\*Definitive (final) host –(harbors adult or sexually reproductive stage of a parasite) /\*parasite(benefited partner): lives on or within another organism

\*Intermediate host-(harbors larval or asexually reproductive stage of a parasite / classifed into first, secound, third intermediate host)

\*Reservoir hosts-(habitat where an infectious agent is naturally found, grows, multiplies and does not cause illness or disease)

\*Zoonosis-(animal’s diseases which can be transmitted to man) / \*Infective Stage-(parasite can invade human body and live in it )

\*Life cycle-(process of a parasite’s growth, development and reproduction, which proceeds in one or more different hosts)

\*parasite lives in the body (Endoparasite) usually protozoa and helminthes / \*parasite lives on the body (Ectoparasite) usually anthropods

\*transmission can be (1-mechanical : Arthropods play a role of the transportation of pathogens

 2-biological : Pathogens have to spend a part of their life cycle in the vector arthropods in which they multiply or develop

\*Pathogenicity : (1-Mechanical effects - Ascaris Perforate,Obstruction / 2-Depriving nourishment -. Hookworm Suck blood / 3- Toxic –E.histolyica Proteolytic

 enzyme that leads to Necrosis /4- Immuno-pathological lesion - Schistosoma liver cirrhosis, hydatid fluid from the rupture of a hydatid cyst >> anaphylaxis

\* Human Immunity (1-intensity and specificity are usually at a lower level than bacteria and viruses / 2- Eosinophils, Basophils main killers /3- Antibodies )

\* 1.Protozoa >> Classified on their: means of locomotion, and mode of reproduction into (1- Flagellates - Giardia lamblia, Trypanosome sp. and Trichomonas vaginalis / 2- Aamebae - Entamoeba and Endolimax / 3- Sporozoa(lack locomotion organs) – Malaria /4- Ciliates - Balantidium coli

* **Intestinal protozoa ( flagellate*-*** ***Giardia lamblia,*****ameba*-******Entamoeba histolytica ,* sporozoa*-******Cryptosporidium hominis)***
* ***S*exually transmitted protozoa (flagellate-*****Trichomonas vaginalis* )**
* **Blood and tissue protozoa (Leishmanis, Trypanosoma)**

-Routes of entery (1- penetration of eyes – Acanthamoeba / 2-inhalation –Acanthamoeba,Enterobius,Naegleria / 3-sexual contact-Entamoeba,Giardia,Trichomonas / 4- penetration of skin- Ancylostoma,Necator,Schistosoma/5-vector bourne-Trypanosoma(kissing bug),plasmodium and Wuchereria(mosquito),Leishmania(sand fly)/6- fecal-oral,ingestion (all others )

* **Amoeba (pseudopodia – move and food / Found in water / no truly defined shape / *Entamoeba histolytica-*** ***dysentery,******Naegleria-*** ***primary*** ***meningoencephalitis,******Acanthamoeba-*** ***contact lens)***

*-Entamoeba histolytica: (Carried asymptomatically in the digestive tracts of humans / No animal reservoir/* infection >*drinking water and food contaminated with cysts,* *fecal-oral self-inoculation (hand to mouth),* *directly inoculating trophozoites in colon, / converted to trophozoite in small intestine > multiply in large intestine /* Cysts (infective) / Trophozoites (noninfective)-- binary fission / 1-Invasive amebiasis (Intestinal)- watery, bloody and mucus containing diarrhea ,,

2-Invasive extraintestinal amebiasis (Liver, Respiratory tract, Brain)

- Acanthamoeba : (free-living amebae / Cyst enter through(Nasal membrane , wound , eye) / Trophozoites migrate to the brain / Contact lenses wearers who use tap water or contaminated saline can become infected / *Acanthamoeba* keratitis results from conjunctival inoculation )

- Naegleria fowleri :(Enter via the nose >directly into brain tissue>hemorrhage and damage/symptoms:disorientation , resemble acute bacterial meningitis

* + **Flagellate (*Trichomonas vaginalis(genitourinary flagellates)/ Giardia lamblia(intestinal flagellates)/ Trepanosoma (hemoflagellates)***

*- TRICHOMONAS VAGINALIS (GENITOURINARY FLAGELLATE):( EXISTS ONLY AS A TROPHOZOITE (NO CYST STAGE)/ 5 fllagella/ اعضاء البول*

 IN WOMEN(YELLOW OR CREAM-COLORED DISCHARGE, PRURITUS, AND BURNING SENSATION )/ IN MEN(THIN, WHITE DISCHARGE

 TRANSMISSION >> SEXUAL / INFANT S MAY BE INFECTED DURING BIRTH )

- Hemoflagellates (Blood and tissue infection ) :( 1- *Trypanosoma-* African: Sleeping sickness(tsetse fly), American: Chagas disease(kissing bugs)

 2- *Leishmania*- Cutaneous, Mucocutaneous, Visceral (sand flies) /

- *GIARDIA LAMBLIA (INTESTINAL* FLAGELLATE) : (IN THE DUODENUM AND JEJUNUM / TROPHOZOITE and CYST FORMS / ENCYST

 WATERY, SEMISOLID, GREASY, AND FOUL SMELLING stool /

* + **Ciliates (-Balantidium coli (giant intestinal ciliated) : ( tranmission by ingestion ,oral-fecal / persistent diarrhea/ Trophozoites invade large intestine then become cyst )**
	+ **Sporozoa (-PLASMODIUM-MALARIA(SWAMP FEVER) / (4)spicies –(plasmodium (*VIVAX,******FALCIPARUM,******MALARIAE,******OVALE)***

TRANSMISSION ( FEMALE ANOPHELES MOSQUITOES > SPOROZOITES INTO THE BLOOD > ENTER PARENCHYMAL CELLS OF THE LIVER(first stage) > MEROZOITES INVADE ERYTHROCYTES (RBC). / DURING THE ERYTHROCYTIC CYCLES, MEROZOITES BECOME DIFFERENTIATED AS MALE OR FEMALE (GAMETOCYTES)/ GAMETOCYTES MUST BE TAKEN UP AND INGESTED BY BLOODSUCKING FEMALE *ANOPHELES /P.( VIVAX and OVALE) > dormant forms in liver (HYPNOZOITES)/*symptoms> ANEMIA, ORGAN FAILURE, PULMONARY EDEMA, CIRCULATORY COLLAPSE and COMA / INCREASES THE RISK OF MATERNAL DEATH, MISCARRIAGE, STILLBIRTH AND NEONATAL DEATH // they enter the body as sporozoites)

\*2. HELMINTHES (WORM OF HUMANS ) >>( 1- NEMATODA (ROUNDWORMS) -( INTESTINAL ROUNDWORMS*ENTEROBIUS* (PINWORM), *ASCARIS* (GIANT INTESTINAL ROUNDWORM), *NECATOR ,ANCYLOSTOMA* (HOOKWORM)/ TISSUE ROUNDWORMS- *TRICHINELLA SPIRALIS(SMALLEST KNOWN NEMATODE))*
/ 2- PLATYHELMINTHES (FLATWORMS)- HERMAPHRODITIC,, belong to TREMATODA (FLUKES) and CESTODA (TAPEWORMS))

* **Nematodes** **(round worrms)**

- *ENTEROBIUS VERMICULARIS : (*PINWORM—INTESTINAL NEMATODE) : (PINWORMS INFECT MOSTLY CHILDREN/FEMALE PINWORMS>SLENDER end */HAND-TO-MOUTH TRANSMISSION / SYMPTOMs >* *PERIANAL PRURITUS/* *EGGS ARE RECOVERED USING THE “SCOTCH TAPE” TECHNIQUE / D-shaped eggs/in cecum*

- *TRICHURIS TRICHIURA (WHIPWORM—* INTESTINAL NEMATODE) : (INHABIT THE COLON and mate there / FEMALES > eggs in feces >3 WEEKS>become infective

INFECTION BY EATING > LARVAE HATCH IN THE SMALL INTESTINE where they mature >migrate to COLON / SMALL HEMORRHAGES WITH MUCOSAL CELL / BLOODY DIARRHEA, URGENCY, AND RECTAL PROLAPSE(RECTAL WALLS PROLAPSED > THEY PROTRUDE OUT THE ANUS and VISIBLE OUTSIDE THE BODY /cecum

Egg is Barrel-shaped/ lemon)

- ASCARIS LUMBRICOIDES(INTESTINAL NEMATODES) : (*LARGE* / infection - EGGS ARE INGESTED > LARVAE HATCH IN THE DUODENUM > MIGRATE in CIRCULATORY system > LODGE IN LUNG CAPILLARIES(PNEUMONITIS- LÖFFLER SYNDROME, BRONCHIAL SPASM, MUCUS PRODUCTION), PENETRATE THE ALVEOLI > MIGRATE FROM THE BRONCHIOLES TO THE TRACHEA AND PHARYNX > LARVAE ARE SWALLOWED AND RETURN TO THE INTESTINE > MATURE and mate > 200,000 EGGS PER DAY > INFECTIVE AFTER ABOUT 1 MONTH IN THE SOIL/ MAY CAUSE MECHANICAL OBSTRUCTION OF THE BOWEL AND BILE AND PANCREATIC DUCTS (BOWEL PERFORATION AND PERITONITIS / Egg have thick shell and protein coat)

- *TRICHINELLA SPIRALIS* *(INTESTINAL AND TISSUE NEMATODE) : ( infection by eating PORK /* LARVAL STAGE(intestine) , LARVAE MOLT INTO ADULT WORMS > after mating FEMALE WORMS RELEASE LIVE LARVAE > LARVAE PENETRATE THE INTESTINE > CIRCULATE Blood > ENCYST IN MUSCLE / EDEMA , DIAPHRAGM, TONGUE, AND EXTRAOCULAR MUSCLES ARE COMMONLY INFECTED)

* **Platyhelminthes** (flat worms/Trematodes–Flukes – nonsegmented(*Schistosoma* - blood fluke)/ Cestodes – Tapeworms – segmented(taenia))

- Trematodes - Flukes , Schistosoma (blood fluke) : (S*chistosoma (mansoni, japonicum, haematobium)/* *live within the venous system /*

*S.mansoni:* inferior mesenteric veins of large intestine (intestinal schistomiasis) / S.*japonicum*: inferior and superior mesenteric veins of small intestine

*S.haematobium:* veins of urinary bladder (urinary schistomiasis) / Egg with feces or urine > larvae Meracidium > Cercariae in water snails /

Infection - water contaminated with the infectious Cercariae > Cercariae penetrate skin lipids and epidermis > transformed into Schistosomules > enter the peripheral circulation where they mature in hepatoportal system or the bladder/ MOST SIGNIFICANT PATHOLOGY IS ASSOCIATED WITH THE SCHISTOSOME EGGS, NOT THE ADULT WORMS / FEMALE SCHISTOSOMES lay EGGS WITHIN THE VENOUS SYSTEM / PASS OUT WITH THE FECES OR URINE / AGRANULOMATOUS REACTION SURROUNDS THE EGGS AND LEADS TO FIBROSIS OF THE LIVER / *CHRONIC CASES,* PORTAL HYPERTENSION, ACCUMULATION OF ASCITES IN THE ABDOMINAL CAVITY, HEPATOSPLENOMEGALY ESOPHAGEAL VARICES, URINARY TRACT INVOLVEMENT: URETHRAL PAIN, INCREASED URINARY FREQUENCY, DYSURIA, HEMATURIA, AND BLADDER OBSTRUCTION LEADING TO SECONDARY BACTERIAL INFECTIONS)

* **Cestodes (Tapeworms) –(parts include :1-Scolex (head with attachment site)/2- Proglottids (body segments with testes and ovaries)**

Mature proglottid will disintegrate and release eggs ) - *TAENIA(SAGINATA (BEEF), SOLIUM (PORK )) : (infection > eat beef or pork containing LARVAE CALLED CYSTICERCI >* *CYSTICERCI, DEVELOP INTO ADULT WORMS(several meters)intestine>* *EGG-FILLED SEGMENTS BREAK OFF FROM THE ADULT WORM AND PASS OUT WITH FECES/* *EGGS FROM HUMAN FECES ARE CONSUMED BY COWS OR PIGS> LARVAE HATCH > MIGRATE, AND ENCYST AS CYSTICERCI IN (muscle)-meat*

Scolex of T.saginata has 4 suckers and no hook / scolex of T.solium has 4 suckers and a double row of hooks/sexuall reproduction in small intestine

3. ARTHROPODS(As vectors) : (Phylum: Arthropoda- exoskeleton and jointed legs/(2) classes -1- Insecta (6 legs)-lice,fleas,mosquitoes /2- Arachnida (8 legs)- Mites and ticks / transmit diseases