

Protozoans and Helminthes

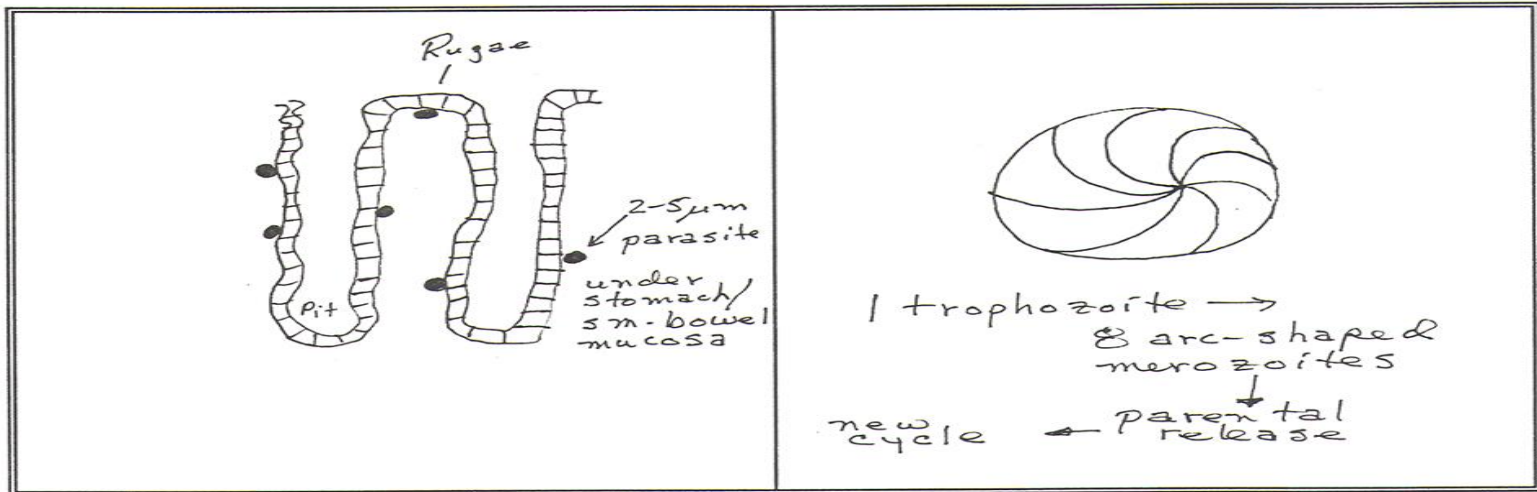
Protozoans

Representative Medically Important Pathogenic Protozoans

Entamoeba histolytica	Amebic dysentery
Cryptosporidium	Cryptosporidiosis
Leishmania	Visceral Leishmaniasis (kala-azar)
Giardia lamblia	"beaver fever"
Trichomonas vaginalis	Trichomoniasis
Plasmodia	Malaria[s]
Toxoplasma gondii	Toxoplasmosis

Protozoan: *Cryptosporidium parvum*

Description:



Transmission: Unidentified modes (?water; ?food; ?oocysts passed in feces MAY be transmission)

Primary Disease: Cryptosporidiosis

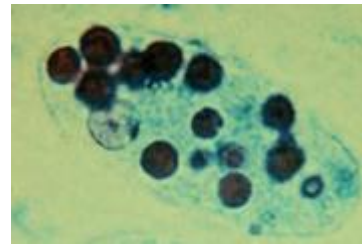
Affects: Bowel

Diagnosis: Fresh stool sample

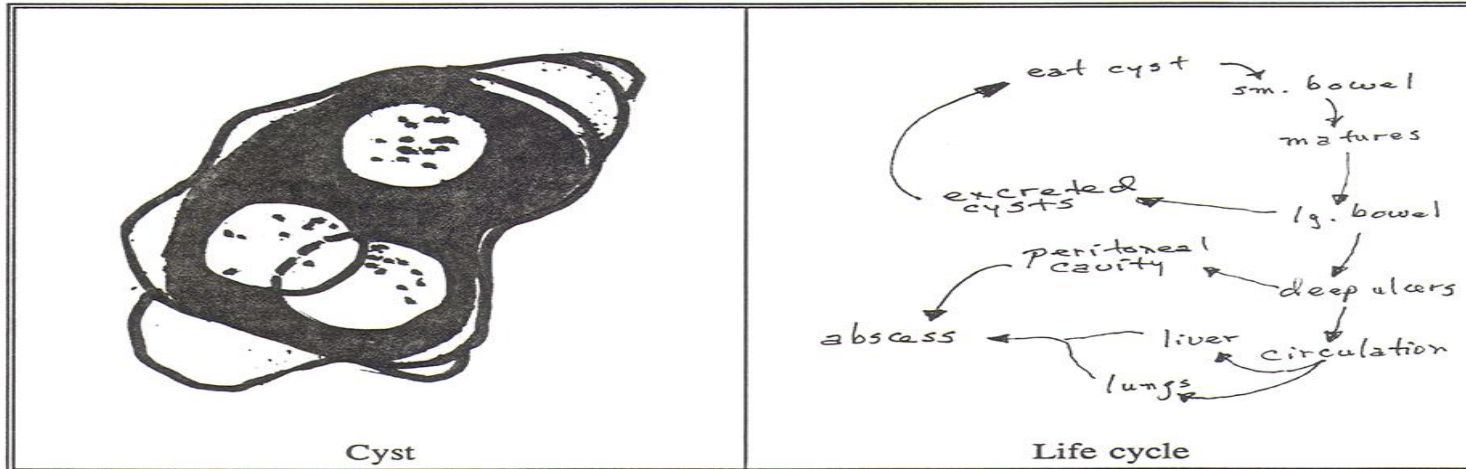
Characteristics: Associated with AIDS; watery diarrhea (explosive and more than 20 L/day); abdominal cramps after 4-14 days incubation; generally lasts between 5-11 days, but may be prolonged for a month; in immunocompromised patients, generally causes death; generally seen in AIDS, CA or organ transplant patients; weight loss; lyte imbalances; Stools HIGHLY infectious! PROTECT yourself! Farm workers/DVM's at high risk of infection

Treatment: NO effective treatment; self limiting (1-2 weeks); 7-8 day incubation

Protozoan: Entamoeba histolytica



Description:



Transmission: Water/food; direct contact

Primary Disease: Amebic dysentery

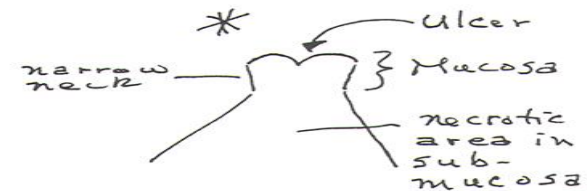
Affects: Intestine, liver, lungs

Diagnosis: Stool examination; trophozoites in mucous strands

Characteristics: tenesmus; deep intestinal ulcers; abdominal tenderness which may be confused with a hot appy (LRQ pain); diarrhea; weakness; prostration; N/V; pain; [no fever which differentiates it from bacillary dysentery]; complication: amebic hepatitis/abscesses; symptoms develop within 4 days after exposure all the way up to 1 year after exposure or NEVER

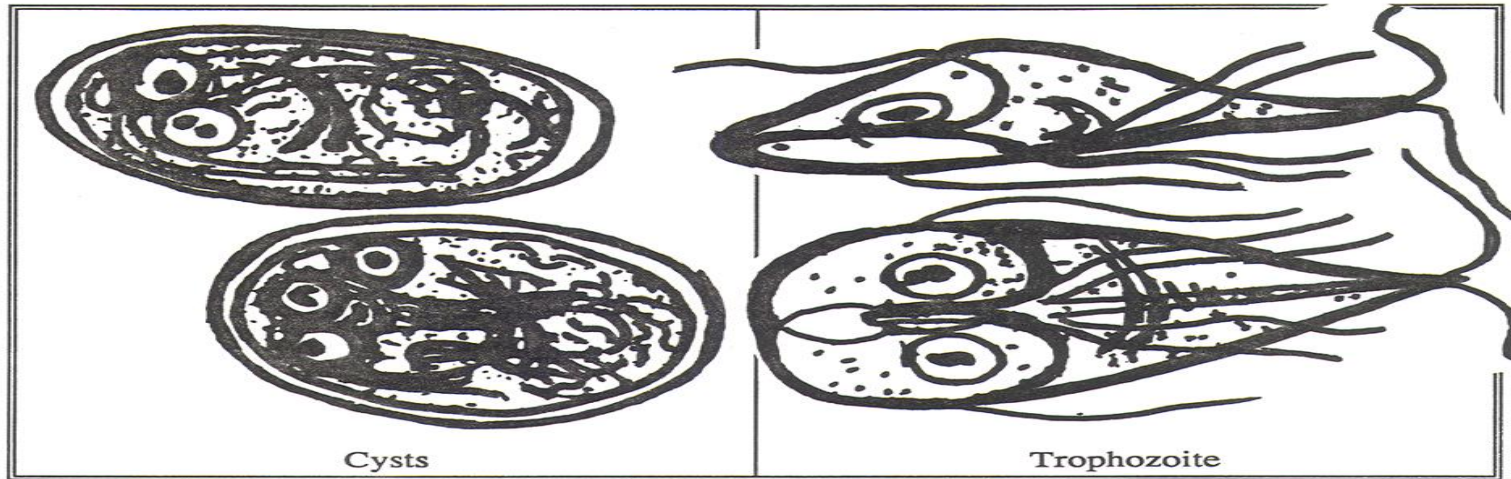
Pathological changes are ALWAYS due to trophozoites: *

Treatment: abscesses may be treated with chloroquine and metronidazole; call CDC for treating asymptomatic carriers



Protozoan: *Giardia lamblia*

Description:



Transmission: Water/contact; secondary to fecal contamination as in day care facilities and jails

Primary Disease: Giardiasis; beaver fever

Affects: Bowel

Diagnosis: Stool examination; do times 3 to be considered negative

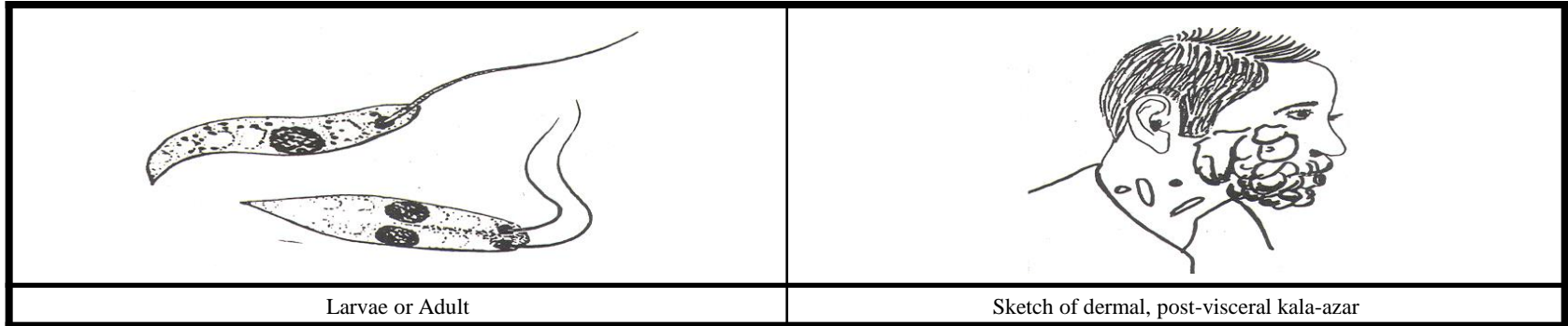
Characteristics: explosive diarrhea with bloody, foul smelling stools; fever; cramps; anorexia; N/V, weakness, weight loss; gas; greasy stools, belching; incubation about 1-3 weeks; disease persists for 2-3 months in many cases;

With chronic disease comes fat malabsorption syndromes: steatorrhea, Vitamins A, D, E, K mal absorption; B₁₂ absorption decreases; folate absorption decreases; reduces activity of all carbohydrate enzymes in small bowel in 1/2 of all patients

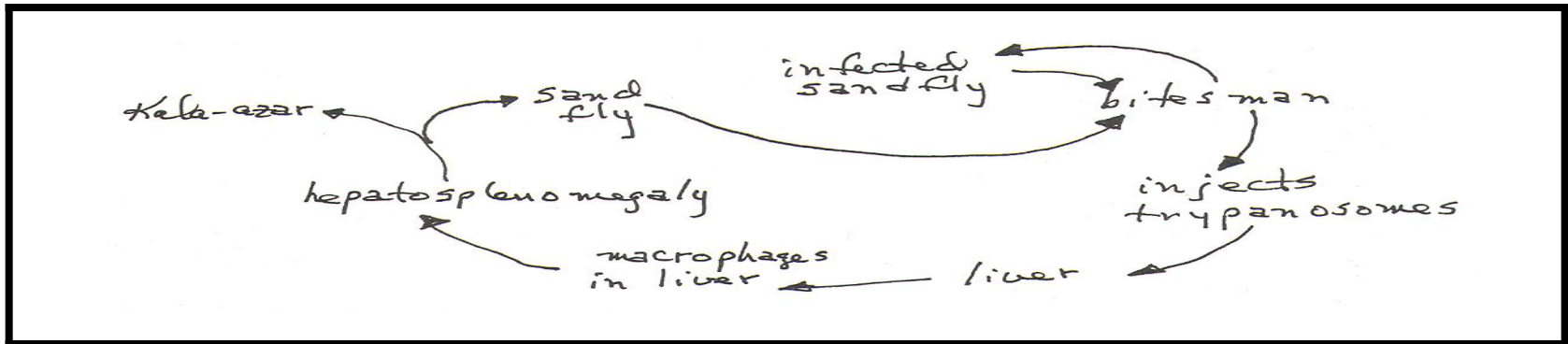
Treatment: Quinacrine, furazolidone

Worm: Leishmania donovani

General Family: Trypanosomes (Blood/tissue flagellates)



Life Cycle:



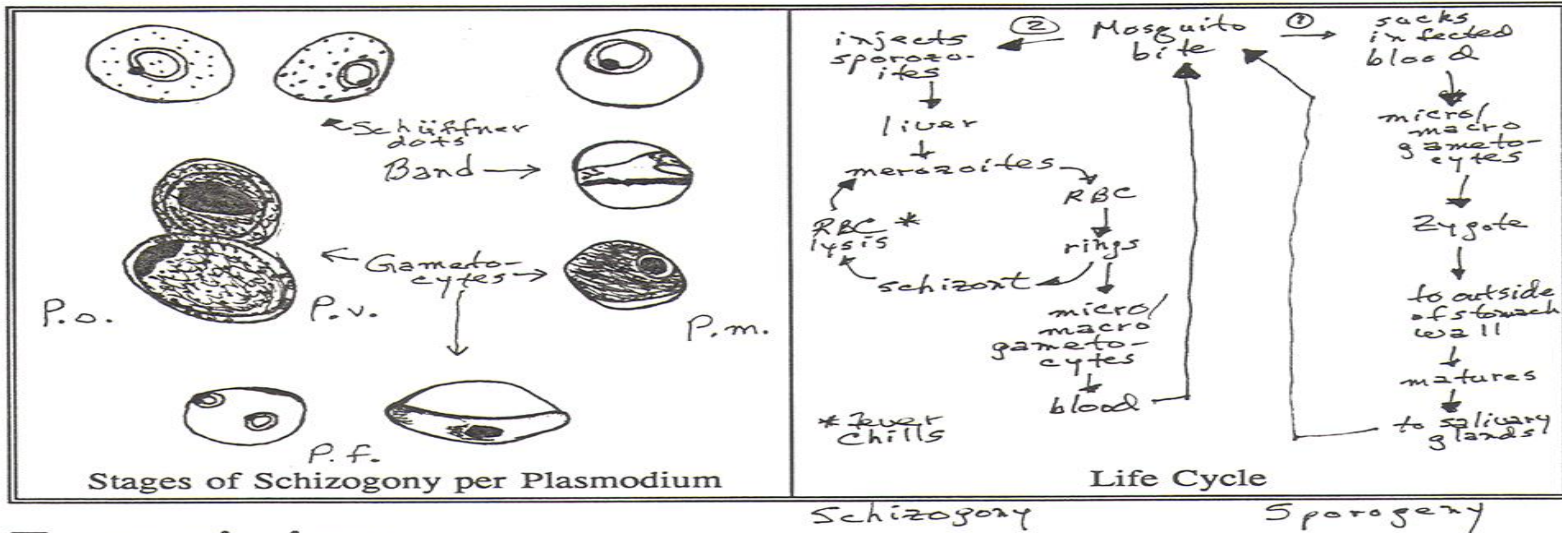
Location: Tropics

Disease: Kala-azar

General Description: lesions in reticuloendothelial system; hepatosplenomegaly, often fatal

Protozoan: Plasmodium ovale, malariae, vivax, falciparum

Description:



Transmission: Mosquito (Anopheles) bite

Primary Disease: Malaria

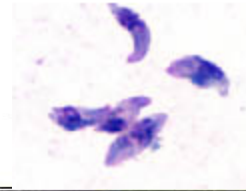
Affects: Liver, RBC

Diagnosis: Peripheral blood smears: thin and thick smears

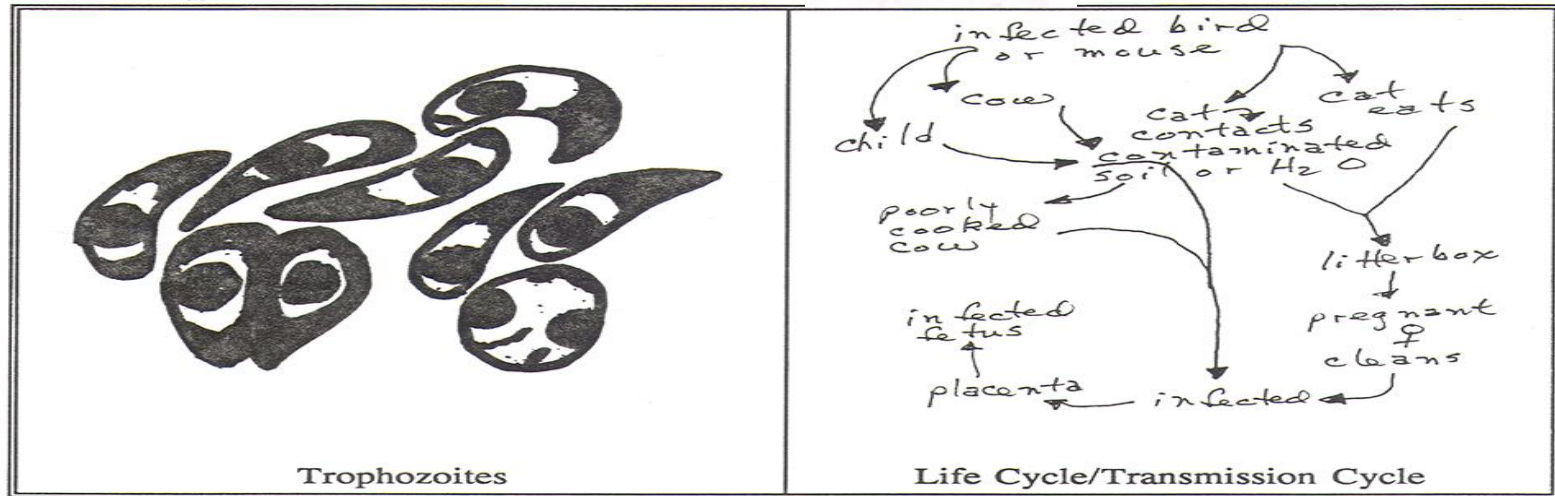
Characteristics: Big problem world-wide; vivax, ovale, falciparum: new merozoites every 48°; malariae: every 72°; vivax and ovale: periodic relapses up to 5 years; also, difficult to tell apart from each other; malariae: lasting 40 years reported; falciparum: invades RBC of ALL ages (including stem cells), make "knobs" on RBC which cause thrombosis and local ischemia; falciparum: more serious infection than ovale, malariae, vivax; COLD phase: initial chill for 15' to 1 hour; N/V, headache; HOT phase: fever spiking at or above 40°C, lasts 3-8 hours; WET phase: sweating, no fever, patient sleeps and awakens feeling well; normocytic anemia also develops in malaria

Treatment: Quinine, chloroquine, primaquine

Protozoan: *Toxoplasma gondii*



Description:



Transmission: Cat/feces; contaminated food; undercooked meat and milk products; 1-21 days after defecation, feces becomes infectious

Primary Disease: Toxoplasmosis; ???? "cat-scratch fever"????

Affects: Blood, eyes, tissue cells

Diagnosis: Peripheral blood smear

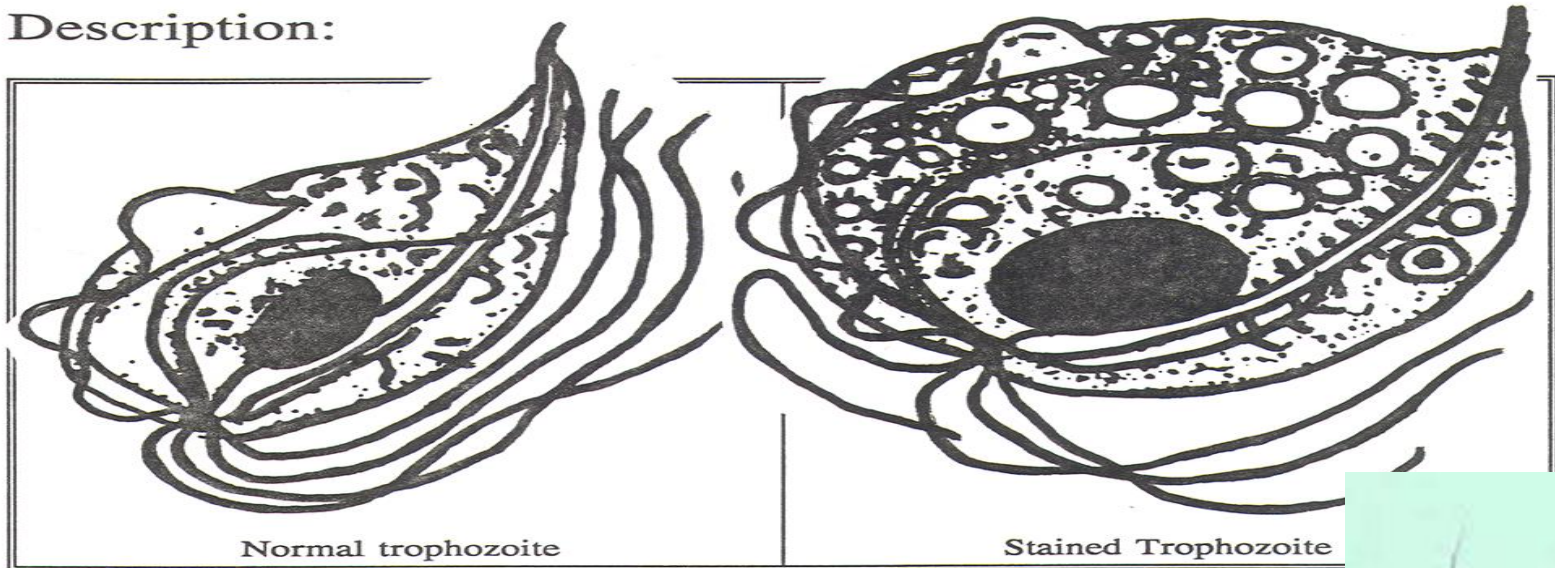
Characteristics: Congenital damage possible: 1st trimester: "stillbirth"; 2d-3d trimesters: blindness, learning difficulties; also associated with AIDS; craniocervical lymphadenopathy, malaise, no fever, muscle pain; In severe form: pneumonitis, hepatitis; In congenital form: lesions in the CNS; jaundice, anemia, general lymphadenopathy (resembles infectious mononucleosis: occasionally with fever at this depth of disease); more common in warmer climates than cold; may be confused with lymphoma

Treatment: Treatment is NOT required for most infections; sulfonamides give some relief

T O R C H Infections		
T	Toxoplasmosis	
O	Other agents	Syphilis HIV's Plasmodia Varicella Zoster Virus Listeria Influenzaviruses Epstein-Barr virus
R	Rubella	
C	Cytomegalovirus	
H	Herpes Simplex	
Intrauterine or perinatally acquired infections		
BIGGEES: hepatosplenomegaly; jaundice; petechiae; meningoencephalitis; chorioretinitis		
LESS OFTEN: microcephaly; hydrocephaly; intracranial calculi; myocarditis; osteogenic lesions		

Protozoan: *Trichomonas vaginalis*

Description:



Transmission: STD

Primary Disease: Trichomoniasis

Affects: Urogenital organs

Diagnosis: UA or swab examination

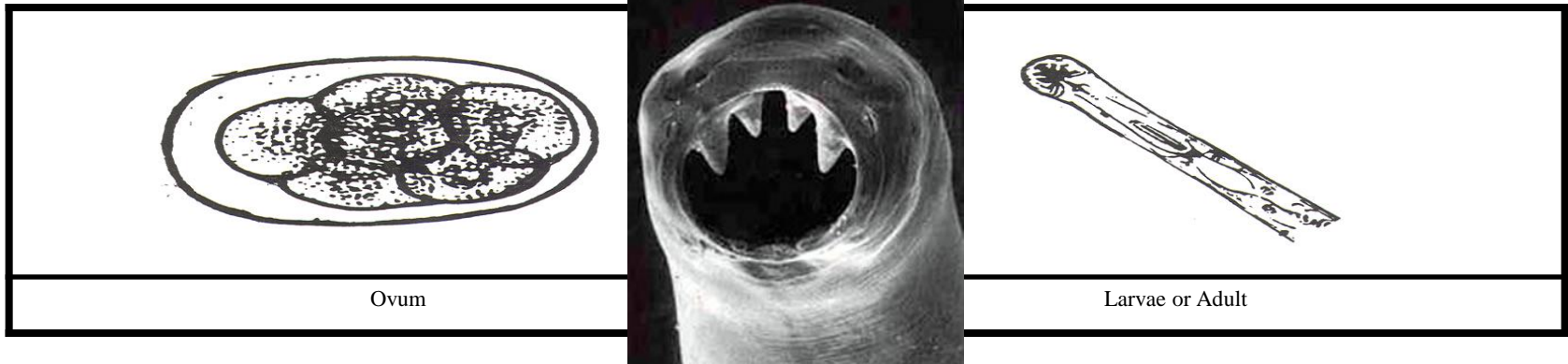
Characteristics: may result in sterility; fairly common in pregnant women or after vaginal surgery; persistent burning; redness; vulvar itching with frothy and/or malodorous discharge; infection **USUALLY** does not go to uterus; mucus membranes covered with frothy yellow-cream colored discharge; mix with KOH and a fishy odor occurs; about 10% of men have a thin white urethral discharge

Treatment: Metronidazole, Tinidazole: **TREAT BOTH** partners; **NO EtOH** with Flagyl

Helminthes

Worm: Ancylostoma duodenale or Necator americanus (Hookworms)

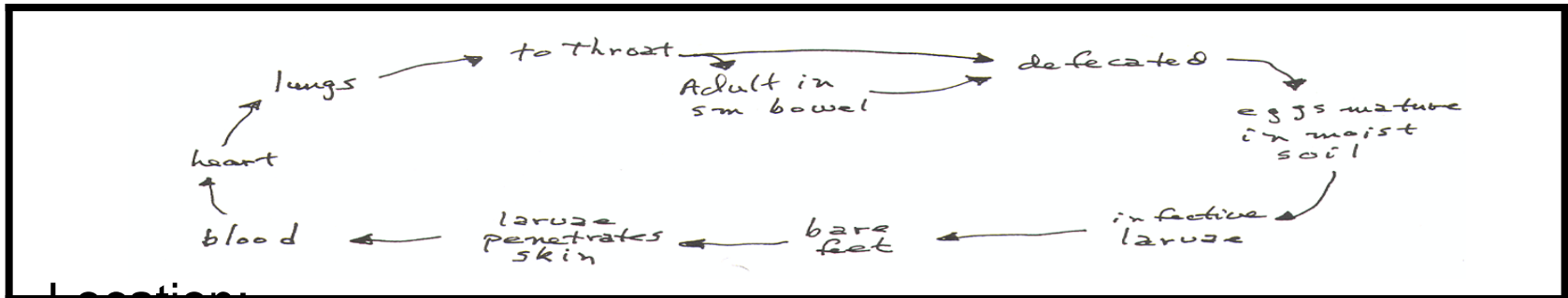
General Family: Nematode



Ovum

Larvae or Adult

Life Cycle:



Location: worldwide

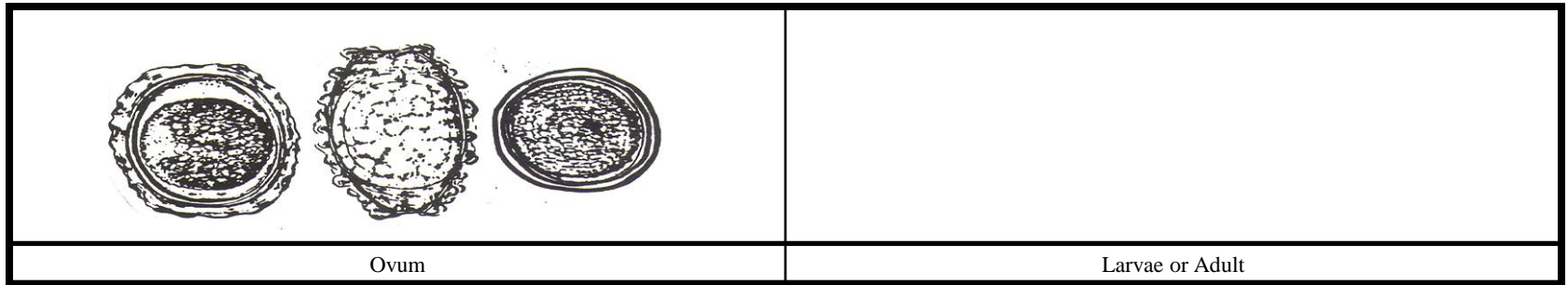
Disease: Hookworm

General Description: Abdominal pain, found in small bowel, larvae transported via lungs, thru skin, contaminated soil, drinking contaminated water

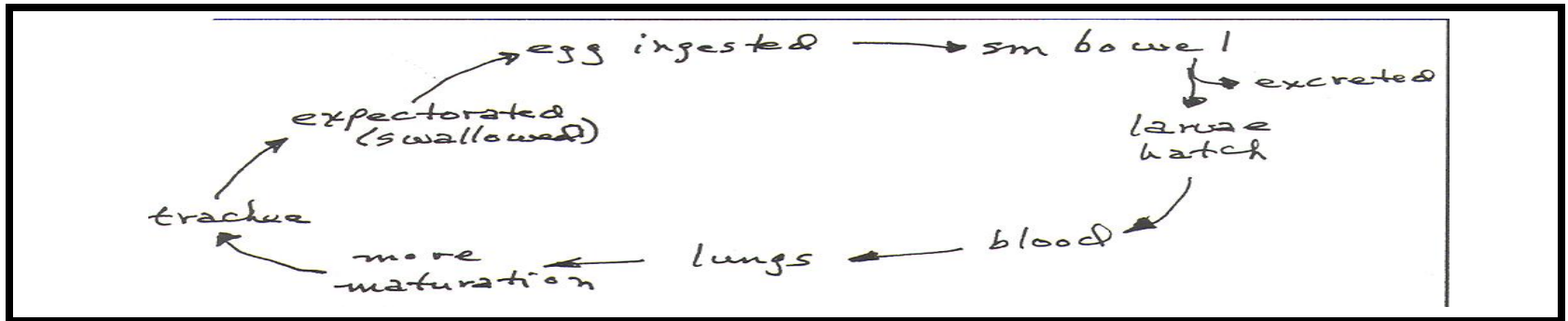
ASIDE: ALL NEMATODES: have longitudinal muscles for penetrating movement; complete digestive systems, separate sexed adults (unlike cestodes); unsegmented

Worm: *Ascaris lumbricoides* (Giant round worm)

General Family: Nematode



Life Cycle:



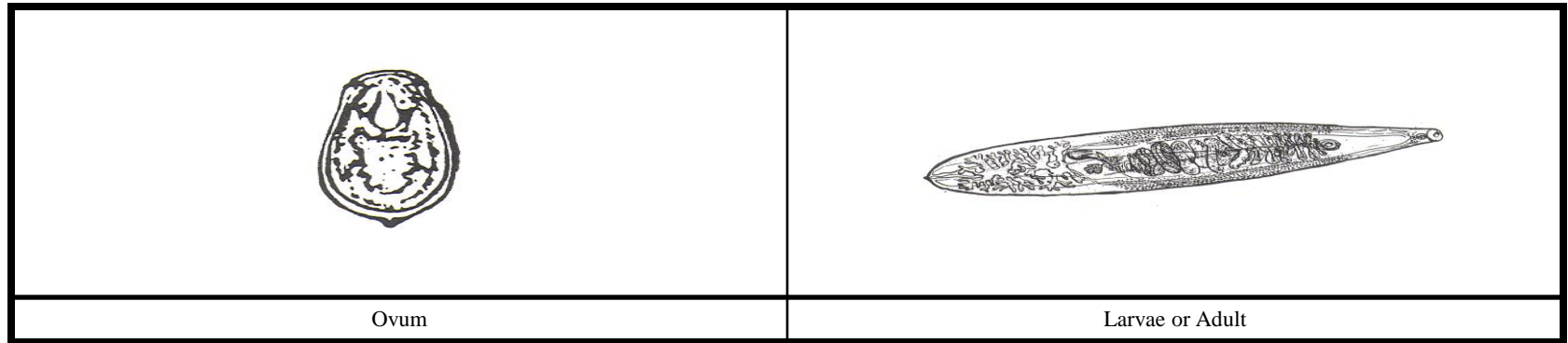
Location: Worldwide

Disease: Ascariasis

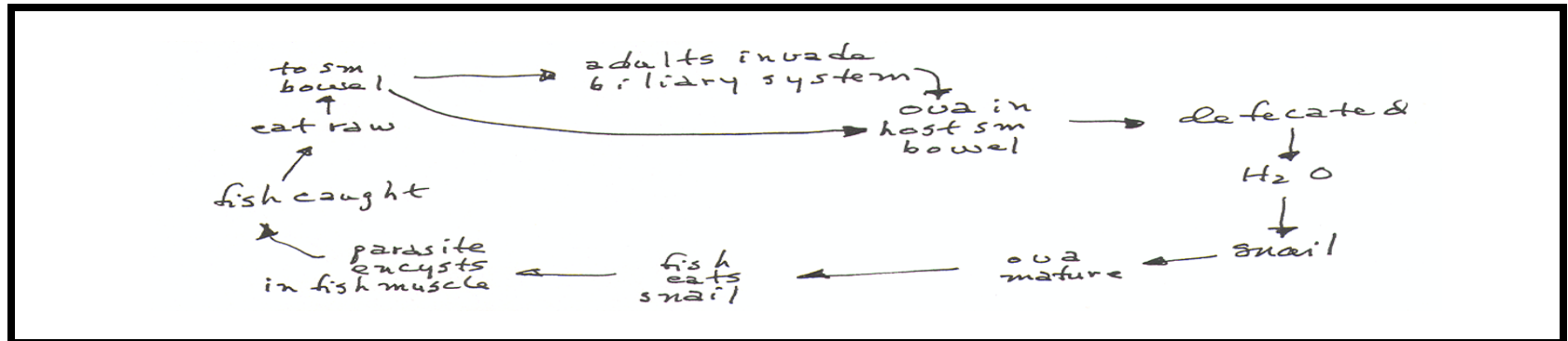
General Description: Emaciation, pneumonia, in small bowel, larvae from lungs, eating eggs from fecally contaminated food/soil

Worm: Clonorchis sinensis (Chinese liver fluke)

General Family: Trematode (flake)



Life Cycle:



Location: China, Japan, Korea, etc.

Disease: Clonorchiasis

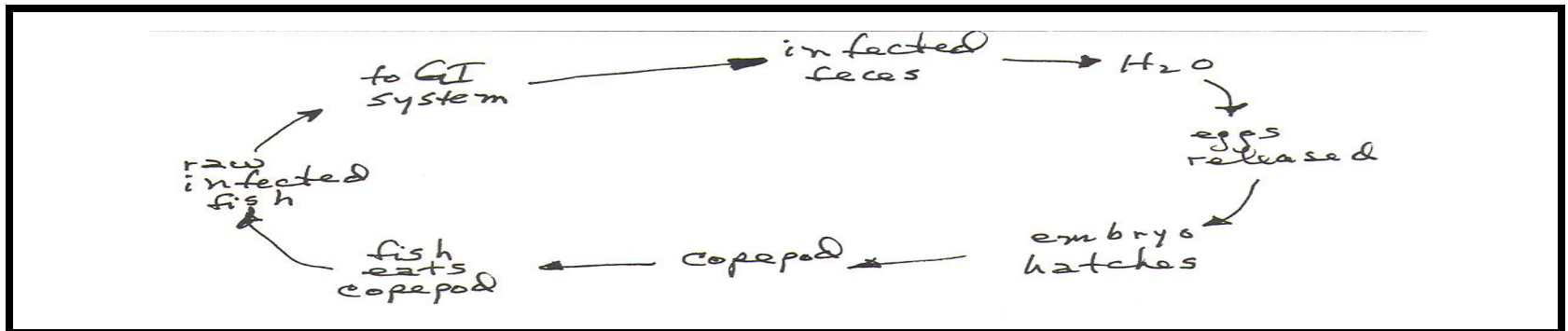
General Description: poor fat digestion, snail, in host liver, raw, smoked or pickled fresh water fish, jaundice

Worm: Diphyllobothrium latum (fish tape worm)

General Family: Cestode (segmented tape worms)



Life Cycle:




Location: Coastal regions of the world

Disease: Tapeworm

General Description: pernicious anemia, small bowel, uncooked freshwater fish; loves B₁₂ (Finns)

Worm: Echinococcus granulosus (dog tapeworm)

General Family: Cestode

	<i>See Taenia spp</i>
Ovum	Larvae or Adult

Life Cycle: See Taenia spp

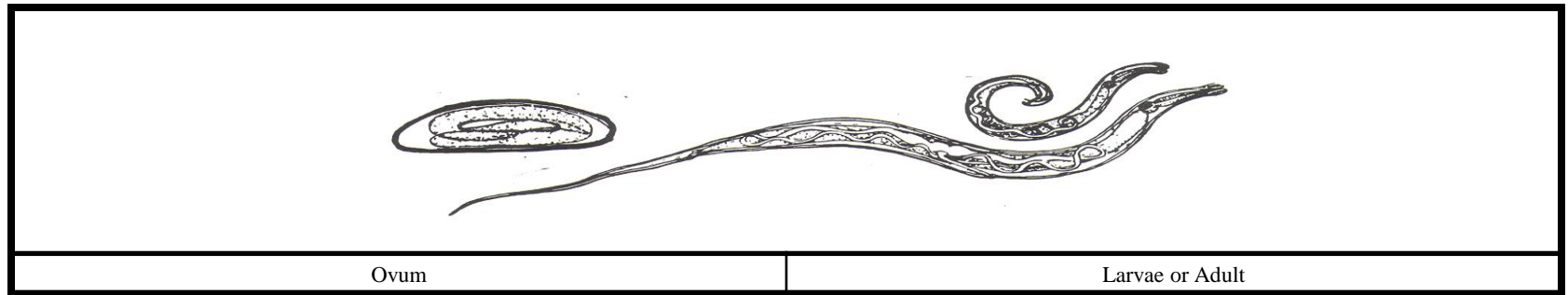
Location: Sheep raising regions of the world

Disease: Hydatidosis

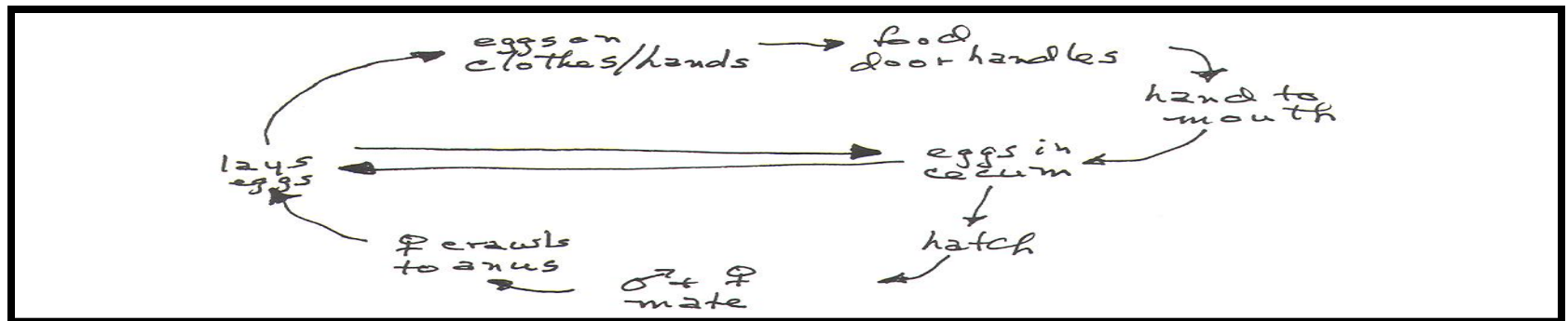
General Description: Liver damage, liver, lung, brain, abdomen, long bones, kidney;
from K9 family

Worm: Enterobius vermicularis (pin worm; urban parasite)

General Family: Nematode



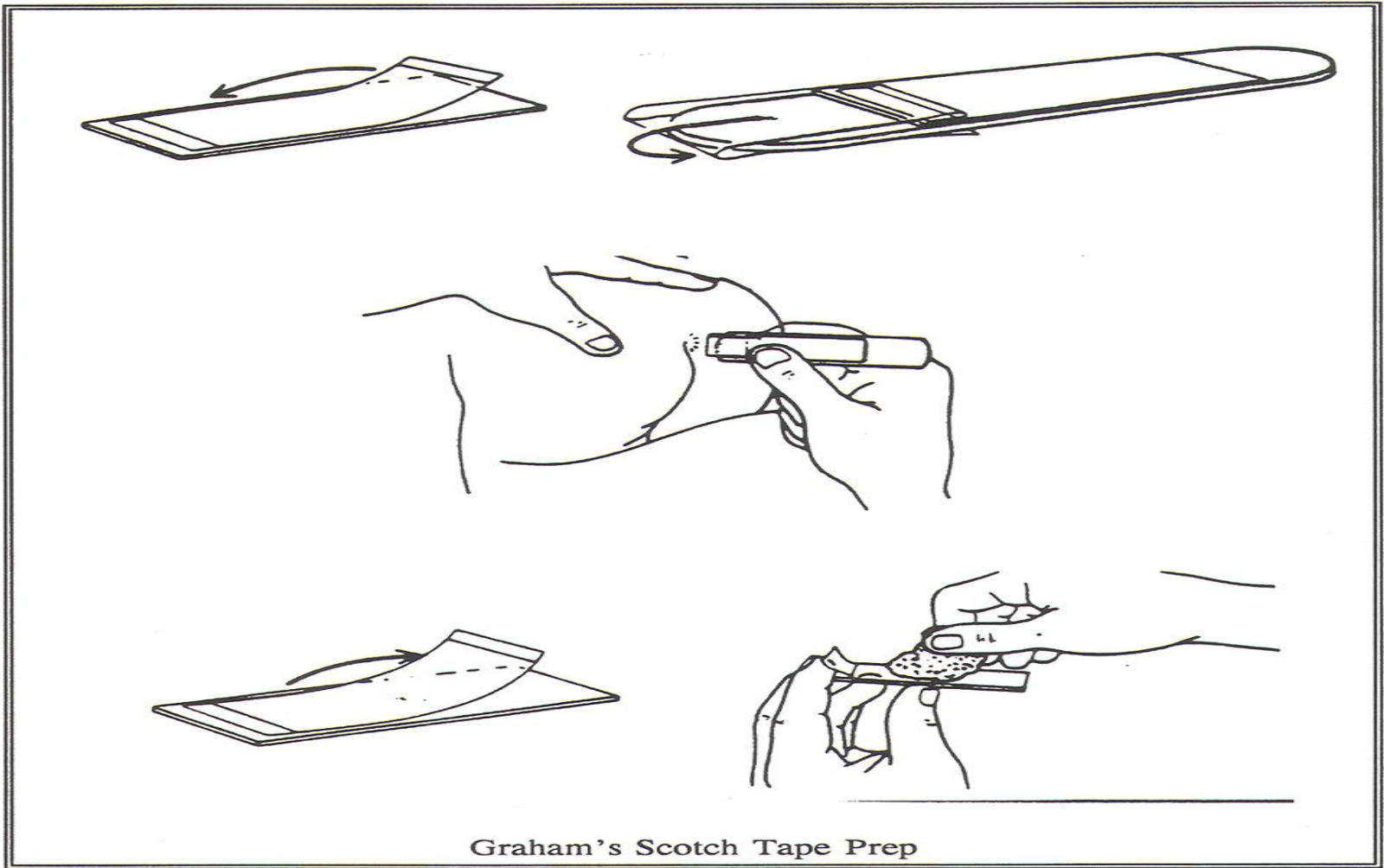
Life Cycle:



Location: Worldwide

Disease: Enterobiasis

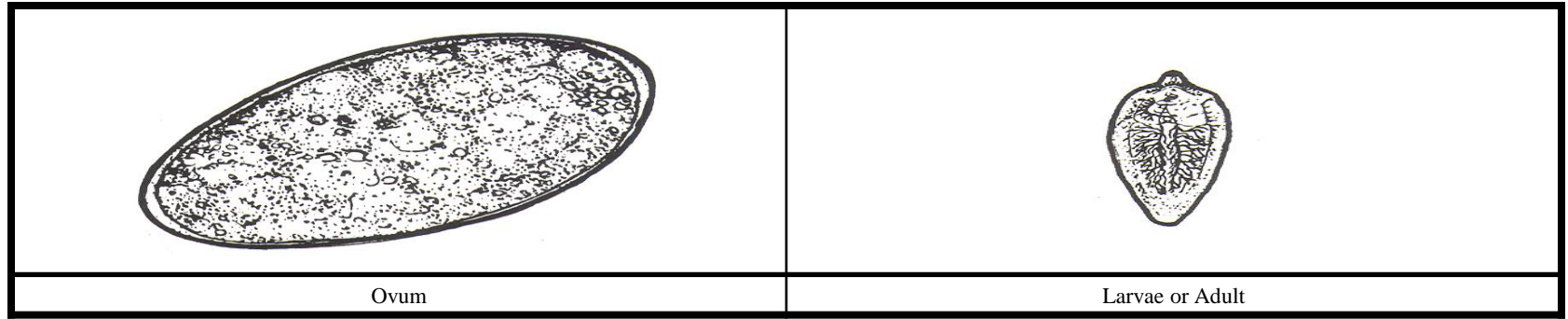
General Description: anal itching; cecum, colon, self-contamination; anal-oral; viable eggs; perianal; scratching; males rarely, if ever, seen



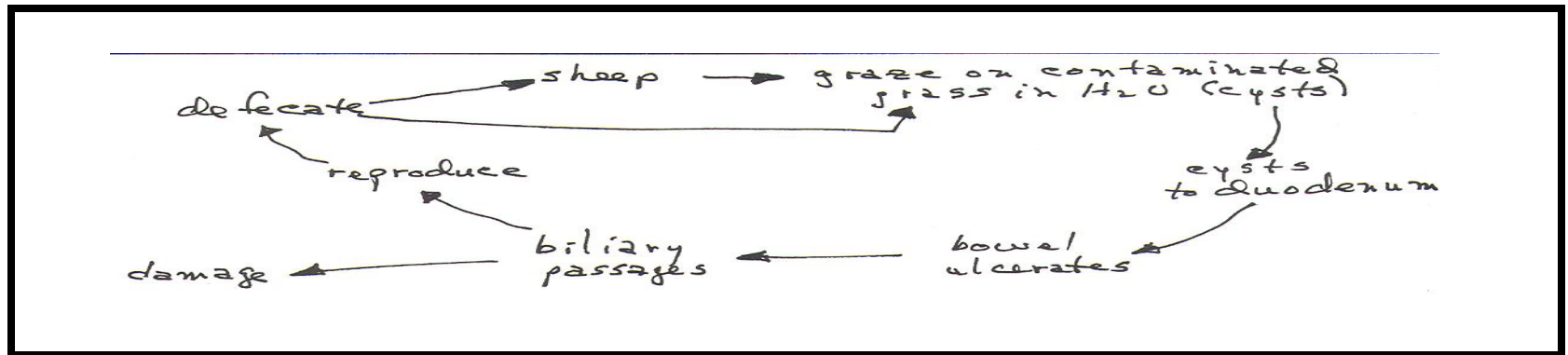
Graham's Scotch Tape Prep

Worm: Fasciola hepatica (sheep liver fluke)

General Family: Trematode



Life Cycle:



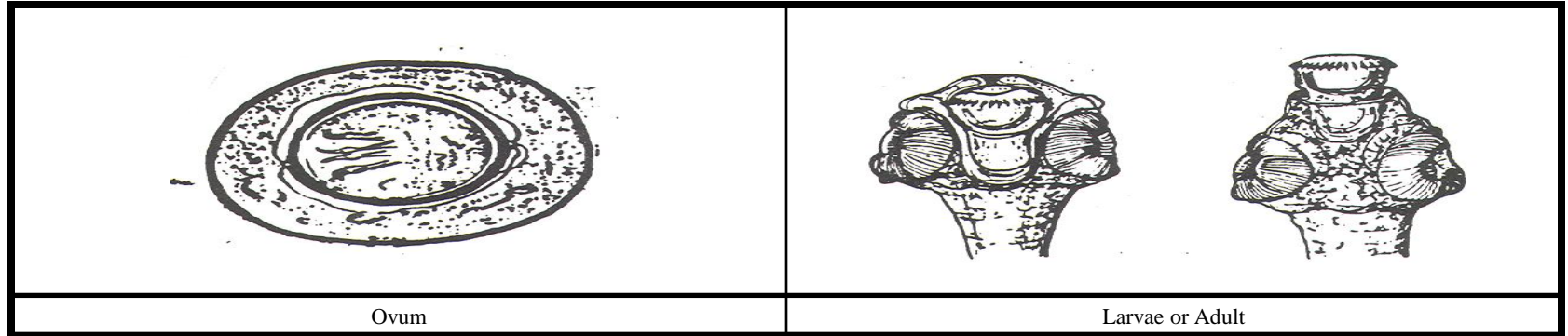
Location: Sheep raising regions of the world

Disease: Fascioliasis (liver rot)

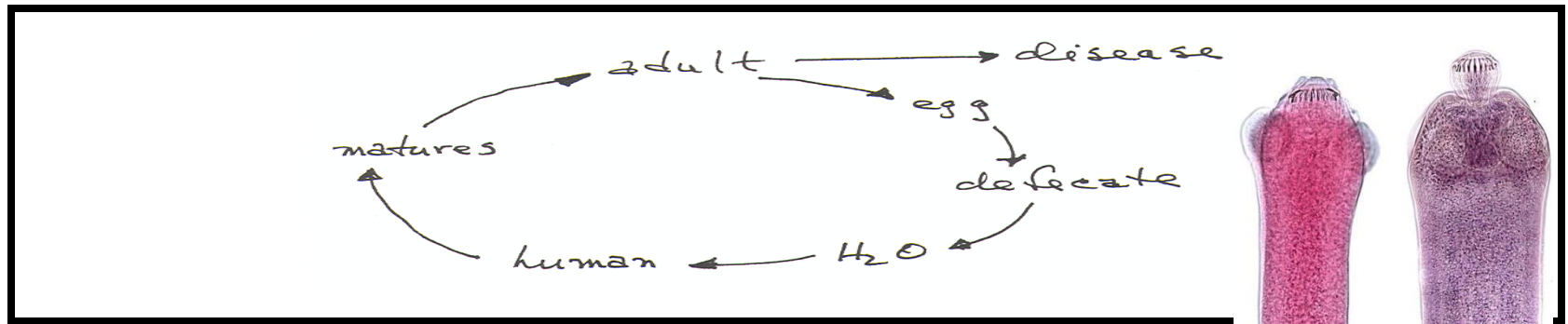
General Description: liver damage, from aquatic vegetation

Worm: Hymenolepis nana (dwarf tapeworm of humans)

General Family: Cestode



Life Cycle:



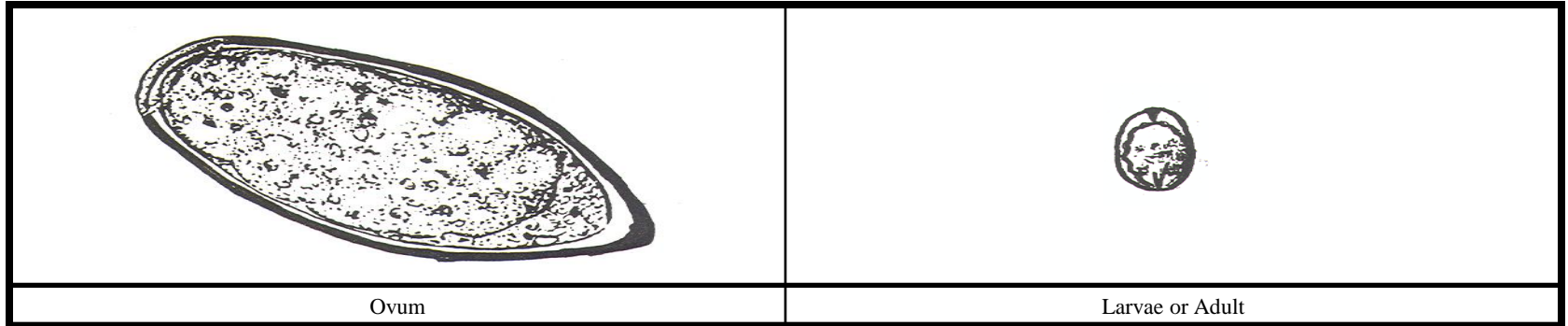
Location: Worldwide

Disease: Tapeworm

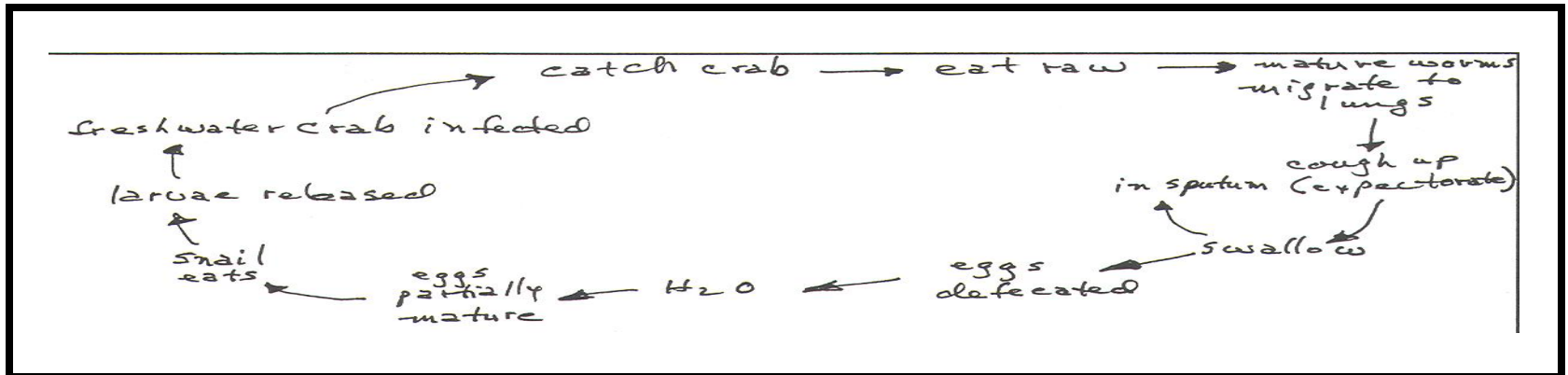
General Description: diarrhea, small bowel, anal-oral; vague abdominal discomfort, loss of appetite leads to weight loss

Worm: *Paragonimus westermani* (lung fluke)

General Family: Trematode



Life Cycle:



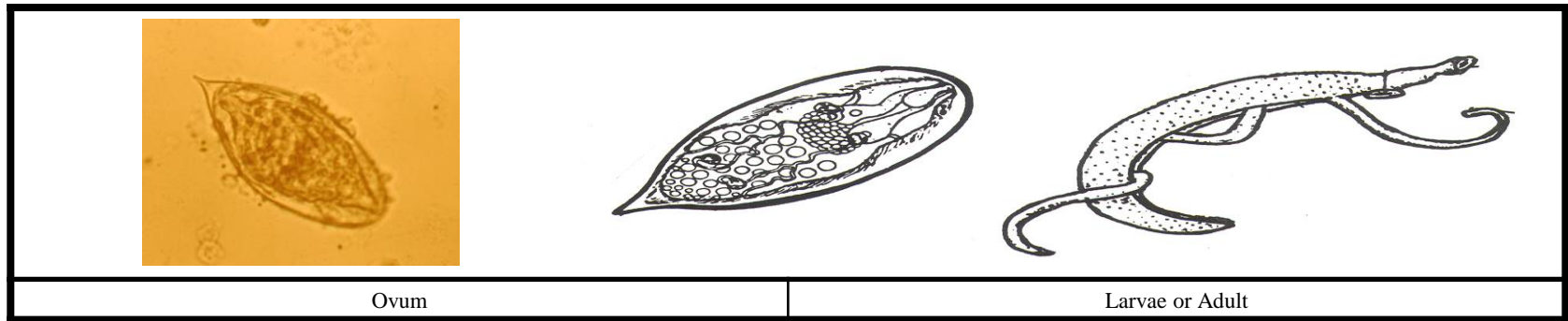
Location: N. America and Far East

Disease: Paragonimiasis

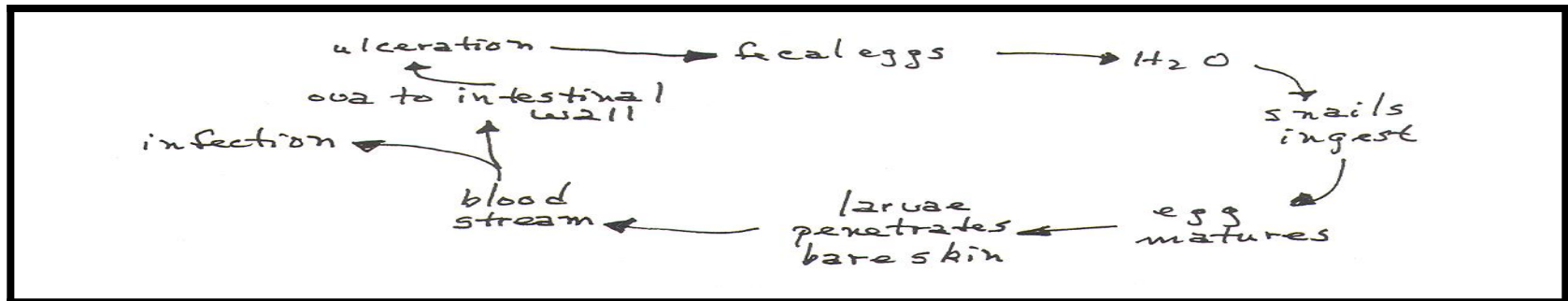
General Description: Lung, brain, raw crab, cough, poor breathing, hemoptysis

Worm: Schistosoma haematobium (blood fluke)

General Family: Trematode (Flat worm)



Life Cycle:



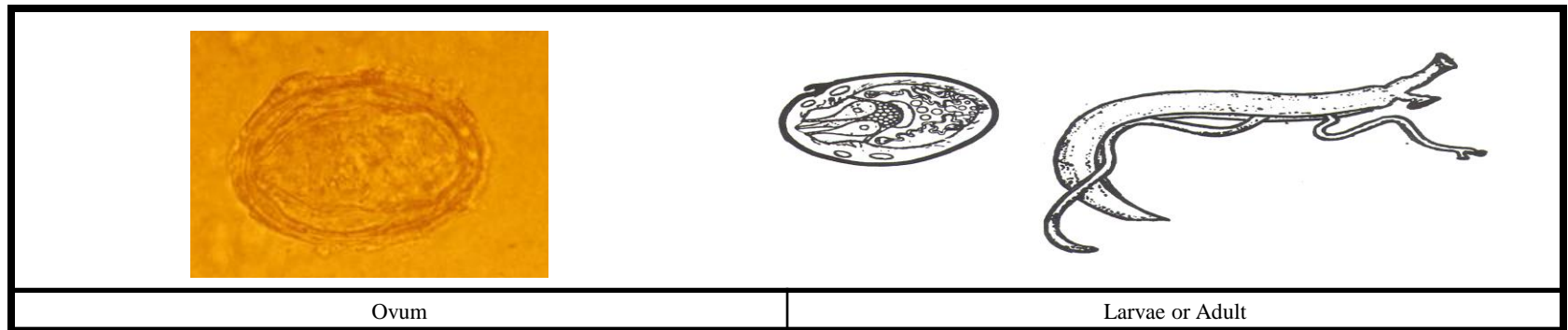
Location: International waters of Africa, mid-East, Egypt

Disease: Schistosomiasis

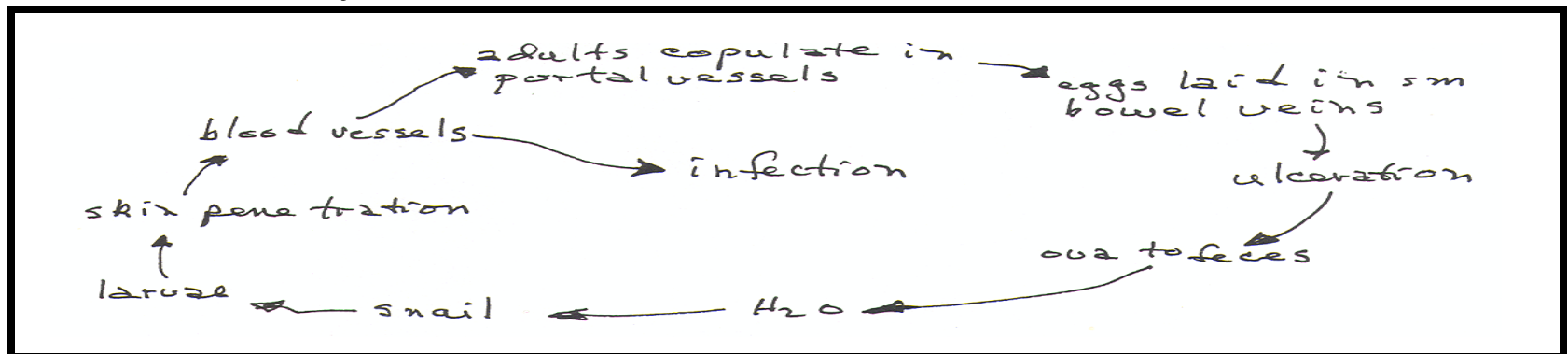
General Description: veins of bladder, large bowel, liver, penetrates skin, rash, fever, from snail, hematuria, dysuria, bladder/rectal CA, found in the last drops of urine at end of micturition

Worm: Schistosoma japonicum (blood fluke)

General Family: Trematode



Life Cycle:



Location: Far East, Africa, S. America, Caribbean, Philippines

Disease: Schistosomiasis

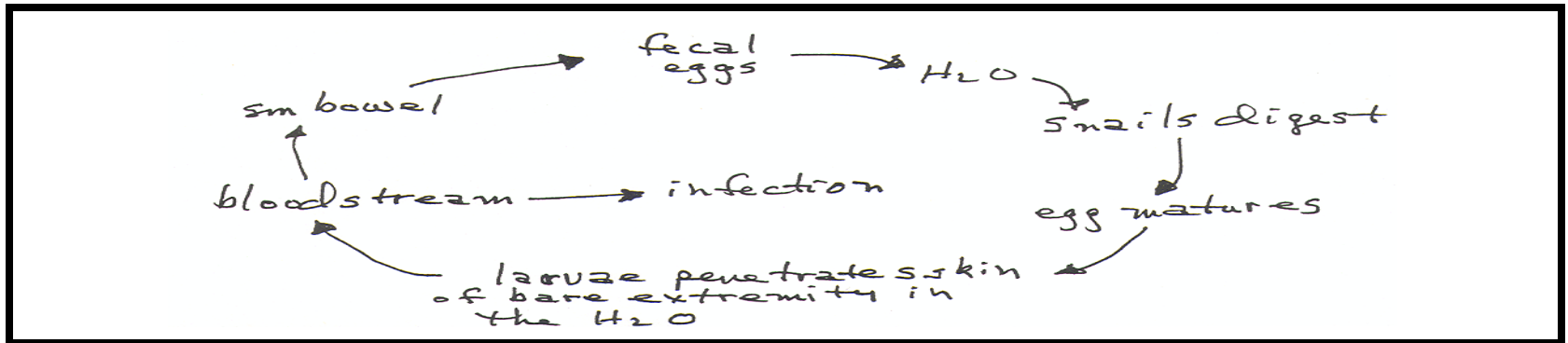
General Description: rash, fever, from snail, veins of colon, rectum, liver, penetrates skin; CNS problems (seizures); see S. haematobium

Worm: Schistosoma mansoni (blood fluke)

General Family: Trematode



Life Cycle:



Location: S. America, Caribbean, Egypt, Japan, China, Philippines

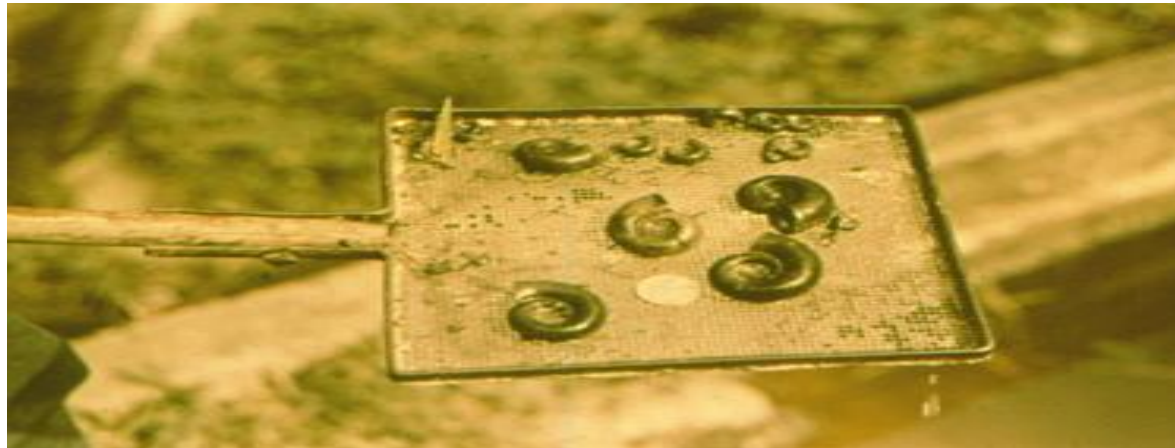
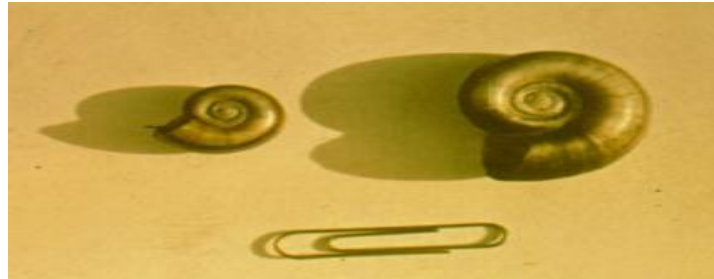
Disease: Schistosomiasis

General Description: rash, fever, from snail, veins of bowel, liver, penetrates skin; see S. haematobium

Aside: Schistosome Dermatitis

- Caused by *Schistosomatium douthitti*
- Causes an allergic dermatitis
- The itch comes because the organisms crawl under our skin and die, causing the hypersensitivity reaction.
- From birds; can not mature in man
- Prominent in Europe and N. America
- aka swimmer's itch
- Destroy the snail with Cu salts
- Happened the last time Washoe Lake was dry and Little Washoe was down (before 2005); at Davis Creek Pond Summer 2017

Snails Hosts of Schistosomes

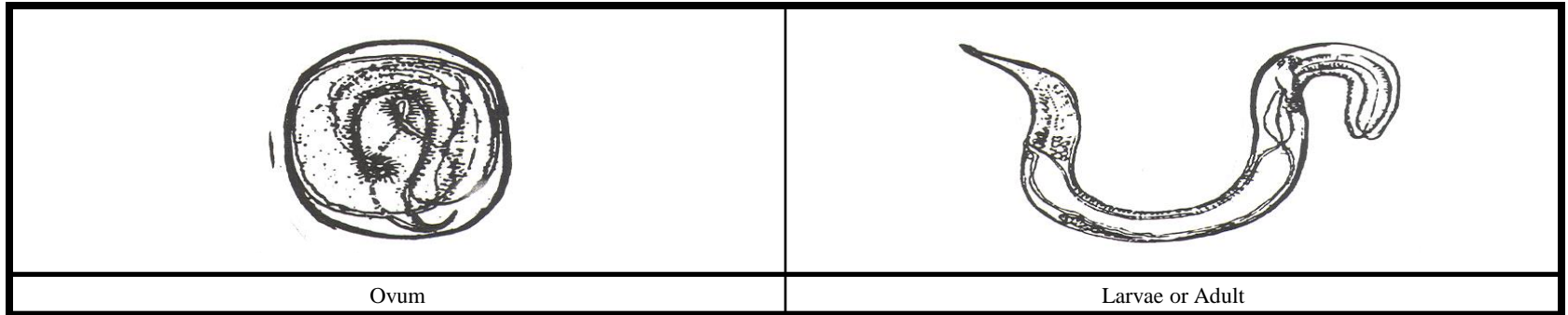


Schistosome Reproduction

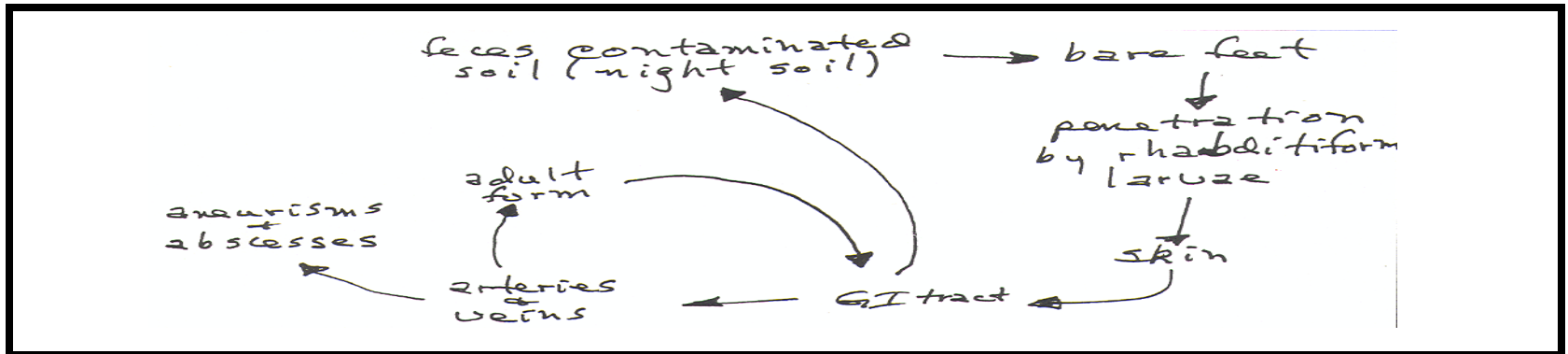


Worm: Strongyloides stercoralis (threadworm)

General Family: Nematode



Life Cycle:



Location: Worldwide

Disease: Strongyloidiasis

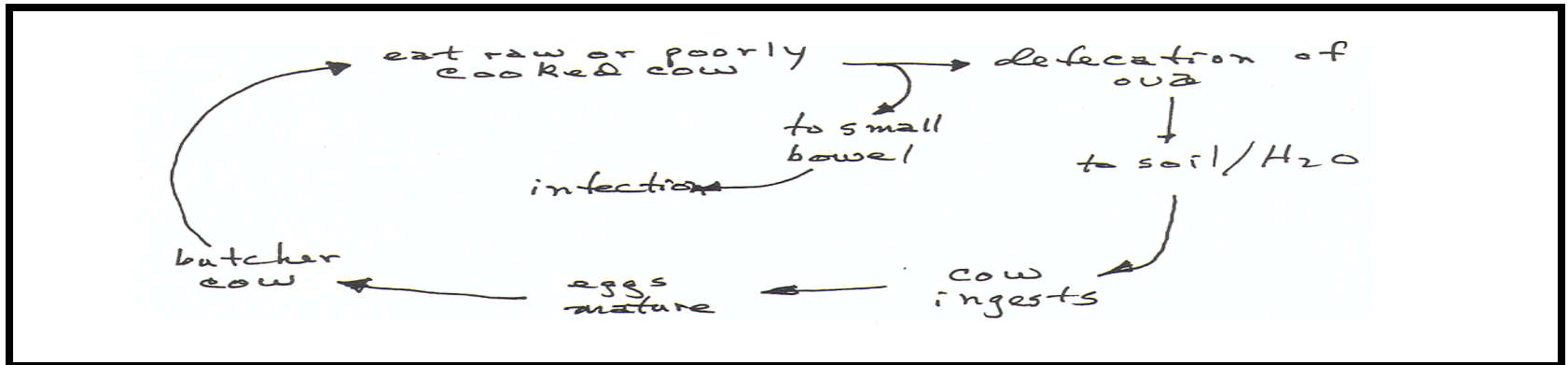
General Description: Anemia, abdominal pain, duodenum, jejunum, through skin and lungs

Worm: Taenia saginata (beef tapeworm; giant tape worm 3-10 m long)

General Family: Cestode



Life Cycle: Ova NOT infective to man; only worm or larvae



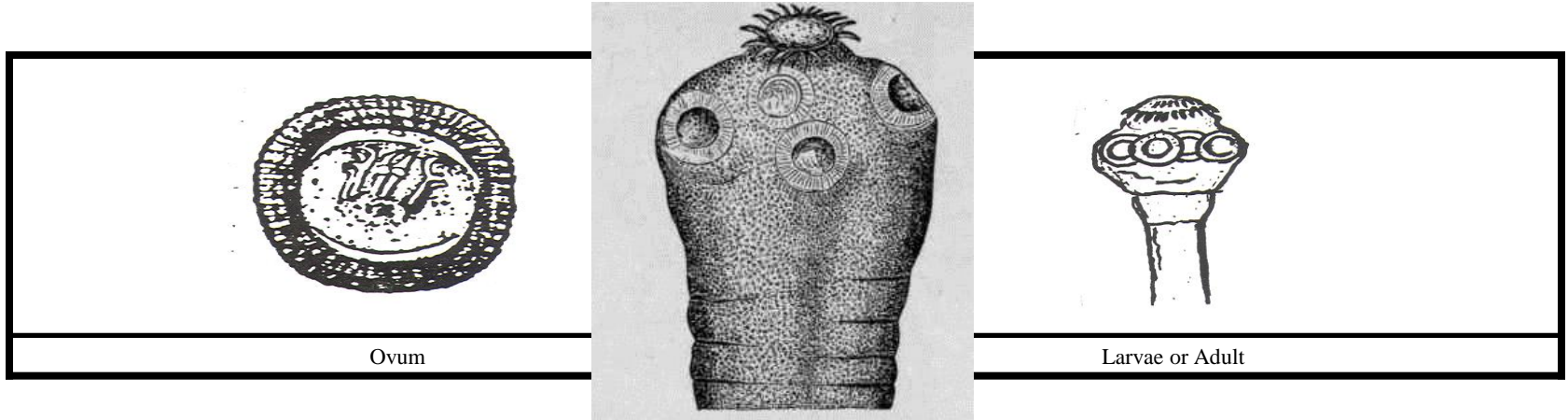
Location: Worldwide

Disease: Tapeworm

General Description: Small bowel, diarrhea, eating uncooked beef

Worm: Taenia solium (pork tapeworm)

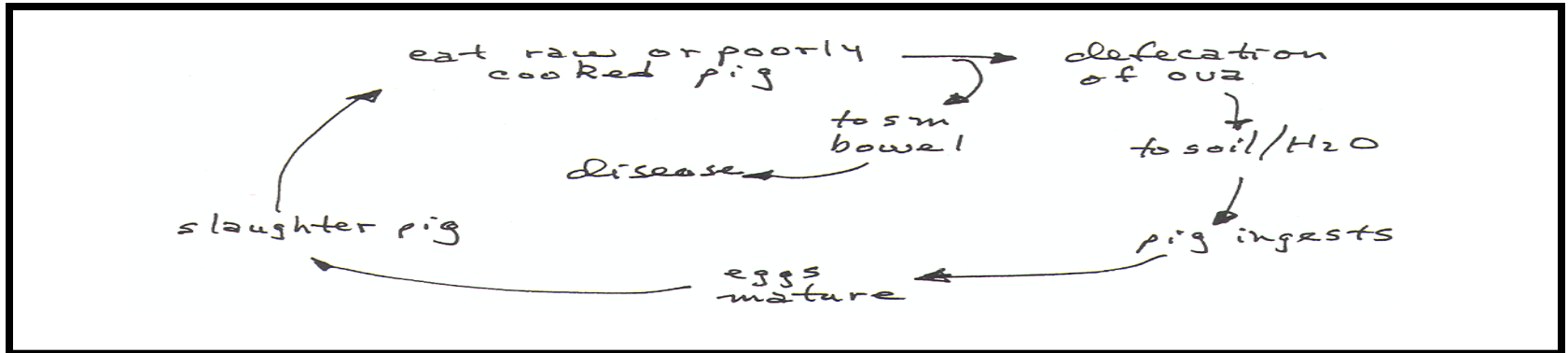
General Family: Cestode



Ovum

Larvae or Adult

Life Cycle:

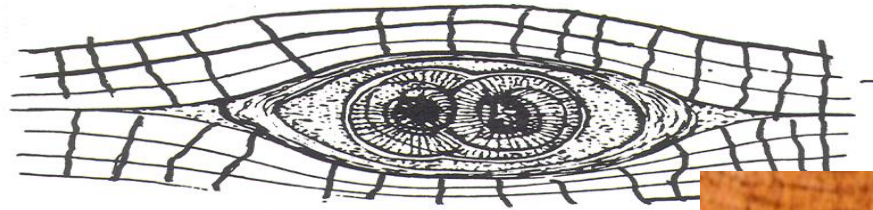


Location: Worldwide

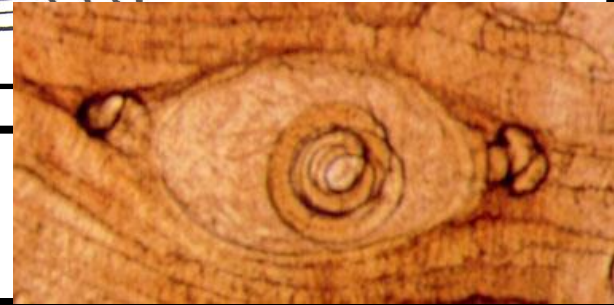
Disease: #1: tapeworm; #2: Cysticercosis

General Description: #1: Small bowel, diarrhea, uncooked pig; #2: eye, SQ, CNS, eat eggs

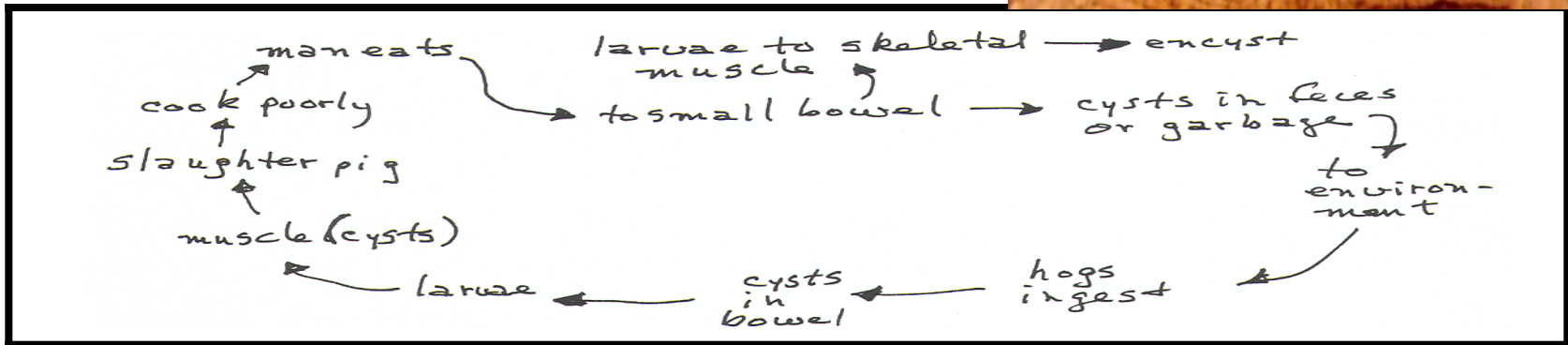
Worm: *Trichinella spiralis*
General Family: Nematode



Ovum



Life Cycle:



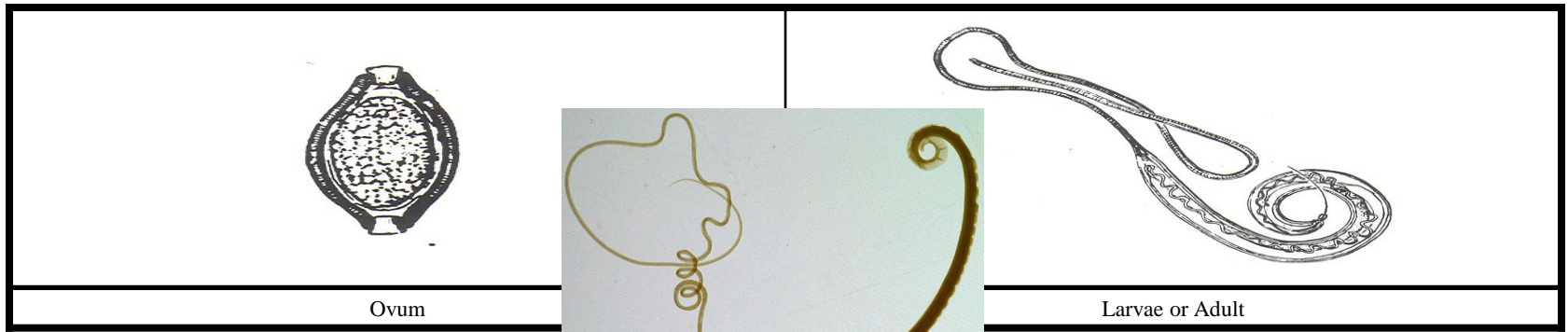
Location: Worldwide

Disease: Trichinosis

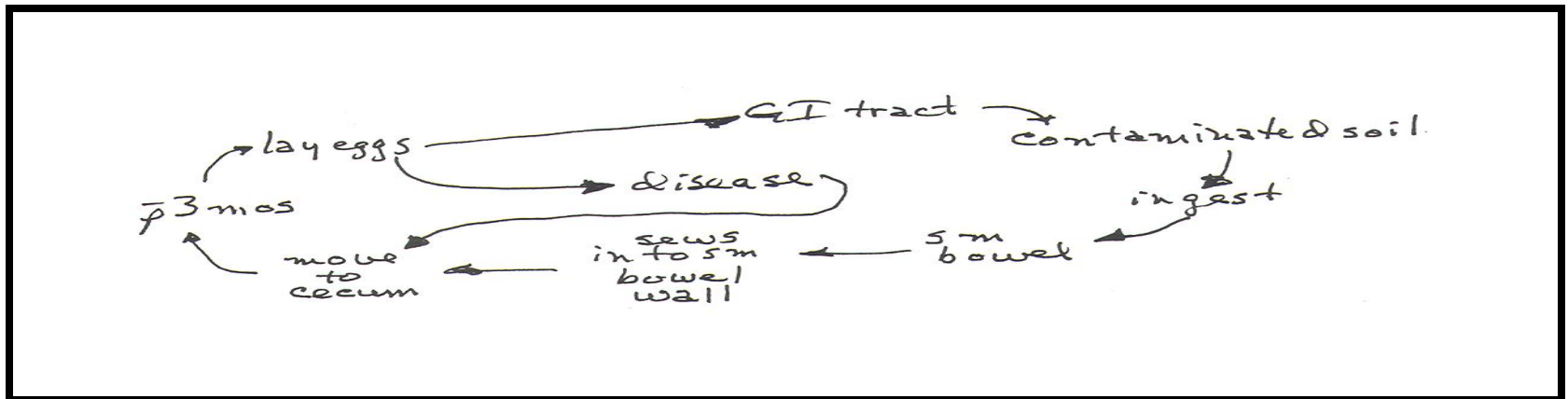
General Description: Diarrhea, muscle pain, loss of eye motion, striated muscle, uncooked pork

Worm: *Trichuris trichiura* (whipworm)

General Family: Nematode



Life Cycle:



Location: Worldwide

Disease: Trichuriasis

General Description: Abdominal pain, cecum, colon, feces and contaminated soil ingestion

Worm: *Wuchereria bancrofti*

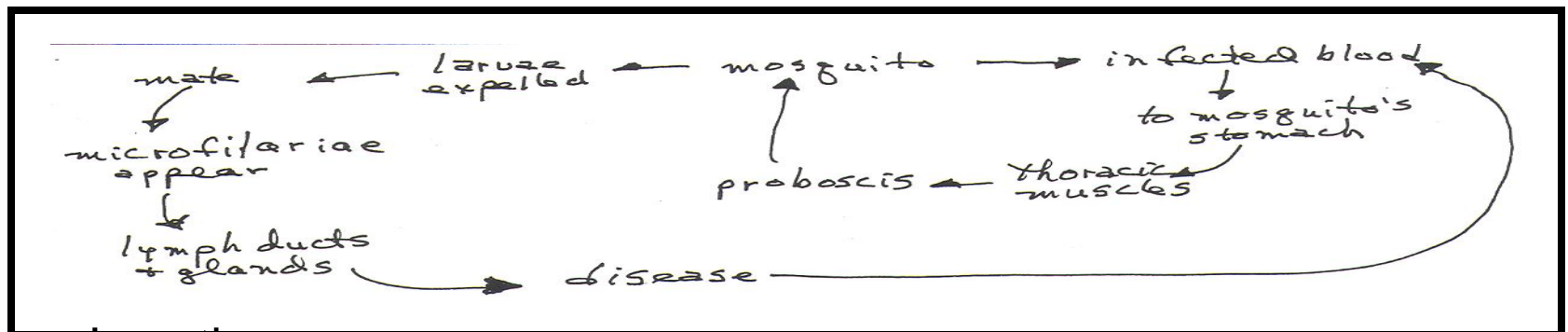
General Family: Nematode



Image source:

<http://www.dpd.cdc.gov/dpdx/HTML/Filariasis.htm>

Life Cycle: TWO hosts



Location: Tropical/subtropical regions of the world

Disease: Filariasis

General Description: edema, elephantiasis (due to blocked lymph drainage); lymph nodes, mosquito bite

Generic Name: Albendazole
Trade Name: Valbozen (Albenza)
Indication/Usage: received FDA approval (1996 or 1997) for use to treat cysts of the liver, lung, peritoneum that are caused by the larvae of Echinococcus granulosus (hydatid disease) and neurocysticercosis caused by T. solium larvae. Albenza is an orphan drug and its approval AND manufacture are important therapeutic gains.
Warnings: Known Allergies
Pregnancy Category: C -- Contraindicated in first trimester (http://www.emedicine.com/med/topic2293.htm)
Administration: Dosage for hydatid disease is 400-mg bid with meals times 28 days, 14 days off, 28 days on, 14 days off and 28 days on
Neurocysticercosis can result in seizures and headaches when the disease gets into brain tissue. Oral or IV corticosteroids should be considered to prevent cerebral hypertensive episodes during the first week of anticysticercal therapy.
Dosage for neurocysticercosis is 400 mg bid with meals times 8-30 days.
In both hydatid disease and neurocysticercosis, if the patient weighs less than 60 kg, the dosage is 15 mg/kg/day with meals divided bid but no more than 800 mg/day.

Generic Name: Diethylcarbamazine citrate
Trade Name: Hetrazan
Indication/Usage: received FDA approval in 1996 or 1997. This is used to treat Bancroft's filariasis and Ascaris. Facial edema and pruritis (eyes) is often encountered with this drug.
Warnings: Known Allergies; Start at low dose (25 mg/d) and progressively increase dose to avoid adverse reactions due to parasite lysis (http://www.emedicine.com/med/topic2293.htm)
Pregnancy Category: C - Safety for use during pregnancy has not been established. (http://www.emedicine.com/med/topic2293.htm)
Administration: Dosage for Bancroft's filariasis is 2-mg/kg tid immediately following meals times 3-4 weeks.
For ascariasis, 6-10 mg/kg tid times 7-10 days will eliminate ascarids from children.

Generic Name: Mebendazole

Trade Name: Vermox

Indication/Use: pinworm, whipworm, giant round worm, hook worm

Warnings: Determine hypersensitivity
Personal hygiene improves treatment due to decreased reinfection
Do NOT use routinely in children < 2 YOA
Do not use in first trimester

Pregnancy Category: C

Administration: p.o.: pinworm tab 1 for 1 day; whip/hook/giant round worm tab 1 q 12 h for 3 days; repeat in 2-3 weeks if necessary

- Adverse effects are negligible, except headaches during early therapy. These symptoms are from metabolites secreted from nematodes that are killed by the drug. Causes worm death by selectively and irreversibly blocking uptake of glucose and other nutrients in susceptible adult intestines where helminths dwell. (<http://www.emedicine.com/med/topic2293.htm>)

Generic Name: Niclosamide*

Trade Name: Niclocide

Indication/Use: Beef tape worm, pork tape worm, fish tape worm, dwarf tape worm

Warnings: Determine hypersensitivity
Refrain from routine use in children < 2 YOA
Chew thoroughly
Segments/ova of beef/fish tape worms after 7 days = tx failure

Pregnancy Category: B

Administration: p.o.

Beef/Fish Tape Worms

Adults: tabs 4 one dose

Children over 75#: tabs 3 one dose

Children between 25-75#: tabs 2 one dose

Dwarf Tape Worms

Adult: tabs 4 qd for 7 days

Children over 75#: tabs 3 one day;
tabs 2 qd for 6 days

Children between 25-75#: tabs 2 one day;
tabs 1 qd for 6 days

- Beef/fish tapeworms: Treatment may be repeated in seven days if needed.
- Dwarf tapeworm: Treatment may be repeated in seven to fourteen days if needed.
- Source:
<http://www.nlm.nih.gov/medlineplus/druginfo/uspdi/202406.html>

Generic Name: Oxamniquine

Trade Name: Vansil

Indication/Use: All stages of *S. mansoni*

Warnings: Epileptiform seizures have been known to occur with this
Dizziness/drowsiness has occurred

Pregnancy Category: C

Administration: p.o.; adult: 12-15 mg/kg one day

Weight range (pounds)	Dose (mg)
66-88	500
90-132	750
134-176	1000
178-220	1250

Give after food to improve patient's toleration of drug

Generic Name: Piperazine citrate

Trade Name: Vermizine

Indication/Use: Giant round worm and pin worm

Warnings: Determine hypersensitivity -- if so, d/c
If GI and CNS sx occur, d/c
Recommend personal hygiene to patient

Pregnancy Category: ?

Administration: p.o.; Round worms: adults: 3.5 g qd before breakfast for 2 days; children: 75 mg/kg for two days (maximum dose = 3.5 g/d) -- Pin worms: Adults and Children: 65 mg/kg qd (maximum dose 2.5 g/d) for 7 days

Generic Name: Praziquantel

Trade Name: Biltricide

Indication/Use: Schistosomiasis

Warnings: Determine hypersensitivity
Do NOT drive/operate machinery on day of treatment OR the day after treatment
Women do NOT nurse on day of treatment or for 72 hours afterwards
Refrain from use in children < 4 YOA
O.D.: give rapid acting laxative
Do not treat ocular schistosomiasis with this: causes irreparable eye damage 2° worm damage in tissues

Pregnancy Category: B

Administration: p.o.: 20 mg/kg tid X 1d; wash down unchewed tabs with liquid during meal; time between doses is to be 4-6 hours

Generic Name: Thiabendazole

Trade Name: Mintezol

Indication/Use: Strongyloidiasis (thread worm), trichinosis (MAY be used with hookworm, whipworm and giant round worm* when wish for a 2d agent (co-drug) or shot-gunning)

Warnings: Determine hypersensitivity
Avoid activities that require mental alertness
Do not use prophylactically, but after diagnosis
Refrain from use in children less than 14 kg
N/v, diarrhea, tinnitus, hyperglycemia, hematuria, live Ascaris in mouth and nose have been reported

Pregnancy Category: C

Administration: maximum daily dose = 3 grams; after meals; p.o.; chew tablets before swallowing; dose based on patient's weight;

Strongyloidiasis	Trichinosis	Ascariasis/Trichuriasis
2 doses qd for 2 days	2 doses qd for 4 days	2 doses qd for 2 days

*MAY cause Ascaris to MIGRATE