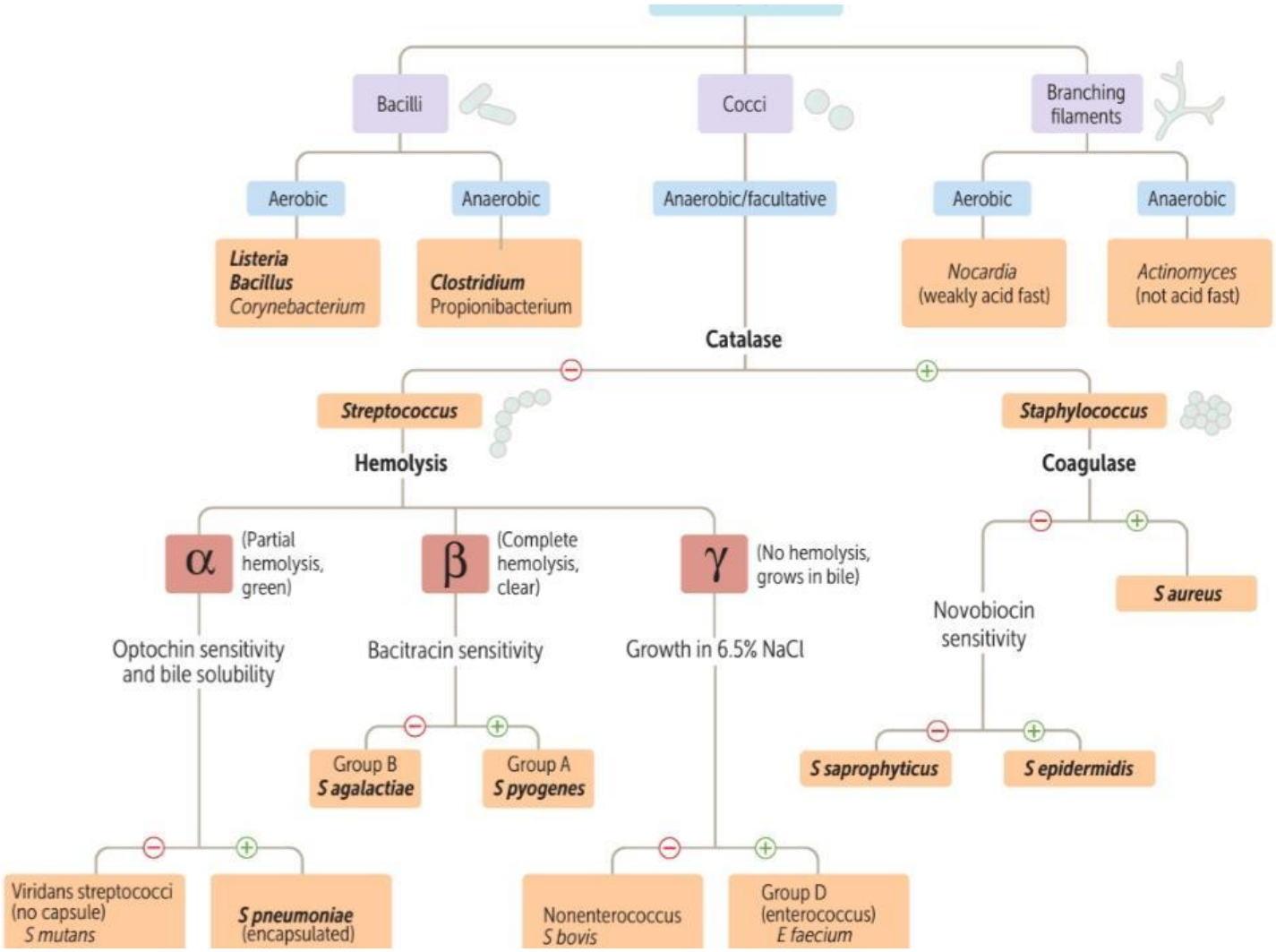
TABLE 5–1 Classification of Medically Important Bacteria

Characteristics	Genus	Representative Diseases
I. Rigid, thick-walled cells		
A. Free-living (extracellular bacteria)		
1. Gram-positive		
a. Cocci	*Streptococcus*	Pneumonia, pharyngitis, cellulitis
	Staphylococcus	Abscess of skin and other organs
b. Spore-forming rods		
(1) Aerobic	*Bacillus*	Anthrax
(2) Anaerobic	*Clostridium*	Tetanus, gas gangrene, botulism
c. Non–spore-forming rods		
(1) Nonfilamentous	*Corynebacterium*	Diphtheria
	Listeria	Meningitis
(2) Filamentous	*Actinomyces*	Actinomycosis
	Nocardia	Nocardiosis
2. Gram-negative		
a. Cocci	*Neisseria*	Gonorrhea, meningitis
b. Rods		
(1) Facultative		
(a) Straight		
(i) Respiratory organisms	*Haemophilus*	Meningitis
	Bordetella	Whooping cough
	Legionella	Pneumonia
(ii) Zoonotic organisms	*Brucella*	Brucellosis
	Francisella	Tularemia
	Pasteurella	Cellulitis
	Yersinia	Plague
(iii) Enteric and related organisms	*Escherichia*	Urinary tract infection, diarrhea
	Enterobacter	Urinary tract infection
	Serratia	Pneumonia
	Klebsiella	Pneumonia, urinary tract infection
	Salmonella	Enterocolitis, typhoid fever
	Shigella	Enterocolitis
	Proteus	Urinary tract infection
(b) Curved	*Campylobacter*	Enterocolitis
	Helicobacter	Gastritis, peptic ulcer
	Vibrio	Cholera
(2) Aerobic	*Pseudomonas*	Pneumonia, urinary tract infection
(3) Anaerobic	*Bacteroides*	Peritonitis
3. Acid-fast	*Mycobacterium*	Tuberculosis, leprosy
B. Non–free-living (obligate intracellular parasites)	*Rickettsia*	Rocky Mountain spotted fever, typhus, Q fever
	Chlamydia	Urethritis, trachoma, psittacosis
II. Flexible, thin-walled cells (spirochetes)	*Treponema*	Syphilis
	Borrelia	Lyme disease
	Leptospira	Leptospirosis
III. Wall-less cells	*Mycoplasma*	Pneumonia

TABLE 14–1 Major Bacterial Pathogens

Type of Organism	Genus
Readily Gram stained	
Gram-positive cocci	*Staphylococcus, Streptococcus, Enterococcus*
Gram-negative cocci	*Neisseria*
Gram-positive rods	*Corynebacterium, Listeria, Bacillus, Clostridium, Actinomyces, Nocardia*
Gram-negative rods	
Enteric tract organisms	
Pathogenic inside and outside tract	*Escherichia, Salmonella*
Pathogenic primarily inside tract	*Shigella, Vibrio, Campylobacter, Helicobacter*
Pathogenic outside tract	*Klebsiella–Enterobacter–Serratia* group, *Pseudomonas, Proteus–Providencia–Morganella* group, *Bacteroides*
Respiratory tract organisms	*Haemophilus, Legionella, Bordetella*
Organisms from animal sources	*Brucella, Francisella, Pasteurella, Yersinia*
Not readily Gram stained	
Not obligate intracellular bacteria	*Mycobacterium, Mycoplasma, Treponema, Leptospira*
Obligate intracellular bacteria	*Chlamydia, Rickettsia*



Staphylococcus

Gram +, cocci in grape like cluster

Catalase + (degrade H2O2) (virulence factor: prevent killing by neutrophil H2O2

3 pathogenic species: S aureus, S epidermidis, S saprophyticus

→ Normal flora of #skin = #Staph_epidermidis
#Nose= #Staph_aureus
#Vagina= #Staph_saprophyticus

TABLE 15–2 Important Features of Pathogenesis by Staphylococci

Organism	Type of Pathogenesis	Typical Disease	Predisposing Factor	Mode of Prevention
S. aureus	1. Toxigenic (superantigen)	Toxic shock syndrome	Vaginal or nasal tampons	Reduce time of tampon use
		Food poisoning	Improper food storage	Refrigerate food
	2. Pyogenic (abscess)			
	a. Local	Skin infection (e.g., impetigo, surgical-wound infections)	Poor skin hygiene; failure to follow aseptic procedures	Cleanliness; handwashing; reduce nasal carriage
	b. Disseminated	Sepsis, endocarditis[1]	IV drug use	Reduce IV drug use
S. epidermidis	Pyogenic	Infections of intravenous catheter sites and prosthetic devices	Failure to follow aseptic procedures or remove IV catheters promptly	Handwashing; remove IV catheters promptly
S. saprophyticus	Pyogenic	Urinary tract infection	Sexual activity	

IV = intravenous.

★Staph aureus

Coagulase +

Culture: Golden colour colony- staphyloxanthin

Causes Beta haemolysis- hemolysin

Ferments mannitol

Normal flora of anterior nares

Disease produced:

1. Toxin mediated:

★Enterotoxin: Food poisoning (Gastroenteritis): Prominent vomiting, watery diarrhoea

★TSST: Toxic shock syndrome: in tampon using mensturating woman, nasal packing patient of epistaxis

★Exfoliatin/epidermolytic toxin: Scalded skin syndrome, in young children

★Alpha toxin & PV leucocidin: severe SSTI, Necrotizing pneumonia

2. Pyogenic Inflammation: (pus producing)- skin, soft tissue, bones, joints, heart, lung, kidney infection

★SSTI: Abscess, furuncles, carbuncles, boils, paronychia, folliculitis, cellulitis, impetigo, necrotizing fasciitis, conjunctivitis, eye lid infection (stye, blepharitis, hordeolum), mastitis

★Pyogenic infections: Endocarditis, Osteomyelitis, Septic Arthritis, Pneumonia→ empyema, lung abscess, Metastatic abscess

Hospital acquired pneumonia

Septicaemia & sepsis (from wound infections, IV drug users)

Post Surgical wound infection (S aureus most common cause)

★Necrotizing fasciitis (gangrene): homeless & IV drug users, contact sports & wrestlers, caused by specially CA-MRSA (Other causes: Strep pyogenes, Cl perfringens)

★Endocarditis: normal/prosthetic heart valve, Right sided (tricuspid valve) in IV drug users

★Osteomyelitis & septic arthritis: via hematogenous spread or from wound infection, common cause in children

★Pneumonia, empyema, lung abscess: following viral RTI (influenza), post op/ ICU pt (ventilator associated pneumonia)

★MRSA: skin abscess, Pneumonia, necrotizing fasciitis, sepsis

MRSA: chromosomal gene mecA gene→ PBP→ Methicillin resistance

Drug of choice: Vancomycin

√Coagulase -- :★ S epidermidis (novobiocin sensitive), normal flora of skin & mucous membrane

★ S saprophyticus (novobiocin resistant), normal flora of mucosa of female genital tract

Doesn't produce exotoxin

Only pyogenic infection

Staph epidermidis

Pyogenic infection on prosthetic implants: Prosthetic heart valve (endocarditis), Prosthetic joint infection (osteomyelitis, septic arthritis), Vascular grafts

IV catheters

Most common cause of CSF shunt infection

Peritonitis in indwelling peritoneal dialysis catheters

Neonatal sepsis

Almost always hospital acquired

Staph saprophyticus

UTI (cystitis) in sexually active woman

Most common cause : E coli

Mostly community aquired

SBA Question clue:

*Central line infection = think Staph_epidermidis

*Peritonitis due to peritoneal dialysis=think Staph_epidermidis

*Prosthetic joint infection = think Staph_epidermidis

*Prosthetic valve endocarditis < 2 months = Staph_epidermidis

👉 Prosthetic valve endocarditis > 2 months = Staph_aureus

👉 Bullous impetigo with intraepidermal splitting = Staph_aureus

#Osteomyelitis = staph_aureus

#septic_arthritis = staph_aureus

💉💉 IV drug use + pneumonia + cavitation on CXR =#Staph_aureus

💉💉IV drug use + Acute Infective endocarditis = #Staph_aureus

★Pneumonia after influenza virus infection= staph aureus

👉 High fever +Hypotension + Generalised systemic upset(headache, myalgia, sore throat, vomiting, diarrhoea)+ Diffuse erythematous Blanching rash + H/0 #nasal_pack use/ #Tampoon using #Menstruating lady + desquamation+ Multiorgan failure = #TSS by staph aureus

food poisoning→ short incubation period 2-6hrs, non bloody diarrhoea, massive vomiting. Enterotoxin is heat labile(not destroyed by cooking.

#DM / IV drug use + Fever + Back pain + High ESR, CRP, neutrophil = Staphylococcal discitis not MM
(staph aureus)

Toxins of Staph aureus
1. TSST :Toxic shock syndrome
2. PV leucocidin: Necrotizing pneumonia
3. Hemolysin: Hemolysis (B hemolytic)
4. Exfoliative toxin: Scalded skin syndrome
5. Enterotoxin: staphylococcal food poisoning

#MRSA Cause --- Mutation of PBP (MecA gene)

Rx--- Vancomycin
Daptomycin
Rifampicin
Linezolid

Clindamycin
Cotrimoxazole
Tetracycline
Tigecycline

(Mnemonic: VDRL - CT)

Prevention : Hand hygiene

#. S.epidermidis: Gram+, catalase+, Coagulase--, urease+, novobiocin sensitive
Normal flora of skin, contaminates blood culture
Forms biofilm on prosthetic implants (heart valve, joint implant), & IV catheters

👩 UTI in sexually active young lady = think #staph_saprophyticus (2nd most common cause)
Normal flora of female genital tract & perineum

Streptococcus

★Gram + cocci arranged in chains or pairs

★Catalase –

★Classified based on: Hemolysis (a,B,y), C carbohydrate(lancet classification) Grp A, B....U

★M protein in strep pyogenes: antiphagocytic, nephritogenic & rheumatogenic strains

★normal flora: Strep pyogenes- skin & oropharynx

/colonize Strep agalactea- vagina

Strep pneumoniae & viridans strep- oropharynx

Strep bovis & enterococci- colon

TABLE 15–4 Important Features of Pathogenesis by Streptococci

Organism	Type of Pathogenesis	Typical Disease	Main Site of Disease (D), Colonization (C), or Normal Flora (NF)
S. pyogenes (group A)	1. Pyogenic		
	a. Local	Impetigo, cellulitis	Skin (D)
		Pharyngitis	Throat (D)
	b. Disseminated	Sepsis	Bloodstream (D)
	2. Toxigenic	Scarlet fever	Skin (D)
		Toxic shock	Many organs (D)
	3. Immune-mediated (poststrepto-coccal, nonsuppurative)	Rheumatic fever	Heart, joints (D)
		Acute glomerulonephritis	Kidney (D)
S. agalactiae (group B)	Pyogenic	Neonatal sepsis and meningitis	Vagina (C)
E. faecalis (group D)	Pyogenic	Urinary tract infection, endocarditis	Colon (NF)
S. bovis (group D)	Pyogenic	Endocarditis	Colon (NF)
S. pneumoniae	Pyogenic	Pneumonia, otitis media, meningitis	Oropharynx (C)
Viridans streptococci	Pyogenic	Endocarditis	Oropharynx (NF)

Group A B hemolytic Strep- Streptococcus pyogenes: causes 3 types of disease

1. **Pyogenic:** local: Pharyngitis, Tonsillitis, SSTI (Cellulitis, Erysipelas, impetigo, necrotizing fasciitis)
   Disseminated: sepsis

   ★Streptococcal pharyngitis: Most common bacterial cause of pharyngitis.
   If untreated leads to:
   Rheumatic fever
   Otitis media, Sinusitis, Mastoiditis
   Meningitis
   Peritonsillar/retropharyngeal abscess

2. **Toxigenic:** Scarlet fever (Erythrogenic/Pyrogenic exotoxin)
   Toxic shock syndrome (Pyogenic exotoxin A)

3. **Immunogenis:** RF, AGN

   ★Acute Glomerulonephritis:
   *Occurs 2-3 weeks after GAS skin infection in children (M protein type 49)
   *CF: HTN, edema of face(periorbital) & ankle, smoky urine
   *Ag-Ab complex deposition on GBM cause complement activation and inflammation in glomerular capillaries
   *reinfection rarely cause recurrence of AGN

   ★Rheumatic Fever:

*2 weeks after GAS pharyngitis in children 5-15 years
*Antibody formed against M protein cross react e tissues in heart, joint, basal ganglia
*Fever, migratory polyarthritis, pancarditis, erythema nodosum, sydenham's chorea
*raised ASO titre, prolonged PR interval, raised ESR
*RF (esp carditis) exacerbate by recurrent strep infection
*require long term prophylaxis e penicillin to prevent reinfection

Group B B hemolytic strep- Streptococcus agalactae:

Leading cause of **Neonatal sepsis** & **Meningitis**

Prolonged rupture of membrane >18hours in women colonized e strep. agalactae

Group D A or Y hemolytic strep: Enterococcus & strep bovis

★Endocarditis in patient undergone GI/ Urinary tract surgery or instrumentation= **Enterococci** (hospital acquired UTI)

★Endocarditis in patient e CA colon= **Strep bovis/gallolyticus**

A hemolytic strep: S pneumoniae, viridans strep

Viridans streptococci: mutans, mitis, sanguinis

Normal flora of month & pharynx

Causes Subacute bacterial endocarditis after dental surgery

Present e prolonged fever, changing murmur, anemia, embolic events: splinter hge, janeway lesion, subconjunctival petechiae, roth spot in fundoscopy

Streptococcus pneumoniae

Pneumonia

Sepsis (esp in splenectomised pt)

Meningitis

URTI: Sinusitis, Otitis media, Mastoiditis

Conjunctivitis in children

Special properties: polysaccharide capsule (Quellung reaction), produce IgA protease→ colonize oropharynx

SBA Question clue:

👉 Cellulitis = #Strep_pyogenes

👉 Erysipelas = #Strep_pyogenes

👉 Bacterial Pharyngitis >> #Strep_pyogenes

👉Type 2 necrotizing fascitis>> #Strep_pyogenes

Neonatal Meningitis, Sepsis >> #Strep_agalactiae

★★ Gram (+) diplococci =#Strep_pneumoniae
(#Pneumococcus)
Alpha hemolytic, Encapsulated, produce IgA protease.

★★Pneumococcus: most commonly causes (MOPS): CAP, Meningitis, Otitis media, Sinusitis

★★★ Community acquired pneumonia(CAP)>> most commonly #Pneumococcus

★★★Cold Sore / Herpes labialis +
CAP with Rusty sputum= think
#Pneumococcus

★★★ SPLENECTOMY + CAP with Rusty sputum=
#Pneumococcus

★★★ Meningitis + CSF : Gram (+) cocci = think

#Pneumococcus

★★★ School age children + Diffuse erythematous sandpaper like blanching rash + initially coated tongue later becomes red and swollen (#strawberry_tongue)+ circumoral pallor+ petechial rash in cubital fossa (#pastia_sign)=

Strep pyogenes(#Scarlet_fever) (pyrogenic exotoxin)
Rx: Benzylpenicillin

★★ Viridans group Streptococci: normal flora of Oropharynx

S.mutans & S.mitis→ Dental Caries
S.sanguinis→ can bind to damage heart valve(dextran-platlet fibrin aggregate)→Subacute bacterial Endocarditis

★★★★Poor dental hygiene / dental procedure +
Infective endocarditis = think
#Strep_viridans

★★★ ★★Large bowel malignancy +
Infective endocarditis = think
#Strep_gallolyticus /bovis

☞ Fever + #NO cough + Sore throat + tender ant. cervical lymphadenopathy + purulent tonsillar exudate = #Strep_pyogenes

👉 High fever + Rash and progressive swelling in one side of face = think #Erysipelas

→Enterococcus: UTI, Biliary tract infection, IE

TABLE 7–16 Different Strains of Bacteria Can Cause Different Diseases

Bacteria	Diseases	Virulence Factors	Mode of Action
Staphylococcus aureus			
1. Exotoxin mediated	Toxic shock syndrome	Toxic shock syndrome toxin	Superantigen
	Food poisoning (gastroenteritis)	Enterotoxin	Superantigen
	Scalded skin syndrome	Exfoliatin	Protease cleaves desmoglein
2. Pyogenic	Skin abscess, osteomyelitis, and endocarditis	Enzymes causing inflammation and necrosis	Coagulase, hyaluronidase, leukocidin, lipase, and nuclease
Streptococcus pyogenes			
1. Exotoxin mediated	Scarlet fever	Erythrogenic toxin	Superantigen
	Streptococcal toxic shock syndrome	Toxic shock syndrome toxin	Superantigen
2. Pyogenic (suppurative)	Pharyngitis, cellulitis, and necrotizing fasciitis	Enzymes causing inflammation and necrosis	Hyaluronidase (spreading factor)
3. Nonsuppurative (immunopathogenic)	Rheumatic fever	Certain M proteins on pilus	Antibody to M protein cross-reacts with cardiac, joint, and brain tissue
	Acute glomerulonephritis	Certain M proteins on pilus	Immune complexes deposit on glomeruli
Escherichia coli			
1. Exotoxin mediated	Watery, nonbloody diarrhea (traveler's diarrhea)	Labile toxin	Activation of adenylate cyclase increases cyclic AMP; no cell death
	Bloody diarrhea (associated with undercooked hamburger); O157:H7 strain	Shiga-like toxin (verotoxin)	Cytotoxin inhibits protein synthesis; cell death occurs
2. Pyogenic	Urinary tract infection	Uropathic pili	Pili attach to Gal–Gal receptors on bladder epithelium
	Neonatal meningitis	K-1 capsule	Antiphagocytic

Brucella

👉 Farmer + TB like feature + H/0 unpasteurized milk intake = think #Brucellosis

👉 Farmer + Generalized lymphadenopathy + Hepatosplenomegaly + pancytopenia>> think #Brucellosis

👉 Screening test = Rose bengal plate test

👉 Best / Confirmatory test = Brucella serology

👉 Rx = Aminoglycoside + Tetracycline

Lyme disease

Borrelia burgdorferi (Flagellated spirochete)

★3 stages:

1. Early localised disease: Erythema migrans (bull's eye) + flu like symp (fever, headache, regional LNpathy)+ Arthralgia

2. Early disseminated disease: (Joint, CNS, CVS)
   CNS(Lymphocytic meningitis, bil facial nerve palsy)
   CVS(Carditis, AV conduction defect)

3. Late disease: -prolonged large joint arthritis
   -Neuropsychiatric disorder, Encephalopathy
   -Acrodermatitis chronica atrophicans

👉 H/0 forest visit + Bilateral LMNL of facial nerve palsy + Rash over forearm (Erythema migrans) =

#Lyme_disease

👉 slowly enlarged Erythema + lymphocytic meningitis>>>

#Lyme_disease

👉 prolonged arthritis+ neuropsychiatric disorder = lyme disease

👉 1st sign >> Erythema migrans

👉 #bulls_eye lesion = #Lyme_disease

👉 1st line test = ELIZA

👉 Confirmatory test = Immunoblot / Western blot

👉 Rx ----Doxycycline : Early disease
ceftriaxone : Disseminated /CNS involved

Leptospira

👉 #Farmer/ #Sewage worker + #Hepatorenal_Syndrome = think #Leptospirosis

👉 #Farmer / #Sewage worker + fever + AKI + Jaundice + thrombocytopenia+Hepatomegaly +haemorrhage= think #Leptospirosis
(#NOT Dengue haemorrhagic fever)

👉 Fever + Muscle pain (calf muscle) + Vomiting / diarrhoea + Conjunctival congestion + #Farmer/#Sewage worker = think #Leptospirosis

👉 Investigation of choice ----- Microscopic Agglutination Test (#MAT)

👉 Ab to Leptospira > 7 days
Blood, CSF culture (+) at 1st 10 days
Urine culture (+) at 2nd weeks
Leptospiral DNA by PCR of blood in early case

Listeria

Special features:

√Gram + rod, V or L shaped, Tumbling motility

√Cold enrichment

√produce Listeriolysin – prevent phagocytosis – stay intracellularly

Spread: Unpasteurised milk product (**Cheese**), raw vegetables

Disease produced:

√ Immunocompetent person: Febrile Gastroenteritis outbreak

√ Pregnant woman & fetus: Chorioamnionitis, Abortion, Premeture delivery, fetal death

√ Neonate (infected during delivery): Sepsis, Meningitis

√ Immunocompromised person (Renal transplant recipient): Bacteremia, sepsis, Meningitis (↑Neutrophi, Normal Glucose)

★only bacterial meningitis with NORMAL glucose

👉 Meningitis + Brainstem involvement+ immunosuppressed pt = think

#Listeria_meningitis

👉 H/0 chemotherapy / transplant recipient / elderly on immunosuppressive drug + Meningitis >>>

#Listeria

👉 Fever + headache + neck rigidity + CSF : Gram positive Bacillus = think

#Listeria_meningitis

👉 Meningitis + CSF: cloudy, neutrophilic but glucose normal = think

#Listeria_meningitis

👉 HIV pt with diarrhoea for 3 days now present with fits / meningitis = think

#Listeria

👉 Listeria is Diagnosed by blood culture

👉 Rx --- IV amoxicillin/ ampicillin + gentamicin

Salmonella

★Disease Produced:

Inside GIT: 1. Enterocolitis (S enteritidis, typhimurium)

Outside GIT:

2. Enteric Fever (S typhi, paratyphi)

3. Bacteremia e metastatic infection

(Osteomyelitis in sickel cell anemia)

👉 Fever + Relative bradycardia + Leucopenia + #Rose_Spot on trunk = #Enteric_fever

👉 Fever + abdominal pain + Diarrhoea/ constipation + faint maculopapular blanching rash + just palpable Hepatosplenomegaly = #Enteric_fever

👉 Osteomyelitis + Sickle cell anemia = think

#Salmonella

👉 Fever + headache + constipation + Gram(-) rod = think

#Salmonella

👉 Diagnostic test = #Blood_Culture

👉 Rx----Azithromycin

Ceftriaxone in severe diasease

👉 Chronic carriage --- 4 weeks of ciprofloxacin +- cholecystectomy

Melioidosis

👉 Strongest risk factor ---- DM

👉 Most common C/F ----- Pneumonia

👉 Farmer + Acute pneumonia + CXR: resembling cavitary TB + culture : Gram(-) bipolar rod shaped = #Meliodosis

👉 Diagnostic test : Culture in Ashdown agar media

👉 Rx : IV ceftazidime / meropenem / imipenem for 10-14 days then oral TMP/SMX for 3-6 months

Actinomyces & Nocardia

TABLE 22–1 Actinomycetes

Species	Disease	Habitat	Growth in Media	Diagnosis	Treatment
Actinomyces israelii	Actinomycosis (abscess with draining sinus tract and "sulfur granules" in pus)	Oral cavity	Strictly anaerobic	Gram-positive branching filamentous rods; culture (anaerobic)	Penicillin G
Nocardia asteroides	Nocardiosis (abscesses in brain and kidneys in immunodeficient patients, pneumonia)	Environment	Aerobic	Gram-positive branching filamentous rods; often acid-fast; culture (aerobic)	Trimethoprim-sulfamethoxazole

👉 Painless sweling in sole of feet with yellowish green discharge >>> #Nocardia

👉 isolation of #Nocardia -- use paraffin as a source of carbon for growth

👉 H/0 IUCD use + pelvic suppurative disease =

#Actinomyces

👉 Hard painless swelling which drained #sulphur_granule= think

#Actinomyces

👉 Rx : penicillin

E coli

👉 Facultative anaerobe, Gram (-) bacilli

★Virulence factors: Pili, Capsule, Endotoxin, 3 Enterotoxin

★Disease inside GIT:

ETEC: 2 enterotoxin (LT & ST) - Traveler's Diarrhoea
EIEC (bloody diarrhoea)
EPEC, EAEC- Watery diarrhoea in infant & children
EHEC: Bloody diarrhoea (Shiga toxin), HUS (O157:H7)

★Disease outside GIT:

UTI (Cystitis, Pyelonephritis) most common organism
Neonatal Meningitis (K1 capsular polysaccharide)

Gram – sepsis (endotoxin)

TABLE 18–8 Clinical Aspects of *Escherichia coli*

Clinical Finding/Disease	Major Pathogenetic Factor	Main Laboratory Result
Findings within the intestinal tract		
Watery, nonbloody diarrhea (traveler's diarrhea)	Enterotoxin that increases cyclic AMP	No RBC or WBC in stool
Bloody diarrhea caused by *E. coli* O-157; hemolytic-uremic syndrome (HUS)	Shiga toxin (verotoxin) inhibits protein synthesis	RBC in stool; schistocytes in blood smear
Findings outside of intestinal tract		
Urinary tract infection	Gal-gal pili bind to bladder mucosa	WBC in urine, positive urine culture
Neonatal meningitis	K-1 capsular polysaccharide is antiphagocytic	WBC in spinal fluid, positive CSF culture
Sepsis, especially in hospital	Endotoxin induces fever, hypotension, and DIC	Leukocytosis, positive blood culture

AMP = adenosine monophosphate; CSF = cerebrospinal fluid; DIC = disseminated intravascular coagulation; RBC = red blood cell; WBC = white blood cell.

👉#SBP- Spontaneous Bacterial peritonitis (CLD + Fever + abdominal pain + ascites) >>>> #E_coli

👉#Travellers_diarrhoea = #E_coli (ETEC)

👉 Haemolyic uremic syndrome (AKI + Thrombocytopenia +haemolytic anemia) =think #E_coli 0157:H7

👉#UTI >>>>> #E_coli

👉 Pyogenic Liver abscess >>> #E_coli

👉 #charcots_triad of Ascending Cholangitis(Pain in RUQ abdomen+ fever + jaundice) >>> #E_coli

Campylobacter

★ Disease produced: Enterocolitis (watery→bloody, cramp, fever)

👉 GBS >>>> #Campylobacter_jejuni

👉 Post infectious Reactive Arthritis, Reiters Syndrome> Campylobacter jejuni

👉 Immunoproliferative small intestinal disease (#IPSID) / #alpha_heavy_chain_disease / B cell lymphoma of MALT in small intestine =

#Campylobacter_jejuni

👉 young adult + fever, anorexia, malabsorption + mesenteric lymphadenopathy + alpha heavy chain on serum electrophoresis =

#IPSID

Cl difficile

👉 Most common cause of antibiotic associated diarrhoea= #Cl_difficile (CDAD)

👉 Most common cause = Cephalosporin (3rd& 2nd gen)

👉 #Clindamycin is associated with high risk of #Cl_difficile infection

👉 Omeprazole / PPI can ⬆ risk of CDAD

★Others: Ampicillin, Fluoroquinolones

👉 1st line Rx-- METRONIDAZOLE /vancomycin
(Vancomycin more effective but more expensive

👉 #Cl_difficile infection not responding to Metro/ Vancomycin = give #Fidaxomicin

👉Rx of Life threatening infection = Oral vancomycin & IV metro

👉 Dxtic of #Pseudomembraneus_colitis

=#white_yellow_patches/ exudate in colonic mucosa on Sigmoidoscopy

👉 Most specific test = Toxin detection in stool

👉 So Rx options : Metro/ Vancomycin
Fidaxomicin
Steroid
IVIg

Faecal transplantation

Cl_botulinum

👉 #tinned/#Canned_food / IV drug use + Flaccid paralysis + Diplopia, Dysarthria,Dysphagia, ptosis + #No fever + #No sensory loss =

#Botulism

👉 inhibit release of Acetylcholine irreversibly

TABLE 17–3 Important Features of Pathogenesis by *Clostridium* Species

Organism	Disease	Transmission/Predisposing Factor	Action of Toxin	Prevention
C. tetani	Tetanus	Spores in soil enter wound	Blocks release of inhibitory transmitters (e.g., glycine)	Toxoid vaccine
C. botulinum	Botulism	Exotoxin in food is ingested	Blocks release of acetylcholine	Proper canning; cook food
C. perfringens	1. Gas gangrene 2. Food poisoning	Spores in soil enter wound Exotoxin in food is ingested	Lecithinase Superantigen	Debride wounds Cook food
C. difficile	Pseudomembranous colitis	Antibiotics suppress normal flora	Cytotoxin damages colon mucosa	Appropriate use of antibiotics

Pseudomonas

👉 #Cystic_fibrosis in adult = #Pseudomonas aeruginosa

👉 COPD pt respiratory failure + 36 hours after admission in #ITU developed productive cough &

#Yellowish_green_sputum + CXR: Consolidation=

#Pseudomonasa_aeruginosa (Suspected within 48 hours after admission)

Diphtheria

👉 Grey Coating over tonsil + Cervical lymphadenopathy = #Diphtheria

👉 Diagnostic sign = Firm, adherent, wash leather, elevated greyish green membrane over tonsil

👉 Mild fever but marked tachycardia + Neck swelling (#Bulls_neck) + sore throat + painful cervical lymphadenopathy= think #Diphtheria

👉 child with Diphtheria + thick exudate in throat=

#Diphtheria_antitoxin should be given

👉 Investigation = Culture of lesion

👉 Rx = Diphtheria antitoxin + penicillin

👉 difficulty in reading small print + neck sweeling + sore throat = think #Diphtheria

Anthrax

TABLE 17–2 Important Features of Pathogenesis by *Bacillus* Species

Organism	Disease	Transmission/Predisposing Factor	Action of Toxin	Prevention
B. anthracis	Anthrax	1. Cutaneous anthrax: spores in soil enter wound 2. Pulmonary anthrax: spores are inhaled into lung	Exotoxin has three components: protective antigen binds to cells; edema factor is an adenylate cyclase; lethal factor is a protease that inhibits cell growth resulting in cell death (necrosis)	Vaccine contains protective antigen as the immunogen
B. cereus	Food poisoning	Spores germinate in reheated rice, then bacteria produce exotoxins, which are ingested	Two exotoxins (enterotoxins): 1. Similar to cholera toxin, it increases cyclic AMP 2. Similar to staphylococcal enterotoxin, it is a superantigen	No vaccine

👉 #Bacillus_anthracis = Gram + with central spore

👉 Only bacterial capsule with Poly - D- glutamic acid, a polypeptide (usually bacterial capsule is polysaccharide)

👉 #Painless_Black_eschar with surrounding edema=

#Anthrax

👉 Cutaneous #Malignant_pustule= think

#Anthrax

👉 Small pruritic blister developing into nontender black ulcer with central area of necrotic tissue with marked edema = think

#Anthrax

👉 Rx: Ciprofloxacin

Leprosy

★★ High CMI + Limited skin lesion + Asymmetric nerve lesion = think

#Tuberculoid_Leprosy

★★ Low CMI + Extensive skin lesion + Symmetric nerve lesion = think

#Lepromatous_Leprosy

★★ Limited skin lesion + hypaesthesia + Hair loss=

#Tuberculoid_Leprosy

★★ Hypopigmented Skin lesion with Sensory loss=

#Leprosy

☞ hypopigmented skin lesion without sensory loss
Vitiligo, Albinism, Pityriasis versicolor, Pityriasis alba, Phenylketonuria, Hypopituitarism,
Idiopathic Guttate hypomelanosis
(Mnemonic VAPPHI)

★★ for Confirmation & Monitoring of response to Treatment = #Slit_Skin_Smear (SSS)

★★ Both type 1 & type 2 Lepra reaction in >>>

#Borderline_Lepromatous_Leprosy

★★ Most common skin lesion = #Macule / #Plaque

★ Cardinal features =

√Anaesthetic hypopigmented patches
√Thickened peripheral nerves
√AFB on biopsy or SSS

★★ Recurrent rhinitis + Collapse of nasal bridge + Skin biopsy : Multiple AFB = think

#Lepromatous_Leprosy

★★ Rx of Paucibacillary leprosy(< 5 lesion) =

Rifampicin + Dapsone for 6 months

★★ Rx of Multibacillary Leprosy (> 5 lesion) =

Rifampicin+ Dapsone +Clofazimine for 12 months

★★ Type 1 lepra reaction =
CM hypersensitivity
Painful tender nerve without function
Swollen and new skin lesion
Rx--- prednisolone

★★ marked hypopigmentation + Coppery or red skin + Dry scaly surface + Elevated margin + bacterial index : 0 = think

#Tuberculoid_leprosy

Rickettsia

👉 Most common #tick born infection

👉 #Unexplained_fever + Rash on palm and sole in 3rd/4th day + Myalgia + Tachycardia = think

#Rocky_Mountain_Spotted_fever (RMSF)

☞ Major diagnostic sign in RMSF--- Rash

☞ Rx---- Doxycycline

Neisseria

TABLE 16–1 Neisseriae of Medical Importance[1]

Species	Portal of Entry	Polysaccharide Capsule	Maltose Fermentation	β-Lactamase Production	Available Vaccine
N. meningitidis (meningococcus)	Respiratory tract	+	+	None	+
N. gonorrhoeae (gonococcus)	Genital tract	–	–	Some	–

[1]All neisseriae are oxidase-positive.

TABLE 16–2 Important Clinical Features of Neisseriae

Organism	Type of Pathogenesis	Typical Disease	Treatment
N. meningitidis	Pyogenic	Meningitis, meningococcemia	Penicillin G
N. gonorrhoeae	Pyogenic		
	1. Local	Gonorrhea (e.g., urethritis, cervicitis)	Ceftriaxone[1] plus doxycycline[2]
	2. Ascending	Pelvic inflammatory disease	Cefoxitin plus doxycycline[1,2]
	3. Disseminated	Disseminated gonococcal infection	Ceftriaxone[1]
	4. Neonatal	Conjunctivitis (ophthalmia neonatorum)	Ceftriaxone[3]

[1]Other drugs can also be used. See treatment guidelines published by the Centers for Disease Control and Prevention.

[2]Add doxycycline for possible coinfection with *Chlamydia trachomatis.*

[3]For prevention, use erythromycin ointment or silver nitrate drops.

☞ fever + headache +Diarrhoea + red/ bluish petechiae on extensor surface =think

#Meningococcus

👉 Meningitis + Gram (-) bacilli =think

#Meningococcus

👉 Meningococcal meningitis / septicaemia =
Do # PCR_of_blood

#LP_Contraindicated due to thrombocytopenia

👉 Rx--- IV benzylpenicillin / cefotaxime

👉 Close contacts of Meningococcal meningitis =

give #Cipro / Rifampicin as prophylaxis

👉 Urethral discharge + Dysuria + Gram (-)Cocci=

#Gonococcus (Gonorrhoea)

👉 Tenosynovitis + Migratory polyarthritis+ Dermatitis= #DGI

👉 #Gonorrhoea pt received ceftriaxone but symptoms not resolved = think

#Coexistent_Chlamydia_infection

👉 Culture medium = thayer martin media

👉 Investigation of choice = #NAAT

👉 Rx--- IM ceftriaxone or oral cefixime

👉 Most common complication of Gonorrhoea=

#Infertility due to PID

👉 Septic arthritis in sexually active young adult>>

#Gonococcus

👉 monoarthritis + pustular skim rash + Synovial fluid suggestive of joint sepsis in young women>>

#Gonococcal_arthritis

👉 Constipation + mucopurulent anal discharge + perianal pruritus + PR bleeding + pain while opening bowel in homosexual man =

. #Gonorrhoea

TABLE 19–1 Gram-Negative Rods Associated with the Respiratory Tract

Species	Major Diseases	Laboratory Diagnosis	Factors X and V Required for Growth	Vaccine Available	Prophylaxis for Contacts
Haemophilus influenzae	Meningitis[1]; otitis media, sinusitis, pneumonia, epiglottitis	Culture; capsular polysaccharide in serum or spinal fluid	+	+	Rifampin
Bordetella pertussis	Whooping cough (pertussis)	Fluorescent antibody on secretions; culture	–	+	Azithromycin
Legionella pneumophila	Pneumonia	Serology; urinary antigen; culture	–	–	None
Acinetobacter baumannii	Ventilator-associated pneumonia	Culture	–	–	None

Haemophilus influenzae

★★★ Infective exacerbation of #COPD = think

#H_influenzae

★★★ Infective exacerbation of #Bronchiectasis =

#H_influenzae

Klebsiella

👉 Antibiotic associated haemorrhagic colitis=

#Klebsiella_oxytoca

★★ #Alcoholic / #DM / #Aspiration + pneumonia + #red_current_jelly_sputum + Cavitation in UPPER LOBE on CXR = think

#Klebsiella_pneumoniae

★★ Painless Genital ulcer + #NO inguinal lymphadenopathy + intracellular bipolar donovan body on Gram stain = think

#Klebsiella_granulomatis

Proteus_mirabilis

👉 #Rheumatoid_arthritis >>> #Proteus_mirabilis

→(#SYSTEMIC_BACTERIOLOGY ----- THE END)

[12/06, 15:49] ✍: Virology👏👏👏

[12/06, 15:49] ✍: #INFECTIOUS_DISEASES #VIROLOGY, #SBA_PEARL

1. #Measles

2.#Rubella

3.#CMV

♡♡♡ #Measles ♡♡♡

👉 #High_fever + #3C (Cough, Coryza,Conjunctivitis)+ Maculopapular rash = think

#Measles

👉 #Pathognomonic = #Koplicks_Spot

👉 Appear #Last = #Maculopapular_rash

👉 Most common #Complication >>>>>>

#Otitis_Media

👉 Most common cause of #Death >>>>>

#Pneumonia

👉 #Immediate_aftermath of initiatial infection >>>

#Pneumonia

♡♡♡ #Rubella ♡♡♡

👉 Rubella >>>>>>

#Posterior_Auricular_Lymphadenopathy

👉 Fever + #Forcheimer_Spot on soft palate = think

#Rubella

👉 Most common #Cardiac_defect in Rubella syndrome Patent_ductus_arteriosus (#PDA)

👉 Measles like feature but #Mild_prodromal_illness including #Low_grade_fever,
#Mild_Conjunctivitis,Cough, Coryza = think #Rubella

♡♡♡♡ #Cytomegalovirus ♡♡♡♡

👉 Most common cause of congenital anomaly >>

#CMV

👉 Latency ---Mononuclear cell

👉 Renal transplant + Infection >>>

#CMV

👉 #Post-transplantation fever within 1-6 months =

#CMV

👉 Fever + jaundice in a pt with Chemotherapy =

#CMV

👉 HIV + Vision loss = CMV retinitis

👉 Retinitis in HIV = CMV

👉 HIV + Cottage cheese & tomato ketchup or pizza retina = CMV retinitis

👉 HIV + fever + bloody diarrhoea + ulcer on left colon on colonoscopy + biopsy:owls eye inclusion=

#CMV_colitis

[12/06, 15:49] ✍: #INFECTIOUS_DISEASES #VIROLOGY, #SBA_PEARL.....(✍ #PART-2)

1.#HSV ★★★★★★ (Infinity ★)

2. #VZV ★★★

1 ♡ ♡♡♡♡ #HSV ♡♡♡♡

👉 #Bells_palsy >>> #HSV

👉 #Sporadic_viral_encephalitis >>> #HSV

👉 #Temporal_lobe_epilepsy >>> #HSV

👉 #Multiple_Shallow_ulcers in both homosexual and heterosexual male >>> #HSV

★★ Meningitis + #Lymphocytic_CSF_with_NORMAL_GLUCOSE, Raised opening pressure >> HSV meningitis

★★ Hyperintense lesion/ petechial Hge on #MEDIAL_TEMPORAL_& #INFERIOR_FRONTAL lobe on MRI = HSV encephalitis

(if #PARAVENTRICULAR region = #CMV)

👉 HSV meningitis doesnot require Rx

👉 HSV encephalitis Require Rx with 14-21 days of IV aciclovir

★★ Painful Genital ulcer + Painful tender inguinal lymphadenopathy + Dysuria =think

#Genital_Herpes
Rx -- Oral aciclovir

👉 #Dendritic_Corneal_ulcer >> HSV
Rx - topical aciclovir

2♡♡♡♡ A. #VZV ♡♡♡♡

👉 Most CONTAGIOUS organism --- VZV

👉 #Vesicular_Rash all over the body + High fever=

#Chicken_pox

(Bite size medicine)

TABLE 48–1 Features of Important Fungal Diseases

Type	Anatomic Location	Representative Disease	Genus of Causative Organism(s)	Seriousness of Illness[1]
Cutaneous	Dead layer of skin	Tinea versicolor	*Malassezia*	1+
	Epidermis, hair, nails	Dermatophytosis (ringworm)	*Microsporum, Trichophyton, Epidermophyton*	2+
Subcutaneous	Subcutis	Sporotrichosis	*Sporothrix*	2+
		Mycetoma	Several genera	2+
Systemic	Internal organs	Coccidioidomycosis	*Coccidioides*	4+
		Histoplasmosis	*Histoplasma*	4+
		Blastomycosis	*Blastomyces*	4+
		Paracoccidioidomycosis	*Paracoccidioides*	4+
Opportunistic	Internal organs	Cryptococcosis	*Cryptococcus*	4+
		Candidiasis	*Candida*	2+ to 4+
		Aspergillosis	*Aspergillus*	4+
		Mucormycosis	*Mucor, Rhizopus*	4+

[1]

TABLE 48–2 Important Features of Skin and Subcutaneous Fungal Diseases

Genus	Forms in Tissue Seen by Microscopy	Mode of Transmission	Important Clinical Findings	Laboratory Diagnosis
Trichophyton, Epidermophyton	Hyphae	Human to human	Tinea capitis, tinea pedis, etc., ("ringworm");—ring of inflammatory, pruritic vesicles with a healing center	Potassium hydroxide (KOH) prep shows septate hyphae culture on Sabouraud's agar
Microsporum	Hyphae	Animal to human as well as human to human	Tinea capitis, tinea pedis, etc., ("ringworm");—ring of inflammatory, pruritic vesicles with a healing center	KOH prep shows septate hyphae culture on Sabouraud's agar
Malassezia	Hyphae and yeasts	Human to human	Scaly plaques on trunk; often hypopigmented; often nonpruritic	KOH prep shows mixture of hyphae and yeasts
Sporothrix	Yeasts	Penetrating lesion in garden implants fungal spores, e.g., rose thorn	Pustule or ulcer on hands often with nodules on arms	KOH prep shows cigar-shaped yeasts culture at 20°C shows hyphae with daisy-like conidia

TABLE 49–1 Important Features of Systemic Fungal Diseases

Genus	Form in Tissue Seen by Microscopy	Geographic Location	Important Clinical Findings	Laboratory Diagnosis
Coccidioides	Spherule	Southwestern United States and Latin America	Valley fever in immunocompetent; dissemination to bone and meninges in immunocompromised, pregnant women, African Americans, and Filipinos	Culture at 20°C grows mold with arthrospores; serologic test for IgM and IgG
Histoplasma	Yeasts within macrophages	Ohio and Mississippi River valleys; worldwide; associated with bird and bat guano	Cavitary lung lesions; granulomas in liver and spleen; pancytopenia and tongue ulcer in immunocompromised	Culture at 20°C grows mold with tuberculate macroconidia; serologic test for IgM and IgG; urinary antigen
Blastomyces	Yeasts with single broad-based bud	Central and southeastern United States; Africa	Ulcerated lesions of the skin	Culture at 20°C grows mold
Paracoccidioides	Yeasts with multiple buds	Latin America, especially Brazil	Ulcerated lesions of the face and mouth	Culture at 20°C grows mold; serologic test for IgM and IgG

TABLE 50–1 Important Features of Opportunistic Fungal Diseases

Genus	Form in Tissue Seen by Microscopy	Geographic Location	Important Clinical Findings	Laboratory Diagnosis
Candida	Yeast forms pseudohyphae (also hyphae)	Worldwide	Thrush in mouth and vagina; endocarditis in intravenous drug users	Gram-positive; culture grows yeast colonies; *Candida albicans* forms germ tubes; polymerase chain reaction (PCR) assay
Cryptococcus	Yeast with large capsule	Worldwide	Meningitis	India ink stain shows yeast with large capsule; culture grows very mucoid colonies; PCR assay
Aspergillus	Mold with septate hyphae	Worldwide	Fungus ball in lung; wound and burn infections; indwelling catheter infections; sinusitis	Culture grows mold with green spores; conidia in radiating chains
Mucor and Rhizopus	Mold with nonseptate hyphae	Worldwide	Necrotic lesion formed when mold invades blood vessels; predisposing factors are diabetic ketoacidosis, renal acidosis, and cancer	Culture grows mold with black spores; conidia enclosed in a sac called a sporangium

A 37-year-old presents with a 2-week history of fever and malaise with few kg wt loss.

she has been delivering lambs on her farm. there is generalised lymphadenopathy and a 4

cm hepatomegaly. Routine bloods -WCC (3.1 x 103/L), (Hb 10.8 g/dl) and ALT (135 U/l).

Which one of the following fits best with this clinical picture?

a) Amoebic liver abscess

b) Brucellosis

c) Mixed connective tissue disease

d) Subacute bacterial endocarditis

e) Tuberculosis

A man presents with a high fever and headache. He is drowsy with confusion and

constipation. His heart rate is 72 bpm, temperature is 40 °C and BP is 105/70mmHg. He

also has a sparse generalised rash comprising small papules. CBC is normal except for

thrombocytopenia. His chest X-ray is normal. most likely diagnosis?

a) Typhoid

b) Acute tuberculosis

c) Acute HIV infection

d) Infectious mononucleosis

e) Giardia lamblia infection

An old man is referred with peripheral oedema of the arms and recurrent rhinitis. On

examination there is deformity of the nose with collapse of the nasal bridge and multiple

skin plaques. A skin biopsy reveals multiple acid-fast bacilli. Most likely diagnosis?

a) Lepromatous leprosy

b) 'Atypical' mycobacteria infection

c) Tertiary syphilis

d) Tuberculoid leprosy

e) Yaws