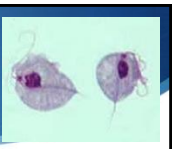
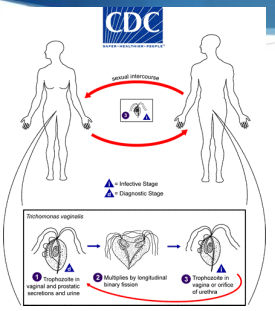
Parasitic infections II.

RNDr. et M.Res Lenka Richterová Ph.D.
NRL for diagnosis of tropical parasitological infections

Nemocnice Na Bulovce

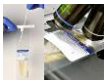
Trichomonas vaginalis





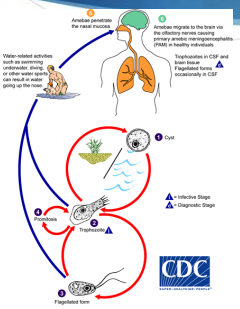
- Average **35** cases/year in CR
- in the **female** lower genital tract and the **male** urethra and prostate
- **Vaginitis with a purulent discharge**
- can be accompanied by vulvar and cervical lesions
- abdominal pain, dysuria and dyspareunia
- **incubation period is 5 to 28 days**
- **In men**, the infection is **frequently asymptomatic**; occasionally, urethritis, epididymitis, and prostatitis

Trichomonas vaginalis

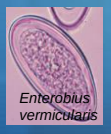


- Microscopic examination of wet mounts - actively motile organisms
- Culture of the parasite 3 to 7 days
- In women, examination should be performed on vaginal and urethral secretions
- In men, anterior urethral or prostatic secretions should be examined.
- **Metronidazole** 2 g orally in a single dose
- **Tinidazole** 2 g orally in a single dose
- **Metronidazole** 500 mg orally twice a day for 7 days

Free Living Amebic Infections
Naegleria fowleri, Acanthamoeba spp.

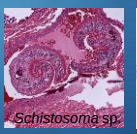


Intestinal parasites



https://www.cdc.gov/dpdx/

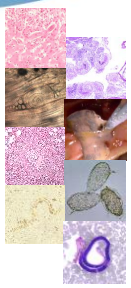
Tissue helmints



https://www.cdc.gov/dpdx/

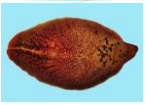
Laboratory diagnosis of tissue helmints

material	TYP VYŠETŘENÍ
serum, CSF, biopsy	toxocariasis Cystic/alveolar hydatidosis (echinokokosis) cysticerkosis trichinelosis fasciolosis angiostrongyloidosis kapilariosis
serum, CSF, biopsy, stool	schistosomosis intestinal strongyloidosis
serum, CSF, biopsy, urin	schistosomosis urinary
serum, CSF, biopsy, blood slide.	filariosis



Nematoda Trematoda Cestoda

Enterobius vermicularis



Fasciola hepatica

Taenia saginata

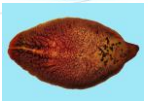
Ascaris lumbricoides

Schistosoma mansoni

Echinococcus granulosus

Nematoda Trematoda Cestoda

Enterobius vermicularis



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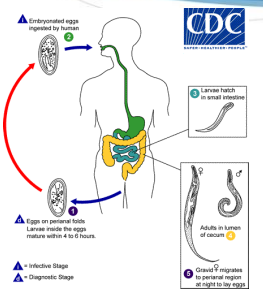


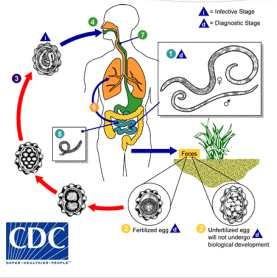
- **Eggs** are deposited on **perianal folds**
- Self-infection - transferring infective eggs to the mouth
- **larvae hatch** in the **small intestine**
- **adults** establish themselves in the **colon**
- from ingestion of infective eggs to oviposition by the adult females is about **1 month**
- **life span** of the adults is about **2 months**
- Gravid females migrate nocturnally **outside the anus and oviposit**
- the eggs become **infective in 4 to 6 hours**

Enterobius vermicularis Clinical Presentation

Mebendazol
Pyrvinium

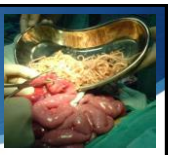
- frequently **asymptomatic**
- perianal **pruritus**
- Occasionally, invasion of the **female genital** tract with vulvovaginitis and pelvic or peritoneal granulomas
- Other symptoms include **anorexia, irritability, and abdominal pain**
- 2018 in CR **1877** recorded cases

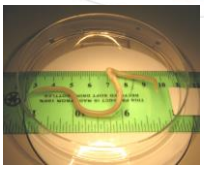
Ascaris lumbricoides



- Adult females: **20 to 35 cm**; adult male: **15 to 30 cm**.
- **Adult worms** live in the lumen of the **small intestine**
- 200,000 eggs per day
- Fertile eggs **embryonate** and become infective after **18 days to several weeks**
- infective **eggs are swallowed**
- larvae hatch **invade the intestinal mucosa**
- carried via the portal, then systemic **circulation to the lungs**
- mature further in the **lungs (10 to 14 days)**, penetrate the alveolar walls, ascend the bronchial tree to the throat, and are **swallowed**
- Between **2 and 3 months** are required from ingestion of the infective eggs to oviposition by the adult female. Adult worms can **live 1 to 2 years**.

Ascaris lumbricoides Clinical Presentation

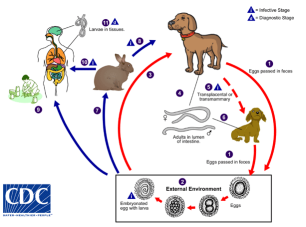




- adult worms usually cause **no acute symptoms**
- High worm burdens may cause **abdominal pain and intestinal obstruction**
- During the lung phase of larval migration - **cough, dyspnea, hemoptysis, eosinophilic pneumonitis**
- The most common human helminthic infection. Worldwide distribution.
- 2018 in CR **16** recorded cases

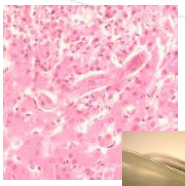
mebendazol

Toxocariasis (larvae of) *Toxocara canis, Toxocara cati*



- **humans** acquiring the infection as **accidental hosts**
- Eggs embryonate and become infective in the environment
- Encysted stages are reactivated in female dogs transplacental and transmammary
- small mammals - tissues encyst
- Humans - accidental hosts - **ingesting infective eggs** in **soil** or **infected paratenic hosts**
- Ingestion - eggs hatch and **larvae penetrate the intestinal wall** - tissues (**liver, heart, lungs, brain, muscle, eyes**)

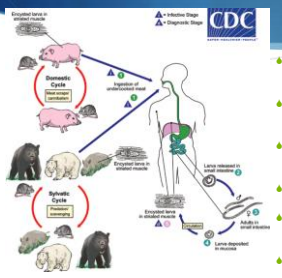
Toxocariasis Clinical Presentation



- Toxocariasis (Asymptomatic, eosinophilia)
- **visceral larva migrans -** fever, anorexia, weight loss, cough, wheezing, rashes, hepatosplenomegaly, and hypereosinophilia
- Death can occur rarely, by severe cardiac, pulmonary or neurologic involvement
- **ocular larva migrans -** various ophthalmologic lesions, older children or young adults, rare eosinophilia
- Diagnosis is usually made by **serology** or the finding of larvae in **biopsy**

Mebendazol
Albendazol

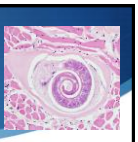
Trichinella spiralis



Diagnosis: clinical symptoms, serology, larvae in biopsy

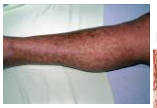
- Adult worms and encysted larvae develop within a **single vertebrate host**
- domestic cycle most often involved **pigs** and anthropophilic **rodents**
- Trichinellosis is caused by the **ingestion of undercooked meat** containing encysted larvae
- In **stomach** - larvae are released from the cysts
- **invade the small bowel mucosa** where they develop into adult worms
- life span in the small bowel is about 4 weeks
- After 1 week, the **females release larvae**
- migrate to striated **muscles** where they **encyst**

Trichinella spiralis

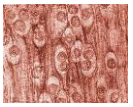


splinter hemorrhages

Periorbital edema



rash

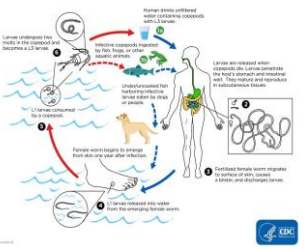


myalgia and weakness

- Light infections may be **asymptomatic**
- **Intestinal invasion** can be accompanied by gastrointestinal symptoms (**diarrheoa, abdominal pain, vomiting**)
- **Larval migration into muscle** tissues (one week after infection) can cause periorbital and facial edema, conjunctivitis, fever, myalgias, splinter hemorrhages, rashes, and peripheral eosinophilia
- Occasional **life-threatening** manifestations include **myocarditis**, **CNS** involvement, and **pneumonitis**

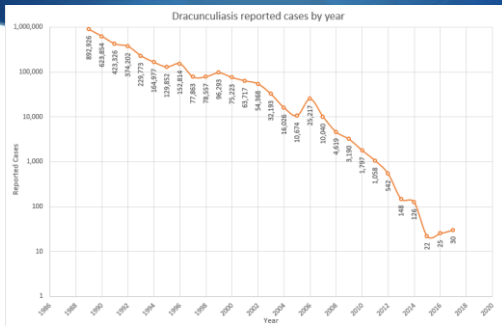
Albendazole
corticoids

Dracunculus medinensis (Guinea worm)



- Humans infected by **water containing copepods** - infected with larvae of *D. medinensis*
- ***Larvae* penetrate the host stomach** and intestinal wall and enter the **abdominal cavity** and retroperitoneal space
- After maturation into adults and copulation, the male worms die and the **females (length: 70 to 120 cm) migrate in the subcutaneous tissues** towards the skin surface
- Approximately **1 year** after infection, the female worm induces a **blister** on the skin, generally on the distal lower extremity, which ruptures
- lesion comes into **contact with water**, female worm emerges and **releases larvae**
- larvae are ingested by a copepod

Dracunculus medinensis

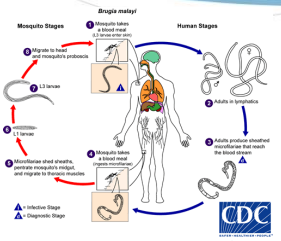


Dracunculus medinensis

- In **2018**, a total of **28 human cases** were reported to WHO from Angola (1), Chad (17), Ethiopia (0), Mali (0) and South Sudan (10).
- Chad 2018 :1040 **dogs** and 25 infected **cats**
- clinical manifestations are localized but incapacitating
- worm emerges 1 to 3 weeks
- in the center of a **painful ulcer**, accompanied by inflammation and frequently by secondary bacterial infection

Lymphatic Filariasis

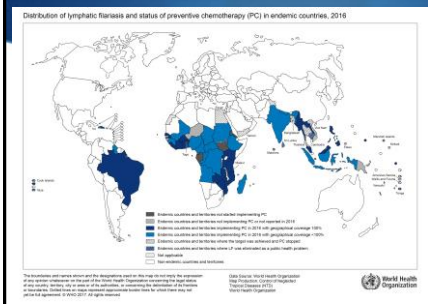
Brugia malayi, B. timori, Wuchereria bancrofti



B. sp. - Mansonia and *Aedes*
W.b. - Culex, Anopheles, Aedes

- Infected mosquito introduces third-stage **filarial larvae onto the skin** of the human host
- develop into **adults** that commonly reside in the **lymphatics**
- **Adults produce microfilariae** - sheathed and have nocturnal periodicity
- The microfilariae migrate into lymph and enter the blood stream reaching the **peripheral blood**
- A mosquito ingests the microfilariae during a blood meal

Lymphatic Filariasis



Albendazole - twice per year (co-endemic with loiasis)

Ivermectin with **albendazole** (co-endemic with onchocerciasis)

diethylcarbamazine citrate and **albendazole** (co-endemic with onchocerciasis)

in 2000 over 120 million people were infected, with about 40 million disfigured and incapacitated by the disease.
preventive chemotherapy with safe medicine combinations repeated annually

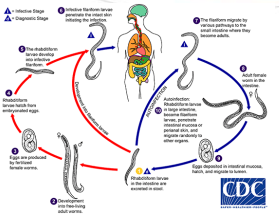
Lymphatic Filariasis Clinical Presentation

25 million men with hydrocele and over 15 million people with lymphoedema

- **Diagnostic:** microfilaria in peripheral **blood smears, Antigen detection**
- **infection may be acquired during childhood** its visible manifestations may occur later in life
- The vast majority of infected people are **asymptomatic**, but virtually all of them have subclinical **lymphatic damage** and as many as 40% have **kidney damage**, with proteinuria and haematuria.
- People with **lymphedema and elephantiasis** are unlikely to benefit from DEC treatment because most people with lymphedema are not actively infected with the filarial parasite.

Diethylcarbamazine kills the microfilariae and some of the adult worms

Strongyloides stercoralis



autoinfection may explain the possibility of persistent infections for many years in persons who have not been in an endemic area!

- **3** cases in CR in 2018
- alternation between free-living and parasitic cycles,
- potential for **autoinfection** and **multiplication within the host**
- **Filariform larvae** in contaminated soil **penetrate the human skin**
- migrate to the small intestine
- in **small intestine** they molt twice and become **adult female worms** by parthenogenesis **produce eggs**
- yield **rhabditiform larvae** is passed in the **stool** or can cause **autoinfection**

Strongyloidiasis Clinical Presentation

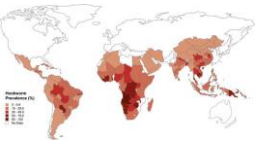
- **Disseminated strongyloidiasis**
- immunosuppressed patients - abdominal pain, distension, shock, pulmonary and neurologic complications and septicaemia, and is **potentially fatal**.

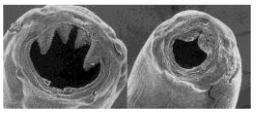
- **Tropical** and **subtropical** areas, but cases also occur in **temperate** areas
- Frequently **asymptomatic**.
- **Gastrointestinal symptoms**: abdominal pain and diarrhoea
- **Pulmonary symptoms** during pulmonary migration of the filariform larvae
- **Dermatologic manifestations** include urticarial rashes in the buttocks and waist areas
- **eosinophilia**

Ivermectin, in a single dose, 200 µg/kg orally for 1—2 days
Albendazole, 400 mg orally two times a day for 7 days.

Hookworms

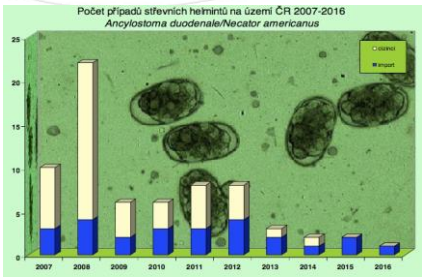
- Estimate 576-740 mil. People infected





Hookworms

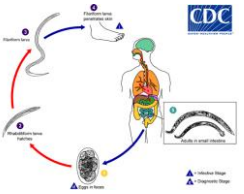
CR 2018 **5** cases



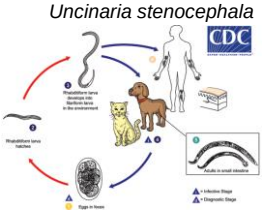
Hookworms

Drug	Dosage for adults and children
Albendazole	400 mg orally once
Mebendazole	100 mg orally twice a day for 3 days or 500 mg orally once
Pyrantel pamoate	11 mg/kg (up to a maximum of 1 g) orally daily for 3 days

Ancylostoma duodenale
A. ceylanicum
Necator americanus



A. braziliense
A. caninum
Uncinaria stenocephala



Nematoda Trematoda Cestoda

Enterobius vermicularis

Fasciola hepatica

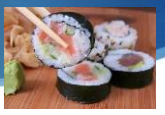
Taenia saginata

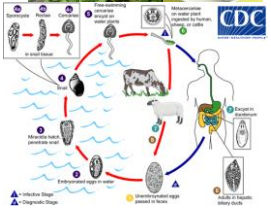
Ascaris lumbricoides

Schistosoma mansoni

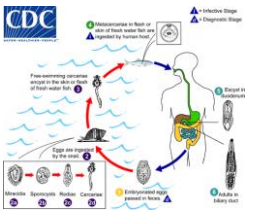
Echinococcus granulosus

Fascioliasis and Opisthorchiasis



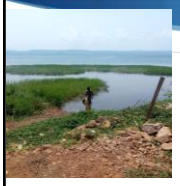


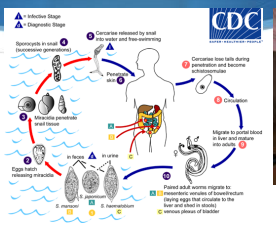
Fasciola gigantica and Fasciola hepatica
abdominal pain, hepatomegaly, fever, vomiting, Diarrhea, **biliary obstruction**



Opisthorchis felineus and Opisthorchis viverrini
Cholangitis - cholecystitis - **chlolangiocarcinoma**

Schistosomiasis



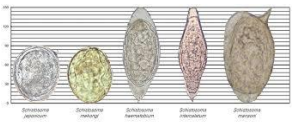


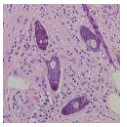
2018 **6** cases CR

Clinical Presentation: **Katayama's fever** may occur weeks after the initial infection
fever, cough, abdominal pain, diarrhea, hepatosplenomegaly, and eosinophilia
granulomatous reactions and fibrosis in the affected organs
colonic polyposis with bloody diarrheoa , portal hypertension with hematemesis and splenomegaly
cystitis and ureteritis - can progress to **bladder cancer**, glomerulonephritis; and CNS lesions

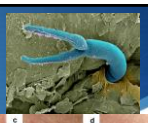
Schistosomiasis

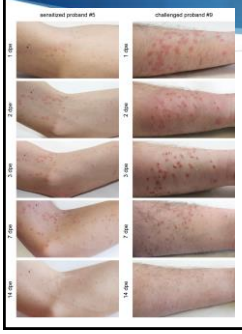
- Katayama fever : serology 2-10 weeks from exposition
- Sheading of eggs: microscopy after 10-12 weeks from exposition

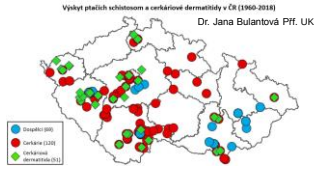




Cercarial dermatitis in ČR

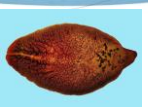






Nematoda Trematoda Cestoda

Enterobius vermicularis



Fasciola hepatica

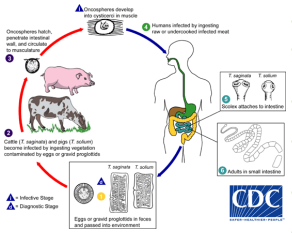
Taenia saginata

Ascaris lumbricoides

Schistosoma mansoni

Echinococcus granulosus

Taeniasis
Taenia saginata, Taenia solium, Taenia asiatica

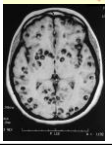


- ***T. saginata*** CR 2018 **11** cases
- *Taenia saginata* (beef tapeworm), *T.solium* (pork tapeworm - cysticercosis) and *T.asiatica* (Asian tapeworm)
- Eggs or gravid **proglottids** are passed with feces
- In the **animal's** intestine, the **oncospheres** hatch, invade the intestinal wall, migrate to the striated muscles, **cysticerci**
- **Humans** become infected by **ingesting raw or undercooked infected meat**
- cysticercus **develops over 2 months** into an **adult tapeworm**, which can **survive for years** (adult 5-25m)

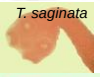
1,000 to 2,000 proglottids,
up to 100,000 eggs per proglottid

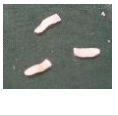
Taeniasis
Clinical Presentation

T. solium



T. saginata

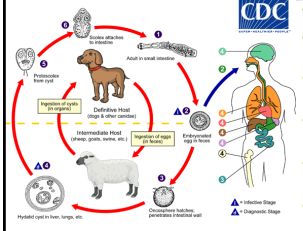




- ***Taenia saginata*** taeniasis produces only mild abdominal symptoms
- passage (active and passive) of proglottids
- ***Taenia solium*** taeniasis is the risk of development of **cysticercosis**.

Praziquantel 5-10 mg/kg orally once

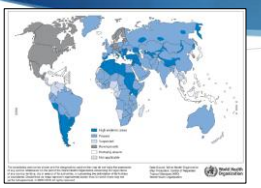
Echinococcus spp.
Echinococcosis, hydatidosis, or hydatid disease

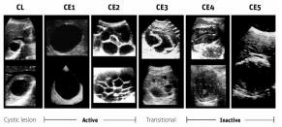


Echinococcus granulosus,
E. multilocularis, E. oligarthrus, E.vogeli

- *E. granulosus* - **cystic echinococcosis (dog)**
- *E. multilocularis* - **alveolar echinococcosis (fox - *rodents)**
- **Adult - small bowel of dogs/foxes** - **eggs** in feces
- **ingestion** by sheep, goat, swine, cattle, horses, camel (human)
- **egg hatches** in the small bowel and releases an **oncosphere**
- penetrates the intestinal wall and **migrates** through the circulatory system
- develops into a **cyst** enlarges gradually, producing **protoscolices** and daughter cysts that fill the cyst interior

E. granulosus
cystic echinococcosis
(most frequent)



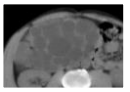


E. multilocularis
alveolar echinococcosis

Echinococcosis

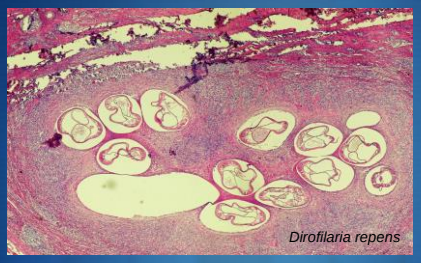
(In average **3** cases/ year CR)
***E.granulosus* prevalence levels as high as 5–10%** parts of Argentina, Central Asia, China, East Africa and Peru

- ***Echinococcus granulosus*** infections remain silent for years
- enlarging **cysts** cause symptoms
- **Hepatic** - abdominal pain, a mass in the hepatic area, and biliary duct obstruction
- **Pulmonary** - chest pain, cough, and hemoptysis
- **Rupture of the cysts** - fever, urticaria, eosinophilia, and anaphylactic shock, cyst dissemination
- **brain, bone, heart**



- ***E. multiocularis***
- **Liver** as a slow growing, destructive tumor
- abdominal pain, biliary obstruction, and occasionally metastatic lesions into the **lungs** and **brain**

Albendazole
400 mg orally twice a day for 1-6 months



http://www.cdc.gov/dpdx/

http://mikrobiologie.lf3.cuni.cz/

Tropical infectious disease 2011

Nemocnice Na Bulovce