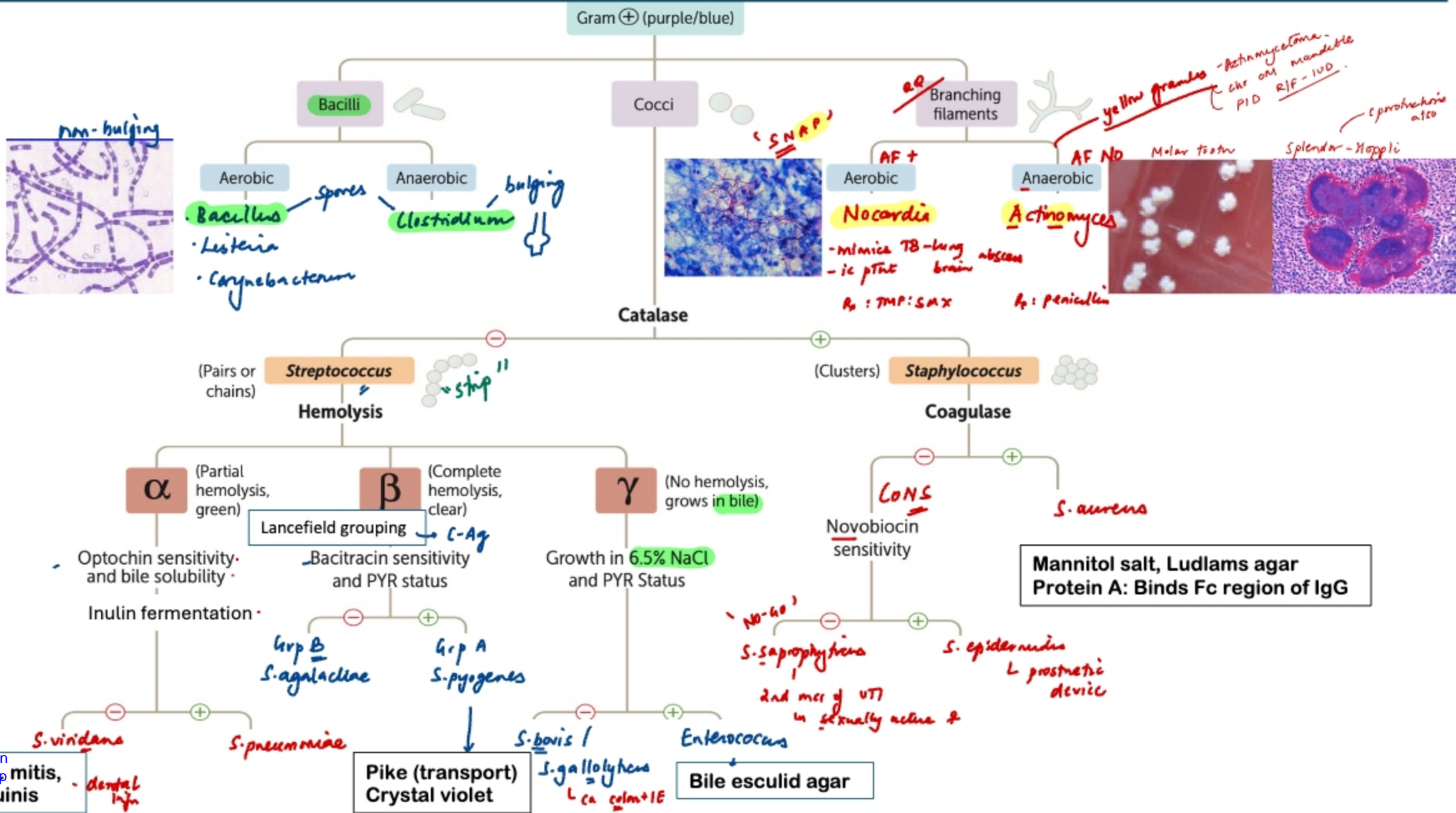
transposons "jumping"



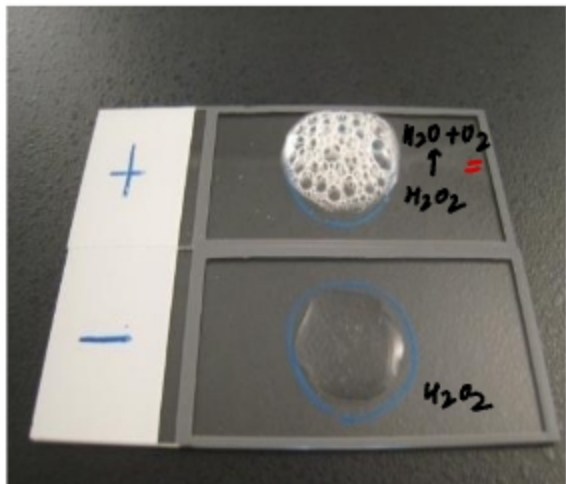
Toxins encoded in a lysogenic phage:

	A	B	C	D	S
GrpA	S. pyogenes	BT	CoT	DT	Shiga

# GRAM POSITIVE BACTERIA



# GRAM POSITIVE COCCI



Catalase (+):

- S - *S. aureus*, *S. terraria* (golden, red, red prodigiosin, red deeper in, pseudo hemophili)
- P - *Pseudomonas* (pyocyanin, pigments)
- A - *Aspergillus*
- C - *Candida*, *Cryptococcus*
- (E) - *Enterobacter*
- No - *Neisseria*
- TB - M.TB

Draughtsmann / Carrom car - autolysin

Quellung rxn

POLYSACCHARIDE CAPS + vaccine

SHEVINI - N. meningitidis

s.pneum Hib Vi-Salmonella

- Vaccine in splenectomy (OPSI)
- PPSV23: >2yrs
- PCV: 13 valent <2yrs -> immunogenicity
- Meningococcus: A, C, Y, W (x B)
- Transformation - Shi N
- IgA protease

Lobar consolidation

Camp test: Grp B Strep. mce of early onset n. capsia

Hippurate hydrolysis +

Reverse camp test: *C. perfringens*

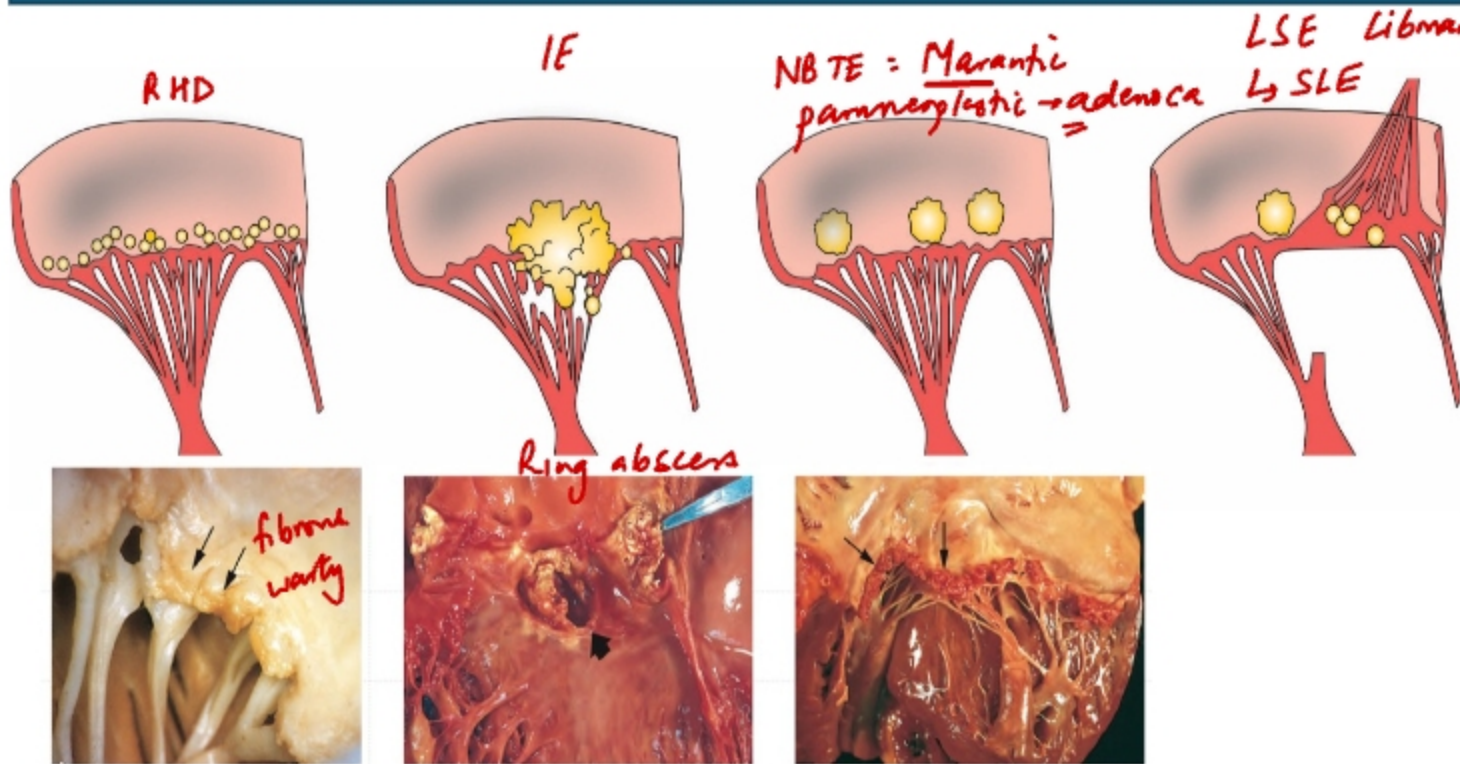


CSD - 10c: OHR > NBT

NAPDH oxidase R: INF Y

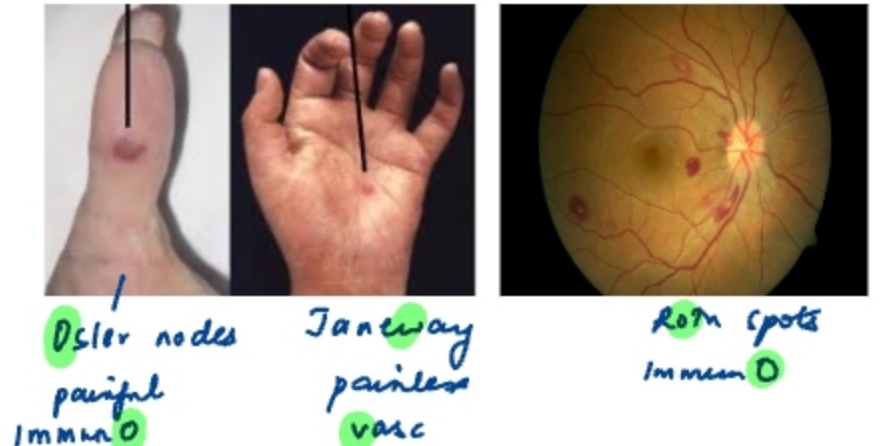
Contact admin  
Join our group

# IE



- Mod. Duke's **Mjr**
- (1) Positive Blood Cultures
    - Min: 3 sets - 30min apart - 2 peripheral - 1 has to central/veget
    - 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 burnetii* or *Bartonella* species *Tropheryma whippelii*
    - 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: mc: mitral except mc: tricuspid  
 MCC in IVDU/ Hospital Acquired / Acute- *S. aureus*  
 MCC in community acquired IE/ h/o dental procedure- *S. viridans*  
 MCC in prosthetic valve IE (<1yr)- *CONS*  
 MCC in ca colon- *S. bovis*  
 MCC in GI/GU procedure- *Enterococcus*



# GRAM POSITIVE BACILLI

## BACILLUS ANTHRAX

Polypeptide capsule

M'Fadyean test

Medusa head

Class A bioterrorism agent

Ring ppt: Ascoli test

Rx: Fa/Doxy Raxibacumab/ Obiltoxizumab

PLET: *B. anthrax* MYPA: *B. cereus*

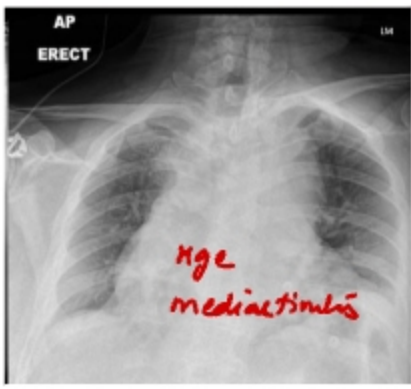
*B. cereus*  
↓  
chinese food  
- early emetic  
- late diarr



Inverted V for tree  
stab culture



Contact admin  
Join our group  
eschar ⊕



Hge mediastinitis

## LISTERIA

Cold, Tumbling motility

Differential: at 22 C, not 37 C

PALCAM

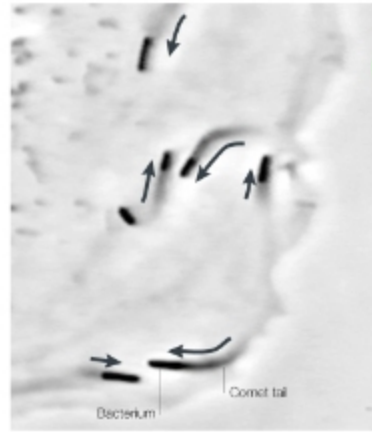
Actin polymerization: Rocket tails

Anton test

Unpasteurized milk products/  
deli meats/transplacental

Meningitis in extremes of ages

DOC- Ampicillin



Tob blue  
Indene  
TIM - Mot gram  
Albert  
DT: meliør  
granulæ /  
Babes Ernet /  
volutin

## LOEFLER BACTERIUM

Chinese letter

K tellurite agar/ Loeffler slope/ McLeod

Shick test - susceptibility

Ponder, Loeffler's methylene blue, Albert,

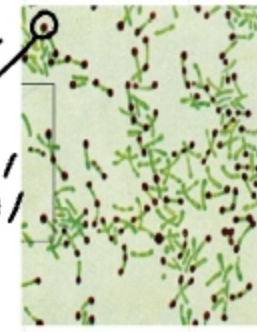
Neisser

myocarditis - toxemia

Case: Isolation till 2 negative culture +  
Macrolides + Antitoxin

Contact: Culture + Antibiotic (Macrolides)

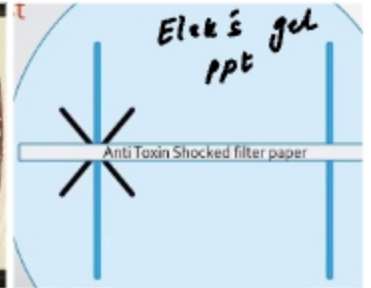
Vaccine status: <3 doses: DPT/DT booster  
>3 doses: >5yrs- DT booster <5yrs xx  
last dose



⊗ easily rem



Bull's neck



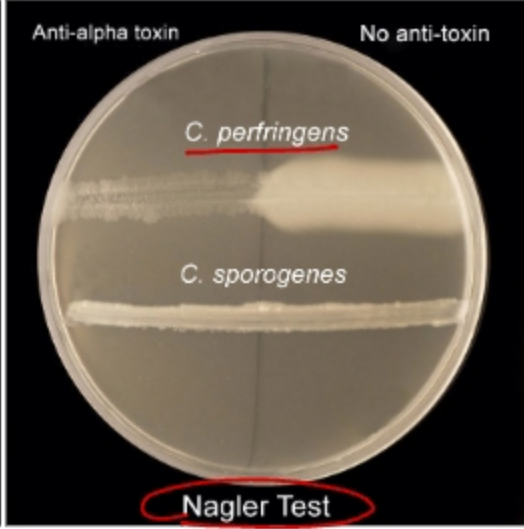
Elek's gel ppt

Anti Toxin Shocked filter paper

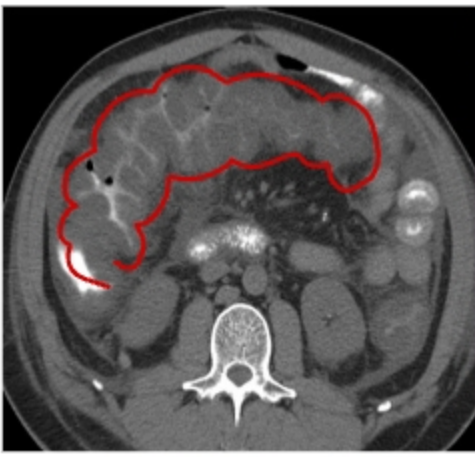
# CLOSTRIDIUM



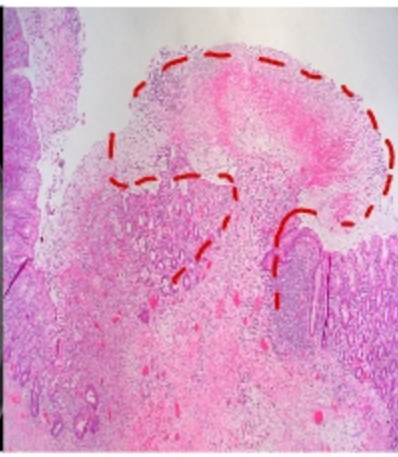
GAS GANGRENE  
"crepitus"



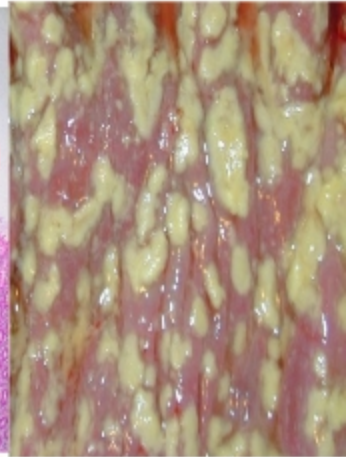
Nagler Test



ACCORDION SIGN



VOLCANO SIGN



pseudomembrane

Pseudomembrane colitis

C. difficile

C. perfringens

↓  
α toxin = Zn phospholipase / lecithinase  
most lethal: Botulinum

Target hemolysis  
Reverse CAMP  
Stormy clot  
RCMB

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



All Clostridium are (⊕) capsulated except

All Clostridium are motile except

C. perfringens  
C. butyricum  
Contact admin  
only by group

C. Perfringens  
C. Tetani VI



H/O antibiotic usage/PPI + Diarrhea

Toxin A: Enterotoxin

Toxin B: Cytotoxin

Glutamate deH assay

IOC: Toxin demonstrat<sup>n</sup> → PCR > ELISA

DOC: FIDAXOMICIN > oral vancomycin

New: Bezlotoxumab

# Tetanus PEP

All wound receive surgical toilet

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

Other wounds

## Immunity category

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

## Immunity category

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

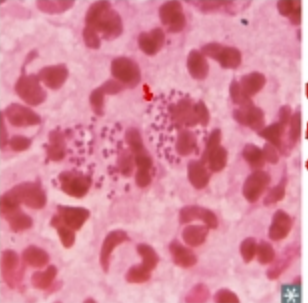
- A – Has had a complete course of toxoid or a booster dose within the past 5 years.
- B – Has had a complete course of toxoid or a booster dose more than 5 years ago and less than 10 years ago.
- C – Has had a complete course of toxoid or a booster dose more than 10 years ago.
- D – Has **not** had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

# GRAM NEGATIVE BACTERIA

All are GPC except: "MaNVi"

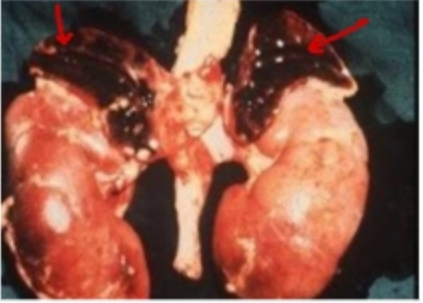
- Moraxella*
- Neisseria*
- Vibrio*
- Yersinia*

Transport: Stuart - Aronies  
Culture: Thayer Martin



Polysaccharide capsule

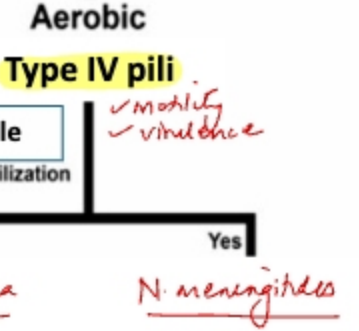
intracellular diplococci  
GNC



meningitis + petechial rash  
shock / DIC  
water hnoc - Friedrichson



perihepatitis  
PID +  
Fitz-Curtis-Hugh Sp



- H. influenzae*
- B. pertussis*
- Pasteurella*
- Brucella*
- F. tularensis*

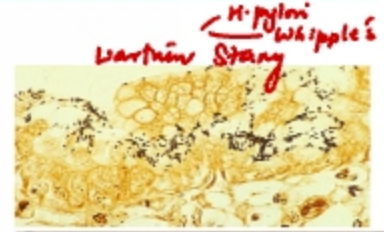
Grows in 42°C



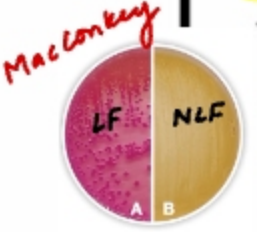
Grows in alkaline media



Urease producing

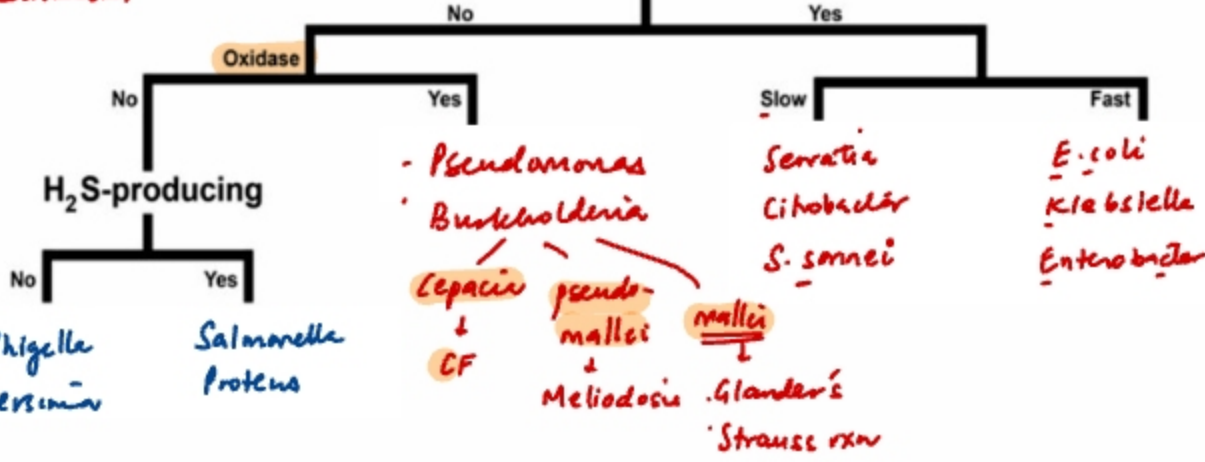


UREA  
Cag A / vac A



Campy BAP, Butzler, Skirrow  
GBS / Ritter Sx

Lactose fermenting



VIBRIO

Darting motility → Vibrio / Campylo  
String test  
Transport: V-R medium  
Cary-Blair  
Culture: TCBS (sucrose)

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

**Ecthyma gangrenosum - ic pseudomonas**  
**Vs Ecthyma contagiosum**

- Malignant Otitis externa - DM
- Burns (MC)
- CF

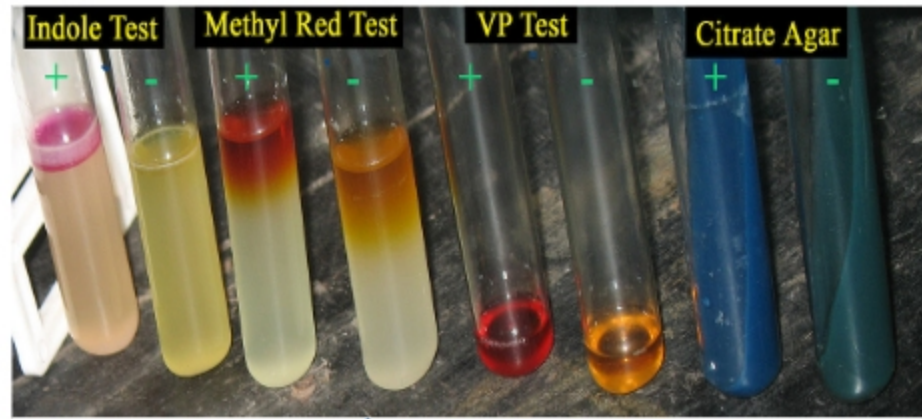


MC in young- *S. aureus* MC in adults- *Pseudomonas*

- Contact lens ↑ r/o perforation
- Shanghai fever
- Hot tub folliculitis

Acute osteomyelitis - Nail / drug abusers

\*MCC- *S. aureus* Sick cell- *Salmonella* ag



*E. coli* + + - -  
*Klebsiella* - - + +

**Typhoid : Fever + bradycardia, Rose spots**  
 Detection: "BASU"  
 Blood cul 1st wk, 2nd, 3rd, 4th urine  
 Faget's sign, Leptospira, Legionella, Salmonella  
 n2-3rd wk

- EPEC** Pathogenic - pili - Pediatric diarrhea - effacement of villi
- ETEC** Toxicogenic - LT CAMP ↑, ST CAMP ↑ - traveller
- EIEC** Sereny test Invasive - dysentery
- EHEC** Hemorrhagic - HUS DIS7:H7 - ferment sorbitol
- EAEC** aggregating - persistent diarrhea



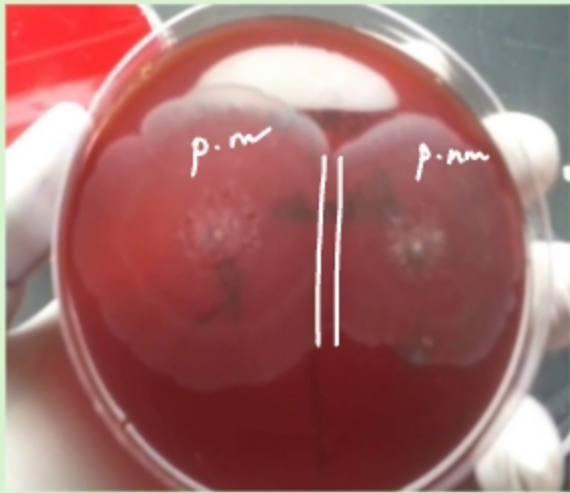
Stacked brick appearance on Hep2



Wayson stain - bipolar



Mucoid colonies  
*Klebsiella pneumoniae* = Friedlander bacillus  
 - alcoholics - red currant jelly sputum

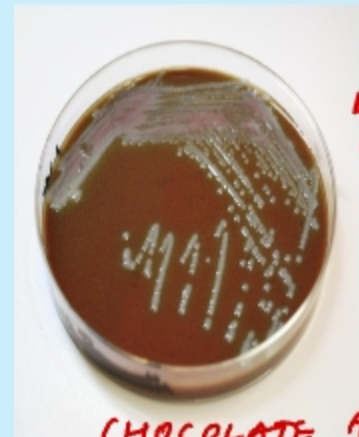


Diene phenomenon

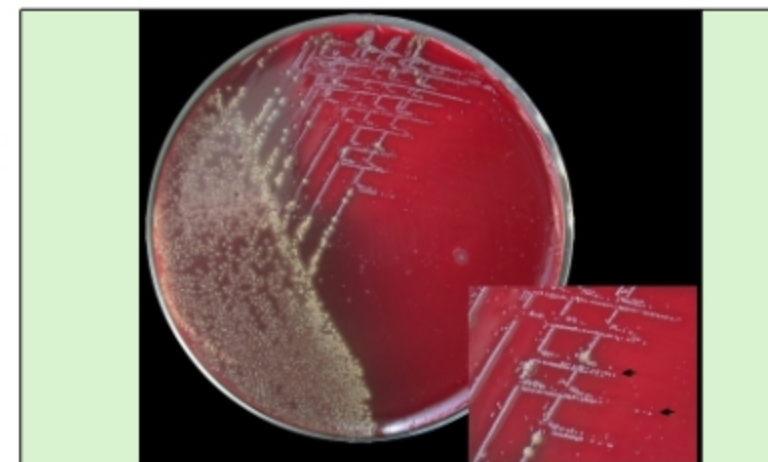
PROTEUS  
 urease (+) Swarming  
 Staghorn  
 Calculus  
 Struvite



H. ducreyi  
 f II only



CHOCOLATE AGAR  
 f II / f III  
 NAD Hematin  
 H. influenzae  
 = Pfeiffer bacillus

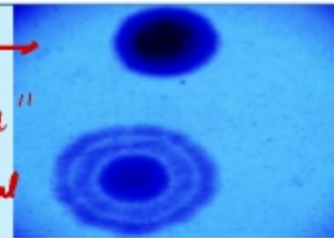


Bordet-Gengou agar  
 bisected pearly / Mg / M paint  
 PERNSSIS  
 - apnea in infants

Diene staining  
 Fried egg  
 Eaton, PPLO agar  
 Walking pneumonia  
 Cold agglutinin (IgM)  
 Joker  
 Mollicute  
 Not effective: B-lactams  
 DOC: Macrolides

MYCOPLAZMA  
 (X) cell wall  
 (X) gram stain

interstitial = atypical



# Spirochetes



Corkscrew motility

Levaditi- tissue  
Fontana- fluid



Lashing motility

B. Burdgoferi- Lyme D  
B. Recurrentis- Relapsing fever  
- Epidemic: Louse  
- Endemic: Soft Tick

h/o tick - Ixodes hard tick →

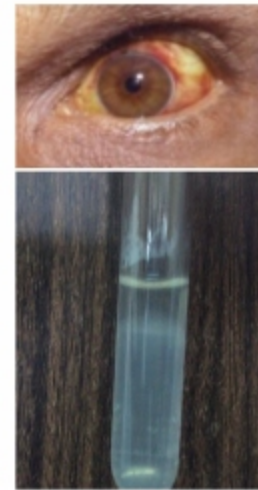


E. migrans  
↓  
- 7th CN palsy  
- meningitis



Weil's disease  
Rats "FARMER"  
EMJH medium

idEo hemorrhagic fever  
"paddy fields"  
DINGER'S RING



MAT: MICROSCOPIC - Leptospira  
CAT: COLD Mycoplasma / EBV  
IgM → ⊗ Chronic  
SAT: STANDARD BRUCELLA  
Casteneda's biphasic agar  
Rose Bengal test  
- zoonoses  
"milk"

Bartonella bacilliformis  
↓  
Oraya F / Carrion D - sandfly

henselae - B. anguatum (HIV+)  
- Peliosis hepatis  
Cat-scratch D  
- stellate granuloma

quintana = Trench fever  
↓  
Louse

# Syphilis



Dark field m

1<sup>o</sup> syphilis  
Pain-less  
Indurated

→ 2<sup>o</sup> syphilis  
CARS - palms & soles  
- Cocksackie Alb - HFMD / Herpangina - vesicles  
- RMSF  
- 2<sup>o</sup> syphilis

snail-track ulcers  
moth eaten alopecia

3<sup>o</sup> syphilis  
CVS: Aortic dissec "tree-bark"  
CNS: Tabes dorsalis  
↳ DC - loss of papr  
Argyll Robertson pupil:  
accom reflex ⊕ ; LR ⊖

2<sup>o</sup> → Latent →

Coxsackie A24, Enterovirus 70 } Hgic conjunctivis

Coxsackie B  
↳ Neuropathy = Bornholm's D

Great imitator  
No- Pruritus / Vesico bullous  
Contact admin  
Characteristic LN: Epitachlear

CONDYLOMA LATA: FLAT topped mucocut jn

CONDYLOMA ACUMINATA: WARTS HPV 6, 11

Most specific test: TPI ; FTA-ABS (sn)  
Best test to monitor response: VDRL  
Congenital syphilis: VDRL - 4x baby  
Early- <2yrs Snuffles (mc), HSM, rash  
Late- >2yrs Hutchinson Δ  
(Mulberry moles) Incuria Int keratino SNHL / clutton jkt

# Culture Media

BCYE - *Legionella* (atypical pneumonia, diarrhoea) (mild)  
 (Water transmission, Bradycardia, HypoNa, Pontiac disease)

CLED } *E. coli* better - 1/2 specific - APC, fungi ✓  
 EMB

Ashtdown (Vietnamese time bomb) *B. pseudomallei* - Meliodosis

Selenite F, Tetrathionate broth (enrichment), DCA, XLD agar *Salmonella, Shigella*

Wilson blair - *S. typhi* - black

Cetrimide agar *Pseudomonas*

Cefoxitin agar *C. difficile*

McCoy, HeLa cell lines (reticular replicative):

Elementary body (EB): inactive, extracellular, infectious

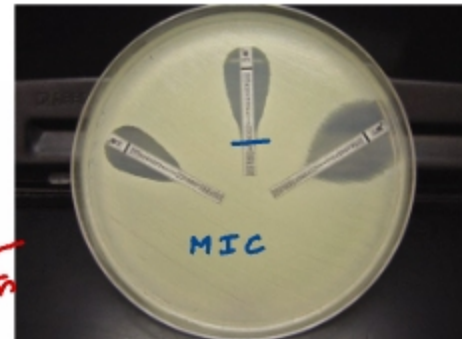
*Chlamydia* ← trachomatis (A-C - trachoma, D-K - conjunctivitis, STB-P10, LGV (L1-L3), Lymphogranuloma venereum)  
 psittacosis "avian"  
 pneumoniae

Lawn culture - UTI



Mueller-Hinton

Kirby Bauer DDT drug sn Qualitative



E-test : MIC

## 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

inv CA CX

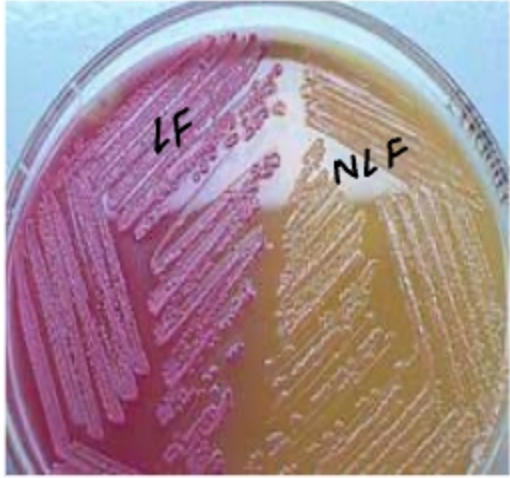
Sucking mice: Coxsackie A/B

Embryonated Egg (4 cavities)

- Chorioallantoic membrane: CAM - HSV / Varicella / Vaccinia
- Yolk sac → Chlamydia, Arbovirus, Rickettsia (CAR)
- Amniotic membrane → Influenza isolation
- Allantoic cavity → Yellow fever, vaccine (Influenza, Rabies)

KASS criteria exception: > 10<sup>5</sup> CFU *E. coli*  
 Suprapubic aspirate  
 Gram positive / candida  
 Antibiotics

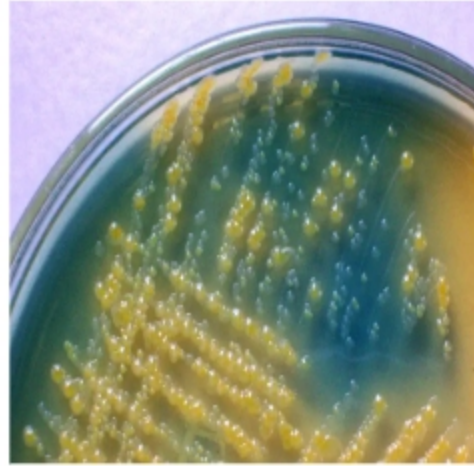
# CULTURE MEDIA



MacConkey

Indicator: Neutral red  
LF: Pink

LACTOSE



CLED

Indicator: BTB  
LF: Yellow

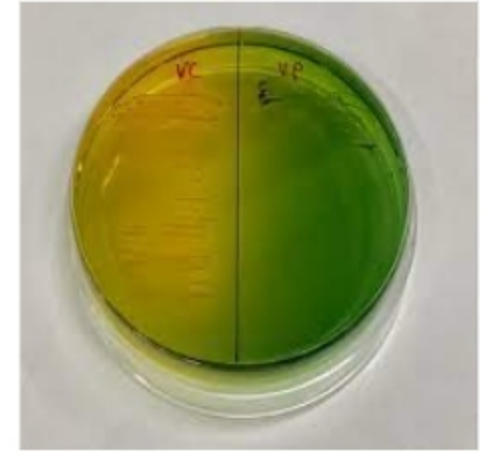
LACTOSE



Mannitol Salt

Indicator: Phenol red  
MF: Yellow

Mannitol



TCBS

Indicator: BTB  
SF: Yellow *vibrio*

Sucrose

# Facts!

obligate anaerobe

Actinomyces  
Bacteroides  
Clostridium

microaerophilic  $\approx 5\% O_2$

Helicobacter  
Campylobacter

oxidase (+)

Pseudomonas }  
Burkholderia }  
Vibrio }  
Campylobacter }  
Helicobacter }  
Neisseria = C+ O+

glycocalyx (metab demand)

Biofilm:

- S. epidermidis - prosthetic - CF
- Pseudomonas aeruginosa - OM
- Nontypeable H. influenzae - dental
- Viridans streptococci - dental

obligate intracellular

Chlamydia  
Rickettsia / Coxiella

} G-ve

UREASE (+)

"? CHUNKS"

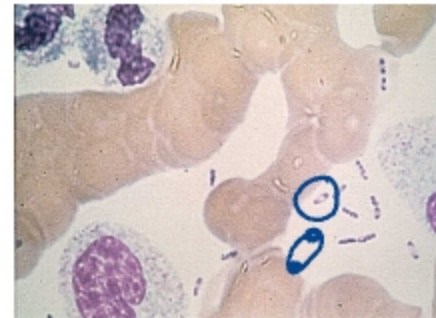
Proteus, Cryptococcus, H pylori, Ureaplasma, Nocardia, Klebsiella, S epidermidis, S saprophyticus

CAPSULE

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

Bipolar staining:

- *Y. pestis*
- *H. ducreyi*
- *K. granulomatis*
- *V. parahemolyticus*
- *B. pseudomallei*



# Rickettsia

**R. Prowazekii (Brill-Zinsser)** Epidemic typhus *x palms & soles*  
**R typhi (Neil-Mooser rxn)** Endemic typhus

LOUSE

(FLENT) FLEA

Weil-felix rxn - Proteus  
 (heterophile Ag)  
 OX-19 +

**R. Ricketsii** - RMSE *x palms & soles*

**R. Conori** Indian tick T

**R. Africae** African " "

**Ehrlichia**  
**Anaplasma**  
 GAME  
 granulocyte monocyte

HARD TICK

OX-19 +  
 OX-2 +

**R. Akari** Rickettsial pox

**R. Tsutsugumashi** Scomb typhus

MITE

OX-K +

**Coxiella** = Q fever

No > soft tick

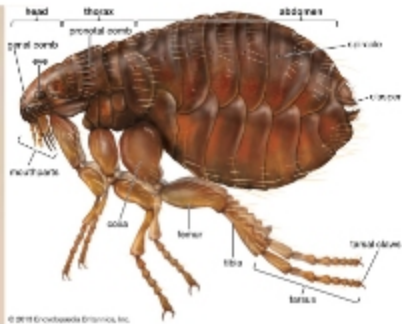


Scomb anthrax spider bite

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

contact admin  
 join our group

# Entomology



FLEA

Rat flea  
Bubonic plague  
Endemic T

Cheopsis index: Rat flea



Soft tick  
✓ Endemic RF  
✓ Coxiella



Hard tick

- Lyme D
- RMSF
- GAME
- CCHF
- KFD
- Babesiosis



MITE  
Scrub T  
"Chiggers"  
R. pox

Transovarian transmission

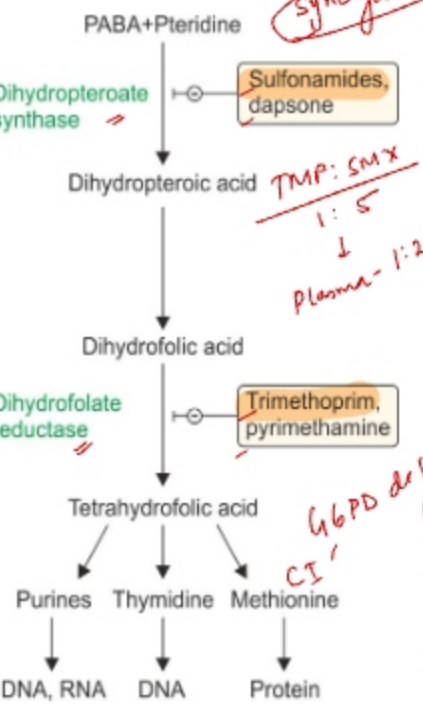
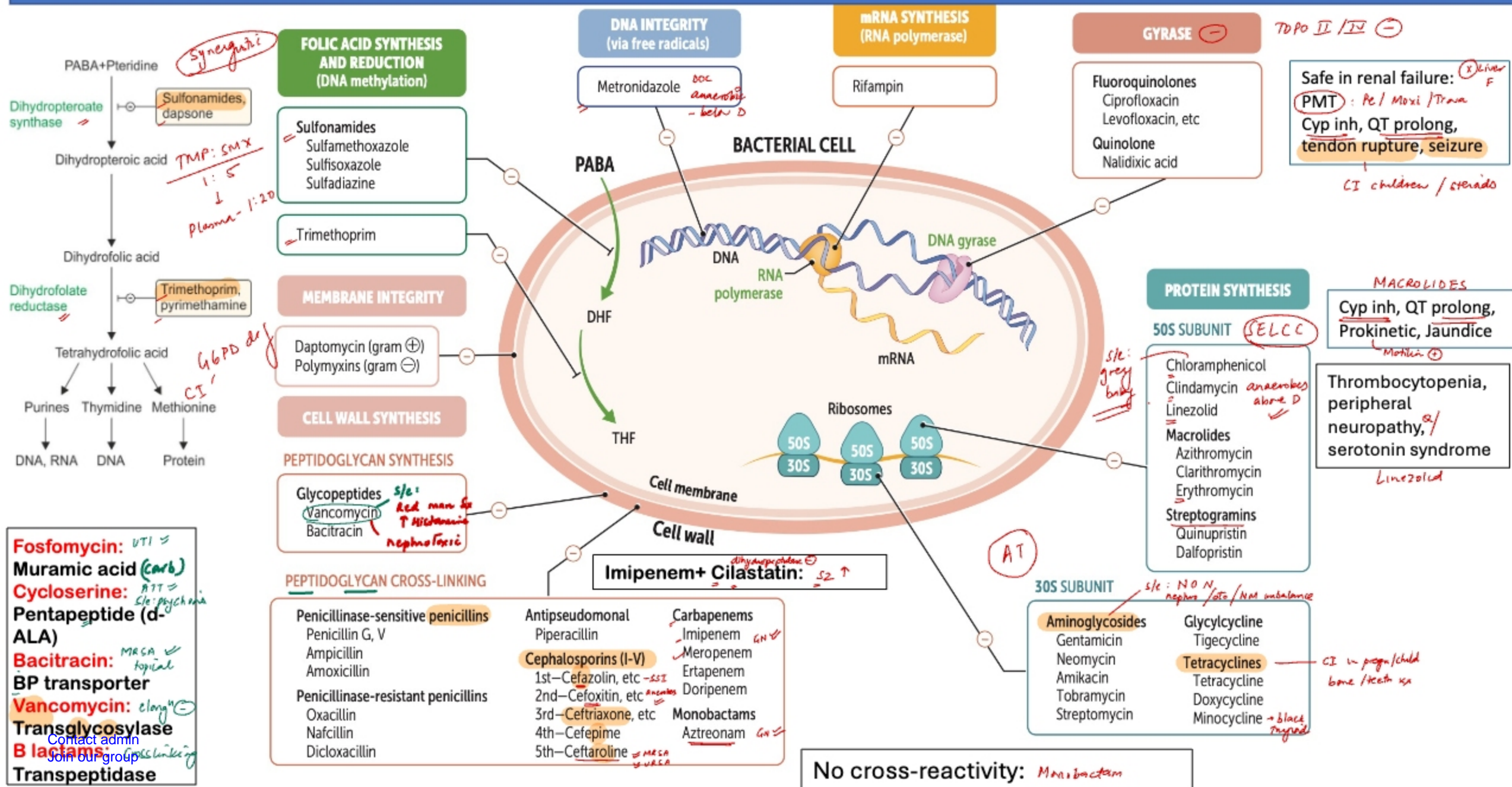


cyclops  
Guinea worm  
D. latum.



LOUSE  
Trench F  
RIF  
Ep

# Antimicrobials



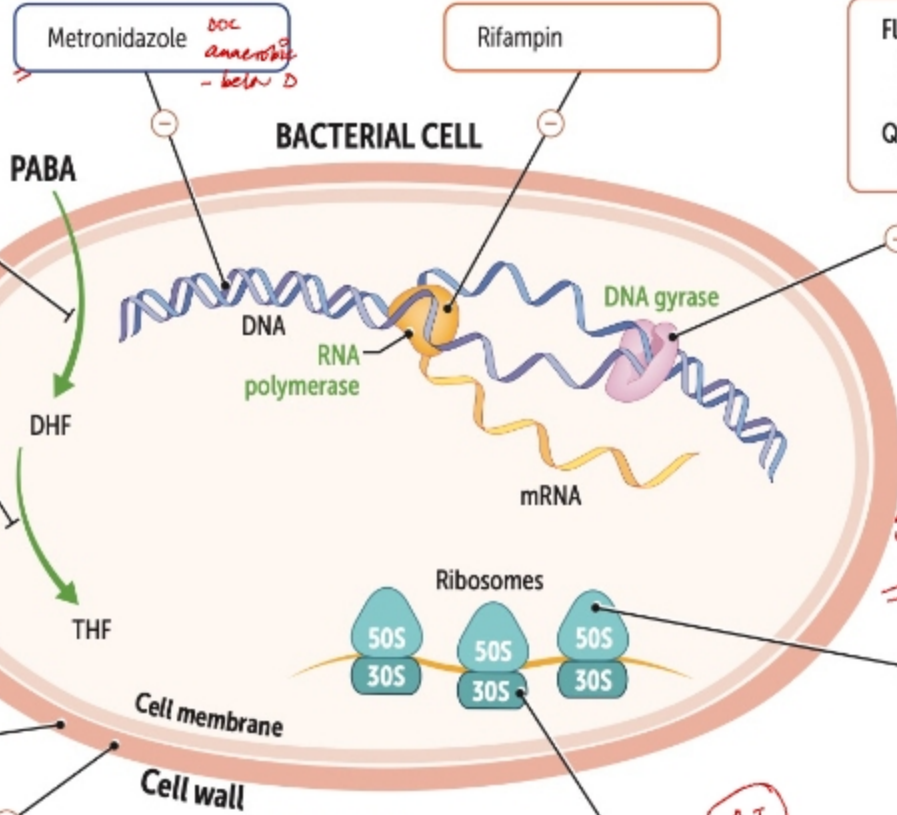
- FOLIC ACID SYNTHESIS AND REDUCTION (DNA methylation)**
- Sulfonamides
  - Sulfamethoxazole
  - Sulfisoxazole
  - Sulfadiazine

- Trimethoprim

- MEMBRANE INTEGRITY**
- Daptomycin (gram ⊕)
  - Polymyxins (gram ⊖)

- CELL WALL SYNTHESIS**
- PEPTIDOGLYCAN SYNTHESIS**
- Glycopeptides: Vancomycin, Bacitracin
- Handwritten notes:** s/c: red man for ↑ Nishanias nephrotoxic

- PEPTIDOGLYCAN CROSS-LINKING**
- |  |  |   |
|--|--|---|
| <p><b>Penicillinase-sensitive penicillins</b></p> <ul style="list-style-type: none"> <li>Penicillin G, V</li> <li>Ampicillin</li> <li>Amoxicillin</li> </ul> <p><b>Penicillinase-resistant penicillins</b></p> <ul style="list-style-type: none"> <li>Oxacillin</li> <li>Nafcillin</li> <li>Dicloxacillin</li> </ul> | <p><b>Antipseudomonal</b></p> <ul style="list-style-type: none"> <li>Piperacillin</li> </ul> <p><b>Cephalosporins (I-V)</b></p> <ul style="list-style-type: none"> <li>1st—Cefazolin, etc -SSI</li> <li>2nd—Cefoxitin, etc -SSI</li> <li>3rd—Ceftriaxone, etc -SSI</li> <li>4th—Cefepime</li> <li>5th—Ceftaroline -MESA, -MESA, -MESA</li> </ul> | <p><b>Carbapenems</b></p> <ul style="list-style-type: none"> <li>Imipenem -GN ⊕</li> <li>Meropenem -GN ⊕</li> <li>Ertapenem</li> <li>Doripenem</li> </ul> <p><b>Monobactams</b></p> <ul style="list-style-type: none"> <li>Aztreonam -GN ⊕</li> </ul> |
|--|--|---|



- Fluoroquinolones**
- Ciprofloxacin
  - Levofloxacin, etc
- Quinolone**
- Nalidixic acid

- 50S SUBUNIT (SELCC)**
- Chloramphenicol
  - Clindamycin -anaerobes above D
  - Linezolid
  - Macrolides: Azithromycin, Clarithromycin, Erythromycin
  - Streptogramins: Quinupristin, Dalbapristin

- 30S SUBUNIT**
- Aminoglycosides:** Gentamicin, Neomycin, Amikacin, Tobramycin, Streptomycin
  - Glycylcycline:** Tigecycline
  - Tetracyclines:** Tetracycline, Doxycycline, Minocycline → black thyroid
- Handwritten notes:** s/c: NO N, nephro / oto / Nat imbalance

- Fosfomycin:** UTI ⊕
  - Muramic acid (carb)**
  - Cycloserine:** ATT = s/c: psychia
  - Pentapeptide (d-ALA)**
  - Bacitracin:** MRSA ⊕, topical
  - BP transporter**
  - Vancomycin:** elong ⊕
  - Transglycosylase**
  - B lactams:** crosslinking
  - Transpeptidase**
- Contact admin  
Join our group

## DOC:

Plague, Tularemia : streptomycin

Rickettsia, Cholera : Doxycycline (pregn - Azithromycin)

Atypical pneumonia, Legionella, Mycoplasma, Chlamydia, Pertussis, Diphtheria *Macrolides*

Nocardia, PCP, Burkholderia, Stenotrophomonas, Cyclospora, Isospora *TMP: SMX*

Meningococcal, Anthrax, UTI, Travelers diarrhea *FQ*

## TABLE OF DRUGS NOT EFFECTIVE AGAINST MICROORGANISMS *DOC*

<b>Mycoplasma</b>	Cell wall inhibitors (beta-lactams, vancomycin)	<i>Macrolides</i>
<b>Pseudomonas</b>	Vancomycin, TMP-SMX	<i>Ceftazidime, Cefoperazone</i>
<b>Burkholderia</b>	Aminoglycosides, Cephalosporin	<i>TMP: SMX</i>
<b>Stenotrophomonas</b>	Aminoglycosides, Cephalosporin, Carbapenems	<i>TMP: SMX</i>
<b>Acinetobacter</b>	Aminoglycosides, Cephalosporin, TMP-SMX	<i>Carbapenems</i>
<b>Salmonella</b>	Aminoglycosides	<i>Cefixime, Ceftriaxone</i>
<b>Anaerobes</b>	Aminoglycosides ( <i>need O<sub>2</sub> active</i> )	<i>Clinda, Meropenem</i>
<b>MRSA</b>	Beta lactams (except fifth generation cephalosporins)	<i>Vancomycin</i>

## VRSA:

Linezolid    Daptomycin    Quinpristine-Dalfopristine    Ceftarolin

*Lungs DOC*

*DOC*

*CE*  
Ceftriaxone, Cefoperazone: Bile excretion

## Cidal Drugs

BEVAFA STREPTOGRAMINS

*B lactams    vanco    Ag    FQ*

*TDK*

*freq doses*

*CDK*

*1-11 large dose*

S. aureus ← Penicillin

$\beta$ -lactamase (Plasmid)

⊥ ⊕ Metnidazol

PBP → PBP2a : MRSA - mec A gene  
LPV toxin

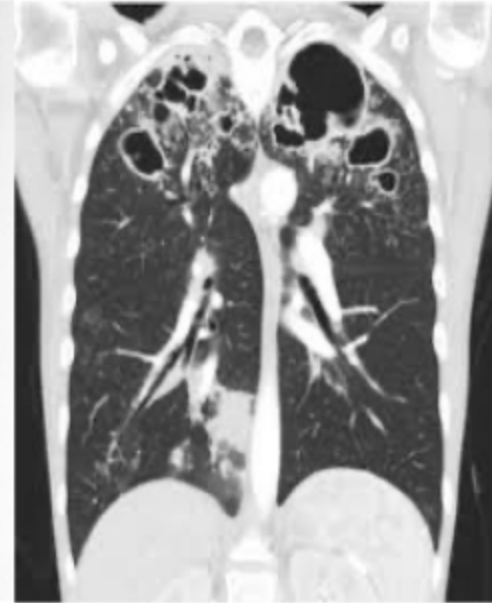
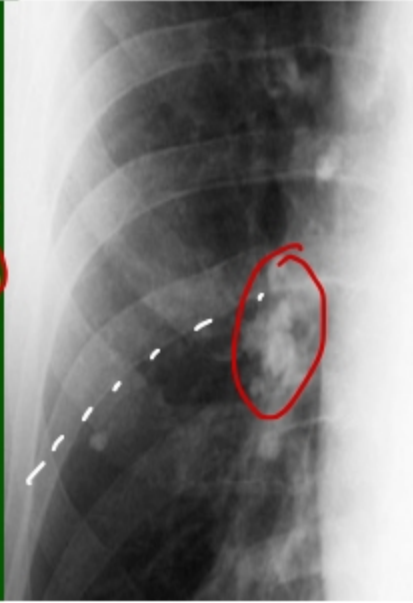
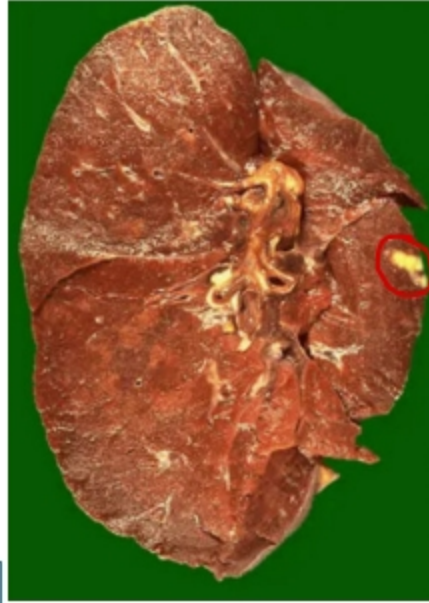
⊥ ⊕ vancomycin

D-ala → D-lac : VRSA

⊥ ⊕  
Linezolid  
Daptomycin

# TB

Ghon focus: 1° focus Lung  
 Ghon complex: FOCUS + LN  
 Ranke complex: Ca<sup>2+</sup>  
 Simon focus: apex  
 Puhl focus: supraclav  
 Assman focus: infraclav  
 Simmond: Liver  
 Rich: Meninges  
 Weigert: prostate/ovary



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

1° TB

Hemalog - Military TB

Fibrocavitary → sequestrae  
(Reaction) - VL?

## Runyon Classification - NTM

### Group 1: Photochromogens (MSK)

Mycobacterium marinum, Mycobacterium simiae, Mycobacterium kansasii

### Group 2: Scotochromogens 'GOD SAVE DARK'

Mycobacterium gordonae, Mycobacterium scrofulaceum, Mycobacterium szulgai

### Group 3: Nonphotochromogens (MAC) - HIV/AIDS

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

### Group 4: Fast growers

Mycobacterium fortuitum, Mycobacterium chelonae, Mycobacterium abscessus



Fish tank granuloma

↓ vaccine  
Mw - Leprosy.

# 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

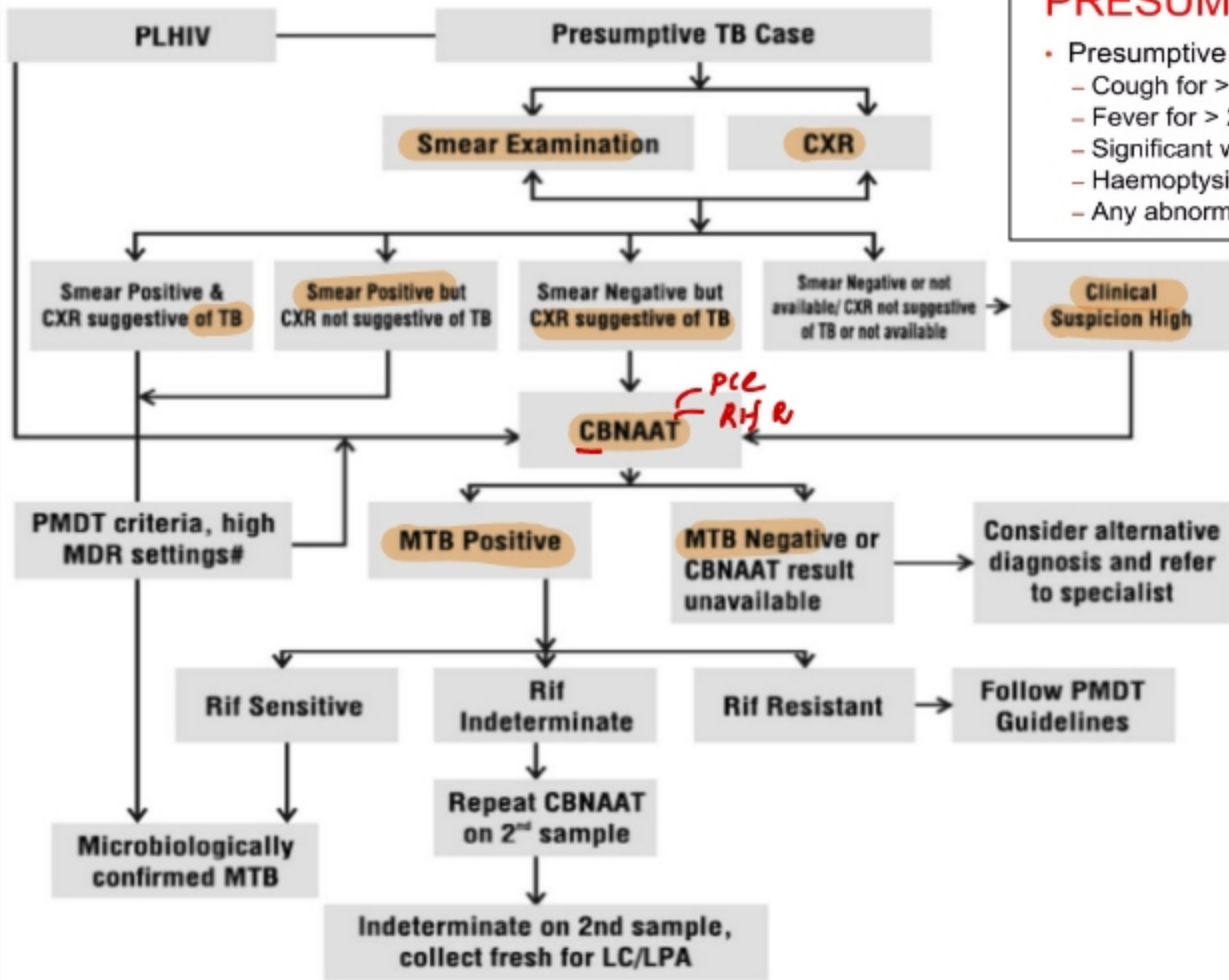
No. of sputum samples: 2 *- spot early mng*  
 Test within: 30 min  
 4% NaOH-concentration (Petross)  
 Auramine/ Rhodamine (fluorescent)

Mantoux/TST - exposure *of BLOOD ONLY*  
 Quantiferon GOLD (IGRA): exposure  
 Distinguish active VS latent? No  
 False + with vaccine? *Mtx ✓ Quantiferon (XX) Lado ✓*  
 Gene Xpert MTB/RIF = CBNAAT  
 TruNAAT *~ 1hr + Rif R.*



*mal green*

LPA: Drug - sn testing  
*Line Probe Assay*  
 LJ/ Middlebrook/ MGIT - culture



High-priority TB-HIV district: *> 10%*  
 TB + HIV: Start *ATT* f/b *ART* 2 weeks later (2mon if disseminated TB)  
 Avoid: *Rifampicin* *→ Rifabutin*  
 (IRIS)

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

# ATT

Z > H > R: Hepatotoxic

Mycolic acid synthesis inhibitor, CYP inh, Hepatotoxic, Neuropathy, Sideroblastic anemia, Lupus <sup>BG ⊖</sup> <sup>SHTP</sup> INH

FA synthesis inhibitor, Hepatotoxic, <sup>MAX</sup> Hyperuricemia, intracellular bacteria: Z

Arabinogalactan synthesis inhibitor, Red-green colour blindness: 'Eye-man butol'

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

Pseudojaundice, uveitis, min inducer of enzyme: Rifabutin

Hepatotoxic, Hypothyroidism: <sup>or</sup> Ethionamide

Psychosis: Psycho-serine (Cycloserine)

QT prolongation: Bequaquinone / Pretomanid → Nitro radicals  
mycolic acid ⊖

ATP synthase inhibitor: Bg

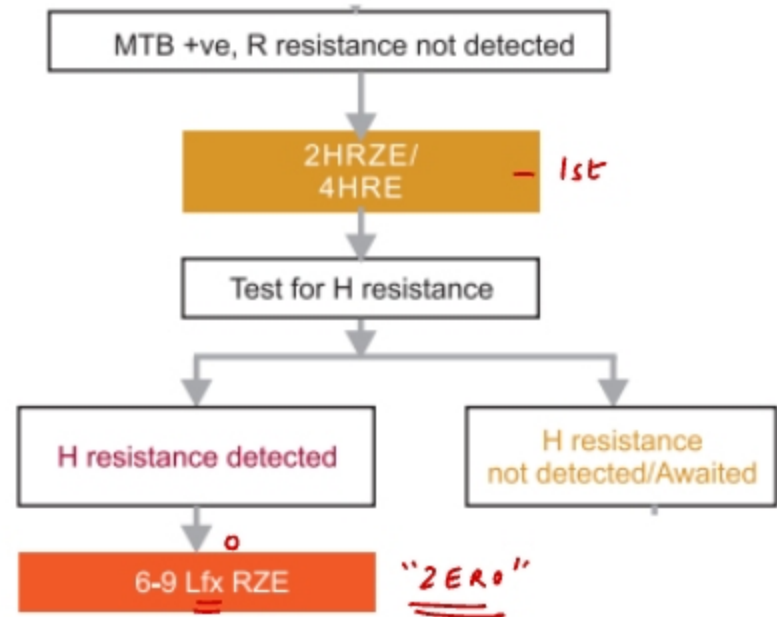
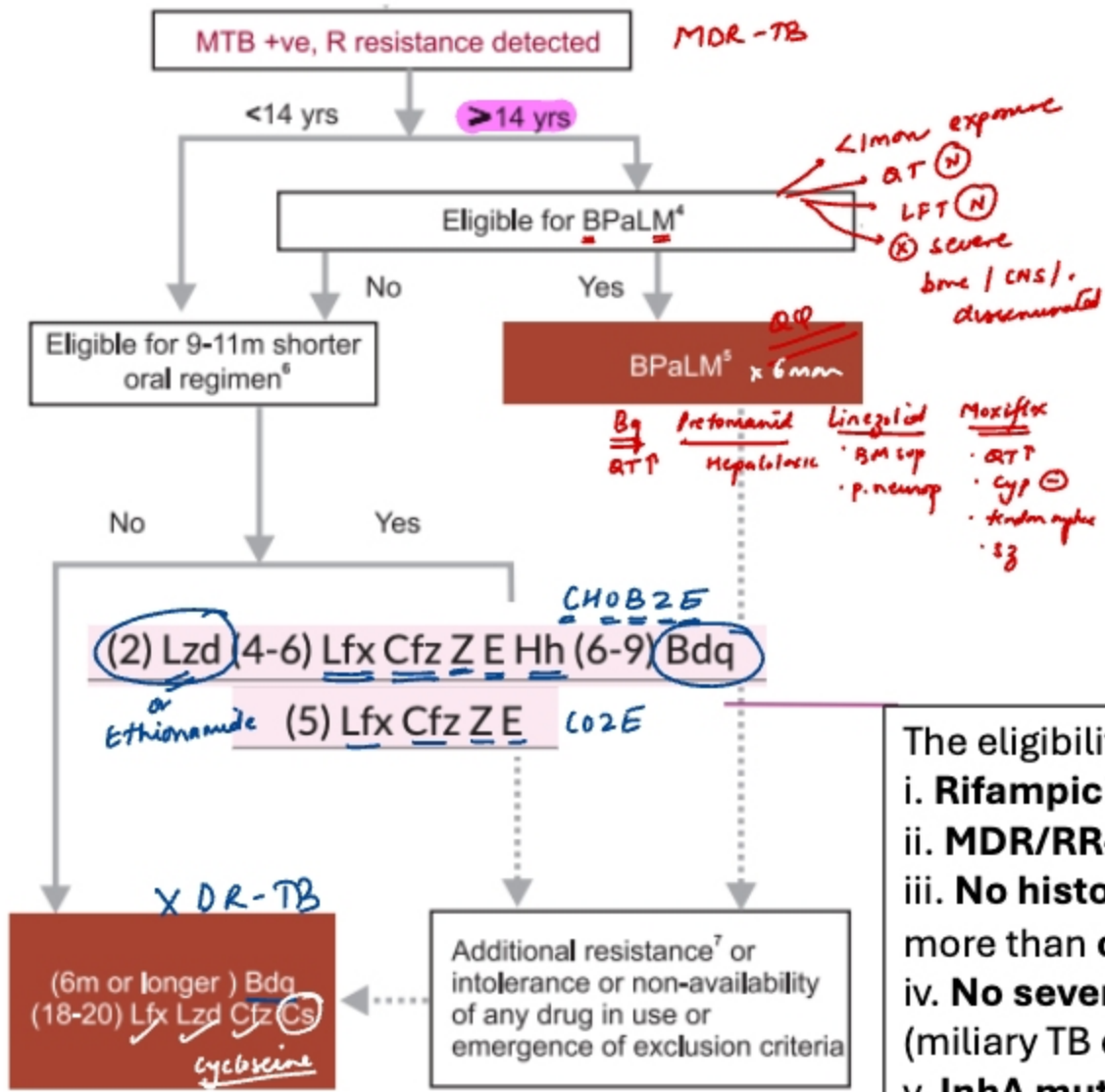
MDR-TB: H + R

PRE-XDR TB: H + R + FQ

XDR-TB: H+R / +FQ + Any Grp A drugs  
Bg  
Linezolid  
MoxiFlax.

CI in pregnancy: Streptomycin ⊗

# Drug-resistant TB

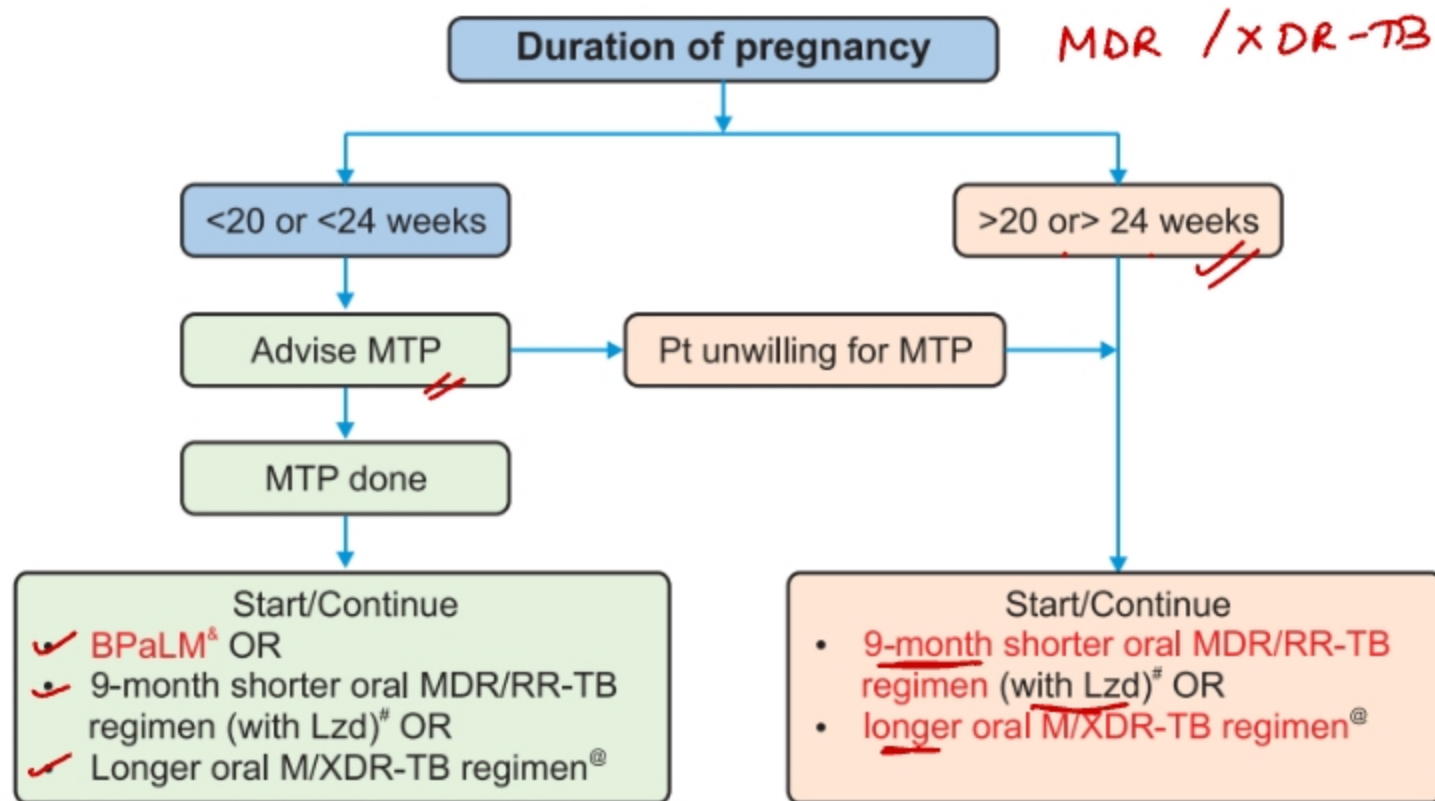


Poly drug R  
↓  
any 2 drugs  
• more than  
4 + 2

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

- Rifampicin resistance detected.
- MDR/RR-TB with FQ resistance not detected.
- No history of exposure to previous treatment with second-line medicines for more than one month
- No severe forms of extra-pulmonary MDR-TB like CNS TB, spinal/skeletal TB (miliary TB or TB with multiorgan involvement or disseminated TB).
- InhA mutation and KatG mutation both:
  - Lzd-containing shorter oral MDR/RR-TB regimen can be given
  - Eto-containing shorter oral MDR/RR-TB regimen cannot be given.

# TB in pregnancy



<sup>&</sup> Regimen: 6-9 Bdq, Pa, Lzd, Mfx

<sup>#</sup> Regimen: 4-6 Bdq, (6m or longer) Lfx/Mfx, Cfz, Lzd (2m), Hh, Z, E / 5 Lfx/Mfx, Cfz, Z, E Lzd can be replaced with Eto if required post MTP or only after 32 weeks' gestation

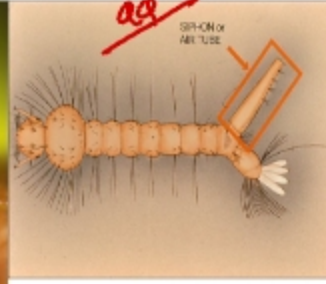
<sup>@</sup> Regimen: 18-20 Lfx, Bdq (6m or longer) Lzd, Cfz, Cs. Modify regimen if one or more drug cannot be used due to reasons or resistance, tolerability, contraindication, availability etc

• in the order of Z E PAS

• Eto may be considered after 32 weeks' gestation, if required



# NVBDCP



Anopheles

"tiger" → Aedes

Culex

Mansonia

Sandfly =  
Phlebotomus

Clean water  
5km

Single eggs - with floats  
Larva parallel  
Adult angle  
Spotted wings

⊗ siphon tube

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

Dirty water  
10km - longest  
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: Aedes

$\frac{\text{no. of containers} +}{\text{no. of houses} +}$

# INTEGRATED VECTOR CONTROL

URBAN ↓

## ANTI-LARVAL MEASURES

### Chemical:

Paris green = Stomach poison

Temephos/Abate = Contact poison

Biological: Gambusia / Guppy  
Bacillus thuringiensis

Environmental control (most effective)

RURAL ↓

## 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 (↑API)

0.0475inch; >150 holes/ich

# Malaria

Peripheral smear stain- JSB

Thin: species Thick: +/-

Fluorescent stain: Acridine orange

1 microscope: 1/25000

Most important measure of malaria control: API (incidence)

Best indicator of operational efficiency: ABER (annual blood exam rate)

Best during outbreak: SPR (slide pos rate)

Absence of duffy Ag: protective

Mosquirix RTS, S/AS01 - VACCINE

Mosquito bite: sporozoite Transfusion: trophozoite

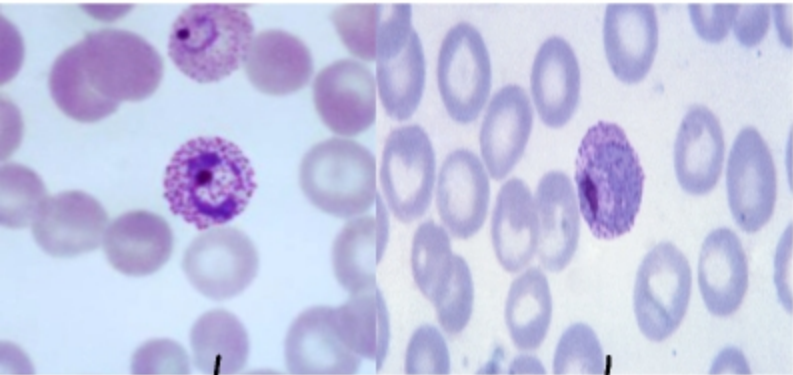
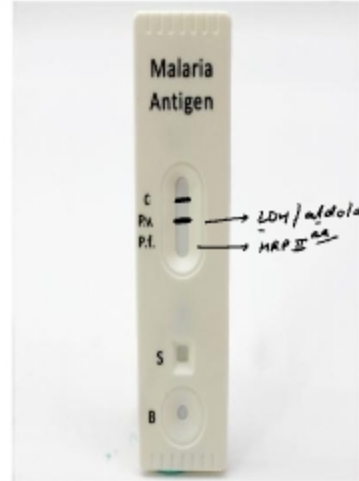
Placental transfer: merozoite

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



Ring trophozoite

Merozoite / schizont

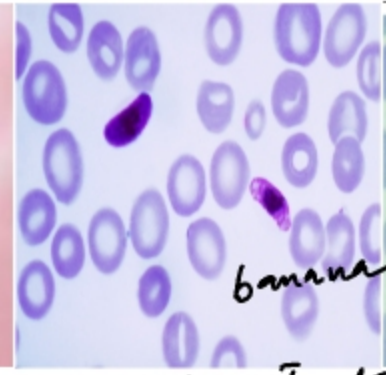
RELAPSE

P. v/o

Schiff-V  
James-O



Accolle form

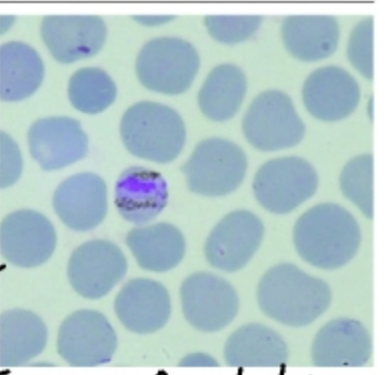


gametocyte

banana

P. falciparum

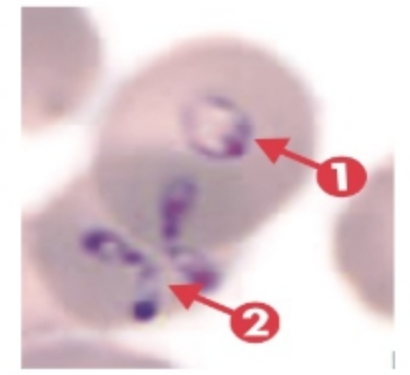
Maurier-F



Band form

P. malariae

Ziemann-M



Babesiosis

- RBCs
- Maltese cross
- Hand tick

R: Azithrom + Atovaquone

# 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	•Artesunate 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
<b>COMPLICATED MALARIA</b> (Seizures, hypoglycemia, pulmonary edema and neurological deficits) <i>ALGID malaria</i>	
P. falciparum (predominantly)	Initial Treatment: <b>IV/ IM Artesunate</b> at 2.4 mg/kg for 3 days or <b>IV/ IM Quinine</b> After stabilisation: State based Oral Artemisinin-based Combination Therapy (ACT) for 3 days.
Pregnancy	<i>PQ CI</i> •ACT - T1 x <i>v/o → 1Q x 3d</i> <i>f/m → T1 - Quinine</i> <i>T2/T3 - ACT</i>
Prophylaxis	<i>Mefloquine wkly</i> 2 weeks prior-4 weeks after <i>Doxycycline OD</i> 2 d prior-4 weeks after → <i>CI in pregn</i>

# DENGUE

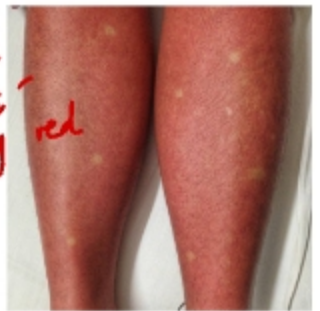
**Diagnosis:**  
 <5days: NS1 Ag(ELISA), virus isolation, RT PCR  
 >5days: IgM

**Management:** iv fluids

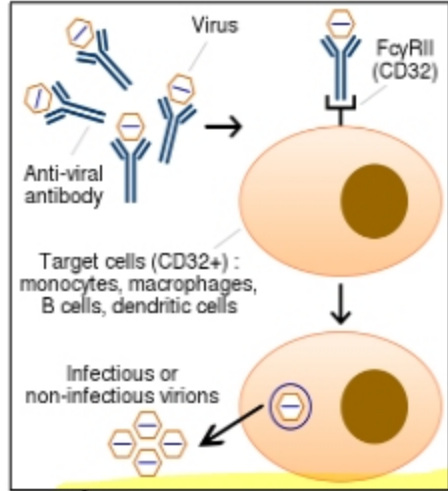
**Platelet transfusion:** <10k / bleeding  
**Criteria for discharge:**

2/3 appetite recovery + No fever x 24hr + >50k

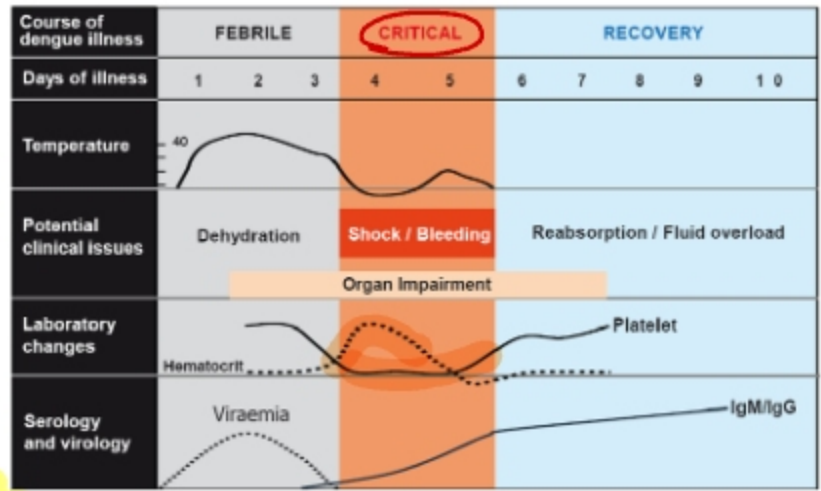
Island of white sea of red



RASH



Antibody dependent enh



## DENGUE WITHOUT WARNING SIGNS

- Fever + any 2 of the following:
- Leukopenia
  - Positive tourniquet test
  - Rash
  - Nausea, vomiting
  - Aches and pains

## DENGUE WITH WARNING SIGNS

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

## SEVERE DENGUE

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

## 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  $\geq 10$  /sq inch
  - Thrombocytopenia with platelet count <100,000/cu.mm.
  - Hematocrit (Hct) rise >20% over baseline.
- Most imp prognostic*

## 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



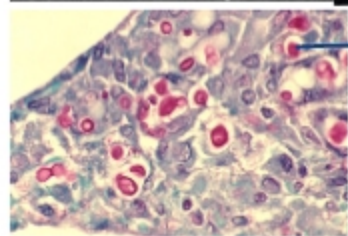
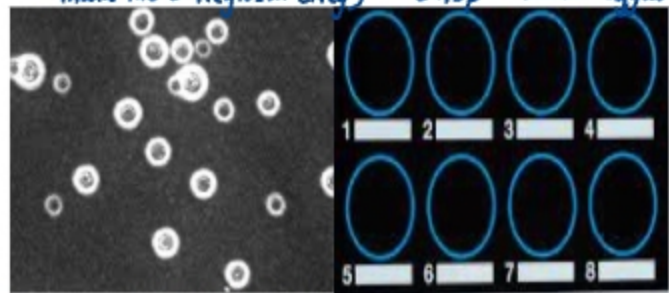
# MYCOLOGY

## YEAST

*Cryptococcus*

India Ink = Negrosin (Neg)

sn/sp: Lateral flow assay  
Lateral agglutination



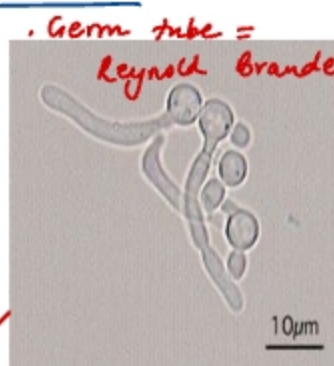
Mucicarmine  
PAC ⊕ Diastase run

## YEAST - LIKE

CANDIDA



Budding



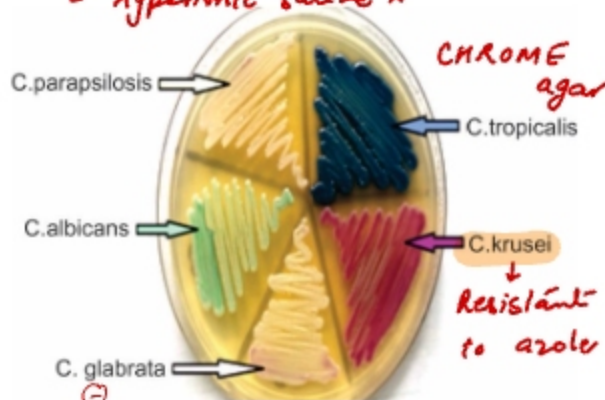
Germ tube = Reynolds Brande

10µm

- *C. albicans*
- *C. dubliniensis*

Chlamydo spores on corn meal agar

45°C x  
hypertonic saline x

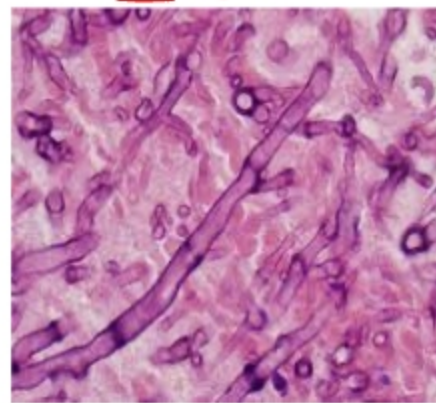


CHROME agar

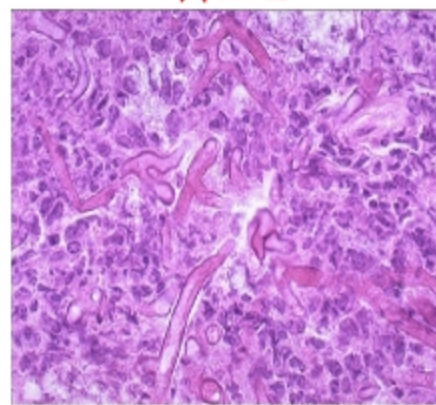
Resistant to azole

## MOLD

- acute septate  
Aspergillus



MUCOR



aseptate  
broad ribbon shaped

## DIMORPHIC

COLD- MOLD - Culture

HEAT- YEAST - HIP (KOH)  
6x

endemic mycosis

HSBC Bank = systemic

- Histoplasma
- Sporotrichosis
- Blastomyces
- Coccidiomycosis
- Paracoccidiomycosis
- Penicillium/Talaromyces marneffii

Pigeon dropping: *C. neoformans*  
Bats  
ic (MIV)

Soil around eucalyptus tree: *C. gatii*

Bird/ Niger seed agar  
Phenol oxidase/Laccase

SDA: pH 5.6, Cycloheximide, Gentamicin

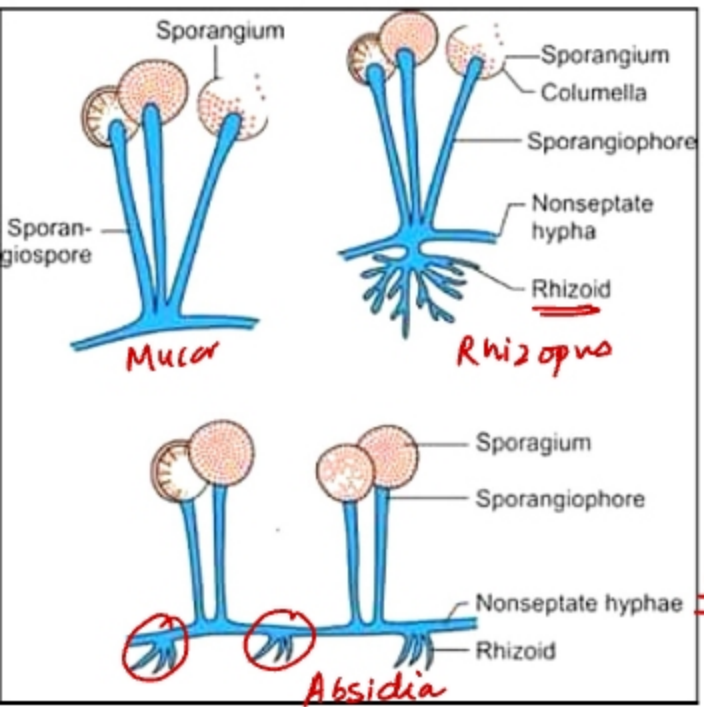
B-Glucan + : CAP - Candida / Aspergillus / PCP ⊕

Galactomannan assay: Inv aspergillosis

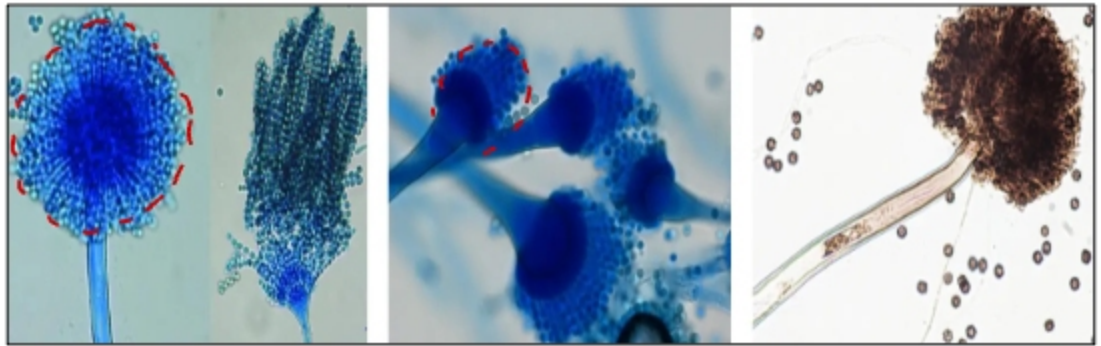
⊕ saprophytic fungi ⊖ bacteria

Contact admin  
Join our group

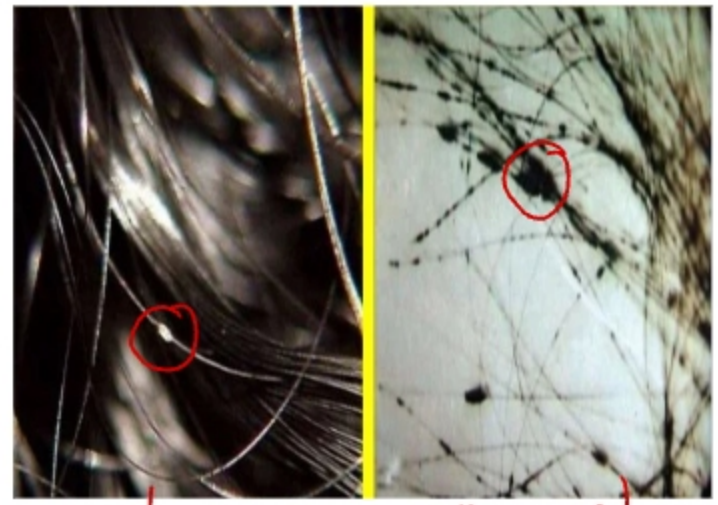
MUCOR spp.



Asp.



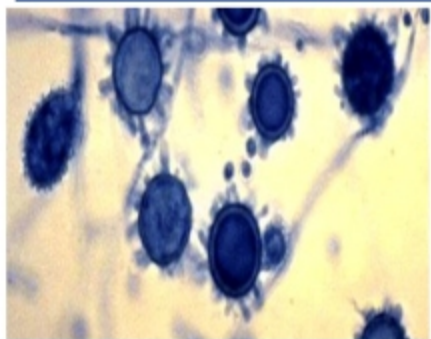
<u>A. flavus</u>	<u>A. fumigatus</u>	<u>A. niger</u>
SDA : yellow-green	Smoky green	black
<u>Aflatoxicosis</u> (p53 ⊖) HCC	<u>Sinusalis</u>	<u>Otomycosis</u>



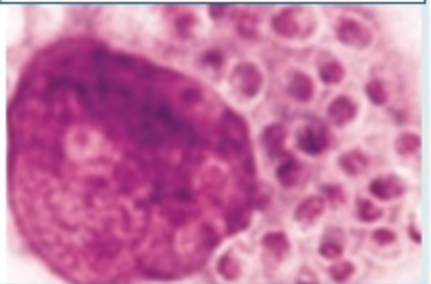
PIEDRA ("stones")

<u>WHITE</u> Trichosporon bigelli	<u>BLACK</u> P. hortae
---	---------------------------

# Endemic & Systemic Mycoses



Tuberculate macroconidia



Intracellular yeasts

Ohio/ Mississippi/ Darling

- mimics TB  
- (X) p-p transmission

Histoplasmosis

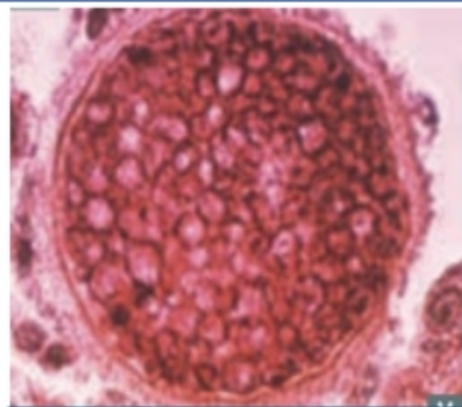


Broad based budding

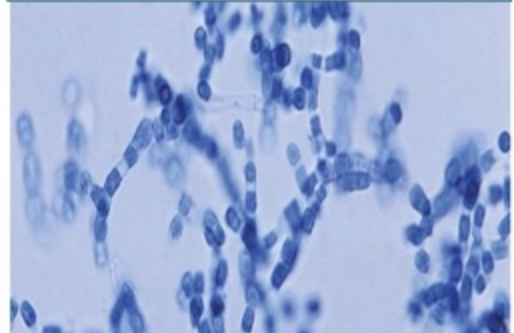


Chicago/ North American/ Gilchrist disease

Blastomyces



Sporangium with endospores



Barrel shaped arthrospores

California/ Valley fever/ Desert rheumatism

Coccidiomyces



Mickey mouse/ Captain's wheel

South American Disease

Paracoccidio

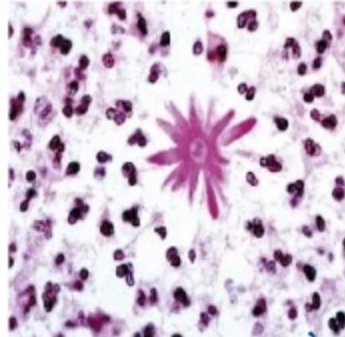
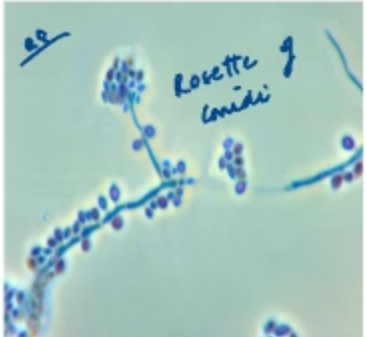


Broom brush

Bamboo rats reservoir

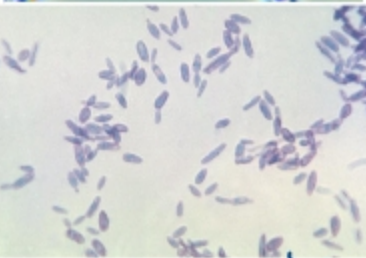
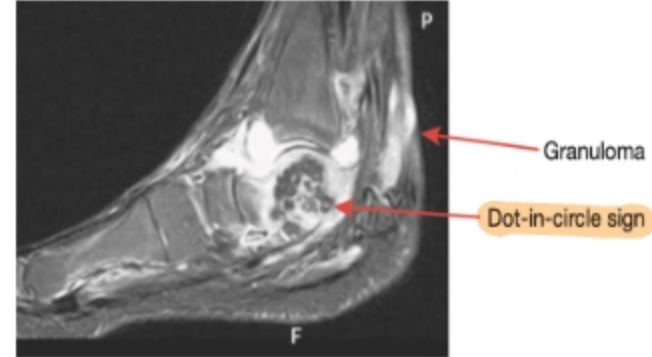
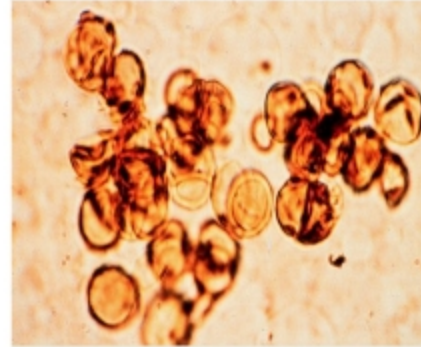
Penicillium / Talaromyces  
["Red fungus"]

# Pattern Approach



Lymphangitis

- S. aureus
- Rx - amox + clav



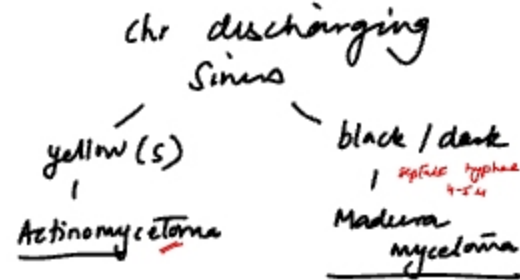
**SPOROTRICHOSIS**

cigar shaped yeast

- Phialophora
- Cladosporium
- Fonsecaea

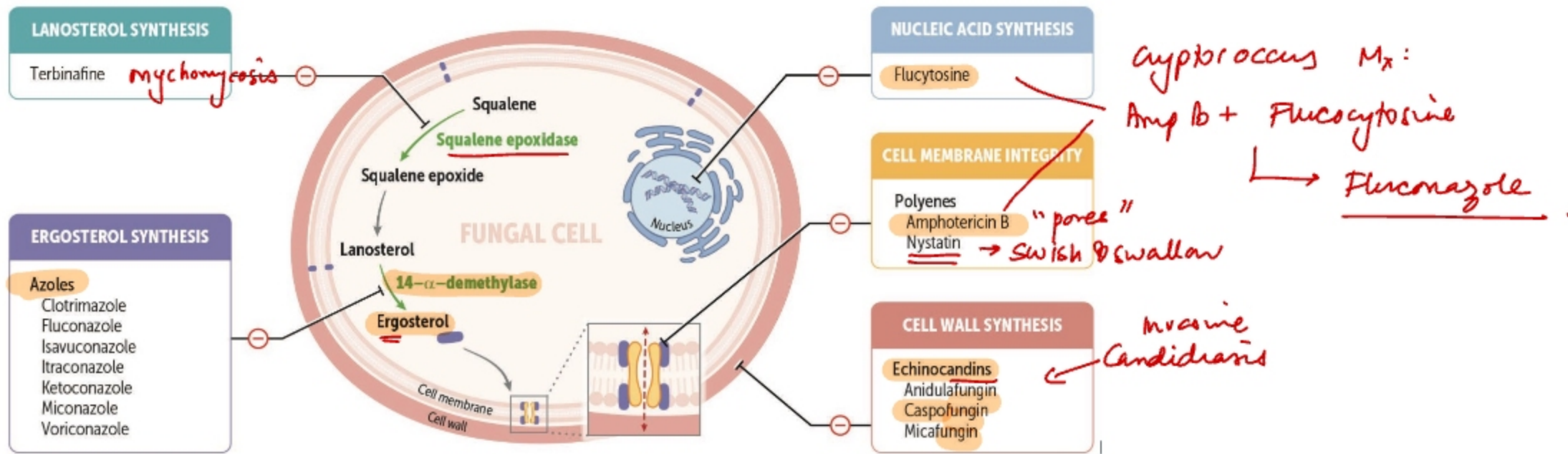
Copper penny / Medlar / sclerotic bodies

**Chromoblastomycosis**



Botryomycosis → misnomer  
↳ S. aureus

# Anti-Fungals



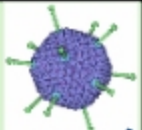
- Systemic severe infection, Mucor, Kalaazar DOC: Amp B (Liposomal)
- Infusion reaction, Nephrotoxicity, RTA type 1, hypokalemia, BM supression: Amp B
- Cryptococcal DOC: Amp B + Flucytosine → Fluconazole
- Candida DOC, Max oral / CNS BA: Fluconazole
- Aspergillus DOC, Transient visual changes: Voriconazole
- Histoplasmosis, Sporothrix, Blastomyces DOC: Itraconazole
- Antifungal causing heart failure: Itraconazole
- Azole useful in mucor: Posa / Isavuconazole
- Azole with antipruritic/ anti-inflammatory action: Serttraconazole

# VIROLOGY- DNA VIRUSES

dsDNA

Nonenveloped <sup>(AP)</sup>

Adenovirus  
- viral vector



spaceship


**PAPOVA**  
Circular

- **Polyoma**
  - JC → PML
  - BK → renal grafts - decay cells
  - SV-40
  - Merkel cell
- **Papilloma**  
HPV

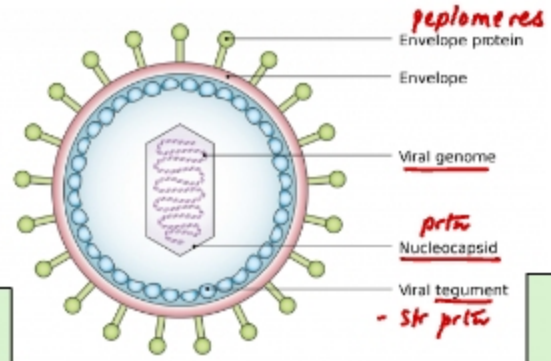
(HP)  
Enveloped

**HSV (HHV)**

- 1- HSV-1 - Labialis / encephalitis
- 2- HSV-2 - STDs / Mollaret meningitis
- 3- VZV - Chicken pox  
↳ pleomorphic centripetal
- 4- EBV
- 5- CMV (mononucleosis-like)  
Monospot -ve
- 6- HHV 6 - Exanthema subitum
- 7- HHV 7 - P. rosea
- 8- HHV 8 - Kaposi sarcoma  
↳ 1<sup>st</sup> effusion lymphoma  
Castlemans D



Herpetic whitlow (HSV-1)



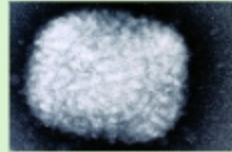
ssDNA

**PARVOVIRUS**  
Nonenveloped  
Smallest

- Replicates through **RNA (RT)** intermediate
  - **Circular (partly)**
- Heep B

**POX**

- Largest Cytoplasm Complex



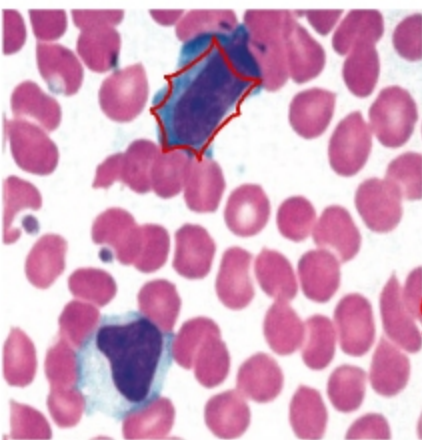
BRICK SHAPED

**Nucleic acid replication**

DNA	RNA
Nucleus	cytoplasm
except	except
POX (cyt)	R I M (N) Retroviruses Influenza Measles

# DNA VIRUS-DISEASES

INFLUENZA

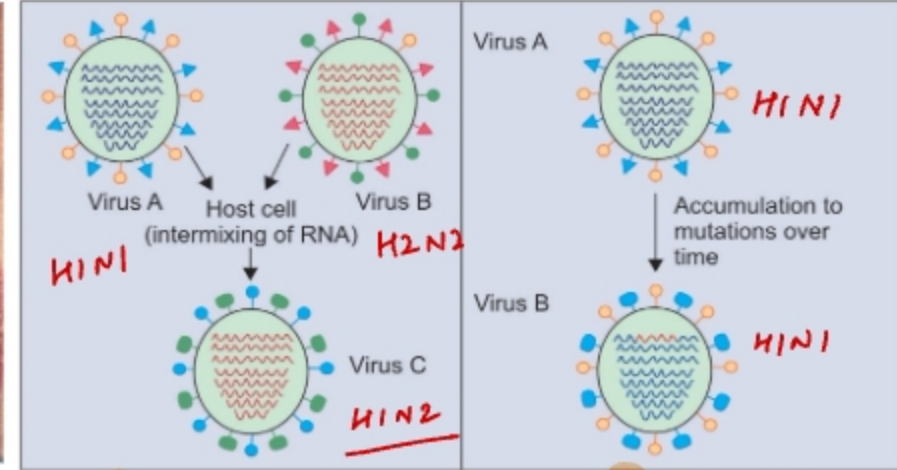


**Fever + Cervical LN + HSM**  
 Kissing diseases - infectious mononucleosis  
 EBV  
**LMP1, EBNA**      CD21 → B cell  
 Rx: Avoid contact sports  
 Avoid ampicillin: morbilliform rash

Ballerina skirt - Downey cell - CD8 T cell reactive.

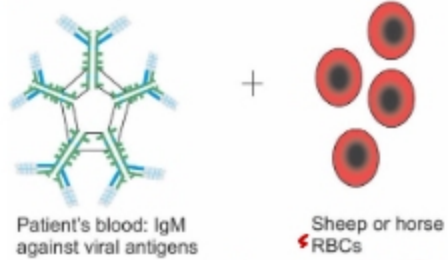


SHINGLES / Herpes zoster:  
 ↓ VZV reactivation  
 mc complic\*: Neuralgia  
 DOC: Pregabalin / Gabapentin



Reassortment  
 Ag SHIFT  
 Sudden / Pandemic  
 'SR DP'

Pt matrix  
 Ag DRIFT  
 Gradual / Epidemic



Heterophile agglutination → Monospot / Paul Bunnell test  
 +: EBV  
 -: CMV

**Burkitt lymphoma**  
**DLBCL, HL, PTL**  
**Leiomyosarcoma**  
**NP ca**  
**Ca stomach**  
**OHL**



VIRUS	RECEPTORS
CMV	Integrins
EBV	CD21
Rabies	Nicotinic AChR
Rhinovirus	ICAM-1
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

*infective*

Negative sense  
Enveloped *need RNA pol to replicate*

dsRNA

*Reovirus - Colorado tick fever*  
**ROTA VIRUS**  
 Nonenveloped  
 Wheel shaped  
 Villous atrophy  
 NSP4 toxin  
 IOC: Ag det<sup>n</sup> stool  
*mcc of diarrhea infants*

Unenveloped

Enveloped

**"MR-FAB Delta"**

- M - Myxo *ortho - Influenza*
- R - Rhabdo - Rabies
- F - Filo *Marburg Ebola*
- A - Arera *Lassa LCMV*
- B - Bunya *CCHF Hanta*
- D - Hep D

*Mumps Paramyxo RSV - bronchiolitis Nipah*

**PEC**

- Picornav
- Hep B
- Calici

*shellichi*  
**Norwalk virus**: *mcc* *adults* *diarrhea*

**PERCH**

- Polio
- ECHO
- Rhino
- Coxsackie
- Hep A

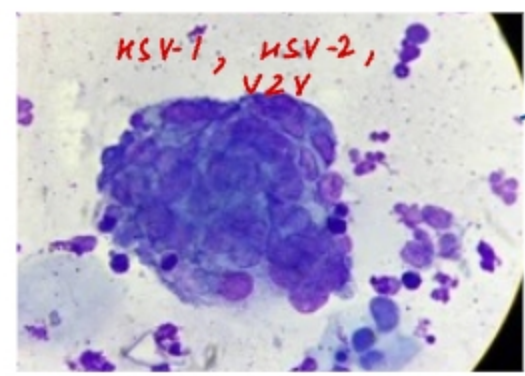
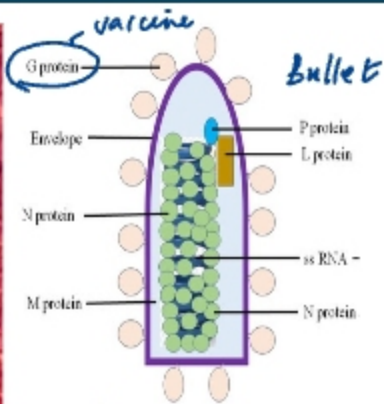
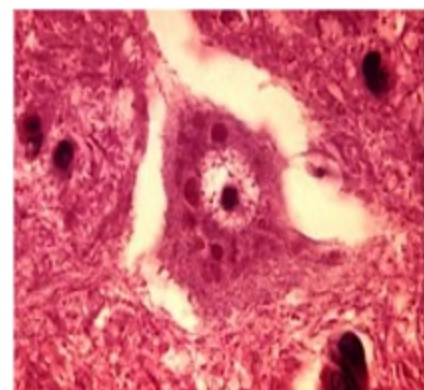
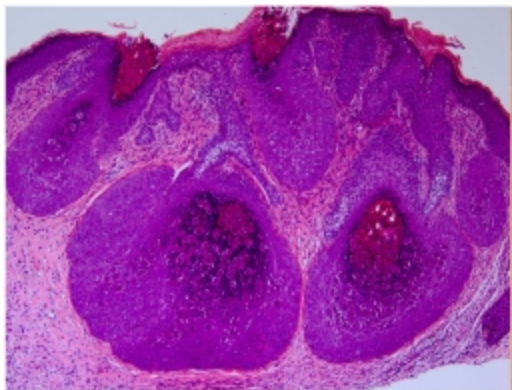
- Flavi  
HCV, YF, Dengue, Zika, WN, JE, KFD
- Toga "CREW"  
*Chikungunya* *equine E*  
*Rubella (Materna)*
- Retro (2 copies)  
HIV *T-cell* *tropical spastic paraparesis*  
HTLV
- Corona

**UNSEGMENTED except**

B	I	R	A
Bunya	Influenza	Rota	Arera
(3)	(8)	(11)	(2)

Contact admin & mortality in preg  
 Join our group  
**Hep A, E: feco-oral**

# CYTOPATHIC EFFECTS



multinucleate GC  
-margination  
-ballooning  
TZANCK (floor of blister)

HP = Handerson-Patterson dome-shaped umbilication  
MCV Pox

Negri bodies  
- 100% CFR  
- Purkinje cell  
- Seller stain

- Rabies

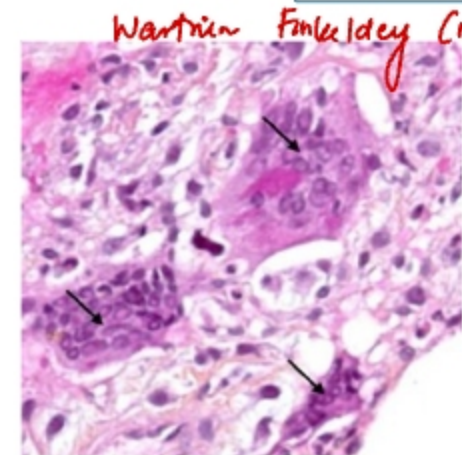
Cowdry A: HSV, JF (HAY)  
Lipshultz bodies (ballooning)- HSV  
Torres bodies- JF  
Cowdry B: Adeno / Polio (BAP)

Lendrum's Phloxine Tartrazine

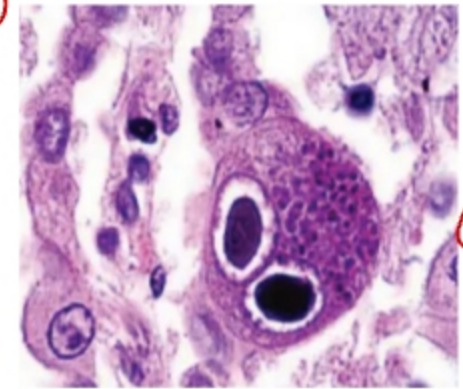
Guarnieri bodies: Vaccinia  
Paschen bodies: Variola  
Bollinger bodies: Fowl pox  
Granular clumping: Adeno  
Crenation: RSV



- koilocyte  
↳ HPV



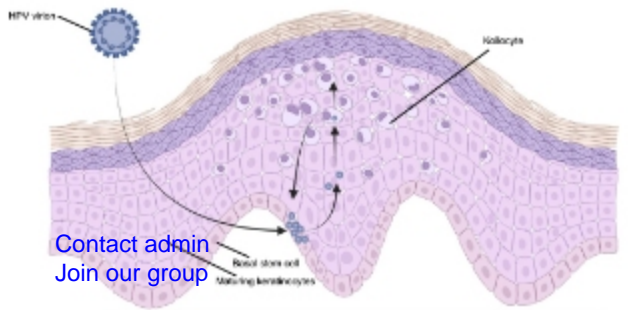
Wartain Finkeldey (measles)



Basophilic owl-eye  
↳ CMV  
(Eoc → R-S cell)

Syncytium formation

- PP65 Ag.  
- Human fibroblast cell line



Contact admin  
Join our group

# Rabies PEP

Categories of contact with suspect rabid animal	Post – exposure prophylaxis measures
<b>Category I</b> <ul style="list-style-type: none"><li>• Touching of feeding animals</li><li>• Licks on intact skin</li></ul>	None
<b>Category II</b> <ul style="list-style-type: none"><li>• <b>Nibbling</b> of uncovered skin</li><li>• Minor scratches or abrasions without bleeding</li></ul>	<ol style="list-style-type: none"><li>1. Immediate vaccination and</li><li>2. Local treatment of wound</li></ol>
<b>Category III</b> "ooze / bleed" <ul style="list-style-type: none"><li>• Single or multiple transdermal bites or scratches</li><li>• Licks on broken skin</li><li>• Contamination of <u>mucous</u> membrane with saliva from licks</li><li>• Contacts with bats</li></ul>	<ol style="list-style-type: none"><li>1. Immediate vaccination</li><li>2. Administration of rabies <u>immunoglobulin</u></li><li>3. Local treatment of the wound</li></ol>

Re-exposure: 0, 3

Pre-exposure: 0, 7, 21

Post-exposure:

Modified Thai Cross: 0, 3, 7, 28  
x 2 id

Essen: 0, 3, 7, 14, 28 im

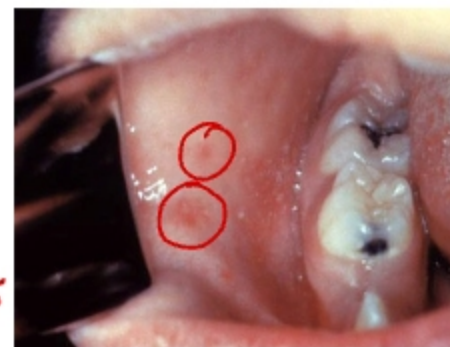
HRIG: 20 IU/kg

Equine IG: 40 IU/kg

↳ infiltrated wound → i.m.  
↳ once in life  
↳ 2 in 7d of bite

# VIRAL EXANTHEMS

<p><b>First Disease</b></p> <p><i>Koplik spots conjunctivitis ↓ 2d</i></p> <p><b>RASH (C-C)</b> <i>(x palms-soles)</i></p>	<p><b>Measles (Rubeola)</b></p> <p>MC complication: <i>otiti media</i></p> <p>MCC of death: <i>Pneumonia (Hecht's)</i></p> <p>Delayed complication: <i>SSPE subacute sclerosing pan encephalitis</i></p> <p>Vaccination in disaster</p> <p>IP: <i>10d</i></p> <p><b>Communicable:</b> <i>4d before - 4d after</i></p>
<p><b>Second Disease</b></p>	<p><b>Scarlet Fever</b> <i>S. pyogenes</i></p>
<p><b>Third Disease</b></p>	<p><b>Rubella</b> <i>post-auricular LN</i></p>
<p><b>Fourth Disease</b> <i>XX</i></p>	<p><b>Duke's Disease</b> <i>XX</i></p>
<p><b>Fifth Disease</b></p>	<p><b>Erythema Infectiosum</b> <i>2d</i></p> <p><b>parvovirus B19</b></p> <p><i>→ mimic RA</i></p> <p><i>→ PP45 - papular purpuric glove &amp; stocking</i></p>
<p><b>Sixth Disease</b></p>	<p><b>Roseola Infantum</b> /</p> <p><i>HHV-6</i>      <i>Exanthem subitum</i></p> <p><i>fev rash</i></p> <p><i>TT</i></p>



Koplik



Forchheimer spots (mucubella)

Nagayama spots (HHV6)

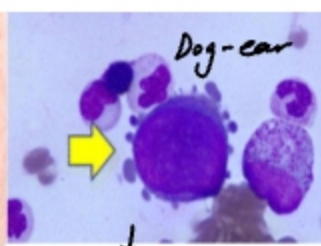


Sandpaper rash

Pastia lines



"SLAPPED CHEEK"



Erythroblast (p-Ag)

- PRCA
- Aplastic crisis

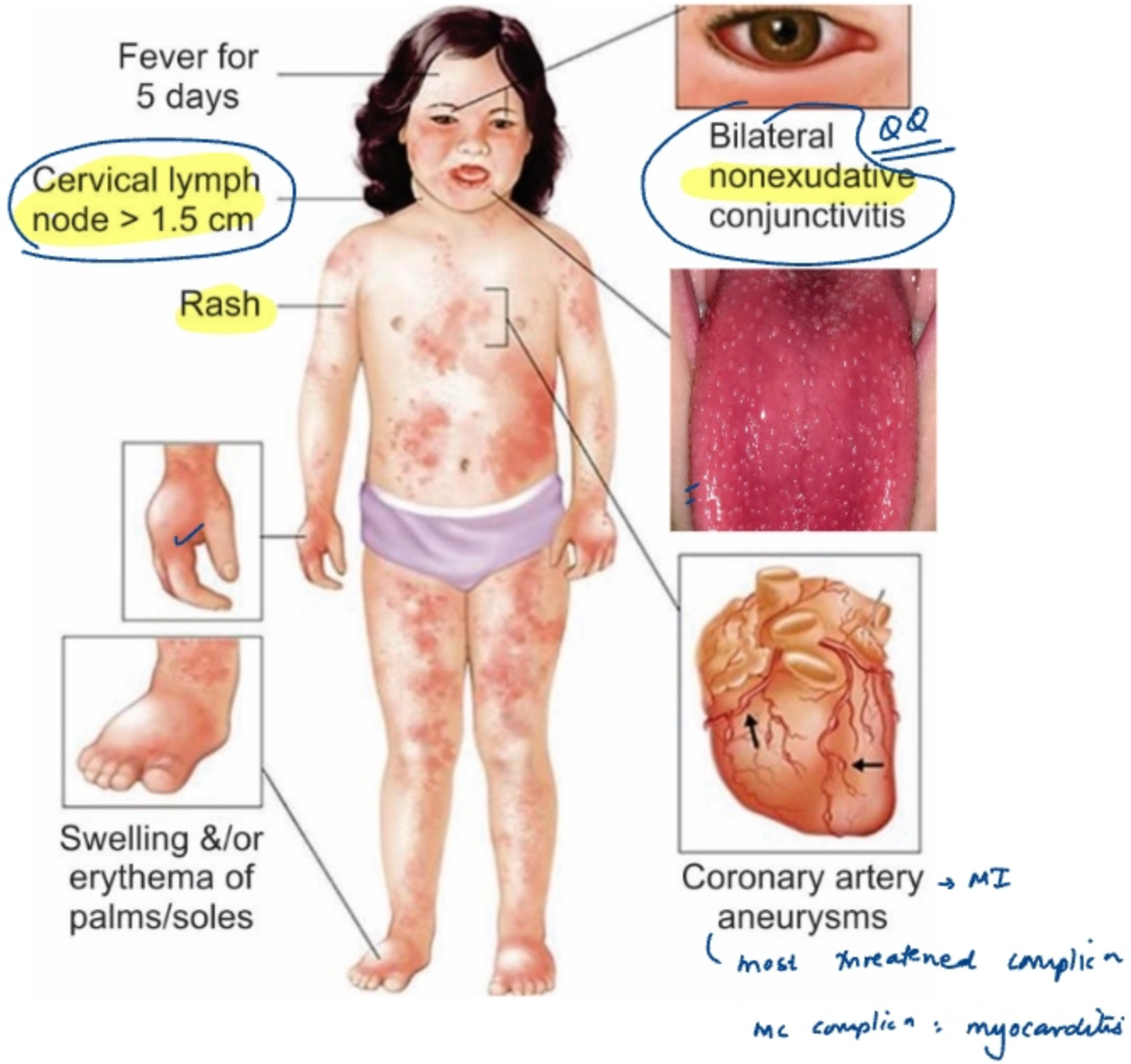
MC info  
Non-immune Hydrops

# KAWASAKI DISEASE

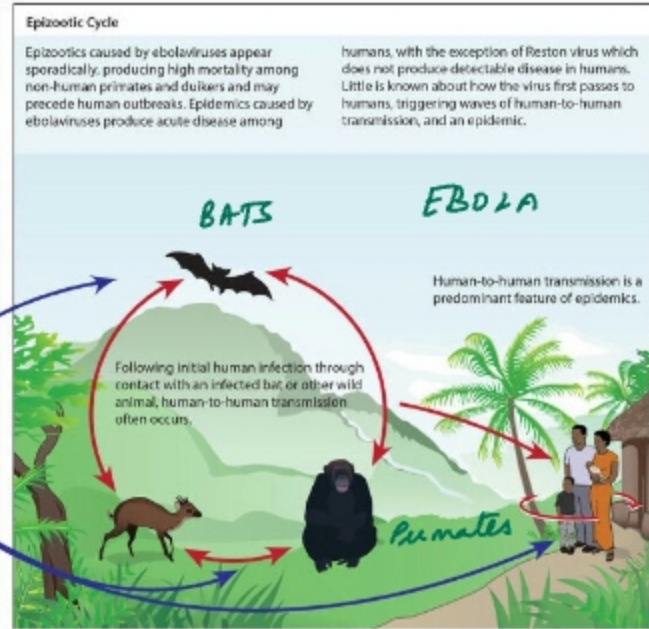
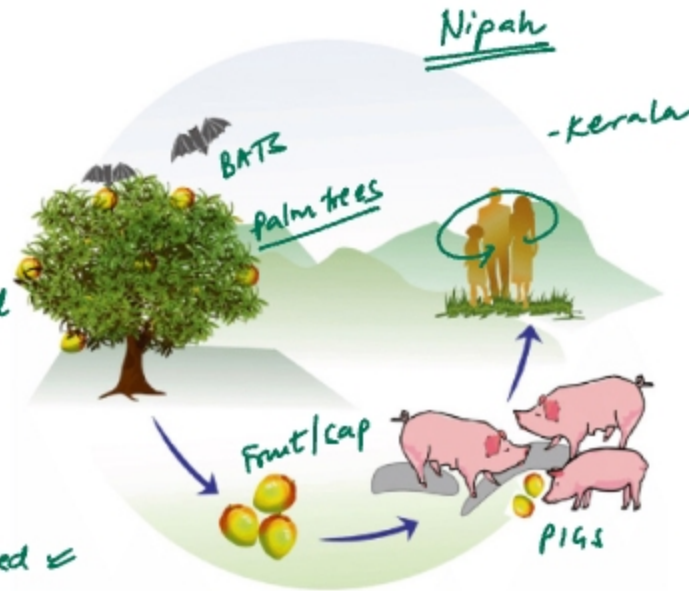
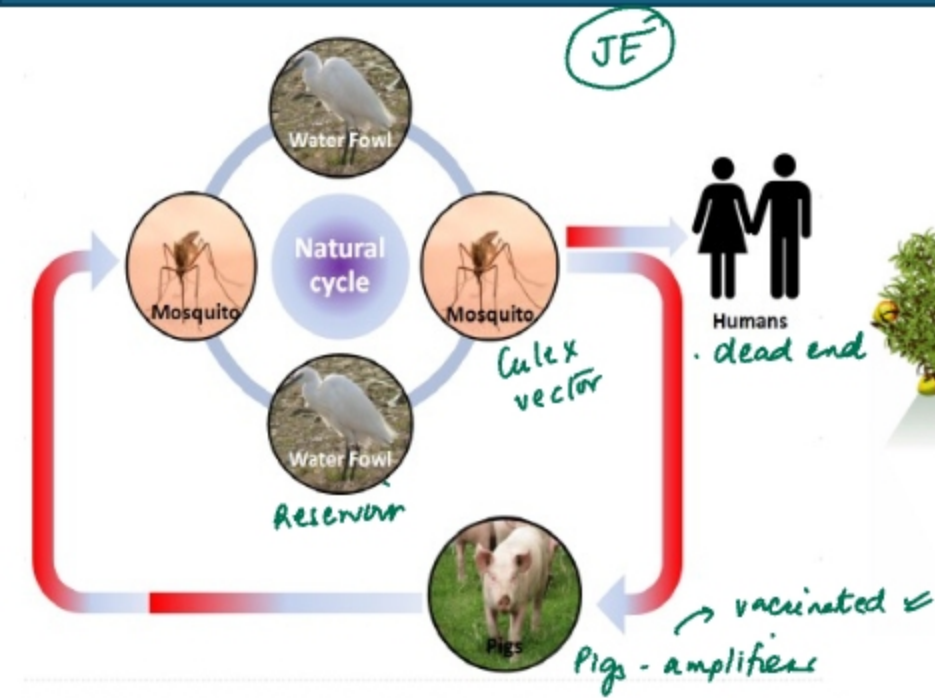
- medium vessel v

anti-endothelial cell Ab.

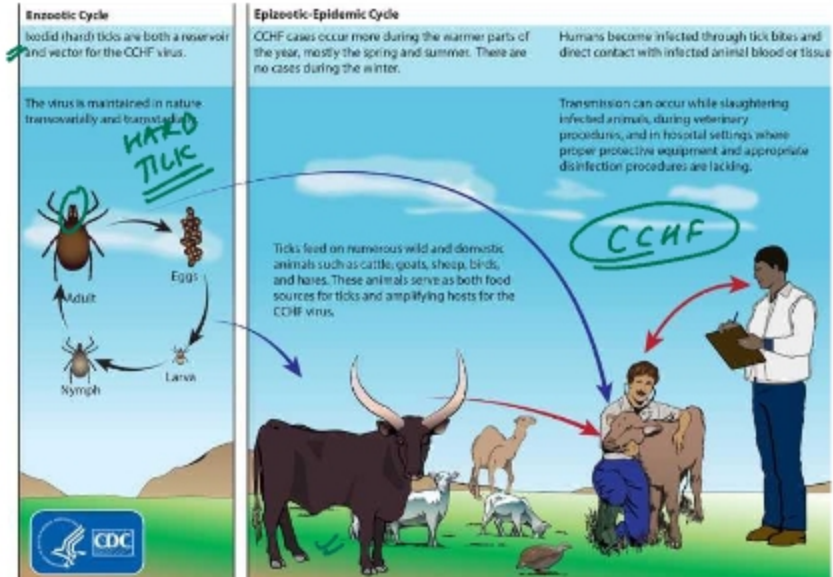
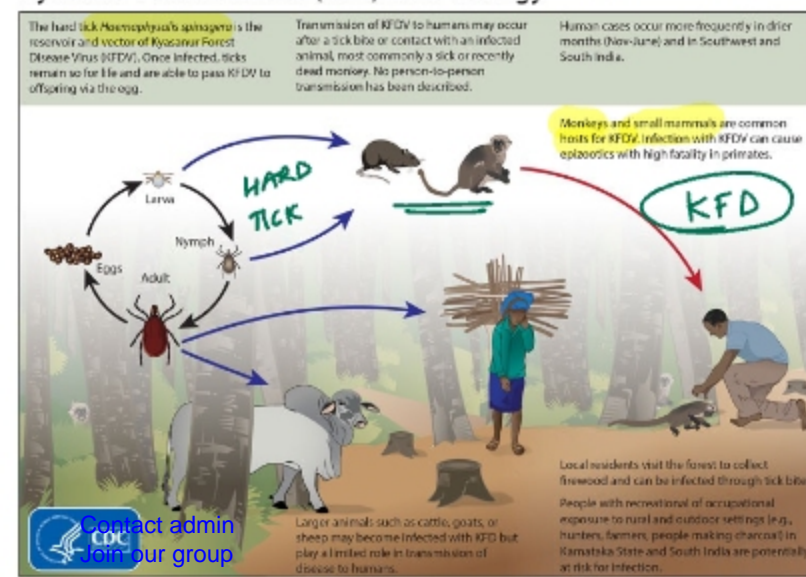
**“Crash & Burn”**  
**Conjunctivitis**  
**Rash**  
**Adenopathy**  
**Strawberry tongue**  
**Hands swelling**  
**BURN (fever lasting > 5 days)**  
Rx: IVIg + Aspirin  
**Reye syndrome:** *vesicular*  
*keratosis*



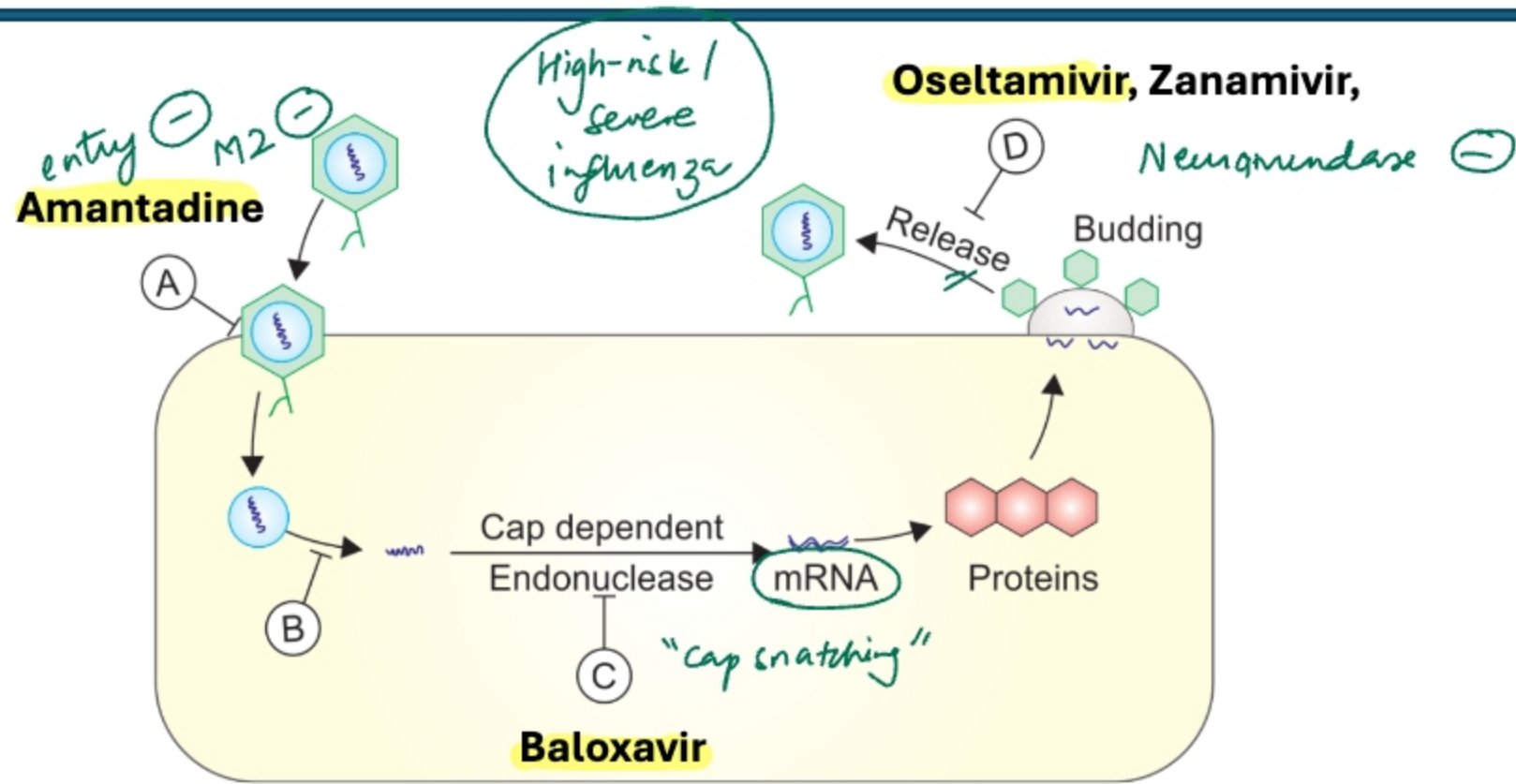
# LIFE CYCLES



**Most virulent: Zaire**  
**Least virulent: Reston**



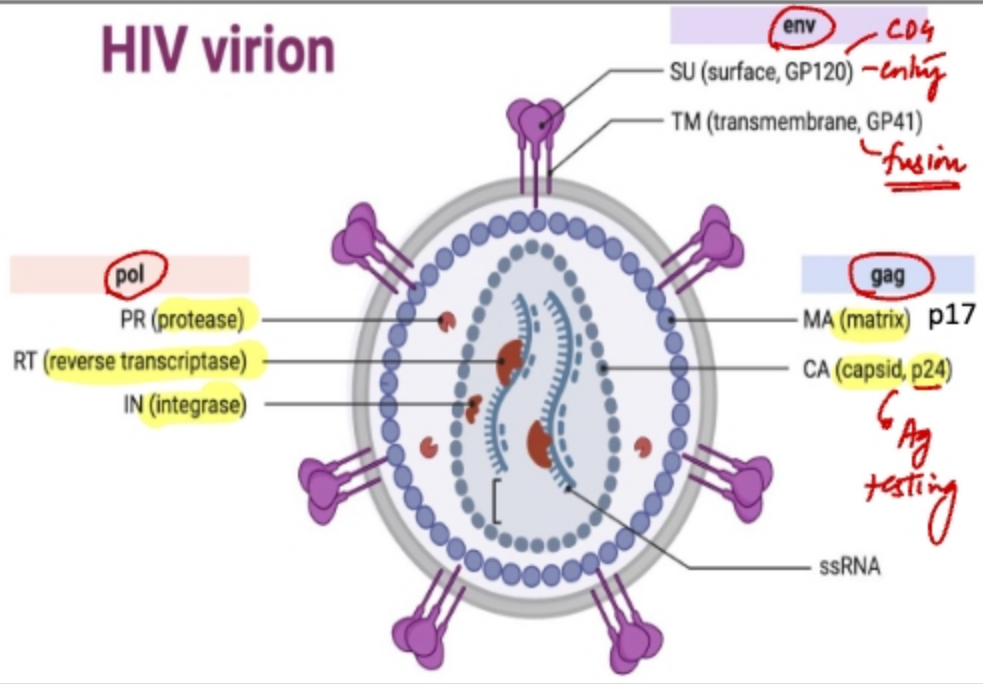
# ANTIVIRALS



Inhibits viral RNA-dependent RNA polymerase in COVID-19: *Remdesivir*  
Inhibit viral DNA polymerase in VZV/HSV (Viral thymidine kinase): *Acyclovir / Fam / Vala*  
Inhibit viral DNA polymerase in CMV (Viral UL97 kinase): *Gancyclovir* → *Foscarnet / Cidofovir*  
Inhibit Pox p37 inhibiting exit from cell: *Tecovirimat*

# HIV/AIDS

## HIV virion



IOC for viral load/ Rx response: HIV RNA (PCR)

Screening: **E/R/S** - ELISA / Rapid / Spot

Confirmation: Western blot

Blood donation: **any 1+** → discard blood

Symptomatic: **any 2+** → confirm

Asymptomatic: **all 3+** → confirm

Mode	Efficiency/Risk
Sexual transmission <sup>(MC)</sup>	0.01-1%
<b>Blood</b>	<b>90%</b>
<b>Needles</b>	<b>0.3%</b> → PEP < asap / Em 72hrs x 2ed
<b>Vertical</b>	<b>30%</b> (max: during delivery)

Coreceptor: **CCR5** on macrophages (early)

**CXCR4** on T cells (late infection)

MC strain in india: **gpr M** subgroup **C**

NACO: 95-95-95: dx / Rx / adequately suppressed

All in initiative: ↑ awareness

Nirantar scheme: HRG - iv du / CGW

SUNRISE project: NE states

**ANC-Opt-out**

HIV + Pregnant female: start ART

Delivery: **NVD** (unless viral load ↑ - LSCC)

Most important prognostic factor: viral load > 1000/ml

Newborn of mother on ART: Nevirapine x 6wks

High-risk newborn: Nev + Zidovudine x 12wks

Early infant diagnosis: 6wks (UN PCR) → start ART → 6 monthly till 2yrs.

# 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 + fever/wt loss
	<ul style="list-style-type: none"> <li>Angular cheilitis</li> <li>Recurrent mouth ulcer</li> </ul>	<ul style="list-style-type: none"> <li>Oral thrush</li> <li>Acute necrotizing ulcerative gingivitis</li> <li>Oral hairy leukoplakia <small>EBV</small></li> </ul>	<ul style="list-style-type: none"> <li>Esophageal thrush</li> <li>Herpes simplex ulceration &gt;1 month</li> </ul>
	<ul style="list-style-type: none"> <li>Recurrent URTI</li> <li>Seborrhea</li> <li>Herpes zoster</li> </ul>	<ul style="list-style-type: none"> <li>Pneumonia</li> <li>Pulmonary TB</li> <li>TB lymphadenopathy</li> </ul>	<ul style="list-style-type: none"> <li>Extrapulmonary TB</li> </ul>
		<ul style="list-style-type: none"> <li>Unexplained fever &gt;1 month</li> <li>Diarrhea &gt;1 month</li> </ul>	<ul style="list-style-type: none"> <li>PCP</li> <li>Cryptococcal meningitis</li> <li>Toxoplasma brain abscess <small>MC infn CNS</small></li> <li>Visceral leishmaniasis</li> </ul>
			<ul style="list-style-type: none"> <li>Lymphoma <small>HHV8</small></li> <li>Kaposi sarcoma <small>HPV</small></li> <li>Invasive cervical cancer</li> </ul>

High risk group:

IVDU / MSM / CSW / TG <sup>or</sup>

Bridge: LDT / SMM

trucker migrants

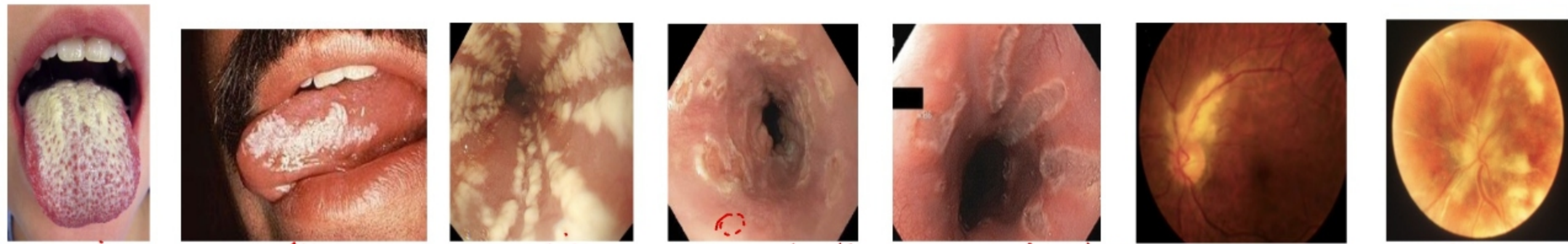
Proxy for general population: ANC

Prophylaxis:

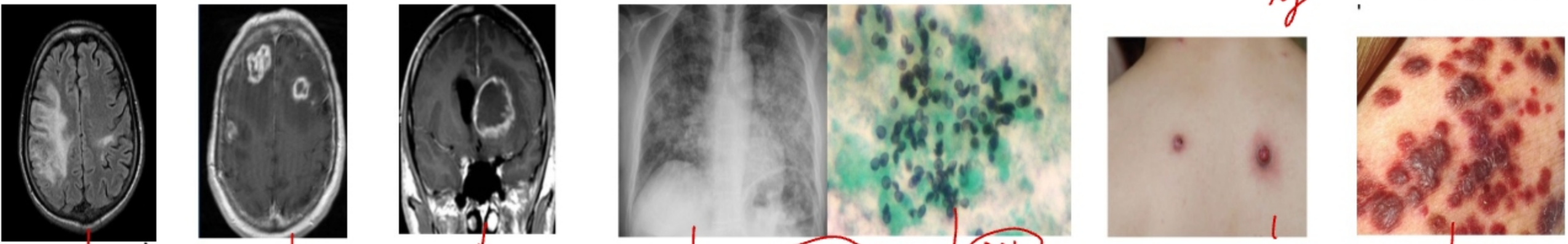
CD4 < 350 - TMP: SMX

PCP

(CD4: < 200)



Candida  
 OHL  
 candida (CMV)  
 punched out  
 ↓  
 HSV  
 serpiginous / shallow  
 ↓  
 CMV  
 toxoplasma  
 ↳ Headlight in Rx  
 CMV Retinitis  
 ↳ pizza pie



asym WM  
 JC = PML  
 VS  
 HAND (encephalopathy)  
 ↳ diffuse  
 ↳ global  
 Toxo  
 Lymphoma  
 GGO ++  
 B/L  
 PCP  
 BAL  
 GMS - ping-pong / sickle  
 Bannister angiomatous  
 Kaposi sarcoma  
 Rx - TMP:SMX  
 ↳ if severe PaO<sub>2</sub> < 60 : O<sub>2</sub> / steroids

# ANTI-RETROVIRALS

TLD - ART / PEP

Tenofovir 300 mg + Lamivudine 300 mg + Dolutegravir 50 mg

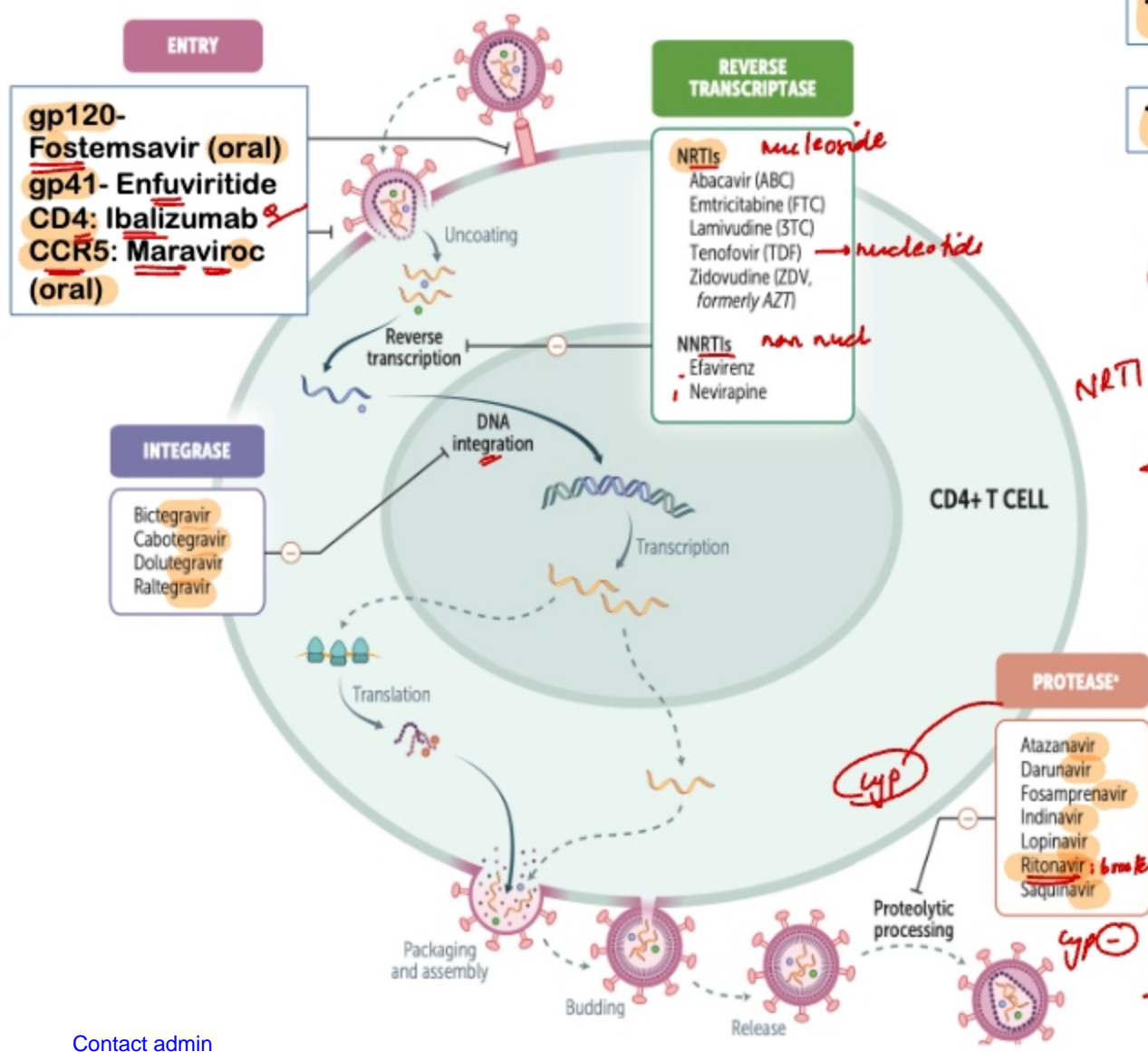
Tenofovir + Emtricitabine: Pre-exposure Prophylaxis *→ spruces / CSW*

Max neuropathy- Stavudine  
 Max pancreatitis- Didanosine  
 BM suppression, Hepatotoxic, mitochondrial myopathy- ZIDOVUDINE *pigma → nails*  
 Nephrotoxic- Tenofovir  
 MI, HLA-B\*5701 Hysn- Abacavi  
 Pigmentation in palms and soles- Emtricitabine  
 Safest- Lamivudine  
 Hep B- LET - Lamiv / Emtr / Tenofovir

Best to prevent vertical transmission- Nevirapine  
 Teratogenic, Vivid dreams- Efavirenz

Min lipodystrophy- Atazanavir  
 Stones, hyperbilirubinemia- Indinavir  
 Intracranial hemorrhage- Tyranivir

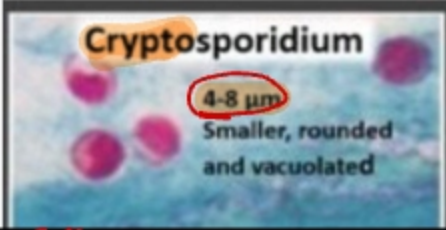
Myopathy- Integrase ⊖



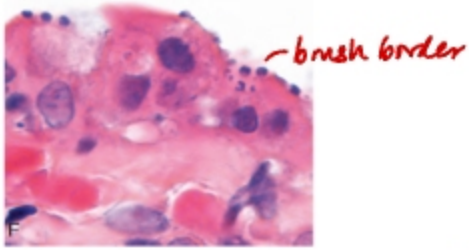
# Parasitology- Protozoa

HIV + diarrhea

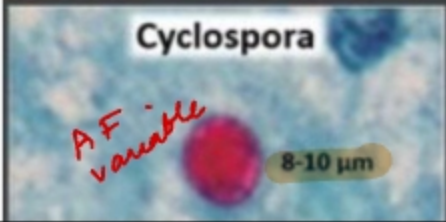
## Sporozoa



DOC-Nitazoxanide



Oocyst immediately infective in stool



DOC-TMP-SMX

- Raspberry  
- Auto-fluorescence



DOC-TMP-SMX

Auto-fluorescence



## TOXOPLASMA

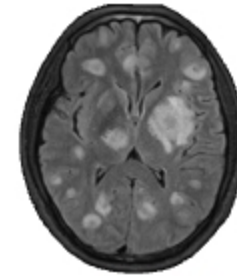
Ingestion-

Cat feces: oo cyst

Meat: bradyzoite

Vertical: tachyzoite

Oocyst infective in stool? NO



HIV +

Frenkel test

Sabin Feldman test complement fix<sup>n</sup>

IgG avidity test:

High- chronic info (reactiv<sup>n</sup>)

Low- acute info

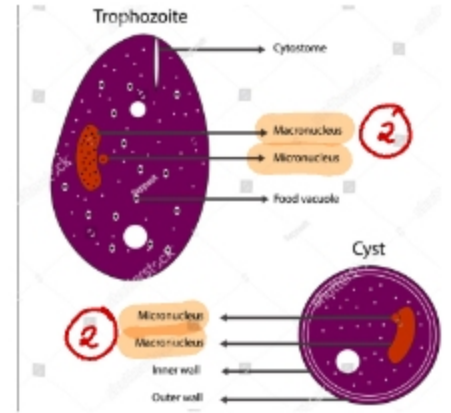
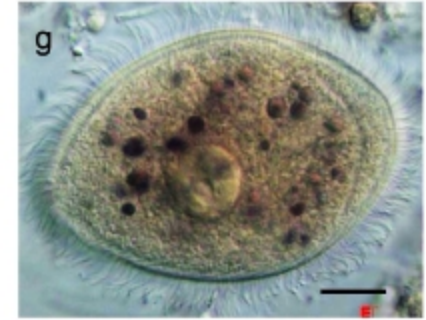
DOC: SP - Sulfadiazine + Pyrimethamine

DOC in Pregnancy: Spiramycin

Plasmodium  
Babesiosis

## Ciliated

B. coli

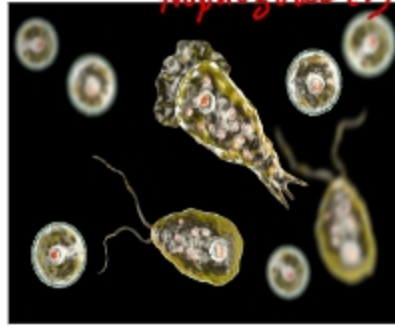


DOC: Doxycycline

# Parasitology- Protozoa

## Amoeba

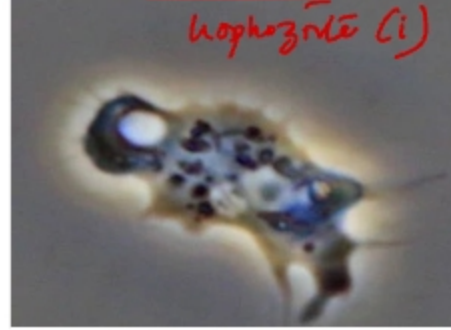
Bath → nasal → CNS → acute ME  
trophozoite (i)



DOC: Amp B

## ACANTAMEBA

trophozoite (i)



DOC: Pentamidine

## NAEGLERIA

blood → Ring / Granular except

Non-nutrient agar with E.coli

Balamuthia  
Sappnia → CNS

## Flagellated

Kala azar

T.cruzi/American trypanosomiasis

Romana sign CHAGAS D

DOC-Benznidazole



Reduvid bug



T.brucei/African trypanosomiasis

Sleeping sickness

DOC-Suramin

NNN medium



Tse tse fly



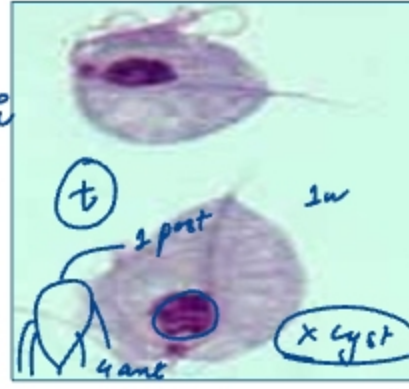
DOC: Metrogl

Giardia

- falling leaf motility
- string test (duod)
- IgA deficiency



Stool (inf)



DOC: Metrogl

itching - Trichomonas

strawberry

Culture: Diamond media

# Parasitology- Nematodes

DH-Man

Fe tēt bro  
D J B12



nm-bite stained  
plano convex



trichuris



fertilised



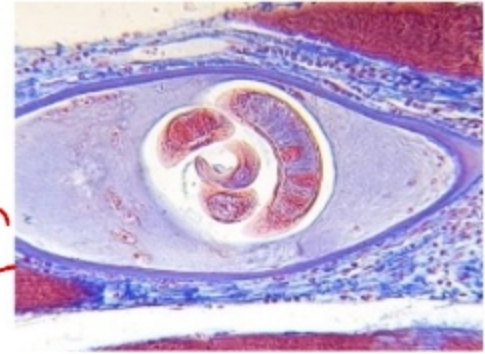
unfertilised



Hookworm



dx:  
rhabditiform



b. vermicularis  
Pinworm

trichura

Whipworm

rectal prolapse

Coconut cake  
rectum

Ascaris

**Chandler's index**

- duodenum

- IDA

old: Ancylostoma duodenale

new: Necator americanus

**Parthenogenesis Fullborne test Smallest**

ovo-vivi p

Strongyloides

**Bachmann test**

TRICHINELLA

(viviparous  
encysted -  
muscle)



♀ Inger

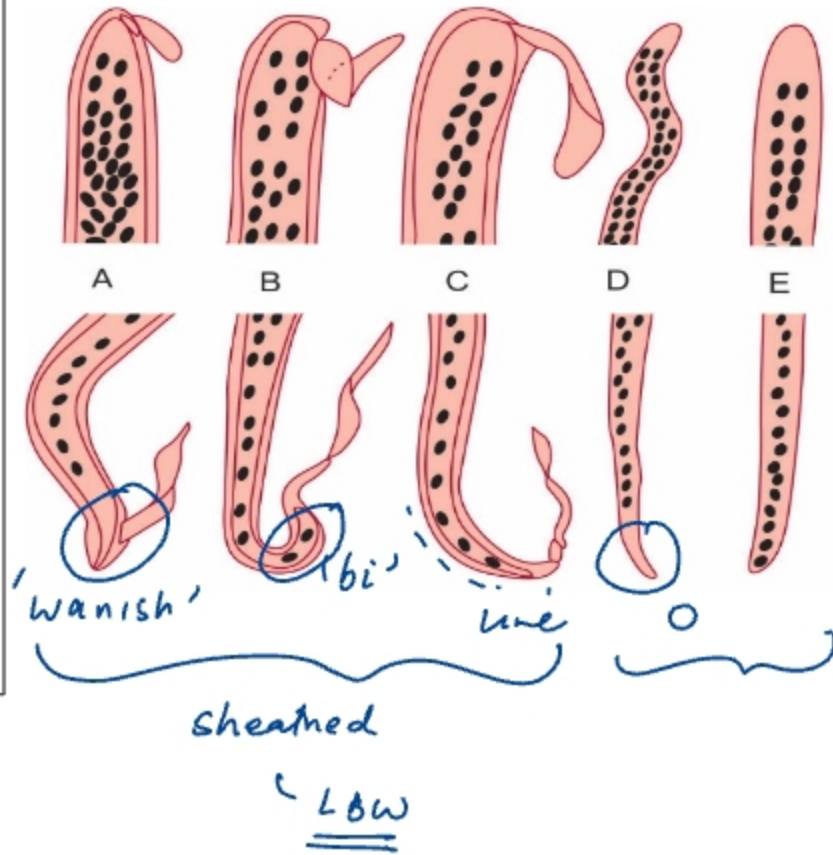
Ingested—Enterobius, Ascaris, Trichuris, Trichinella, Toxocara

Cutaneous—Strongyloides, Hookworm (animal) CLM

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



FILARIASIS

Transmission assessment survey  
 IOC: nighttime blood sample  
 DEC Provocation test  
 Concentration: Membrane filtration / Knott method (2% formalin)  
 DOC: DEC + Ivermectin + Albendazole  
 MDA (2/3) - 1st test

# Parasitology- Cestodes

DH-Man



Taenia  
solium  
saginata

non bile  
H. nana  
Dwarf T  
No IH

H. diminuta  
Rat tapeworm  
IH = Rat

L. Trematodes  
D. latum  
1st IH - cyclops  
2nd IH - Fish

Hydatid cyst (DH - Dog)  
SH - Sheep

Casoni test (type 1 hyen)

ileum: B12 def

NCC egg

T. solium

T. saginata

H. nana

H. diminuta

D. latum

E. granulosus



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:** *metacercaria*  
**Transmission:** *feco-oral*  
**Sexes:** *hermaphrodite*  
**Eggs:** *operculated*  
**Definitive host:** *MAN*  
**Primary Intermediate:** *SNAIL*  
**Second Intermediate:** *Crab / Crustaceans*  
**Paragonimus:** *FISH (RIF-CCA)*  
**Opisthorchis/ Clonorchis:** *fresh aquatic vegs*

**S-** *Cercaria*  
**S-** *skin*  
**S-** *sep sexes*  
**S-** *SPINE*



*Lateral spine*  
*S. mansoni*



*No spine*  
*S. japonicum*

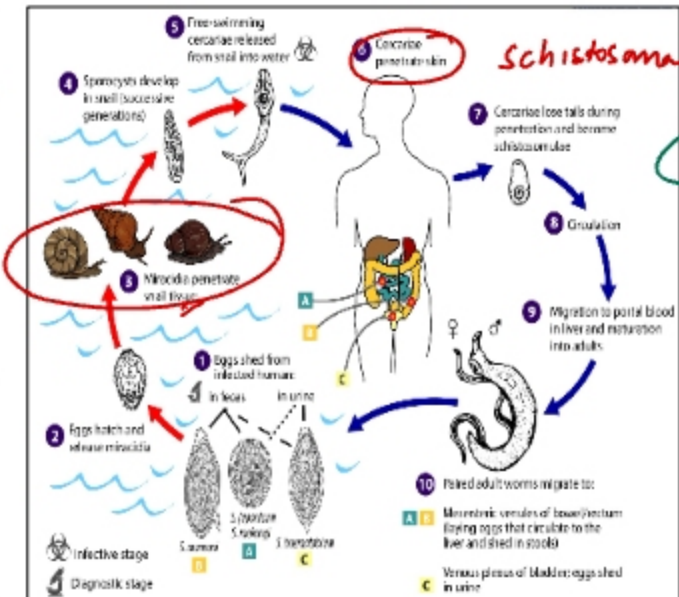
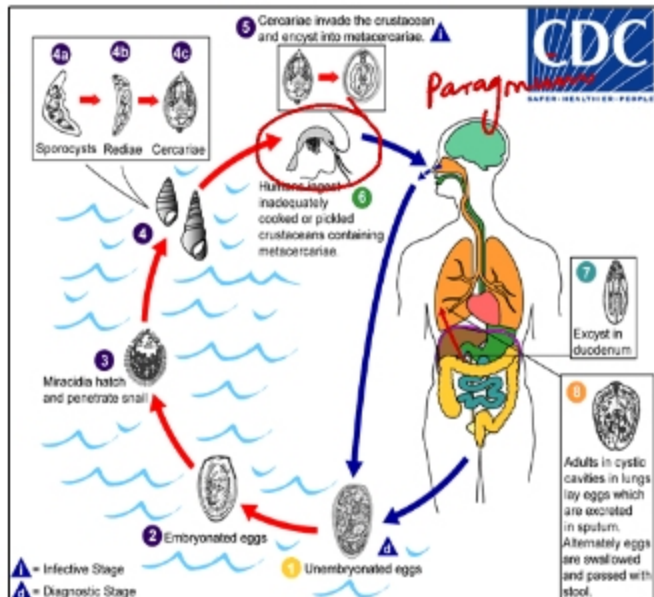
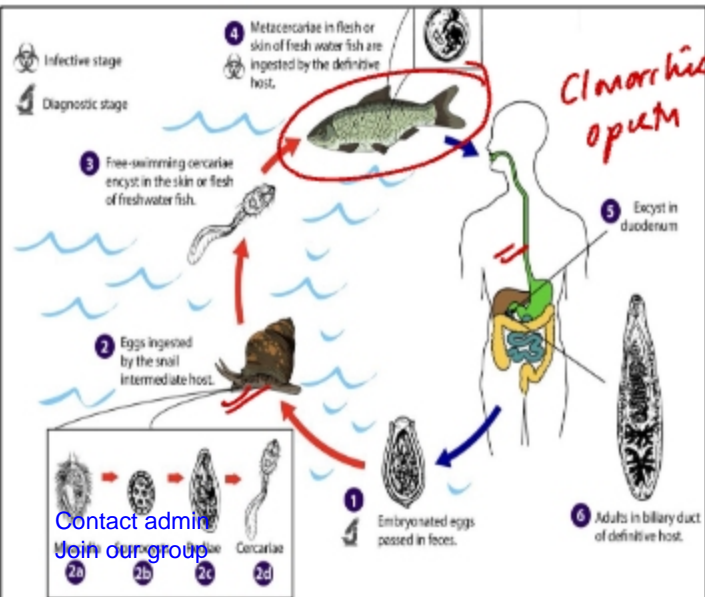


*terminal*  
*S. hematobium*

*inf mesenteric plexus*  
*Sup mesenteric*  
*portal hytn = Katayama fever*

*venical plexus*  
*Sg cc*

**FAIRLEY test**



Contact admin  
Join our group

## Non Bile-Stained

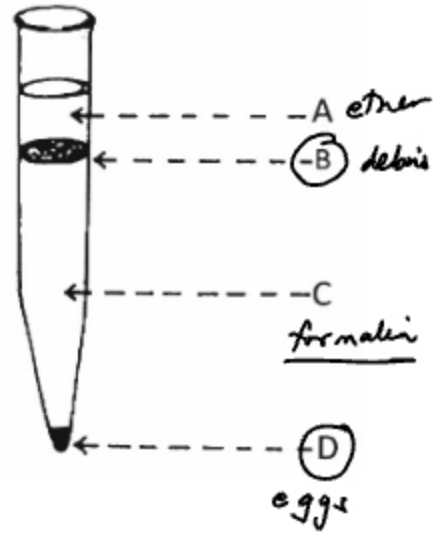
N E H A  
 Necator )  
 Evermicularis )  
 Ancylostoma  
 H. nana

## Don't Float

S U I T  
 Strongyloides )  
 Int tapeworms )  
 Taenia  
 Unfert  
 Azcaris

## Autoinfection

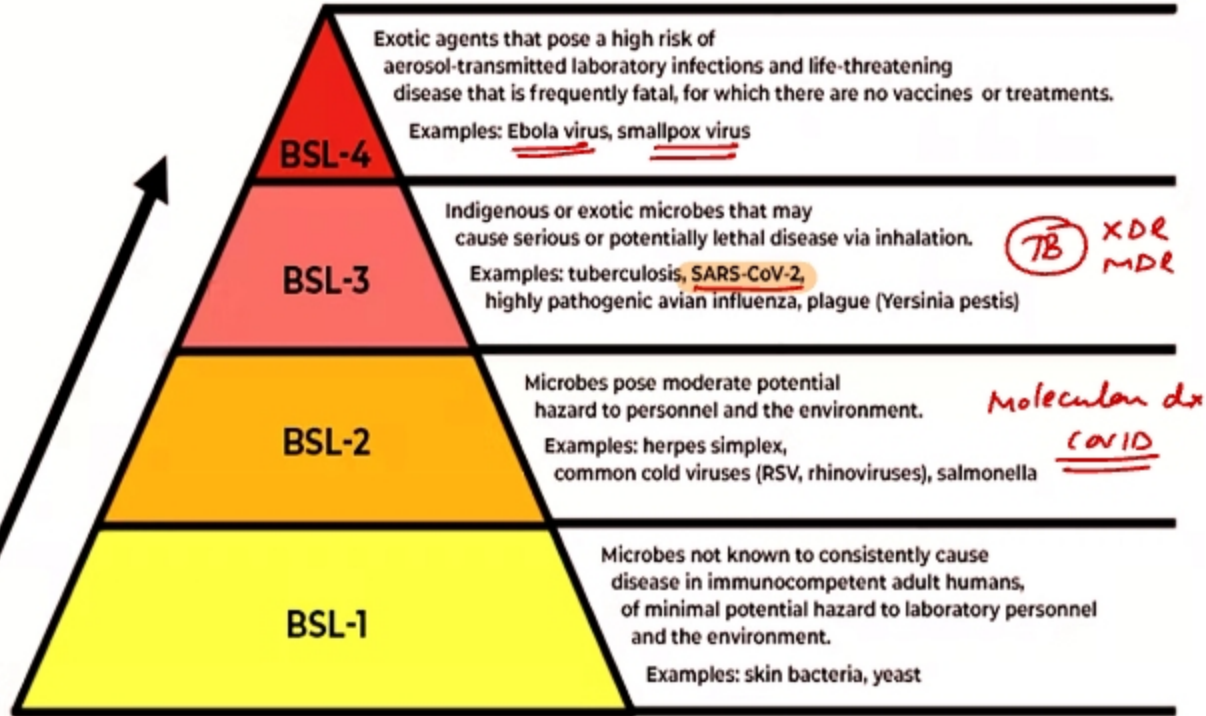
C H E S T  
 Cryptosporidium  
 H. nana  
 Taenia  
 Strongyl  
 Enterobius



DOC: Cestodes, Trematodes- Praziquantel - ↑Ca<sup>2+</sup>  
 Liver Fluke- triclabendazole - NT<sup>⊖</sup> - ↑depot<sup>n</sup>  
 Hydatid, NCC, Nematodes- Albendazole  
 Filaria, Loa, Loa- DEC  
 Onchocerca, Strongyloides- Ivermectin - ↑Cl<sup>-</sup> - Hyperpolariz<sup>n</sup>

# General Microbiology

## Bio Safety Levels

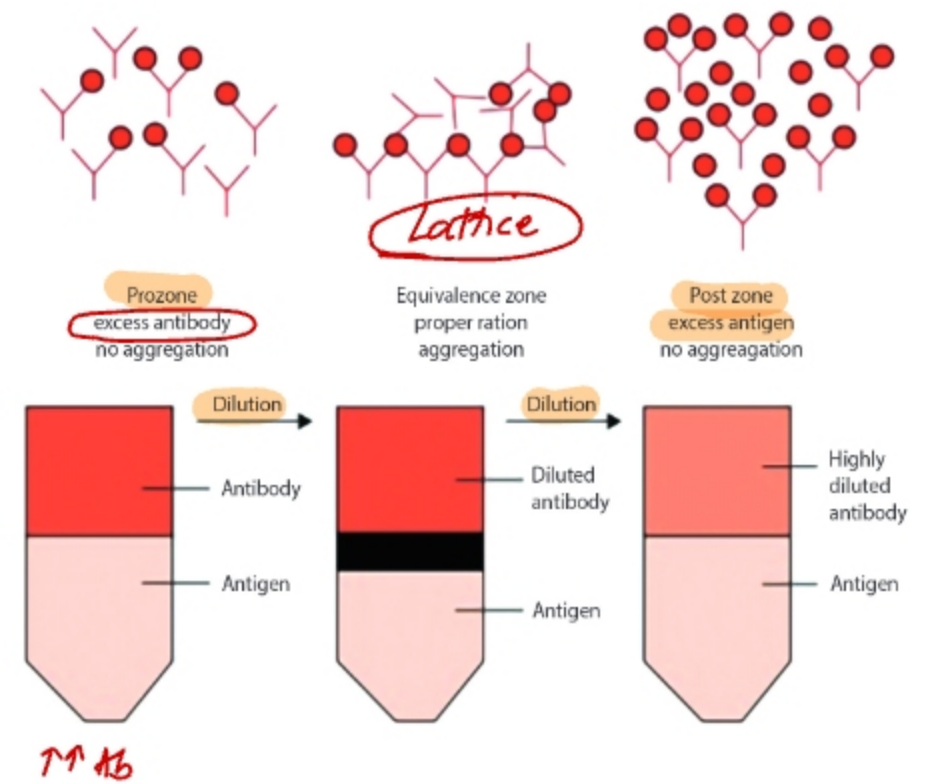
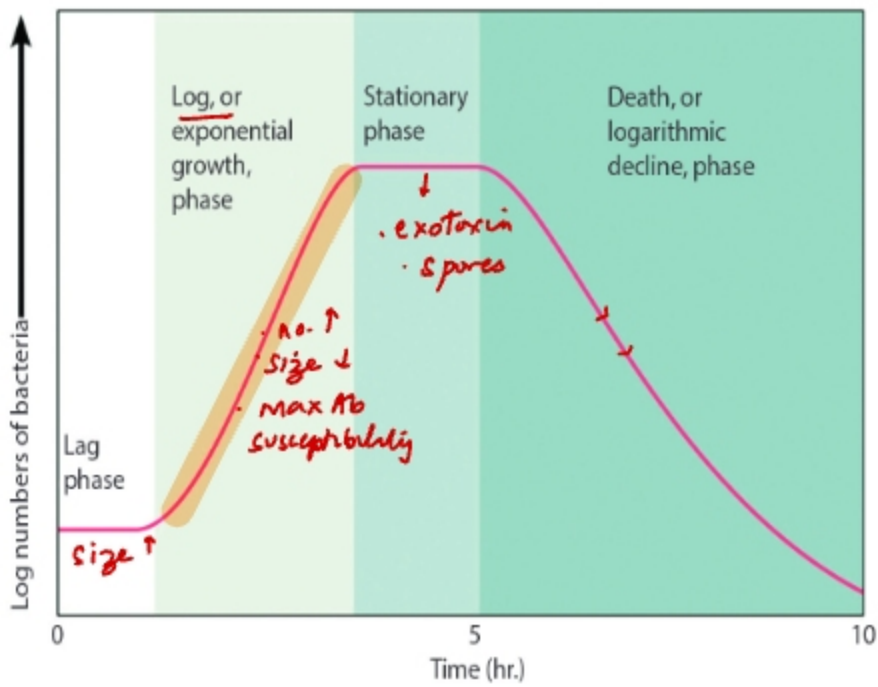


## Bioterrorism Agents

**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



**SPORES :**

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

# Ag-Ab tests

## Precipitation/ Flocculation : Ag soluble

- Ring test: **Ascoli** - Anthrax      **Lancefield**
- Slide: VDRL } syphilis      **L B hemolytic**
- Tube: Kahn }
- Immunodiffusion/ Gel: Elek test
- Rocket electrophoresis: Quantitative

## Agglutination : Ag insoluble

- Slide: Blood grouping, Rose Bengal - Brucella
- Tube: **Widal** **Weil Felix** **Paul-Bunnell** **CAT** **SAT** **MAT**
- Coombs test
- **Indirect/Passive agglutination**:
- **Latex-ASO**, CRP, RF, HCG
- **Heme-Rose Waaler test** RF

## Complement fixation <sup>Q9</sup>

Wassermann, TPI  
Sabin Feldman

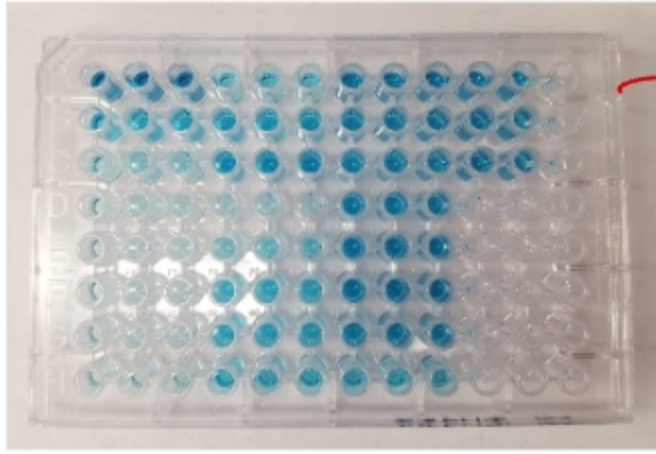
Contact admin  
on our group

	<b>Single dimension</b> Tube	<b>Double dimension</b> Slide
<b>Single diffusion</b> Ag moving	<b>Oudin</b>	<b>Mancini</b>
<b>Double diffusion</b> Ag + AB moving	<b>Oakley-Fulthrope</b>	<b><u>Ouchterlony</u></b>

→ False +ve / titres-comparing

WIDAL TEST	<b>TO</b>	<b>TH</b>	<b>AH</b>	<b>BH</b>
S. typhi	+	+		
S. paratyphi A	+		+	
S. paratyphi B	+			+
Early infection	+	-	-	-
Late infection	-	+	-	-
Vaccinated (Vi)	⊖	+	+	+

# ELISA

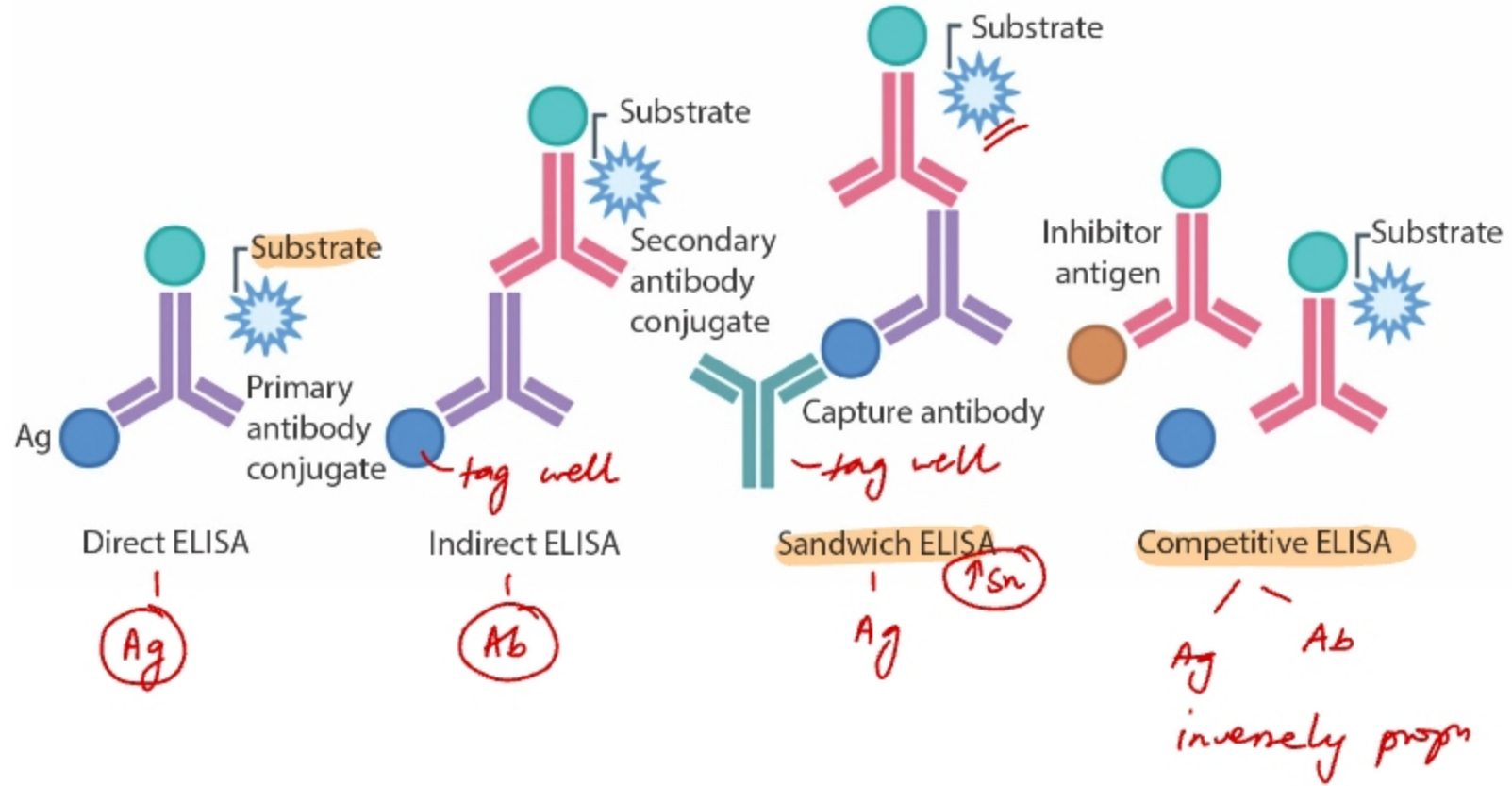


→ 96 wells

**Enzyme:** Horseradish peroxidase

**Substrate:** H<sub>2</sub>O<sub>2</sub>

**Chromogen:** Tetramethylbenzidine (TMB)



# Sterilisation (Joseph Lister)

**Autoclave**  
121 x 15min x 15psi

- Sx instruments exc SHARPS
- Drapes / linen
- Suture except CATGUT
- Culture media except LSS / LJ medium inspisation

**Hot Air Oven**  
160 X 2HR

- SHARPS
- greasy
  - paraffin wax
  - Glassware
  - Powder

**H<sub>2</sub>O<sub>2</sub> = Plasma**

- urethra
- artmo



**Ethylene Oxide**

- syringes
- CPM

**Radiation: Gamma rays**

↓  
Catgut

**Aldehydes: Glutaraldehyde 2%**

↓  
Scopes

**Membrane filtration**

heat sn vaccine

**Hypochlorite 5%**

Blood spills

## Milk Pasteurisation: Non-sporicidal

- 63° x 30 min - Holder / VAT - ⓧ Coxiella
- 72° x 15 sec - HTST / Flash
- 125° x 3 sec - UHT

- Coliform, Standard plate, Phosphatase test <sup>adequacy</sup>  
<sub>best</sub>

## Microbiological Controls - Braine tube

B. subtilis: Hot air oven

B. stearothermophilus: Autoclave / Plasma

B. pumilis: IR rays

B. globigi: ETO

## Spaulding classification

**Critical**: tissue / blood - forceps / retractors - sterilise

**Semi-critical**: mucous memb / non intact skin - HLD - Cidex.

**Non-critical**: intact skin - stethoscope - LLD - isopropyl alcohol