

Subject: Micro

* **Staphylococci**: gram (+) & catalase (+), grape-like irregular cluster, non-mobile.
↳ coagulase (+) → *S. aureus* (golden yellow colonies).
↳ coagulase (-) → *S. epidermidis* (gray to white)

* Bacterial attachment to host cells is mediated by **MSCRAMM** protein.

* *S. aureus* → clumping factor A (fibrinogen-binding protein) → ^{additionally complicating the} recognition process.
protein A → immune evasion (neutralize Ab) → capsule formation → evade phagocytosis.

* *S. epidermidis* → normal microbiota of skin, respiratory & gastrointestinal tract.

* **Staphylococcal infection** → pimple / folliculitis / impetigo / carbuncles / furuncles or boils
↳ Toxin mediated (scalded skin syndrome "affects infants & children" / toxic shock / food poisoning)
↳ prosthetic device infections / catheter & shunt infections.

* **Streptococcus pyogenes**: β -hemolysis, GAS, arranged in chains.

↳ hyaluronic acid capsule → evade phagocytosis.
↳ M protein → blocks C3b → adhesion
↳ C5a peptidase
↳ M & F protein → invasion into epithelial cells.
↳ is spread from person to person through respiratory droplets.
↳ can cause: Pharyngitis, Pyoderma, Scarlet fever, Rheumatic fever, Post-streptococcal glomerulonephritis (sequence of pharyngitis & skin infections).
* Spe "erythrogenic toxin" → Superantigen.
* Streptolysin S → oxygen stable hemolysin
* Streptolysin O → oxygen labile hemolysin
* Patients with cutaneous infections don't develop ASO antibodies.

* **Streptococcus agalactiae**: GBS, resistant to bacitracin, colonize the lower gastrointestinal & genitourinary tract, can cause bacteremia, pneumonia & meningitis.

* **Streptococcus pneumoniae**: diplococci, α -hemolysis "pneumolysin → degrades hemoglobin", encapsulated (The most commonly isolated serotypes are used in a polyvalent vaccine), M protein, F antigen "teichoic acid + lipid", IgA protease, phosphorylcholine → binds to receptors for platelet-activating factor, helps in host cell invasion & amidase function → releasing cell wall components → immune response.
↳ Invasive & meningitis & bacteremia.
↳ noninvasive (mucosal): pneumonia, sinusitis & otitis.

* **Viridans Streptococci** & α -hemolysis "green coloration", colonize the oropharynx.
↳ *S. mutans* → dental caries
↳ *S. mitis* → endocarditis & sepsis in newly open patients.

* **Enterococci** are arranged in pairs & short chains, grow aerobically & anaerobically in a broad temperature range, wide pH range, high conc. of NaCl & bile salts.
↳ infections are associated with urinary catheterization or instrumentation.
↳ *E. faecalis* & *E. faecium*.

Subject: _____

- identical copy of bacterial chromosome . → Bacillus & aerobes
* Endospores → gram (+) bacteria, rods → Clostridium: anaerobes
↳ ↑ calcium + dipicolinic acid ↓ essential proteins & ribosomes
- * Bacillus anthracis: a disease of herbivores, can be part of biological warfare, is acquired by inoculation "skin, most common", inhalation & ingestion.
↳ capsule (poly-D-glutamic acid), edema toxin & lethal toxin.
- * Bacillus cereus: ① emetic form (vomiting disease) → consumption of contaminated rice → ingestion of enterotoxin, not the bacteria → short incubation period.
② diarrheal form → true infection → ingestion of bacteria → long incubation period.
- * Clostridium difficile: in people taking antibiotics → altering the normal enteric flora.
// perfringens: rapid growth, complete hemolysis (by theta toxin), partial hemolysis (by alpha toxin), gas gangrene (alpha toxin), sporulation → enterotoxin → short incubation period.
type A is the only one that survive in soil.
- * Clostridium botuli: motile, drumstick appearance (♀), botulinolysin "oxygen labile hemolysin", botanospasmin "plasmid encoded, heat labile neurotoxin" → inhibitory neurotransmitters "glycine & GABA" → spastic paralysis, sardonic smile
- * Clostridium botulinum: foodborne (home-canned foods) → bilateral descending weakness, flaccid paralysis (due to blocking release of ACh).

order: actinomycetales family: mycobacteriaceae genus: mycobacterium

Subject: _____

* Mycobacterium → obligate intracellular "inside human", facultative "outside human"
 ↳ obligate aerobes, non-motile "except: maximum → motile"
 ↳ non-spore forming
 ↳ Acid fast bacilli "appear red, resist the decolorization by acids"
 ↳ fish aquarium granuloma disease
 ↳ Slow doubling time

* Culture → Semisynthetic agar media (middlebrook 7H10 & 7H11)
 ↳ Broth media (middlebrook 7H9 & 7H12) → low specificity & sensitivity
 ↳ Inspissated egg media (Lowenstein-Jensen) → contain complex organic substances
 ↳ we add Malachite green along with it → inhibit growth of bacteria other than mycobacteria.

* Cell wall → Outer layer (LAM-lipoarabinomannan & LM-lipomannan), protein, polysaccharides
 ↳ Inner layer (Mycolic acids "MA" - Arabinogalactans "AG" - Peptidoglycans "PG")
 50% of the dry weight of the cell envelop ← ↳ thick waxy lipid coat / impermeability.

* Trehalose dimycelates (TDM) → Clumping morphology. MA esterification → glycerol + trehalose.

* Risk factors → rheumatoid arthritis patients.

* "10/3/1 formula" → if 10 people are exposed to mycobacterium TB, 3 → latent TB, 1 → active TB

* TB can affect the bones → Pott disease
 bleed → miliary TB

* TB multiply within macrophages.
 * Granuloma → hall mark for TB infection

NTM → lymph nodes → scrofula

* TB → exudative type "in lung & serious cavities infections"
 ↳ productive type (pneumonia type) → granuloma → Ghon focus (+infection of lymphatics → Ghon complex)

* TB, named also consumption disease (→ weight loss).
 ↳ "Not in the case of miliary TB"

* nucleic acid amplification test (NAAT) → diagnosis of latent TB.

* Tuberculin skin tests (TSTs) "purified protein derivatives" → depending on the size of induration (>15 mm → normal, >10 mm → intermediate risk, >5 mm → HIV patient)
 ↳ FP if patient is immunized (BCG vaccine) or patient is infected with NTM.
 * interferon-gamma release assay (IGRA) test → No FP results.

(environmental) * NTM: group 1 "slow & photochromogens" → moraximum / kansasii / ulcerans
 ↳ group 2 "slow & scotochromogens" → Sacrofulaceum.
 ↳ group 3 "slow & nonchromogens" → MAI
 ↳ group 4 "fast & nonchromogens" → fortuitum complex / chelonae - abscessus.

Types of leprosy →	tuberculoid	lepromatous
Cell mediated immune response	Strong	poor
number of bacteria	limited ³	high ⁶
lepromin test	+	-

→ No serologic tests of value
 ↳ (intracellular¹⁰ infection¹² the³ value of¹⁵ humoral immunity is limited)
 ↳ Lion like face → leprosy

Subject: _____

abdominopelvic (with use of IUCD) cervicofacial

- * **Actinomyces**: anaerobic gram (+) rods, grow slowly, → chronic infection, endogenous,
 - ↳ chronic granulomatous lesion
- * **Nocardia**: aerobic rods, weakly acid fast, grow slowly, exogenous.
 - ↳ catalase & superoxide dismutase, cord factor → prevent phagosome-lysosome fusion.
 - ↳ Mycetoma → "Symptomatic Lymph"
- * **Lactobacillus**: anaerobic rods, ferment sugar to yield lactic acid, found in probiotics.
- * **Propionibacterium**: gram (+) rods → acne vulgaris (necessary but not sufficient for the establishment of the pathology).
- * **Mobiluncus**: anaerobic gram (-) rods but classified as gram (+) because:
 - 1) gram (+) cell wall
 - 2) lack endotoxin
- * **Listeria monocytogenes**: anaerobic rods, can be mistaken for streptococcus pneumoniae, mobile, weak β-hemolysis, intracellular pathogen, can replicate in macrophages, Act A → coordinates assembly of actin.
 - ↳ adhere to host cells via the interaction of internalin A with glycoprotein receptors (epithelial cadherin).
 - ↳ Neonatal disease
 - ↳ asymptomatic in healthy adults
 - ↳ early onset → abortion, stillbirth
 - ↳ late onset → meningitis, septicemia
- * **Corynebacterium diphtheriae**: pleomorphic rod, aerobes or anaerobes, non-mobile,
 - ↳ catalase (+), humans are the only reservoir, → myocarditis.
 - ↳ diphtheriae toxin "classic A-B exotoxin"

Subject: _____

Enterobacteriaceae

gram (-) rods ← non-spore forming ↓ anaerobes
antigenic phase variation ← type III secretion

hydrophilic capsular antigens

lipid A → endotoxin

siderophores or iron chelating compounds

* MacConkey's agar: bile salts & crystal violet dye → inhibit gram (+) bacteria.

→ colonize the colon → neutral red dye → pink "lactose fermentation"

① E. coli: a) Enterotoxigenic E. coli: person to person spread does not occur.

traveler's diarrhea, secretory (watery) diarrhea & abdominal cramps.

heat stable → ↑ cGMP
toxin → heat labile → ↑ cAMP → ↑ secretion ↓ absorption.

b) Shiga toxin-producing E. coli: person to person spread occurs.

hemorrhagic colitis & bloody diarrhea, hemolytic uremic syndrome

* E. coli & GBS cause the majority of CNS infections in infants.

② Salmonella: invade into M (microfold) cells "in peyer patches", the inflammatory response →

↑ prostaglandins, cAMP & active fluid secretion.

→ The most common sources are poultry, eggs & dairy products

→ gastroenteritis & nonbloody diarrhea, typhoid fever & paratyphoid fever (milder form)

→ The infectious dose is low, person to person spread is common.

③ Shigella: ^{dysenteriae} → exotoxin "shigatoxin" → A subunit (cleaves the 28S rRNA in the 60S

ribosomal subunit → preventing binding of aminoacyl-transfer RNA & disrupting protein synthesis)

→ evade degradation in macrophages by inducing an apoptosis like cell death.

→ humans are the only reservoir, person to person spread, infection is self-limited.

④ Klebsiella: K. pneumoniae → hospital acquired lobar pneumonia.

⑤ Proteus: P. mirabilis → urease → ↑ urine pH, precipitating "Mg" & "Ca" in the form of struvite & apatite crystals → renal (kidney) stones.

⑥ Yersinia: Y. pestis "zoonotic" → urban plague "rats" are the natural reservoirs.

→ bubonic plague → bubo (swelling of lymph nodes)

→ pneumonic plague → person to person spread by aerosols.

Subject: _____

* *Campylobacter jejuni*: gram (-) rods, (+) oxidase & catalase, express lipooligosaccharides (lack O-antigen), are killed by gastric acids, microaerophiles (↑ oxygen ↓ carbon dioxide)
↳ the most common cause of gastroenteritis / guillain barre syndrome

* *Helicobacter pylori*: spiral gram (-) rods, microaerophiles, adapt to the acidic conditions of the stomach by using their motility & urease production.
↳ localized tissue damage (by urease, phospholipase, mucinase & VacA).
↳ chronic gastritis → duodenal ulcer, gastric ulcer, gastric cancer & MALT lymphoma.

* *Vibrio*: gram (-), anaerobic, fermentative rods, (+) oxidase, have "polar flagella", grow on a broad temperature & pH range but are susceptible to stomach acids, require NaCl (halophilic), possess LPS.
↳ *V. cholerae* O1 & O139 produce cholera toxin
↳ asymptomatic or self-limited diarrhea, does not produce a capsule.
rice-water stools

- cholera patients are treated by fluid & electrolyte replacement.
↳ A-B toxin → A-subunit → (ATP → cAMP) → ↑ water (↑ dehydration) & electrolytes → metabolic acidosis (bicarbonate loss), hypovolemic (potassium loss).

* *Bacteroides*: gram (-) rods, growth is stimulated by bile, pleomorphic
↳ heat labile zinc metalloprotease toxin → F-actin rearrangement
↳ intraabdominal infections.

* *Mycoplasma*: do not have cell wall, pleomorphic, do not stain → use PCR to find it
↳ *M. pneumoniae* → tracheobronchitis
↳ *M. genitalium* → nongonococcal urethritis & pelvic inflammatory disease.

* *Pseudomonas aeruginosa*: mobile, gram (-) rods, resistant to many antibiotics & disinfectants, blue-green pigment, pyocyanin
↳ opportunistic, the presence of cytochrome oxidase, distinctive smell.
↳ exoenzyme A → blocking peptide chain elongation → disrupts protein synthesis.
↳ swimmers ear / urinary tract infections (with indwelling urinary catheters).
↳ infections are required: moist reservoir & compromised host defenses.

* *Moraxella catarrhalis*: aerobic oxidase (+), gram (-) diplococci, non-colonial pathogen, affects respiratory tract.

* *Legionella*: slender, pleomorphic, gram (-) rods, aerobes, need cysteine, intracellular bacteria are associated with exposure to contaminated aerosols.
↳ *L. pneumophila* → Pontiac fever (influenza-like illness)
↳ legionnaires disease (severe)

* the medium of isolation → buffered charcoal yeast extract (BCYE) agar.

Subject: _____

- * **Bordetella**: aerobic, gram (-) coccobacillus.
 - ↳ **Bordetella pertussis** → whooping cough.
- * **Haemophilus influenzae**: pleomorphic, gram (-) rods, requires hemin (X factor) & NAD (V factor).
 - ↳ type b) → antiphagocytic polysaccharide capsule → contain polyribitol phosphate (PRP)
 - ↳ the most significant pediatric pathogen.
- * **H. influenzae** & **Streptococcus pneumoniae** are the two most common cause of acute & chronic otitis & sinusitis.
- * **Neisseria**: aerobic, gram (-) diplococci, oxidase & catalase (+).
 - ↳ **N. gonorrhoeae**: sexually transmitted disease → purulent urethral discharge
 - ↳ binds to urogenital epithelium by Opa protein & type IV pili. & dysuria
 - ↳ **N. meningitidis** → establish infection in subepithelial space
 - ↳ risk factors: deficiencies in C5, C6, C7 or C8 / post splenectomy.
- * **Spirchetes**: diderm (double-membrane), cork screw shaped.
 - ↳ **Treponema palladium**: gram (-), thin (gram stain & microscopy → little value, we must use darkfield microscopy or immunofluorescent stain)
 - ↳ are dependent on host, cells (has not been cultured in vitro), sensitive to oxygen
 - ↳ **Syphilis** (sexually transmitted disease)
 - ↳ **Borrelia**: stain well with Giemsa, culture is unsuccessful
 - ↳ relapsing fever & **Lyme disease** "major vectors: hard ticks"
 - ↳ if it is not treated → arthritis
- * **Rickettsiaceae**: obligate intracellular, aerobic, gram (-) rods, stain by Giemsa.
 - ↳ spotted fever group & typhus group
 - ↳ tick borne pathogen.
- * **Bartonella**: gram (-), facultative intracellular bacteria, tick borne pathogen.
 - ↳ **B. henselae** → cat-scratch disease.
- * **Chlamydia**: obligate intracellular, unique life cycle → active noninfectious form.
 - ↳ inactive infectious form "elementary bodies (EB)" "reticulate bodies (RB)"
 - ↳ the most common bacterial sexually transmitted disease.
 - ↳ the leading cause of infectious blindness "C. trachoma".

Fungi (humidity & moisture are the favorable condition to develop, fungal infection)

Subject: _____

- harmless (heal spontaneously)
- 2 - eukaryotes
- 3 - aerobes
- 4 - reproduce by budding or by spores, sexually & asexually
- 5 - indolent (needs time for disease to occur)
- 6 - require organic source of carbon → Saprophytic: decomposes organic material on dead cells
- parasitic: decomposes organic material on living tissue

* Characteristics that distinguish Fungi from :-

- 1) Prokaryotes: cell wall is made of polysaccharides (↑ rigidity) & lacks peptidoglycan.
- 2) Eukaryotes: a) animal: cell wall, plasma membrane contains ergosterol (targets for antifungals)
b) plant: lack chloroplasts.

* Yeasts: single cell, oval or round, reproduce by budding, opportunistic.
↳ *Cryptococcus neoformans*: exogenous, have a capsule, stained by India ink.
↳ *Candida albicans*: polymorphic (hyphae or pseudohyphae "incomplete budding/attached" remain), after breathing with KOH → spores are terminal, creamy texture

* Filamentous hyphae (molds): tubular filaments, branched, reproduce by asexual spores, mono or multicellular / mycelium: intertwined hyphae, mat like structure.
↳ Zygomycetes → mucormycosis
↳ aspergillus, dermatophytes → tinea disease

* Dimorphic fungi: grow at 37°C (reversible) → grow at 22°C, endemic & systemic infections.
↳ coccidioides, paracoccidioides, histoplasma capsulatum, blastomyces dermatitidis.

* Fungal disease: 1) allergies: aspergillus fumigatus → asthmatic reaction.
2) Toxins (mycotoxicosis): aspergillus flavus & parasiticus → aflatoxin & aspergilloses.
3) infections (mycoses): a) superficial: without tissue destruction or immunological reactions, don't include nails.
b) subcutaneous (traumatic implantation): ex: Sporobolus schenckii (rose gardener disease)
c) systemic (endemic): cause disease in healthy people.

* Types of specimen: 1) skin scales, scalp, hair shubs → ringworm or skin infections.
2) pus (fluid), biopsies (tissues) → subcutaneous infections.
- Swabs should be taken from mucous membranes.

* Stains: potassium hydroxide (KOH), calcofluor binds to chitin in the cell wall.
* Culture: Sabouraud dextrose medium (SDA) agar.

* The drugs used to treat bacterial disease have no effect on fungal infection.

* Antifungal: 1) polyenes derivatives: The only fungicidal, ex: nystatin, amphotericin B.
2) 5-fluorocytosine (5-FC): inhibitor of DNA & RNA synthesis.
3) Echinocandins: inhibitor for β-glucans synthesis. 4) azoles

Subject: _____

* **Superficial mycosis** : lipophilic yeast
↳ **malassezia** → pityriasis "or tinea" versicolor → carboxylic acid → depigmentation
- asymptomatic Non itchy macules, is diagnosed by wood lamp "look pale greenish under the UV light", under microscope: it looks like spaghetti & meatballs
- **seborrheic dermatitis** → dandruff, there is an association (not causation) relationship between it & malassezia infection.

* **Cutaneous mycosis** : affect the keratinized tissue, itchy scaly rash
↳ **dermatophytes** (microsporum, trichophyton & epidermophyton) (club shaped)
↳ **ring worm or tinea** → (thick wall, spindle shaped) → (thin wall, pencil-shaped)
- Their transmission : Anthroponophilic "from person to person" / Zoophilic "from animals" / Geophilic "indirect contact"
- **Onychomycosis** → nail infections → "nail → thick with yellow or extremely white, brittle, painless".

* **Subcutaneous mycosis** : → sporothrix schenckii → sporotrichosis (rose thorn disease)
↳ **mycetoma (madura foot)** → eumycetoma "by madurella mycetomatis"
↳ **actinomycetoma** "by actinomyces: bacteria"
- you might need surgical intervention.

* **Opportunistic mycosis** : 1) **Conidiasis** : endogenous infection, catheters can cause it, nail infection "painful" → Vulvovaginitis (with VVC) → **Candida dermatitis** → oral lesion (napkin / nappy rash)
- ferments glucose & maltose with acid & gas production * **Crab lice** → germ tube.

2) **Cryptococcus neoformans** : culture : bird seed agar.

3) **Aspergillus** : prognosis is poor.

4) **Zygomycosis** (rhizopus, abisidia, mucor) : the worst prognosis of all opportunistic infection.

5) **Pneumocystis** : treatment → **TMP-SMX**

Subject: _____

* Parasite: ① Protozoa: unicellular

- according to organ of locomotion: 1- Sarcodina (rhizopoda): move by pseudopodia

ex: entamoeba histolytica → amebiasis

2- Mastigophore (Flagellate): ex: giardia lamblia, Lishmania & Trypanosoma

3- Ciliates, ex: balantidium coli 4- Sporozoa: obligate intracellular, no organ of locomotion, transport by gliding, ex: ^(plasmodia & coccidia) plasmodium (causes malaria), cyclospora & cryptosporidius

- according to sexual reproduction of sporozoa → sexual & asexual

Sarcodina, mastigophore & ciliates → asexual

② Helminths: metazoa (multicellular)

1- Nematoda (roundworms): contain separate sexes (male & female), ex:

- intestinal nematodes → ex: ascaris lumbricoides - tissue nematodes → ex: Wuchereria bancrofti

2- Cestoda (tapeworms): segmented worms

ex: Taenia, echinococcus granulosus & diphyllobothrium lactum

3- Trematoda (flukes): leaf-shaped worms, ex: Schistosoma → schistosomiasis (snails fever)

S. mansoni & S. japonicum → in intestine ← S. haematobium → in urinary bladder

* (2) & (3) known as: platyhelminthes (flatworm) & Hermaphrodites (don't contain separate sex)

③ Arthropods: 1- Insecta 2- Arachnida or 1- Mechanical 2- Biological

* Ectoparasite → infestation * Endoparasite → infection, ex: entamoeba histolytica

* obligate & facultative → are related to survival of the parasite.

* permanent → it can not complete its life cycle outside the host.

* Coprozoic or spurious → no symptoms & no disease.

* Types of hosts: 1) Definitive host: harbours the mature adult stage (Sexual reproduction)

ex: man in "taenia"

2) Intermediate host: harbours larval stage (immature or non-sexual reproduction)

ex: snail in "bilharzia"

3) Reservoir host: source of infection, ex: dog in "Kala-azar"

4) Accidental: ex: "Toxo caru" in man

* The relationship: 1) Commensalism: host → is not harmed, parasite → gets benefit ex: entamoeba coli

2) Parasitism: host → is harmed, parasite → gets benefit

3) Mutualism: both derive a benefit

4) Symbiosis: contains all 3 above definitions.

Subject: _____

* Modes of transmission: 1) penetration of the skin, ex: Schistosomes
2) Autoinfection $\left\{ \begin{array}{l} \text{external: pinworm} \\ \text{internal: Threadworm} \end{array} \right.$
* Infective stage: parasite enter the body. * Diagnostic stage: parasite leave the body.

* Plasmodium \rightarrow cellular destruction.
* Schistosoma mansonia \rightarrow immune stimulation \rightarrow hepatic granuloma.

* Diagnosis of parasitic infections: 1) Stool (macroscopic) examination: Taenia segments, ascaris & enterobius vermicularis \rightarrow for intestinal infection.

2) Urine (micro & macroscopic) examination: Schistosoma haematobium eggs, Trichomonas vaginalis trophozoites & eggs of enterobius vermicularis.

3) Blood examination: plasmodium, Leishmania, filaria & trypanosome.

4) sputum // : paragonimus westermani & entamoeba histolytica.

5) Aspirates // (CSF): trypanosoma.

* Protozoa \rightarrow Cysts: protective mechanism, outside host bodies, infective.
 \rightarrow Trophozoite: active, multiplying stage, inside host bodies, help to move & evade host.

* Intestinal protozoa:-
1) Entamoeba histolytica (coli) ^{in large intestine}: the only pathogenic rhizopoda, multiplies by binary fission, cause dysentery (diarrhea containing blood & mucus).

- Cysts $\left\{ \begin{array}{l} \text{immature: uni or binucleated} \\ \text{mature: quadrinucleated} \end{array} \right.$ - Trophozoites: have ingested RBCs (differs from other rhizopoda)
- acute infection: is caused by cyst or trophozoite.

- mature cyst $\xrightarrow{\text{excystation}}$ 8 Trophozoites. - chronic // // // cysts only.

- With heavy infection & lowering of host immunity: Trophozoite \rightarrow lytic enzymes \rightarrow amoebic ulcers.

- Extra-intestinal amoebiasis \rightarrow liver: affect right lobe \rightarrow abscess or hepatitis.

$\left\{ \begin{array}{l} \rightarrow \text{lung} \rightarrow \text{abscess (in the lower part of the right lung) \& pneumonia} \\ \rightarrow \text{brain} \rightarrow \text{abscess} \rightarrow \text{encephalitis} \\ \rightarrow \text{skin} \rightarrow \text{cutaneous amoebiasis (amoebiasis cutis)} \end{array} \right.$

* Intestinal amoebiasis diagnosis \rightarrow Direct: stool examination \rightarrow Trophozoites in loose stool.

\rightarrow Indirect: serological tests \rightarrow cysts in formed stool.
(are "-" in asymptomatic carriers) \rightarrow Sigmoidoscopy & X-ray after barium enema: \rightarrow see ulcer

* Extra-intestinal amoebiasis diagnosis \rightarrow Direct: X-ray, ultrasonography, CT scan & MRI.

\rightarrow Indirect: serological tests, molecular by PCR, blood examination (leukocytosis), liver function tests \rightarrow increased in amoebic liver abscess.
 \rightarrow aspiration of abscess content \rightarrow for liver abscess.

* Treatment: Metronidazole (Flagyl) / paromomycin / diloxanide furoate

Subject: _____

- 2) *Giardia Lamblia* (Duodenales or Intestinalis): reproduce by binary fission, in small intestine, causes steatorrhea (diarrhea: greasy, bulky and has a foully smell), does not invade, only attaches by ventral discs (large concave sucking disk)
- Trophozoite: has 4 pairs of flagella, 2 nuclei with karyosome & 2 axostyles.
 - Cysts:
 - ↳ mature: quadrinucleated
 - ↳ immature: binucleated
 - ↳ can survive in water for up to 3 months from ingestion & are chlorine resistant.
 - excystation → 2 Trophozoites. *infective stage: mature cyst & trophozoite.
 - ELAs detect giardia antigen in stool *Treatment: metronidazole

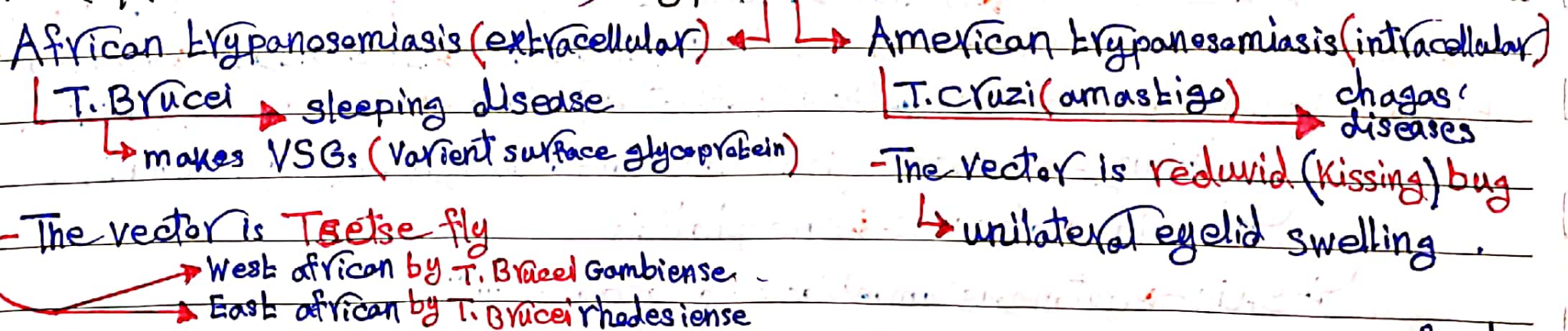
3) *Cryptosporidium*: in immunocompetent: no disease, causes intractable diarrhea (non-stop diarrhea), are diagnosed by acid fastness

4) *Cyclospora*: are diagnosed by acid fastness, in immunocompetent: no disease, the oocyst is not immediately infectious (needs a week to be sporulated).

5) *Balantidium coli*: the largest of all intestinal protozoa, causes dysentery, in large intestine, has 2 nuclei (macro & micro) *Treatment: metronidazole.

* Sexually transmitted protozoa: *Trichomonas*: have only one form (don't have cyst form), 4 anterior & 1 flagellum that form an axostyle, causes vaginitis & vulva vaginitis, asymptomatic in males. in females: yellow, frothy & fishy smelly discharge *Treatment: metronidazole.

* Blood protozoan infections: 1) *Trypanosoma*



2) *Leishmania*: intracellular, target macrophages or mono nuclear phagocyte, the vector is female Sand Fly

- ↳ cutaneous "on face", caused by *L. Tropica* & *L. major*
- ↳ mucocutaneous "Nasopharyngeal", caused by *L. Braziliensis*
- ↳ visceral, caused by *L. Donovani*

* Tissue protozoan infection: *Toxoplasma gondii*: "sporozoa", the vector is cats.

No multiplication in helminthes → except: Echinococcus granulosus → hydatid cyst (multiplication occurs)

Subject:

*The only platyhelminth that has 2 sexes is Schistosoma.

*Nematodes: ① Ascaris Lumbricoides: ^{non-segmented, usually don't need intermediate host & don't multiply in human host.} in small intestine, the largest nematodes, high no. → mechanical obstruction/anesthetics or steroids make it migrate → peritonitis & Löffler syndrome (eosinophilia), malabsorption, female > male, the male has a curved posterior end (copulatory spicule & σ), ^{thick shell} eggs contain bumps & is surrounded by an albuminous coat, contain a primary digestive system, eggs mature when they go back to the intestine for the 2nd time, the infective stage: embryonated egg "contain larvae" (fertilized egg takes around 3 weeks in soil to become embryonated → soil transmitted helminths), the diagnostic stage: (fertilized or unfertilized egg) ^{outside the body} → are diagnosed in stool, ascaris moves through lung → can be diagnosed by sputum sample.

② Enterobius vermicularis (pinworm - intestinal nematode): ^{thin shell} eggs are football shaped & recovered using the "Scotch Tape", ^(female worm) causes perianal pruritus at night among children (is related to cortisone levels), the diagnostic stage: the eggs "at perianal region", the infective stage: embryonated eggs "eggs are immediately infective".

③ Trichuris trichiura (Whipworm - intestinal nematodes): the anterior end is slender & the posterior end is thicker → buggy whip appearance, inhabit the colon, eggs become infective after about 3 weeks in soil.

④ Ancylostoma duodenale & Necator americanus (Human hookworm - intestinal nematode): do not cause disease by ingestion of eggs, the disease is caused by the larvae penetrating, hatch in 48 h → rhabditiform, after 2 days → filariform "infective stage", survive in soil for several weeks, causes bleed with stool, anemia & iron deficiency, ground itch (erythema & intestine pruritus), goes through transpulmonary route, common site: barefoot.

⑤ Strongyloide stercoralis (human threadworm - intestinal & tissue nematodes): do not need to mate with male worms to reproduce, Autoinfection (no need for them to go outside the body), larvae (not eggs) are ingested, the diagnostic stage: larva.

⑥ Trichinella spiralis (intestinal & tissue nematodes): The only intracellular helminthic infection, don't lay eggs (put larvae directly), in muscle: encystation, is acquired by eating raw or improperly cooked pork.

*Tissue nematodes "filariform or thread like": female lay larvae but not eggs, require an intermediate host.

- family Filariidae: Wuchereria bancrofti & Brugia malaya "are transmitted by mosquito"
↳ Loa loa & onchocerca volvulus "are transmitted by flies & cause eye worm disease"

*Lymphatic filaria: causes elephantiasis نجا حيك مستقبلات جملات

↳ Wuchereria bancrofti, Brugia malayi & onchocerca volvulus.

Subject: _____

* Trematodes: asexual reproduction (larval stage: snail "1st intermediate host"),
1st larval form: metacercium / final larval stage: cercarie (infective stage).

① Fasciolidae: (a) Lung fluke: *Paragonimus westermani*

(b) Liver fluke → "sheep": *Fasciola hepatica*

↳ "chinese/oriental": *Clonorchis sinensis*.

(c) Blood fluke: *Schistosoma*: pathology is associated with eggs (not adult worms)

↳ *S. haematobium*: urinary bladder / eggs → terminal spine / host: *Bulinus truncatus*

↳ *S. mansoni*: large intestine / // → lateral // / // : *Biomphalaria alexandrina*

↳ *S. japonicum*: small // / // → curved // / // : *Oncomelania*

* Cestoda: no mouth or digestive tract.

① *Taenia saginata* (beef tapeworm) "by cysticercus": segments called proglottids

② // *Solium* (pork tapeworm): similar to *T. saginata* but slightly shorter & have a modified scolex.

③ *Echinococcus granulosus*: found only in intestine of dogs & other canids, cysts forms in liver, lung & spleen

④ *Diphyllobothrium latum* (Broad fish tapeworm - intestinal cestode), exceeding 10 m in length (the longest); larvae: plerocercoids.