# Eosinophilia and Schistosomiasis

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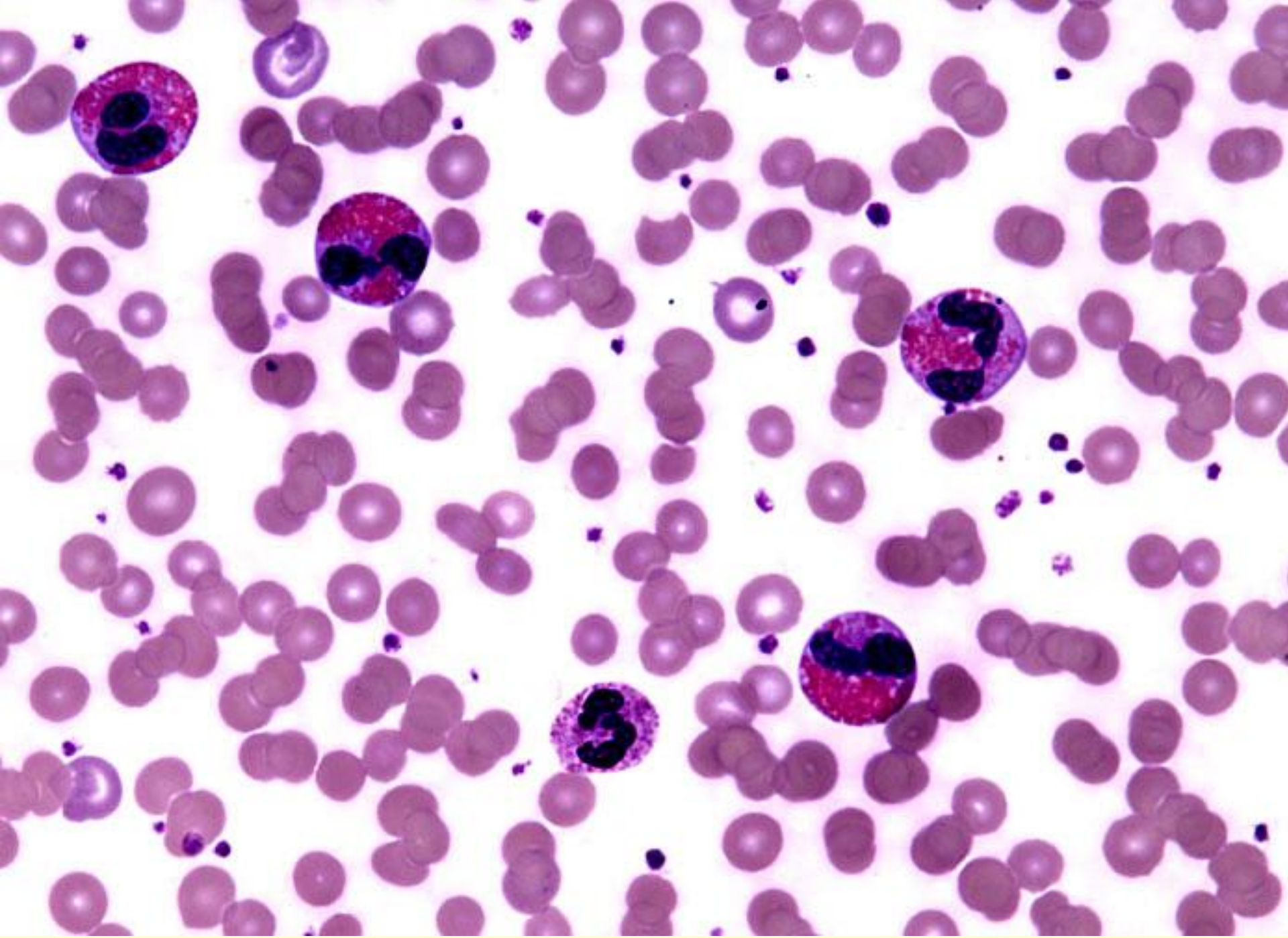
# Eozinophilia

= Increased level of eosinophils:

**Alergic reaction**

**Parasitic infection**

**Not present in protozoal infections!!!**



# Level of eosinophils

**Very high**(30-80% WBC)

*Trichinella, Toxocara, Fasciola*

**Medium high** (10-30% WBC)

*Strongyloides, Ancylostoma, Necator*

**Low, non-existing** (0-10% WBC)

*Enterobius, Ascaris, Trichuris*

# Deposition of helminth in the tissue

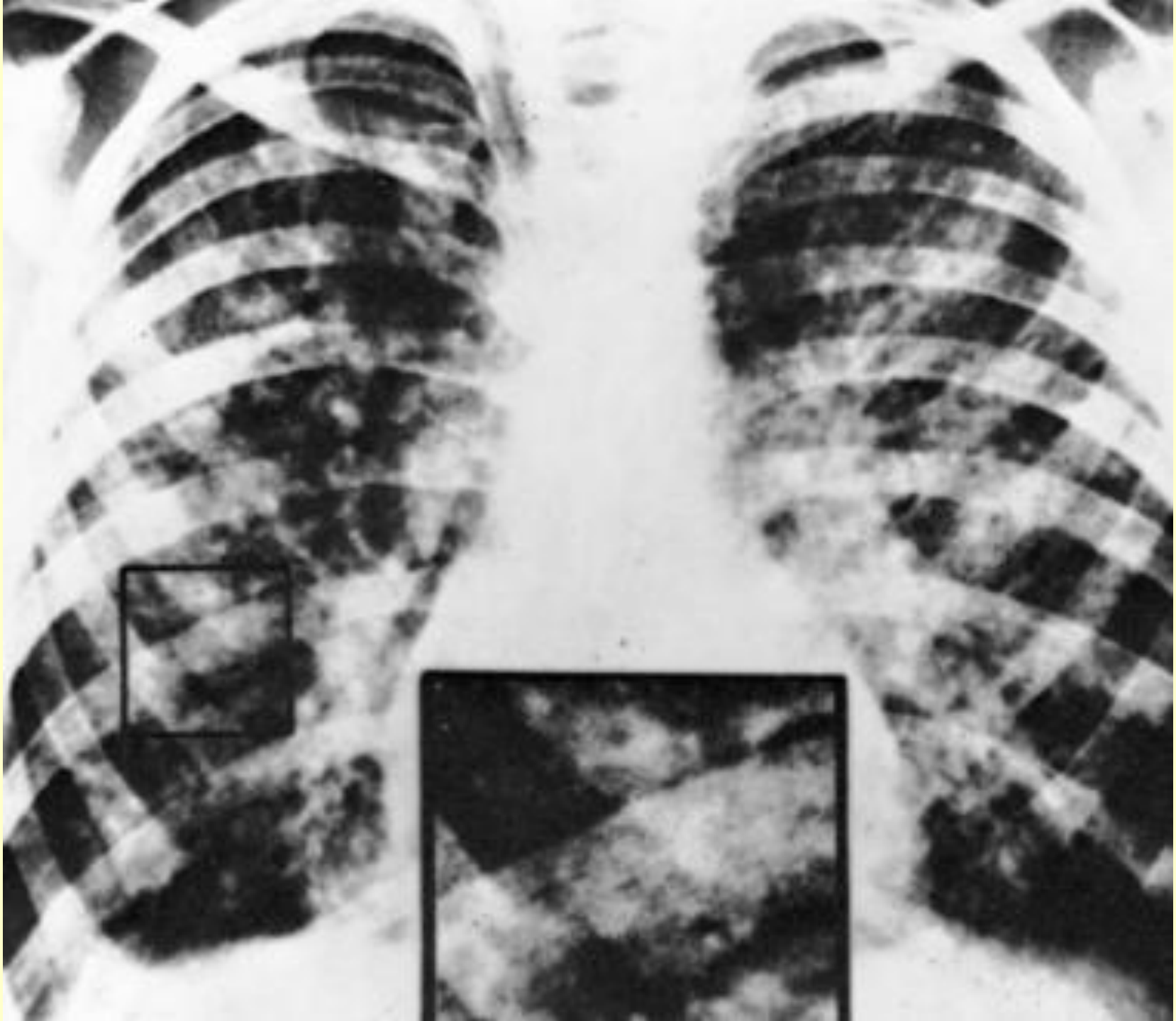
Final site of development –
Final host

Final site of development
- Intermediate host

Transitory site of development

# Tissues as Transitory site of development

- *Ascaris lumbricoides*
- *Ancylostoma, Necator, Strongyloides*
- As part of development, helminths migrate within the host
- Transitory site of development **– Lungs**
- Host usually asymptomatic; heavy infection - pneumonia



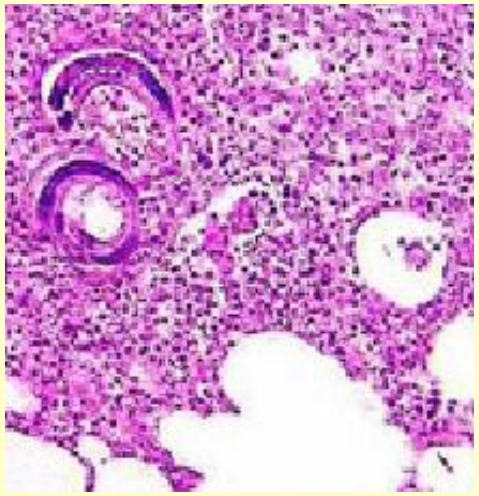
# Pneumonia

Cough, dyspnea, nausea, vomiting

Lofflers eosinophilic syndroma

Blood in sputum

Larvae of parasites



Symptoms associated with the migration within the host disappear after residing within intestine

Eosinophilia low or non-existent

Symptoms depent on the final site of development

**GIT problems**: asymptomatic vs symptomatic
Individual

**DIAGNOSTICS!!!!!**

(ova/parasites in the stool 50 – 80 days pi)

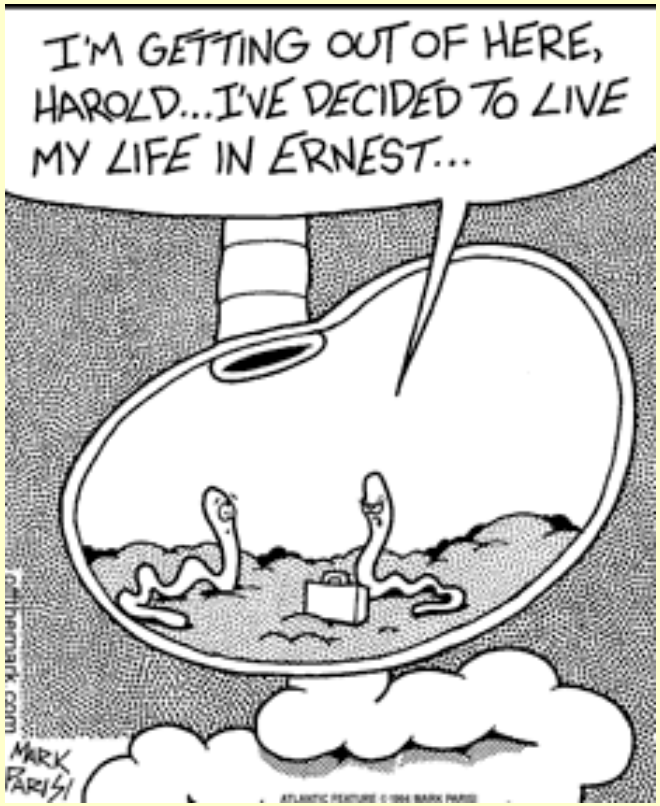
# Therapy

Pneumonia: symptomatic; prendison

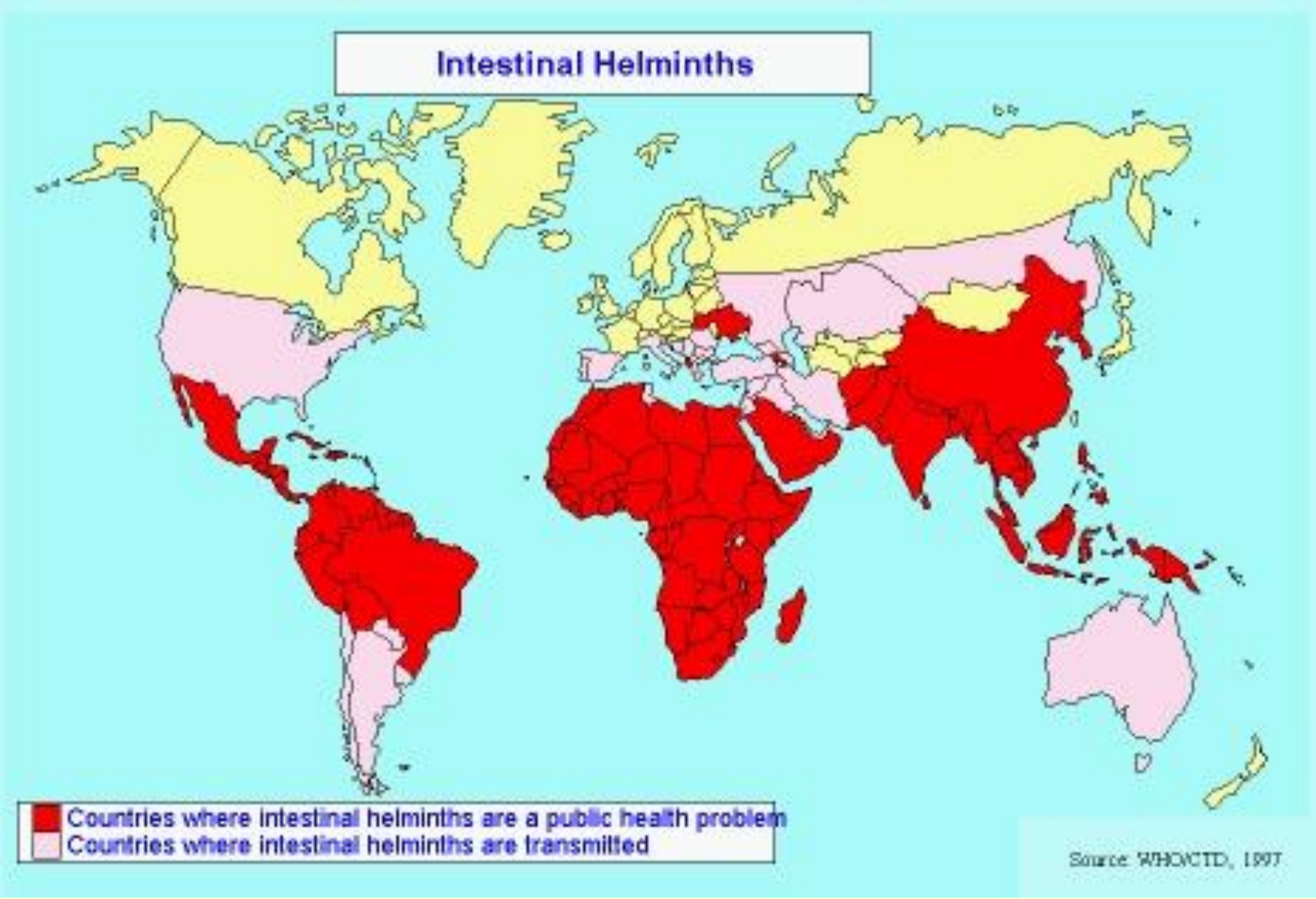
GIT: (nematoda):

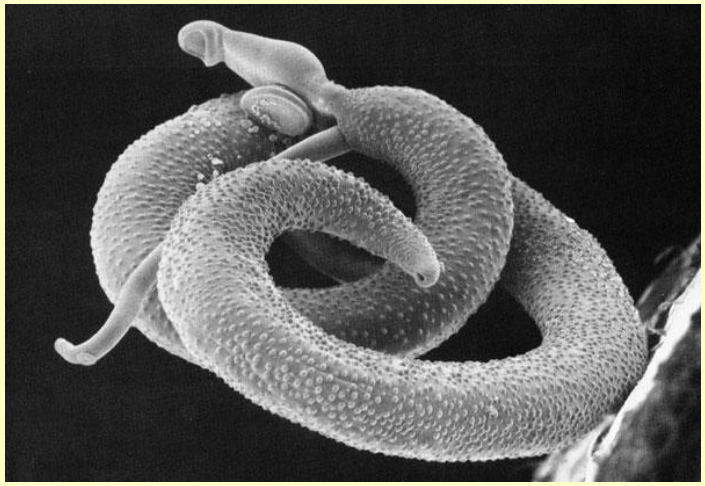
- Albendazol, Mebendazol, Levamisol

# Helmintic infections



# Intestinal Helminths





# Schistosomiasis

Trematoda; Blood fluke

**Snail fever, bilharziosis**

Distribution: tropical and subtropical countries

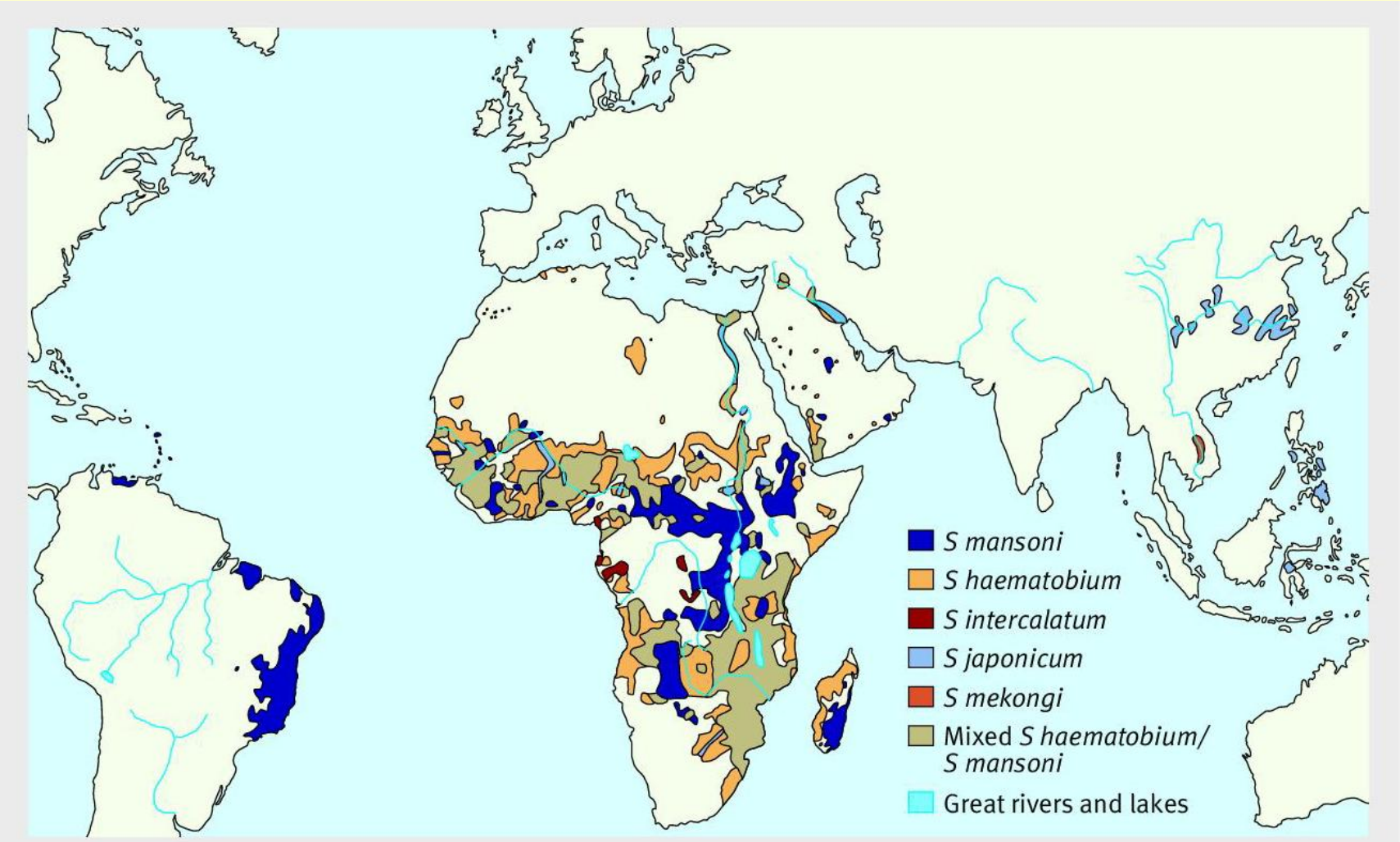
**Most important helminthosis**

200 mil infected; 85% infections in Africa

600 mil at the risk of infection

Archeology : eggs of schistosomas in mummies from XX. dynasty (1250-1000 years BC)

# Global distribution of schistosomiasis




From Gryseels at al., Elsevier publish.

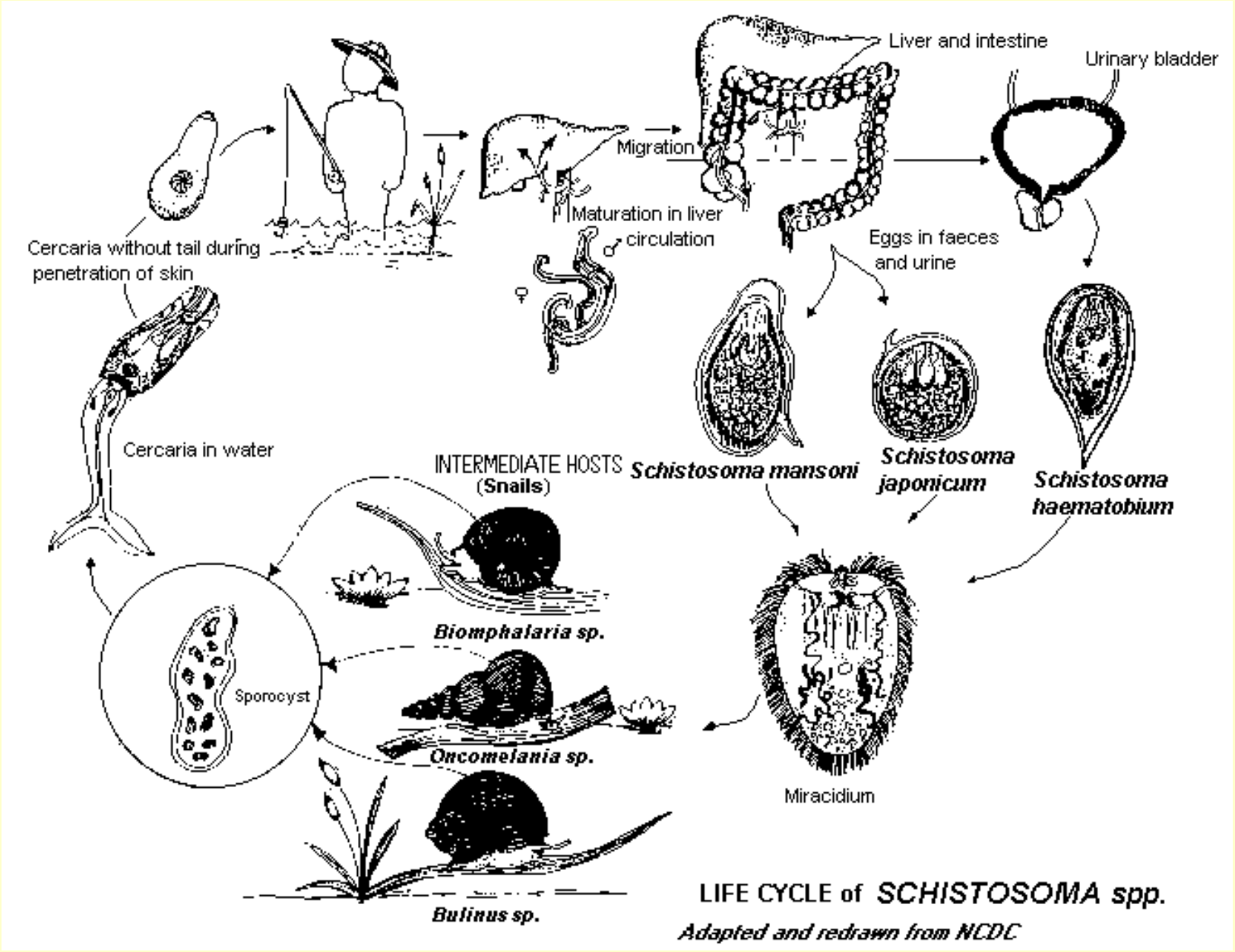
Complicated life cycle

Development in **one intermediate host** – **specific snail**

**Final host – human**

Both sexes

# Life cycle


Liver and intestine
Urinary bladder
Migration
Maturation in liver
♂ circulation
♀
Eggs in faeces and urine
Cercaria without tail during penetration of skin
Cercaria in water
INTERMEDIATE HOSTS (Snails)
Schistosoma mansoni
Schistosoma japonicum
Schistosoma haematobium
Biomphalaria sp.
Sporocyst
Oncomelania sp.
Miracidium
Bulinus sp.
LIFE CYCLE of SCHISTOSOMA spp.
Adapted and redrawn from NCDC

For establishment of infection:

**Fresh water lake/River**

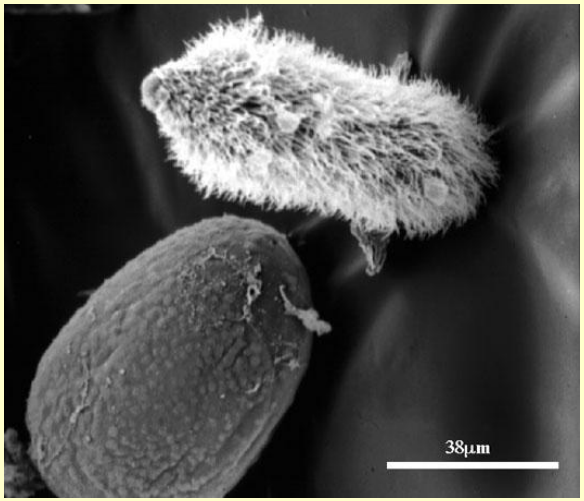
**Final host** discharging

**live eggs**

(water contaminated by human feaces)

Presence of susceptible

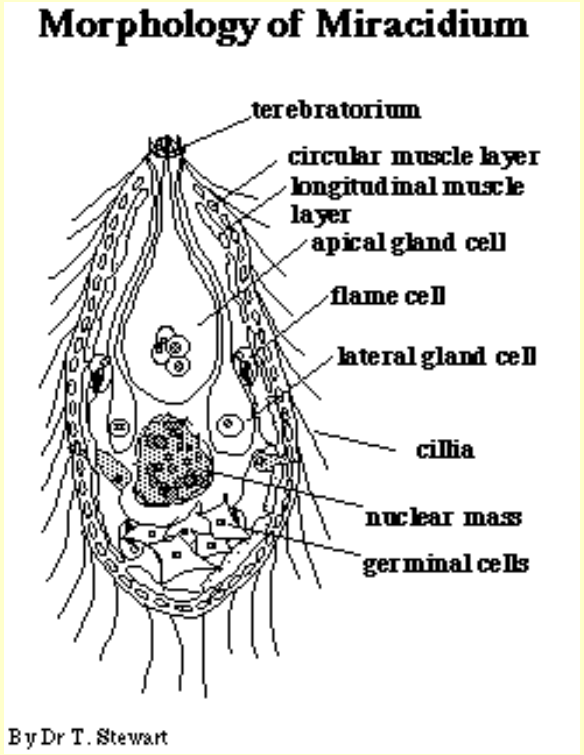
**Intermediate host**



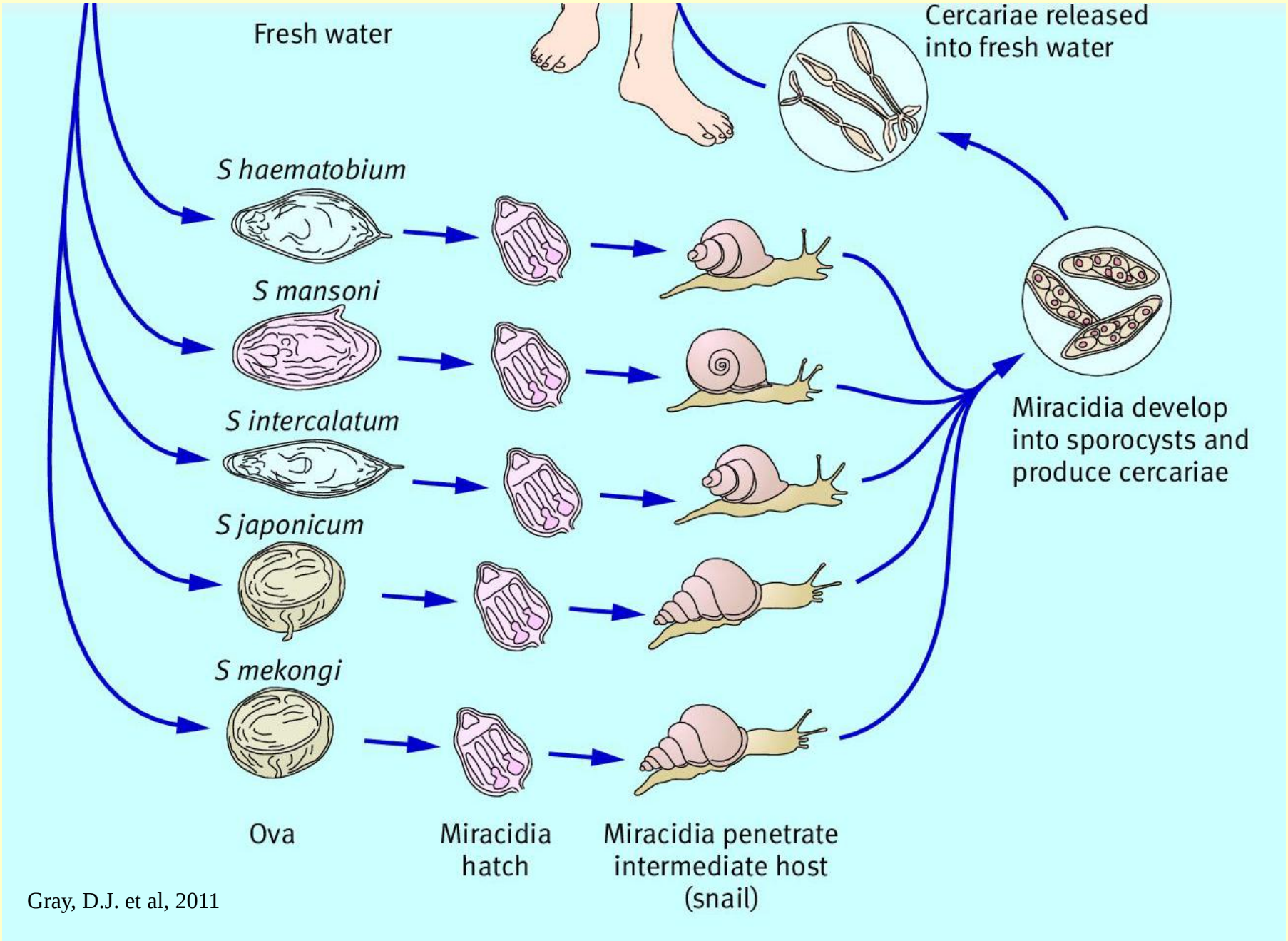

# Miracidium

Larva released from the egg

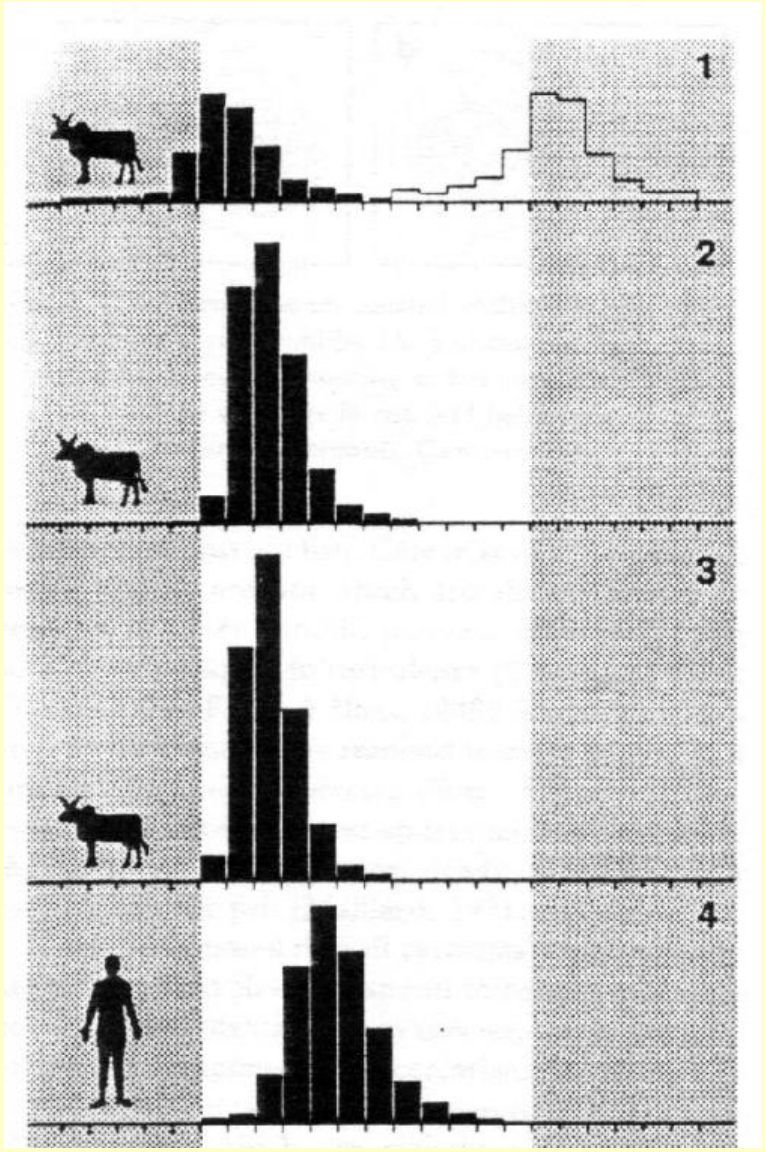
Infective for specific aquatic snail

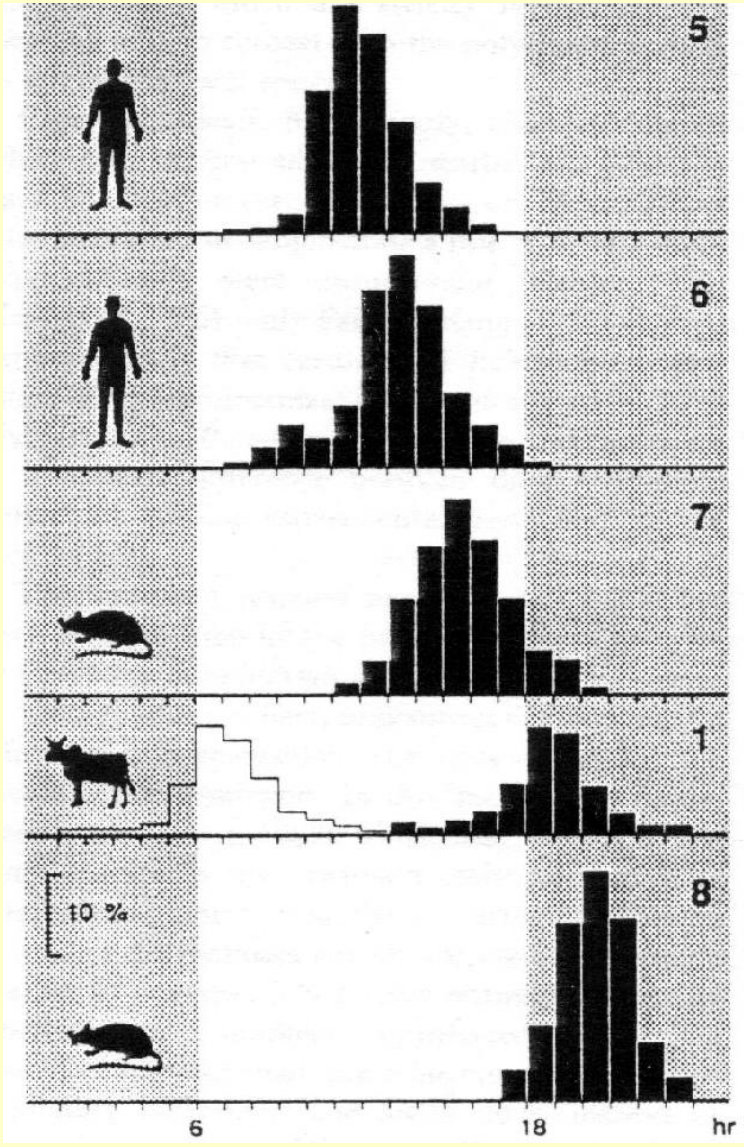



# *Oncomelania spp.* – intermediate host of *S. japonicum*




Gray, D.J. et al, 2011


1
2
3
4


5
6
7
1
8
10 %
6
18
hr


# Cercaria

0,5 mm

Energy source: glykogen (24 hrs)

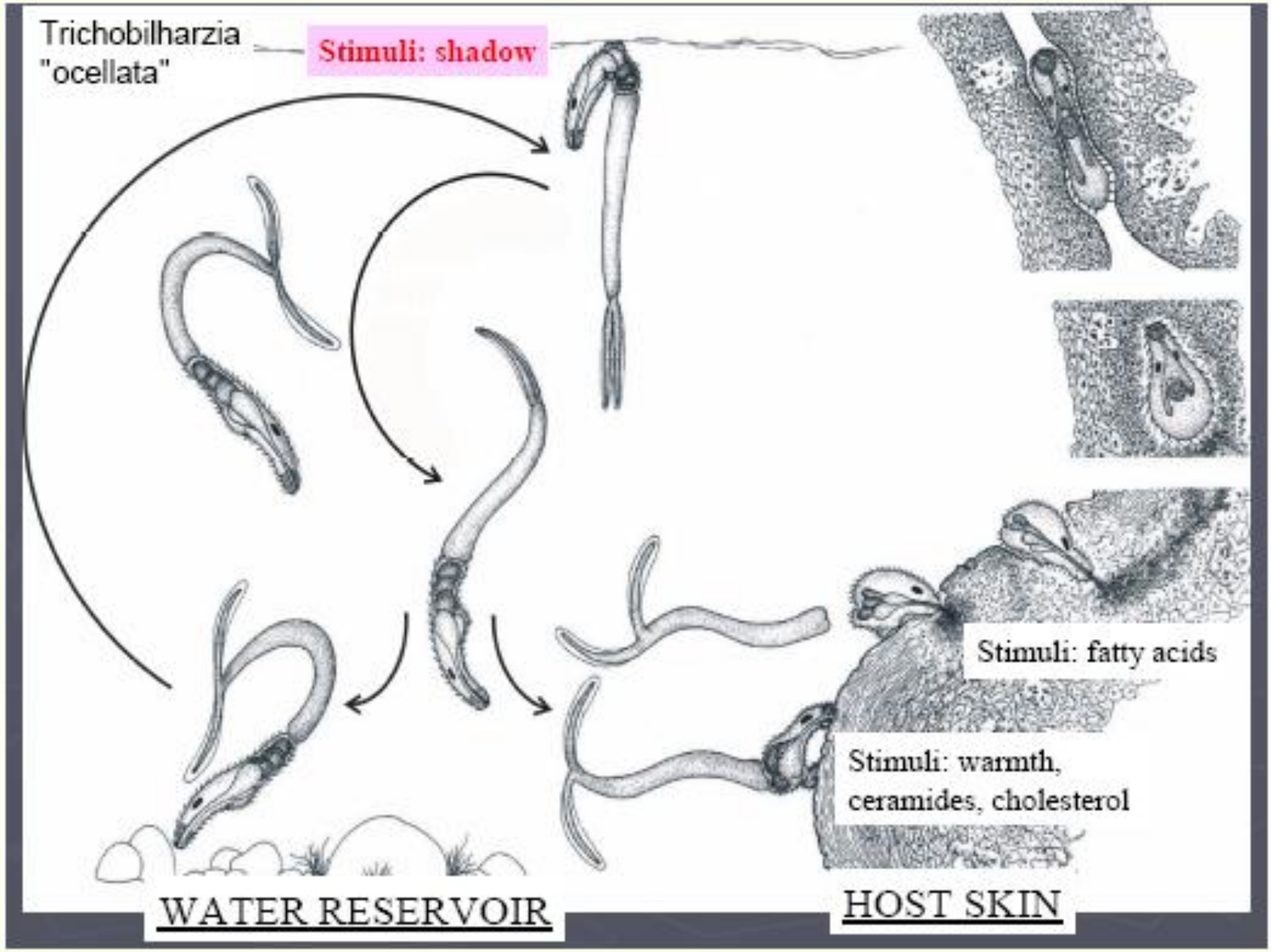
Actively searching for the host:

**Arginine** (*S. mansoni*)

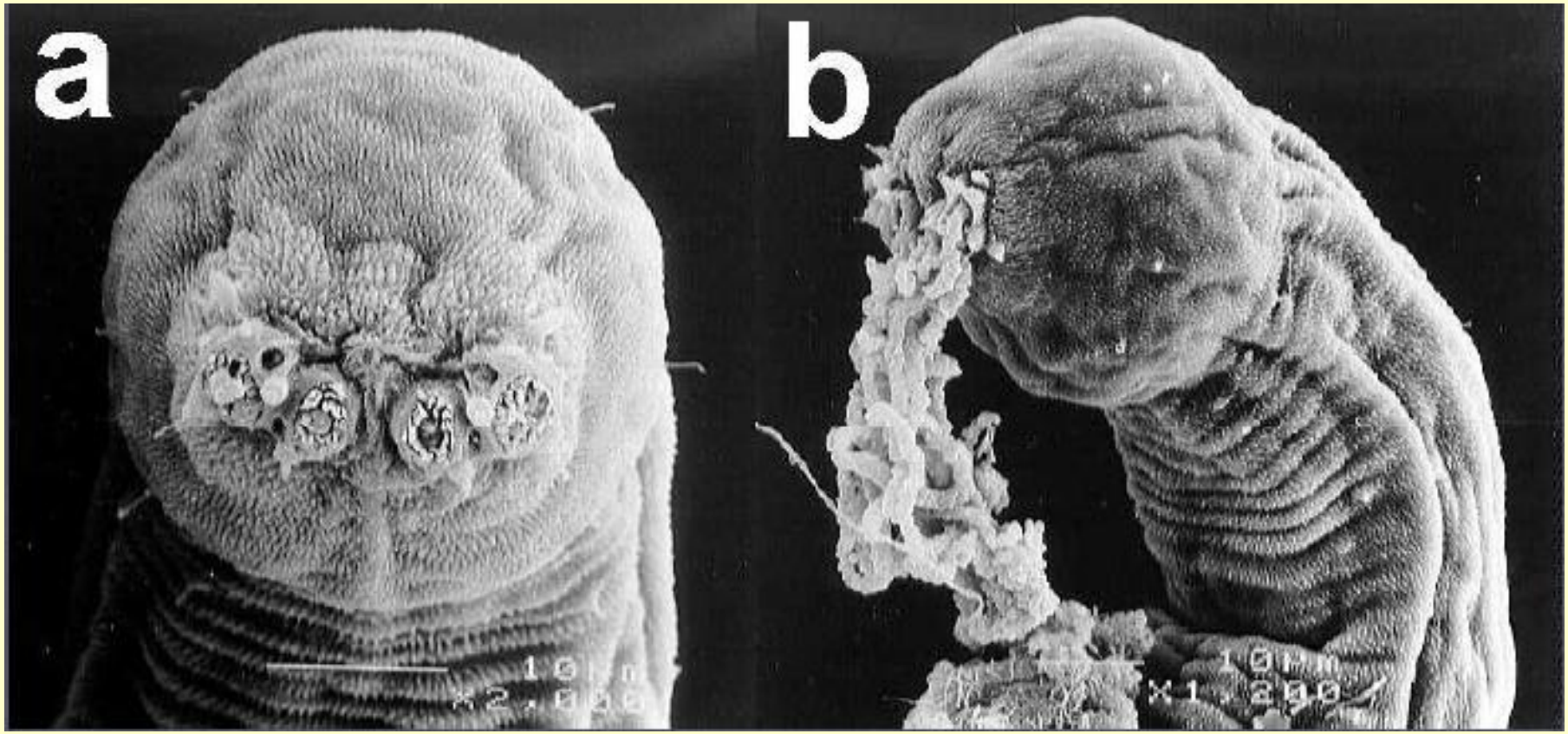
**Lipidic components of skin**

**Temperature**

Phototaxy


Trichobilharzia
"ocellata"
Stimuli: shadow
Stimuli: fatty acids
Stimuli: warmth,
ceramides, cholesterol
WATER RESERVOIR
HOST SKIN

Penetration into the skin and throught the skin is enabled by secretion of proteases: elastase, colagenase, hyaluronidase…




Formation of the **schistosomula** in the skin

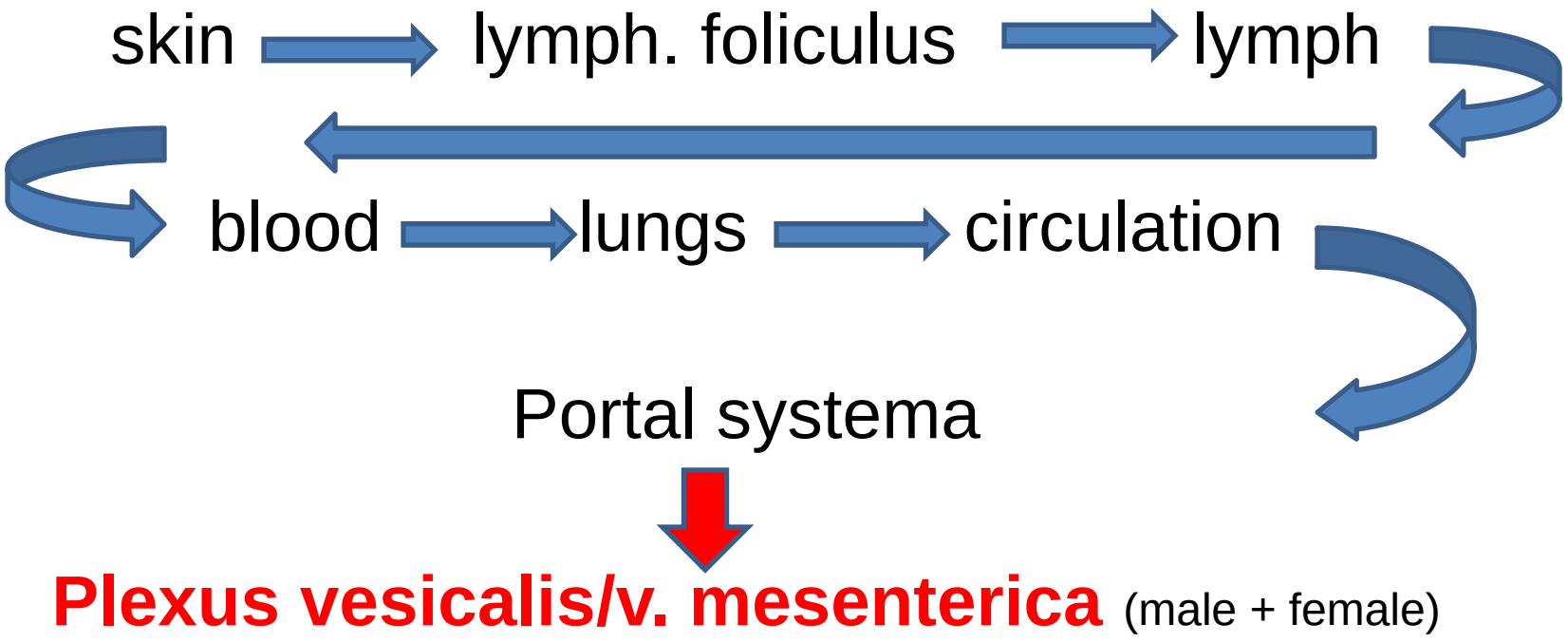
# Cercariae are differentiating to schistosomulas in the skin

Masking with **host antigens**

Change of **metabolism** – aerobic to anaerobic

Deposition in skin appr. 2 days

Schistosomula masked by host antigens and unrecognised by immunity migrates into the circulation



In blood – schistosomae absorb erythrocytes and catabolise haemoglobin (production of haemozoin)

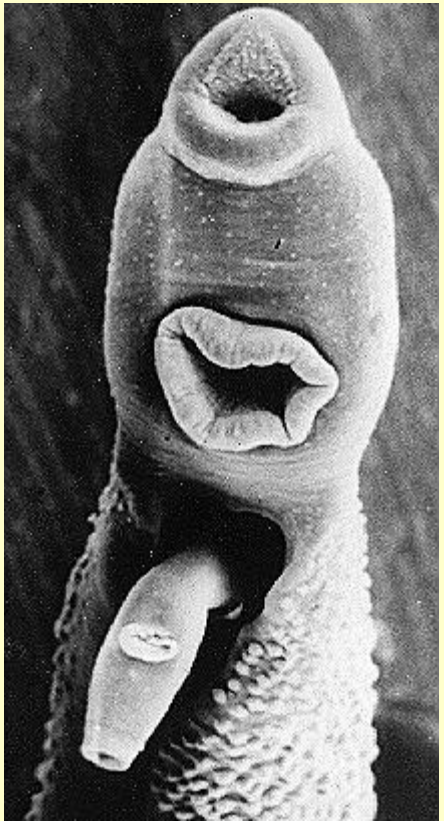
**Copulation – deposition of eggs**

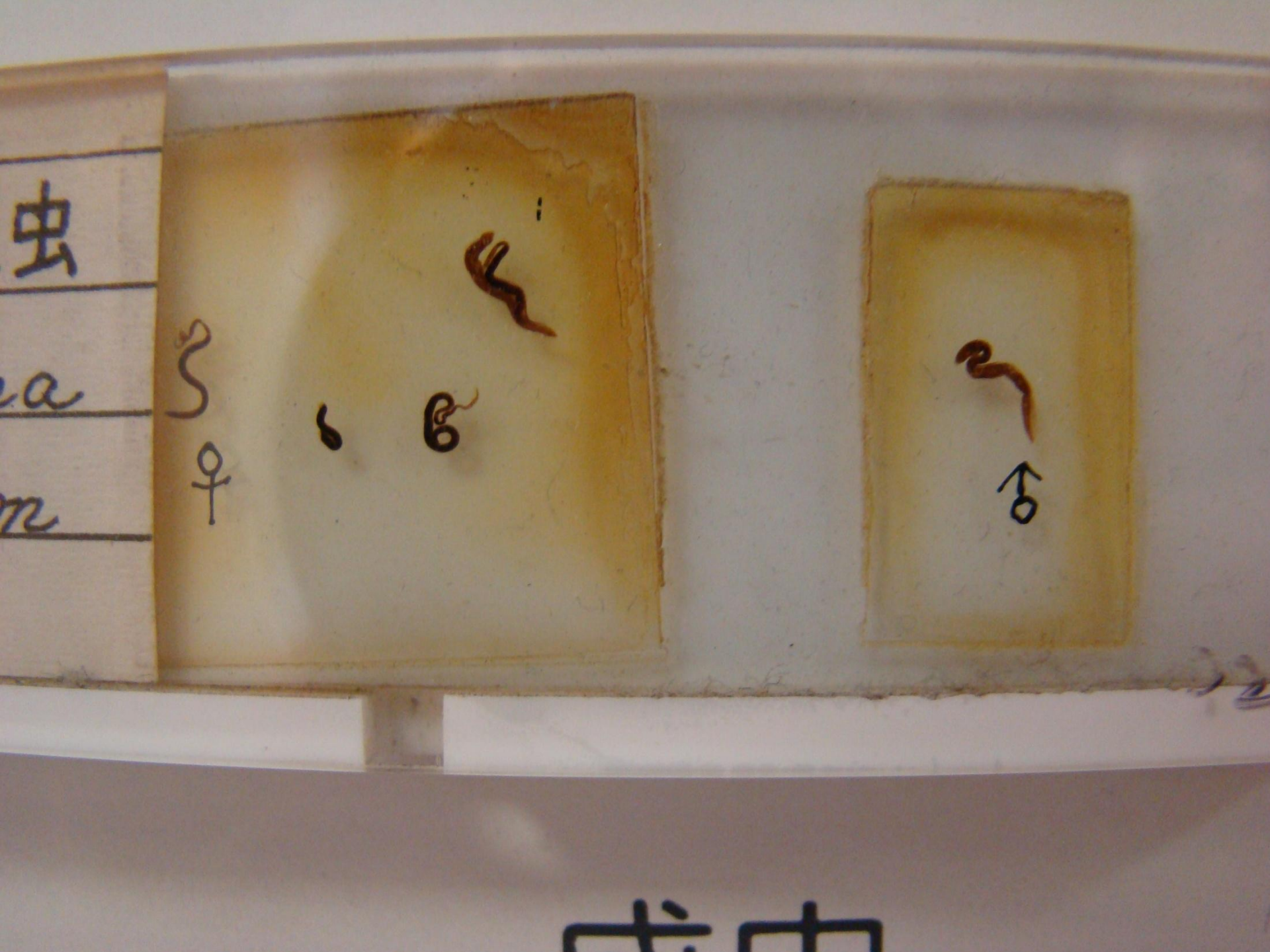
(dilatation of terminal venulas; 300-3000 eggs per day)

1. Antibody response – 50 days pi

Life expectancy: 3 years – *S. haematobium*

6 years – *S. mansoni*

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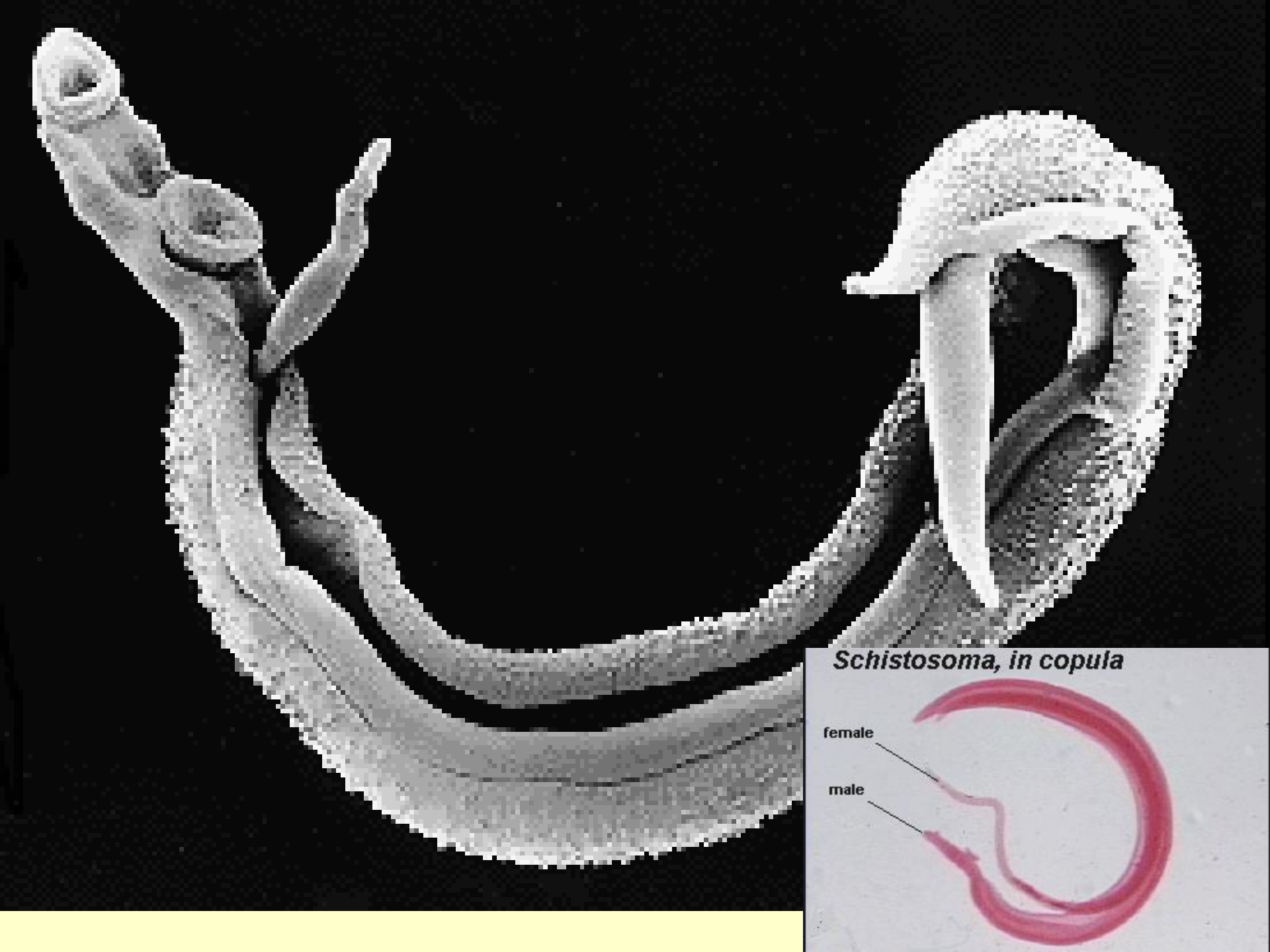


*Schistosoma, in copula*

female

male

# Infection proceeds through few different phases

**Skin infection**

**Cercaria dermatitis**

↓

**Pulmonary**

**subacute pulmonary granulomatic schistosomiasis**

↓

**Acute schistosomiasis**

↓

**Chronic schistosomiasis**

The course and symptomatology of the disease is dependent on several factors

**Species** of schistosoma

**Number of parasites**

**Phase** of the infection

**Immune status** of the host

**Localisation of parasites**

# Dermatitis

**Makulopapulous dermatitis**

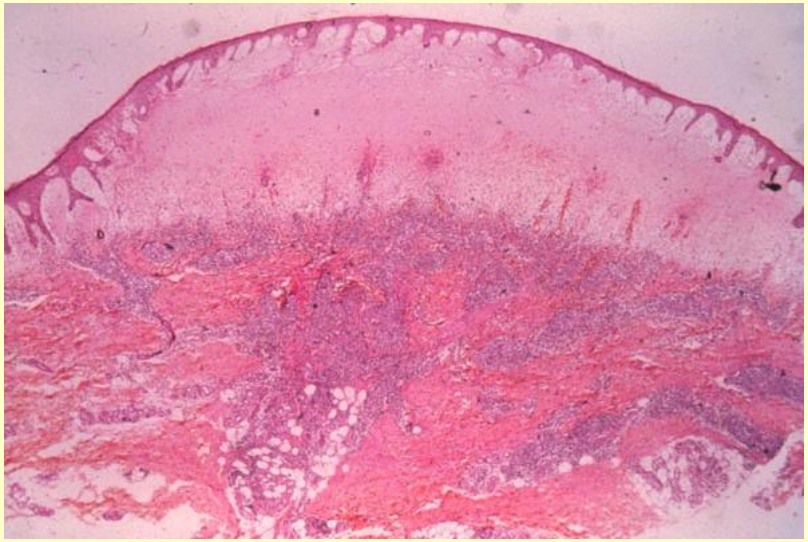
**Urticaria** within 12-48 hrs after contact with contaminated water

pruritus, oedemas, lymphadenopathy, temperature

Symptoms disappear without therapy within 14 days

Dg.: histology within 3 days pi, serology (50 days pi)

# Cercarial dermatitis/swimmers itch



# Pulmonary phase

7-14 days pi

Migration of schistosomulas – pulmonary infiltrates (not visible on X-Ray)

**Dry cought, hemoptysis, temperature, chest pain, myalgia, diarrhoea, rash…**

Bronchiolitis, interstitial pneumonia, thrombosis of pulmonary veins

# Acute infection: toxic stage
## *Schistosoma japonicum*

**Katayama fever;**

4-6 weeks pi (2-16 weeks)

**Migration of schistosomulas**

↓

**Hyperalergic reaction**

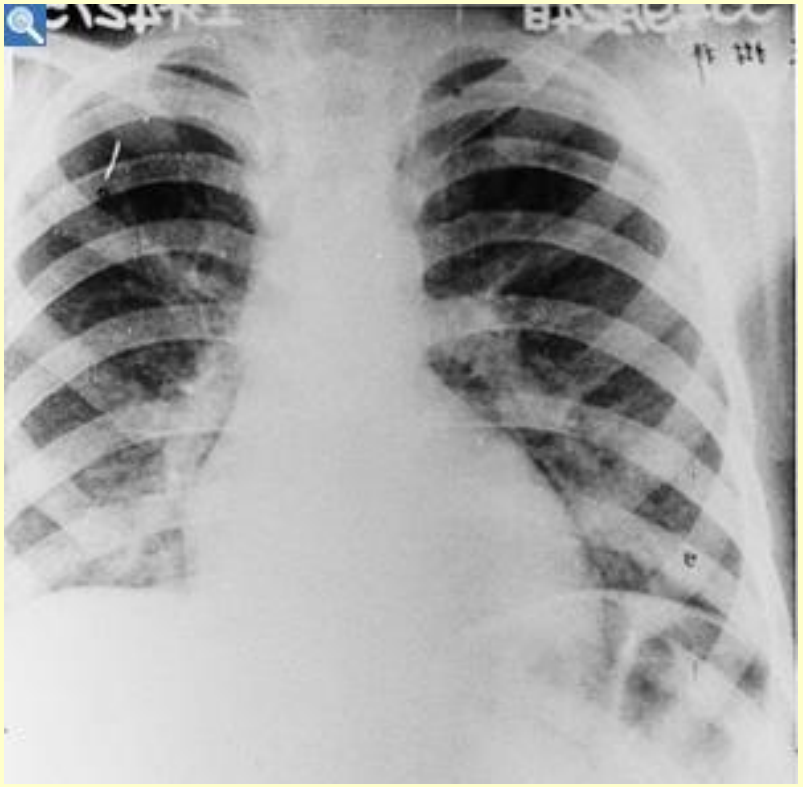
fever, tiredness, myalgia, headchae, abdominal pain, diarrhoea, urticaria, cutaneous oedemas

**Hepatomegaly, splenomegaly**

**Generalized lymphadenopathy**

**Eosinophilia**

# Acute phase of the infection



# Chronic phase: traumatic stage

- 3-6 months pi
- **Granulomatous reaction** around deposited eggs
- T lymphocytes activation
- symptomatology: asymptomatic vs **severe damage to the affected organs**

# Affected organs

**Intestine**

**Hepar**

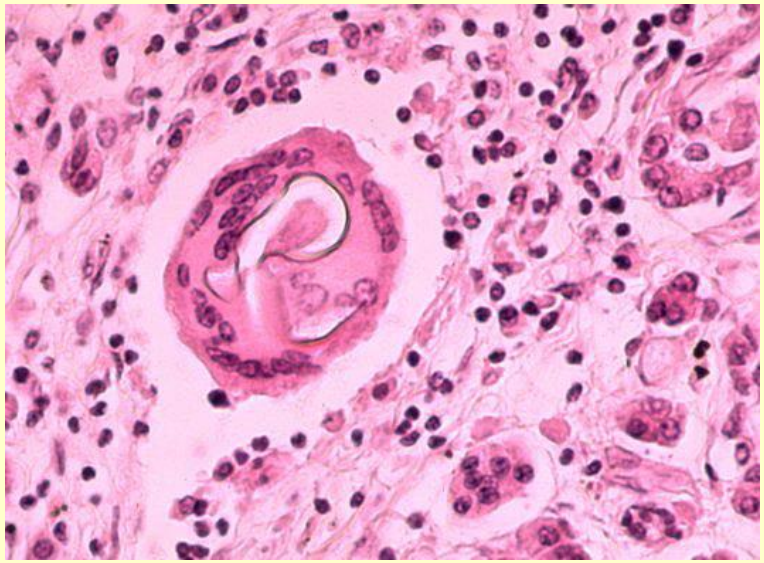
**Lien**

**Ren/Urinary bladder**

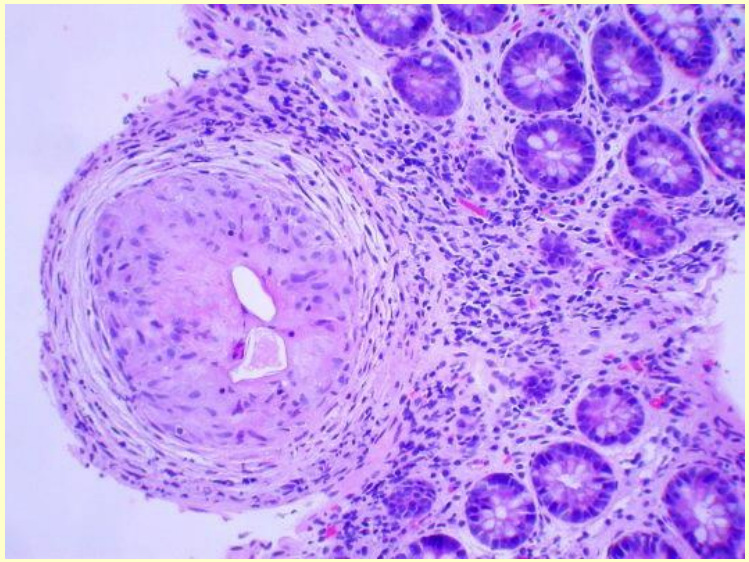
**Lungs and heart**

**CNS**

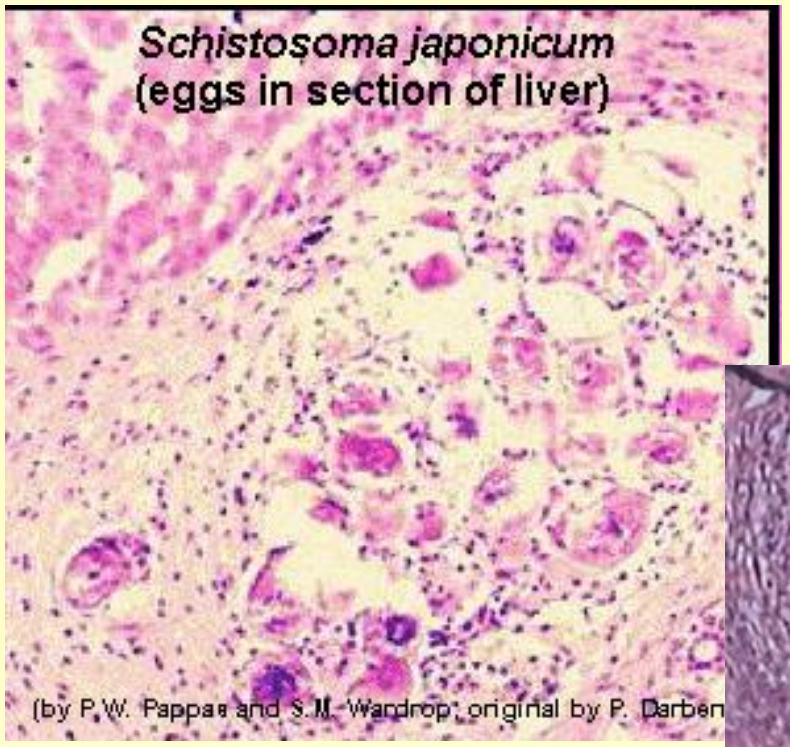
**Reproductive organs**

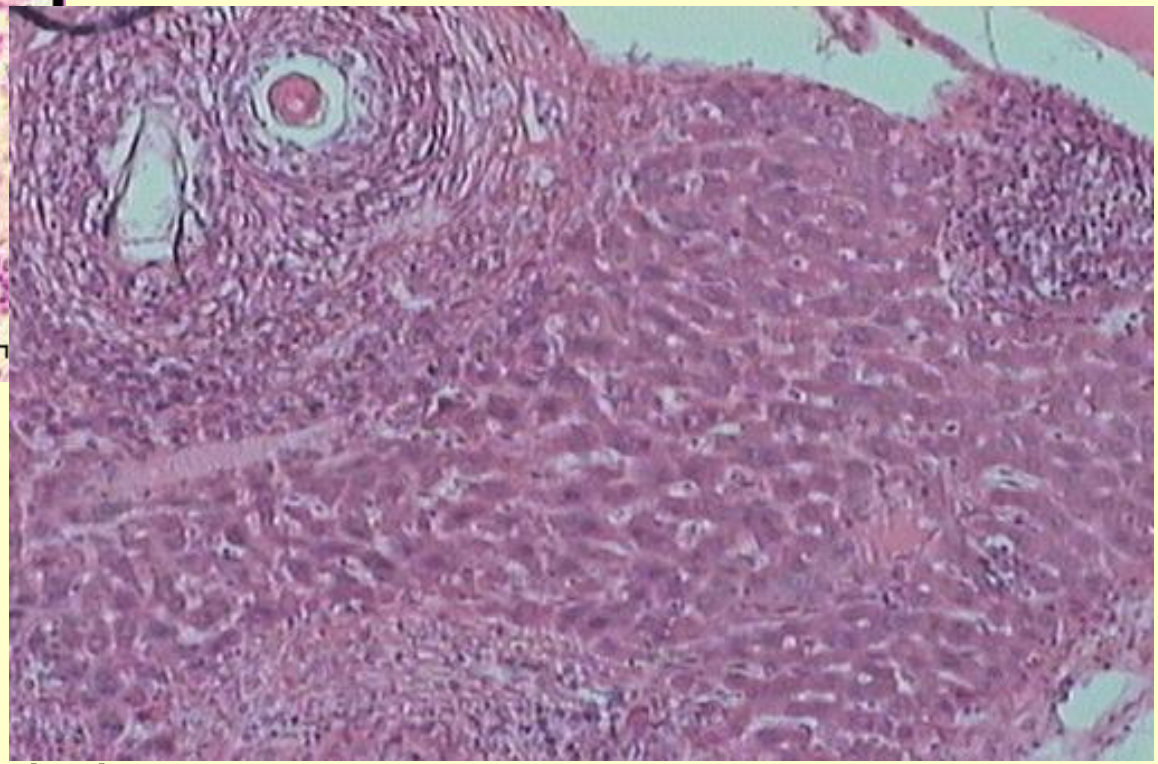


schistozomosis of pancreas



schistozomosis of colon



Granuloma formation in hepar

# *S. mansoni*

Distribution:

Africa, Arabian penisula, Brasilia, Surinam, Venezuela, Portorico

Intermediate host: *Biomphalaria*

Final host: **human**; rarely infection of animals

***S. mansoni*** deposited mainly in
***V. mesenterica caudalis/inferior***

**colon, sigmoideum, rectum, hepar**

**Periportal fibrosis**

adenomatous papiloma on mucous surfaces

portal hypertension; venostatic splenomegaly, fibrosis of pancreas

Eggs discharged in the stool

# Symptomatology

Abdominal pain

persistent diarrhoea (with blood)

anaemia

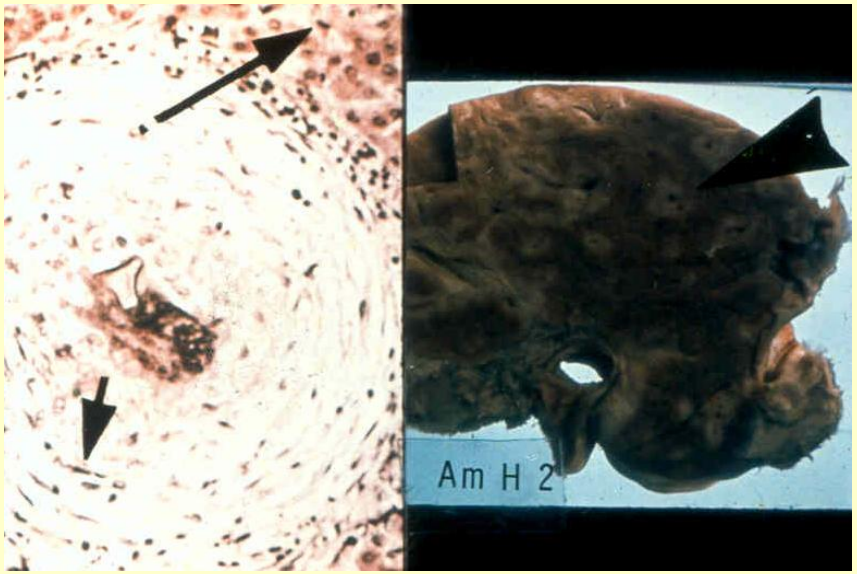
Polyp formation

hepato or splenomegaly,

Signs of portal hypertension

# Infection of colon (*S. mansoni*)

Intestinal polyposis




Granuloma formation in hepar


+ Length = 10.4 cm
X Length = 1.31 cm
Abdomen
C5-2
MI 0.9
TIS 0.3
F4 Gn 72
232dB/C4
G/2/3
29Hz 17cm
P T R
2.0 5.0
P T R
2.0 5.0

# *S. japonicum*

**Distribution:**

Taiwan, Japon, China, Indonesia, Philippinas

Infective for almost **all species of mammals**

Intermediate host: *Oncomelania*

# *S. Japonicum* is deposited mainly in *v. mesenterica cranialis/superior*

*v. mesenterica caudalis, vena portae*

Shape of the eggs – possible deposition in whole body, discharge mainly in stool

Affection of **hepar, intestine, portal hypertension**

Symptomatology: similar to *S. mansoni* inf.

# *S. haematobium*

**Distribution:**

Nile region, Africa, Asia, Cyprus, south Portugal, Jordan,

Intermediate host: *Bulinus*

**Venous plexus vesical and pelvic**

Polyposis of urinary bladder, hypertrophy of muscular layer; secondary bacterial infections

# Symptomatology

**Stenoses a dilatations of ureters**

**papilomas, cysts, ulcerations, lithiasis of ren, hydro a pyonephrosis** (eggs in renal parenchyma)

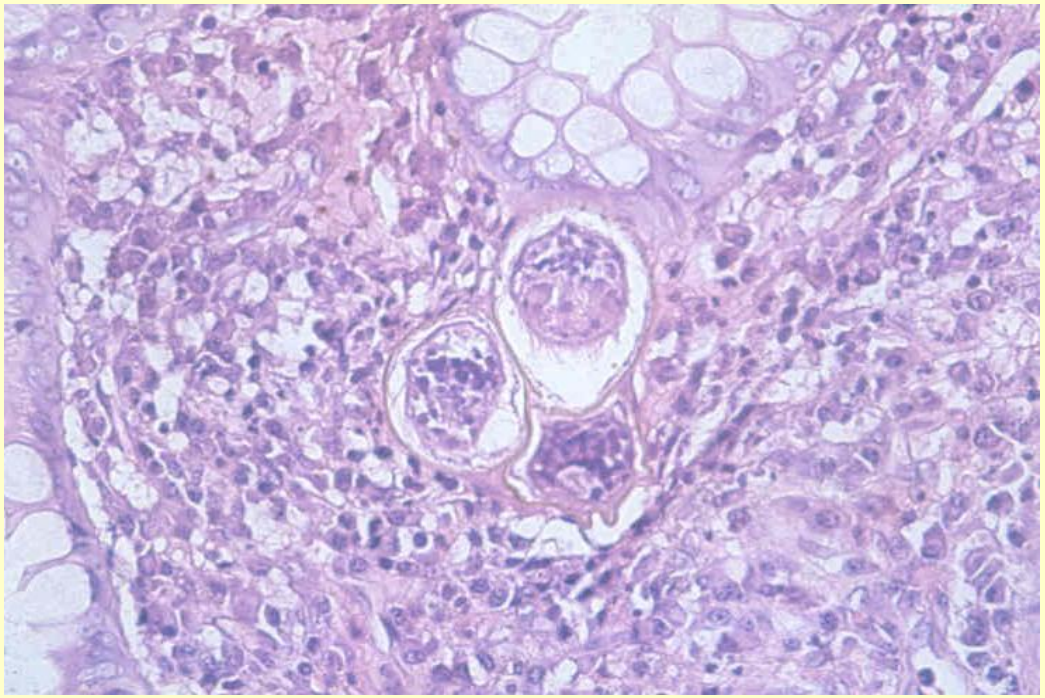
**secondary bacterial infection**

**ca of urinary bladder**

**Dysuria, polakisuria, haematuria, eosinophiluria**

**Impotence**

# *S. haematobium*



Granuloma in urinary bladder

hydronephrosis

Vesicoureteric reflux in ascending cystography

Bladder calcification in plain x-ray

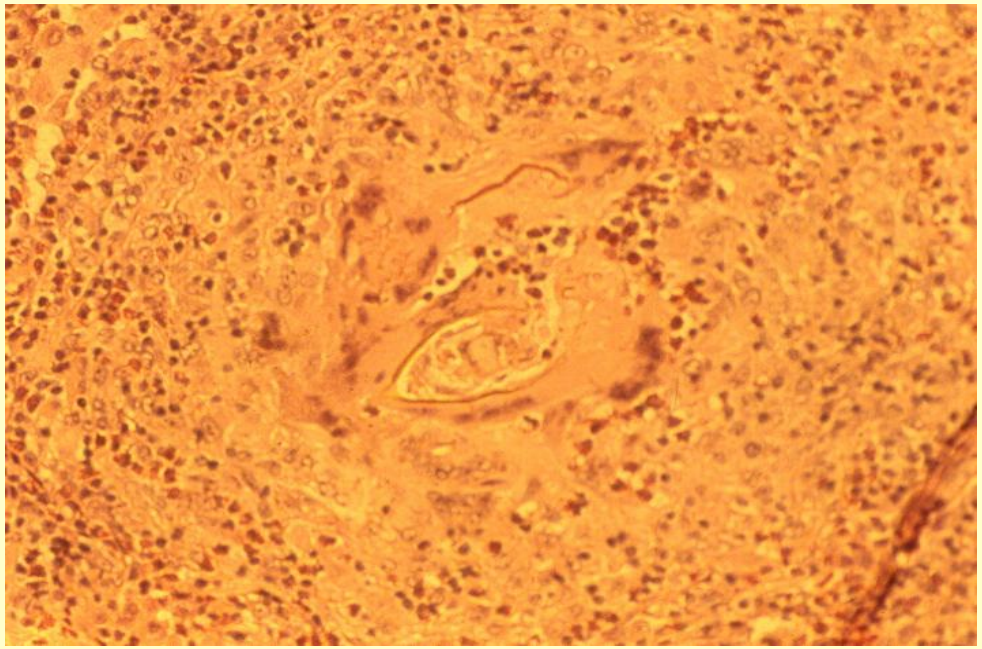
# Eggs can be deposited by blood flow to different organs

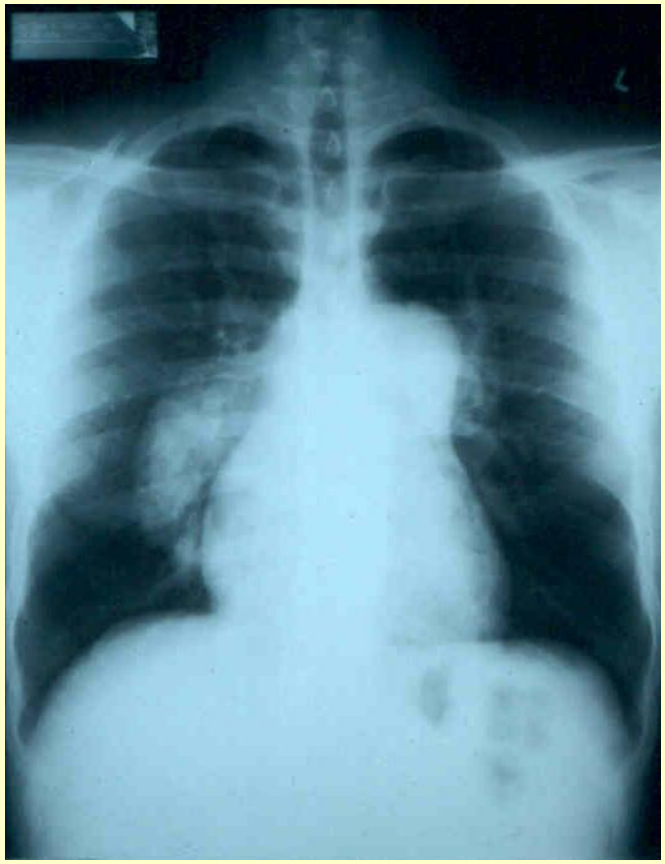
Lungs: pulmonary hypertension

Joints: arthropathy

Brain: epilepsy, headache, vomiting, visual disturbances

# Cor pulmonale, infection with *S. japonicum*



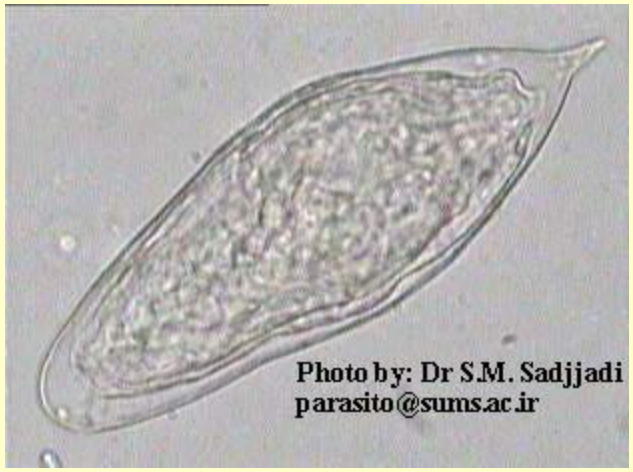


# Diagnostics

**Direct proof of eggs presence** in stool, urine, biopsy

**Serology** (indirect haematogluttination, ELISA)

**The test of viability of miracidia**



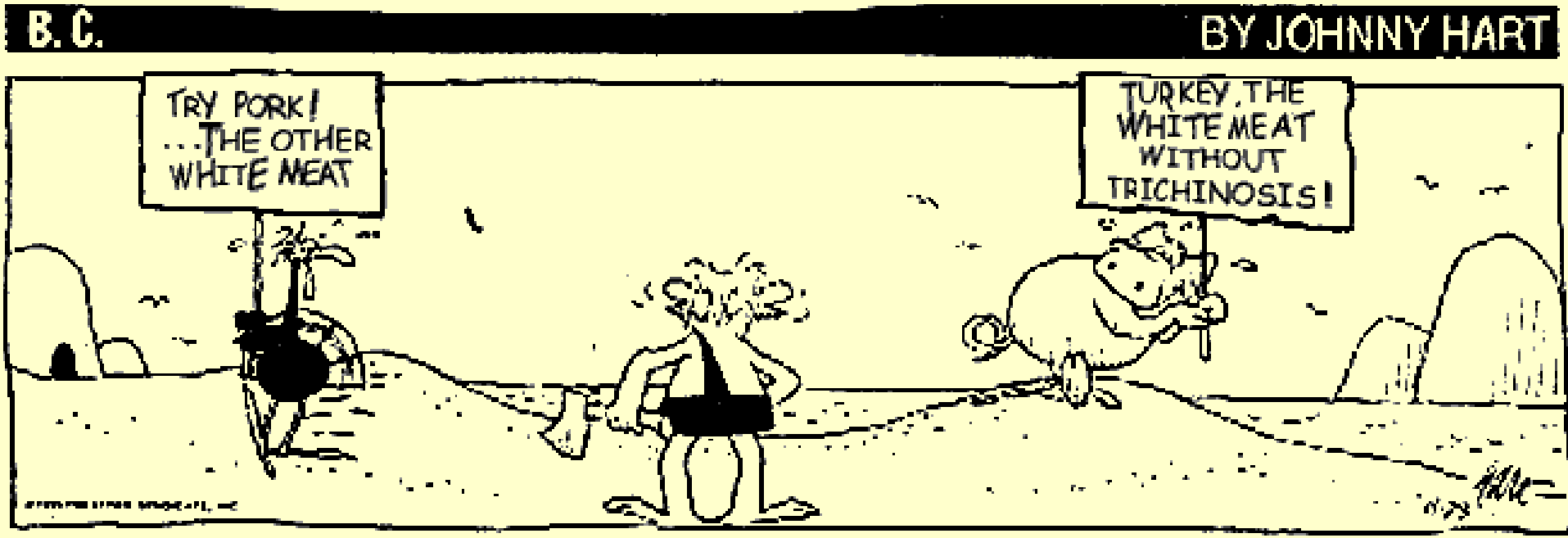

# Therapy

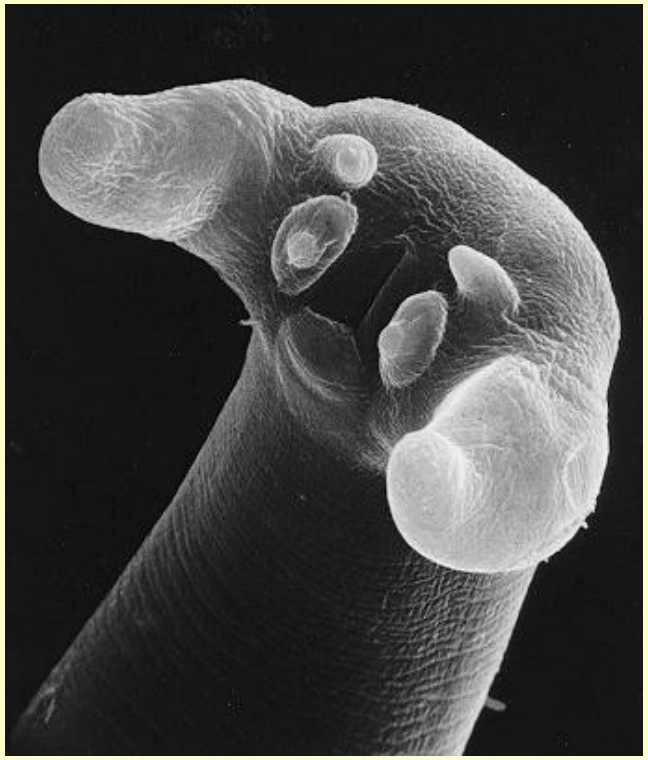
- **Praziquantel:**
- Weak infection: 1 dose po 40 mg/kg
- Severe infection: 2 x 60 mg/kg a 4-6 hrs after meal
- Infection with *S japonicum* 3x á 4 hrs 20mg/kg

- Niridazol
- 25mg/kg/day in three doses 7-10 days in combination with diazepam

- Metrifonate
- Only *S. haematobium* 7,5-10 mg/kg single dose; repeat in three weeks

# *Trichinella spiralis*





Nematoda

**Distribution: cosmopolite**

Transmission:

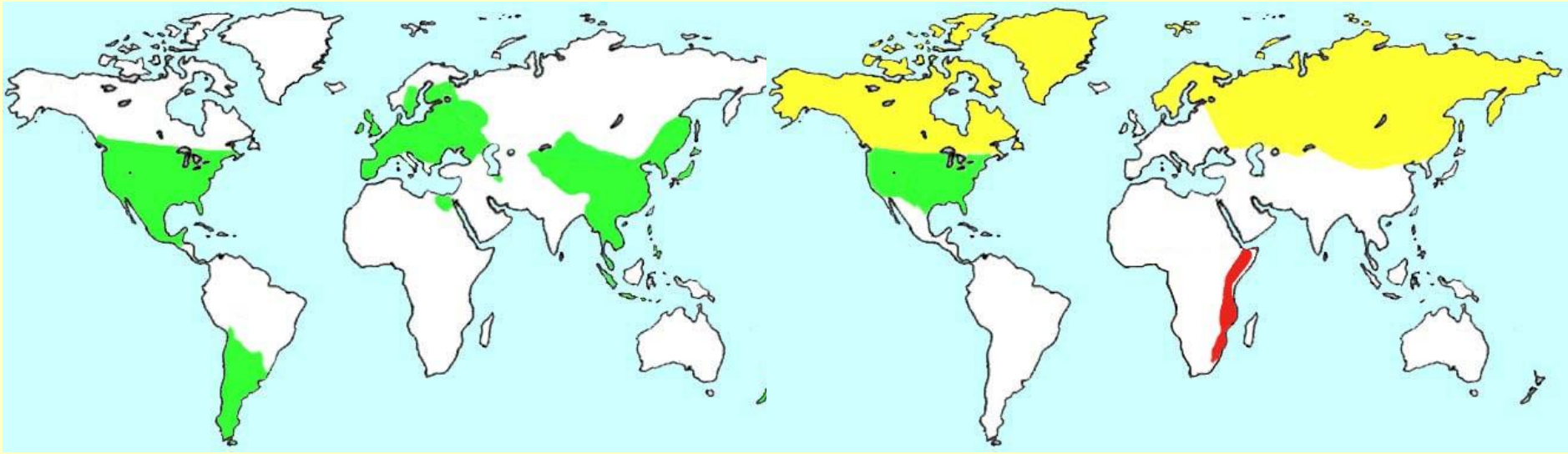
**alimentary**

(consumation of **undercook meat** infected by larvae)

Host: human, swine, bear, **wild boar**

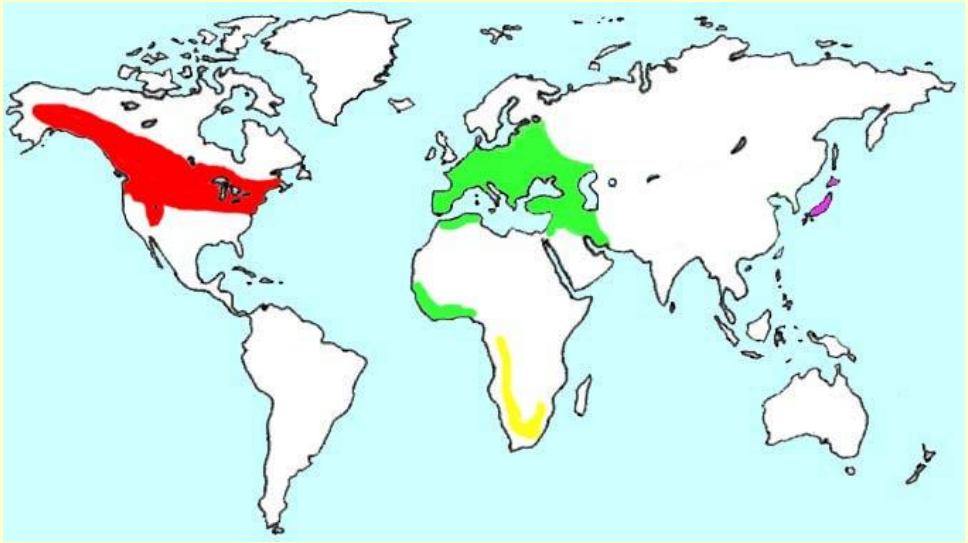
8 species of trichinella

**CR - *T. brittovi***

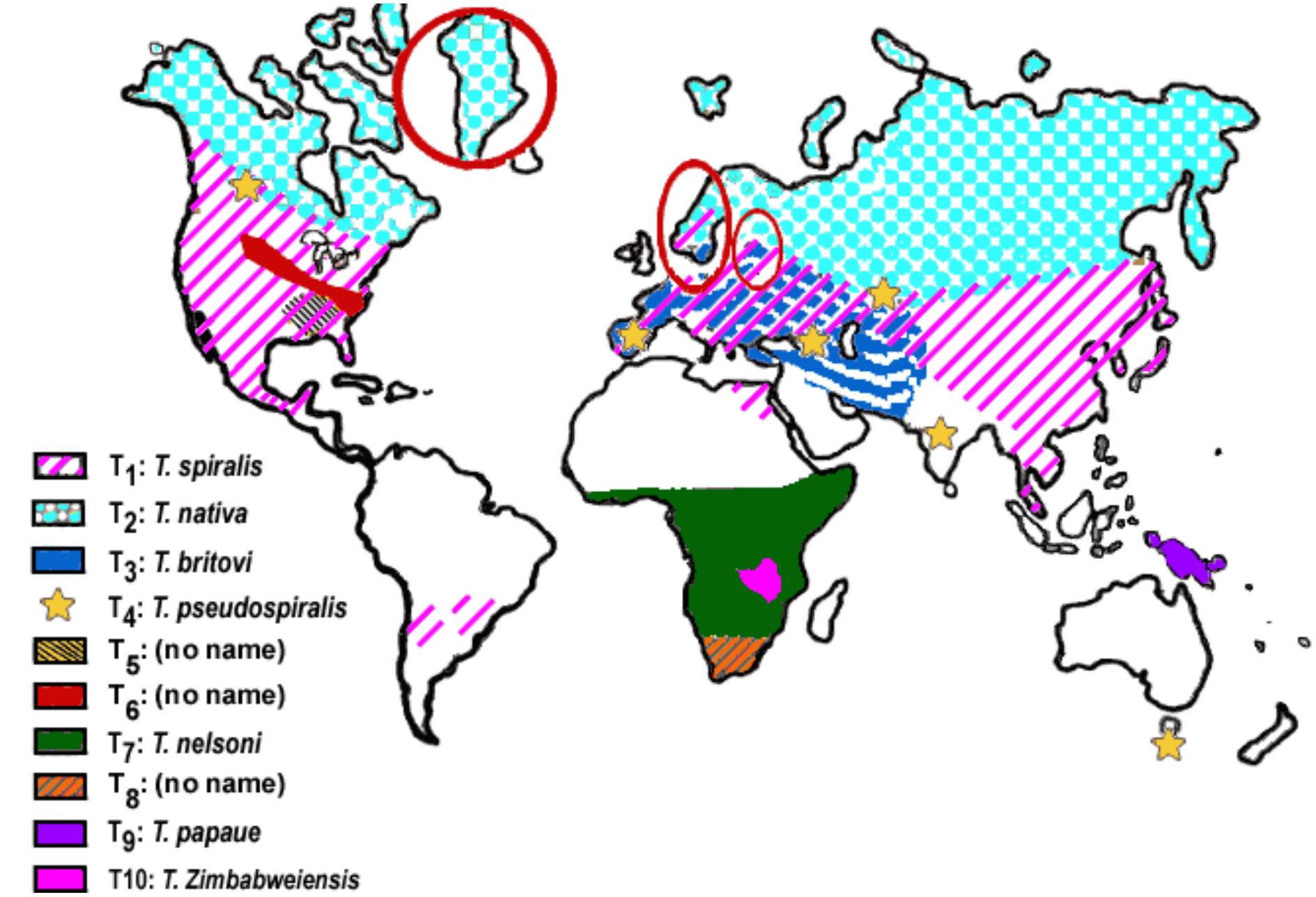


*T.spiralis*

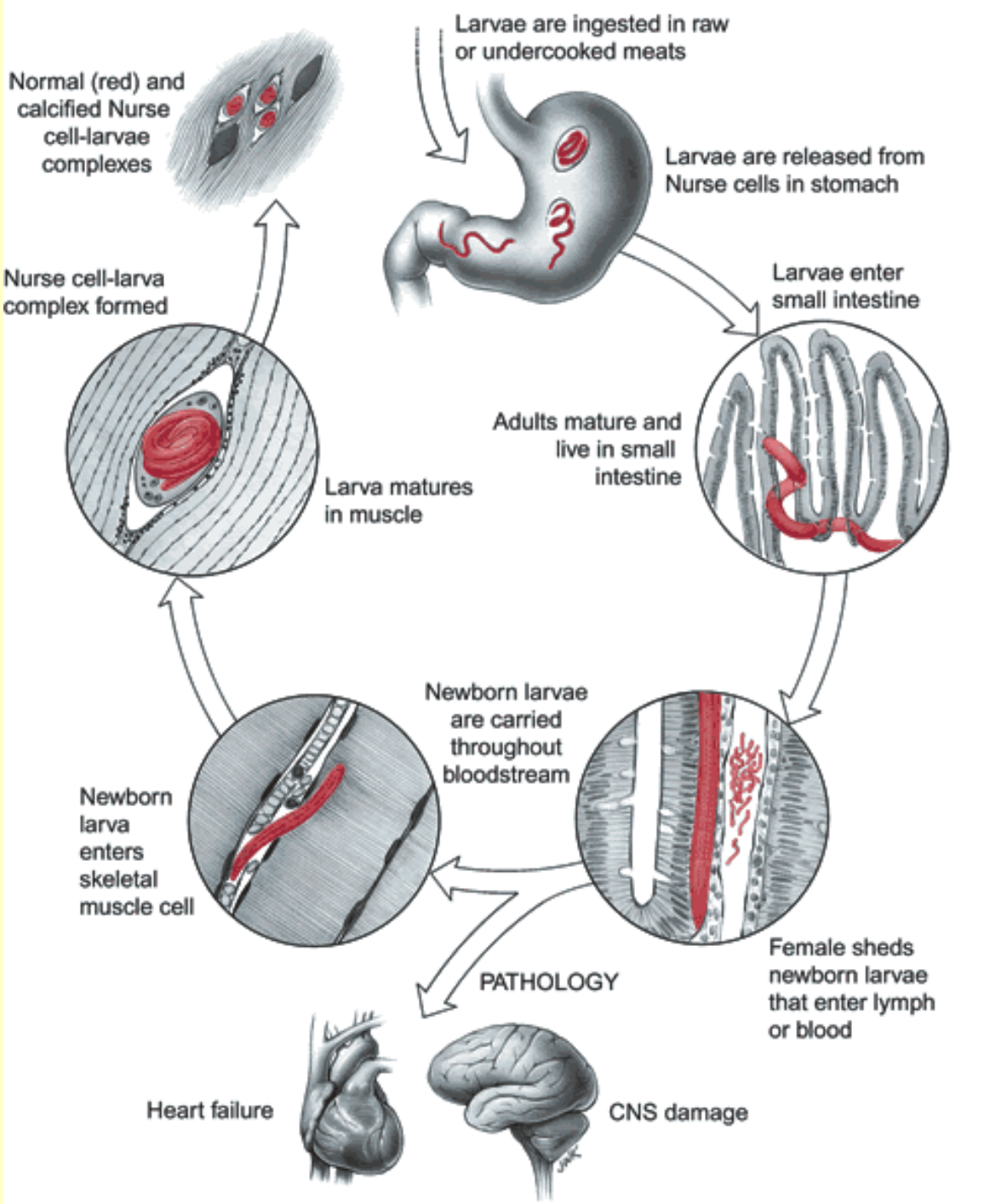
*T. nativa*

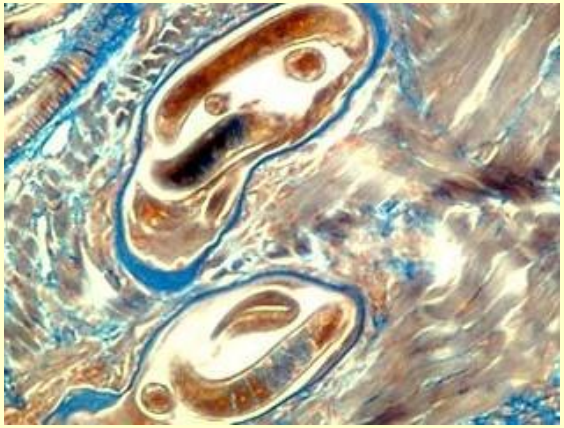


*T. spp.; T. britovi*


T1: T. spiralis
T2: T. nativa
T3: T. britovi
T4: T. pseudospiralis
T5: (no name)
T6: (no name)
T7: T. nelsoni
T8: (no name)
T9: T. papaue
T10: T. Zimbabweiensis

# Life cycle


Larvae are ingested in raw or undercooked meats
Normal (red) and calcified Nurse cell-larvae complexes
Larvae are released from Nurse cells in stomach
Larvae enter small intestine
Nurse cell-larva complex formed
Adults mature and live in small intestine
Larva matures in muscle
Newborn larvae are carried throughout bloodstream
Newborn larva enters skeletal muscle cell
Female sheds newborn larvae that enter lymph or blood
PATHOLOGY
Heart failure
CNS damage



Intestinal phase –

**Maturation of larvae about 30 hrs**

Females are depositing larvae:

**Appr. 4 days pi**;

1000-1500 larvae/1,5 month

**Migration into the muscle** –2-3 days

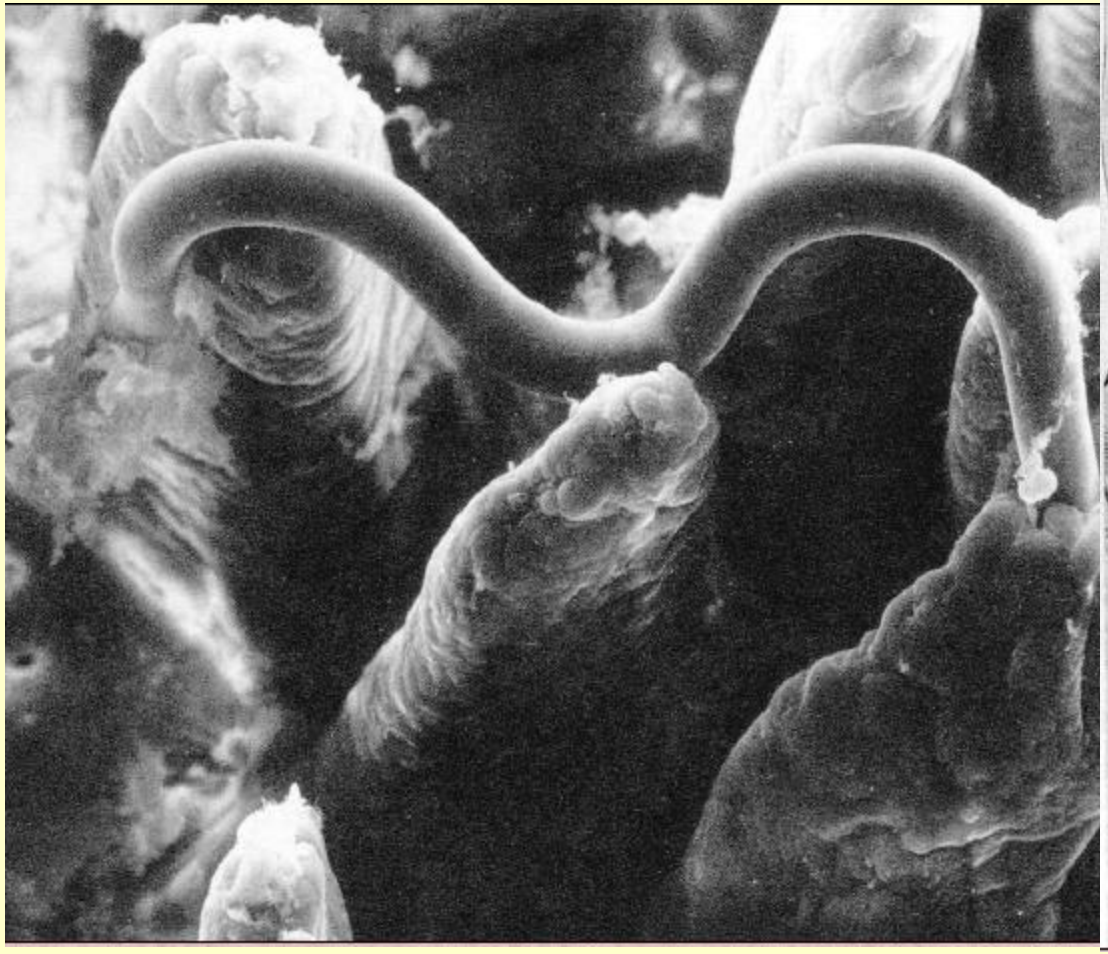
(affection of myocardium – damage to the heart function)

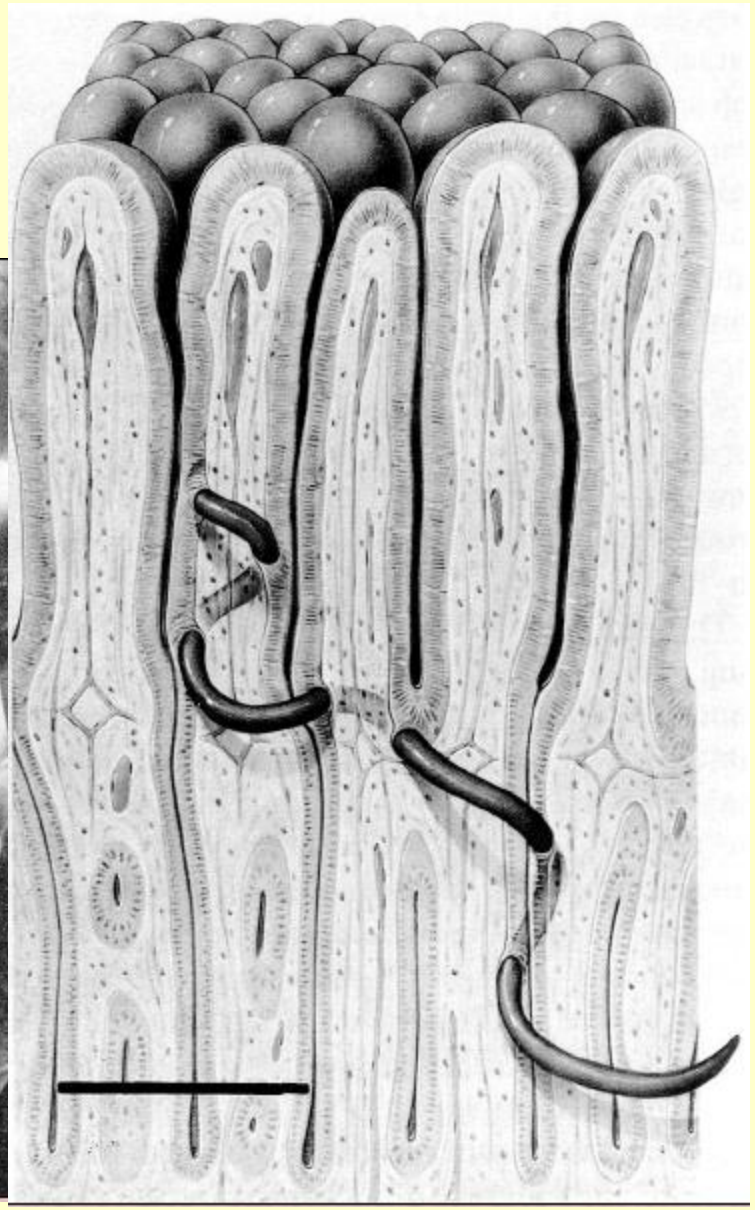
**Calcification of larvae** – after 6-12 months

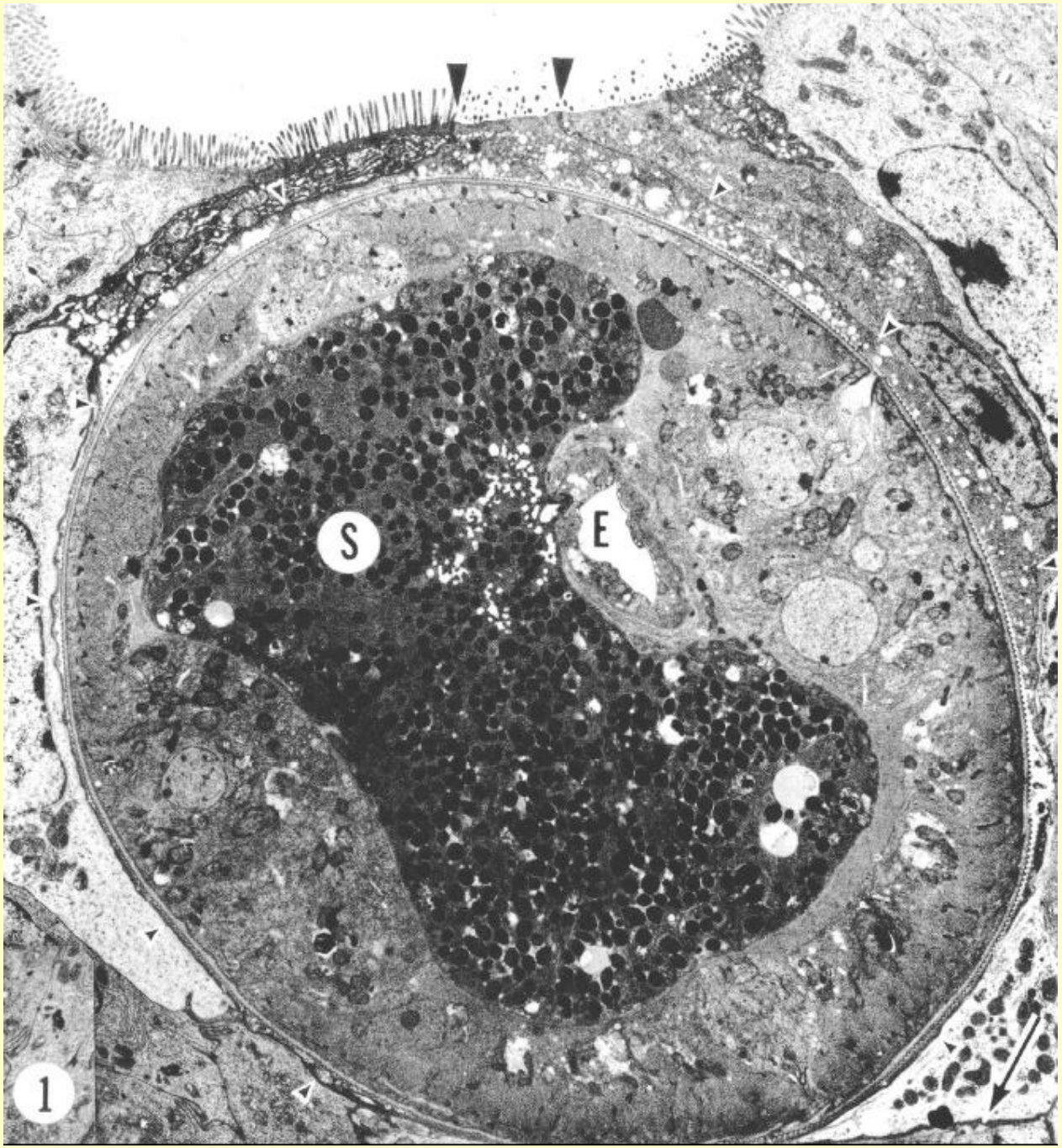
# Trichinella is **intracellular parasite**

Intestinal phase – formation of tunels in enterocytes

Female 5 mm, male 2 mm



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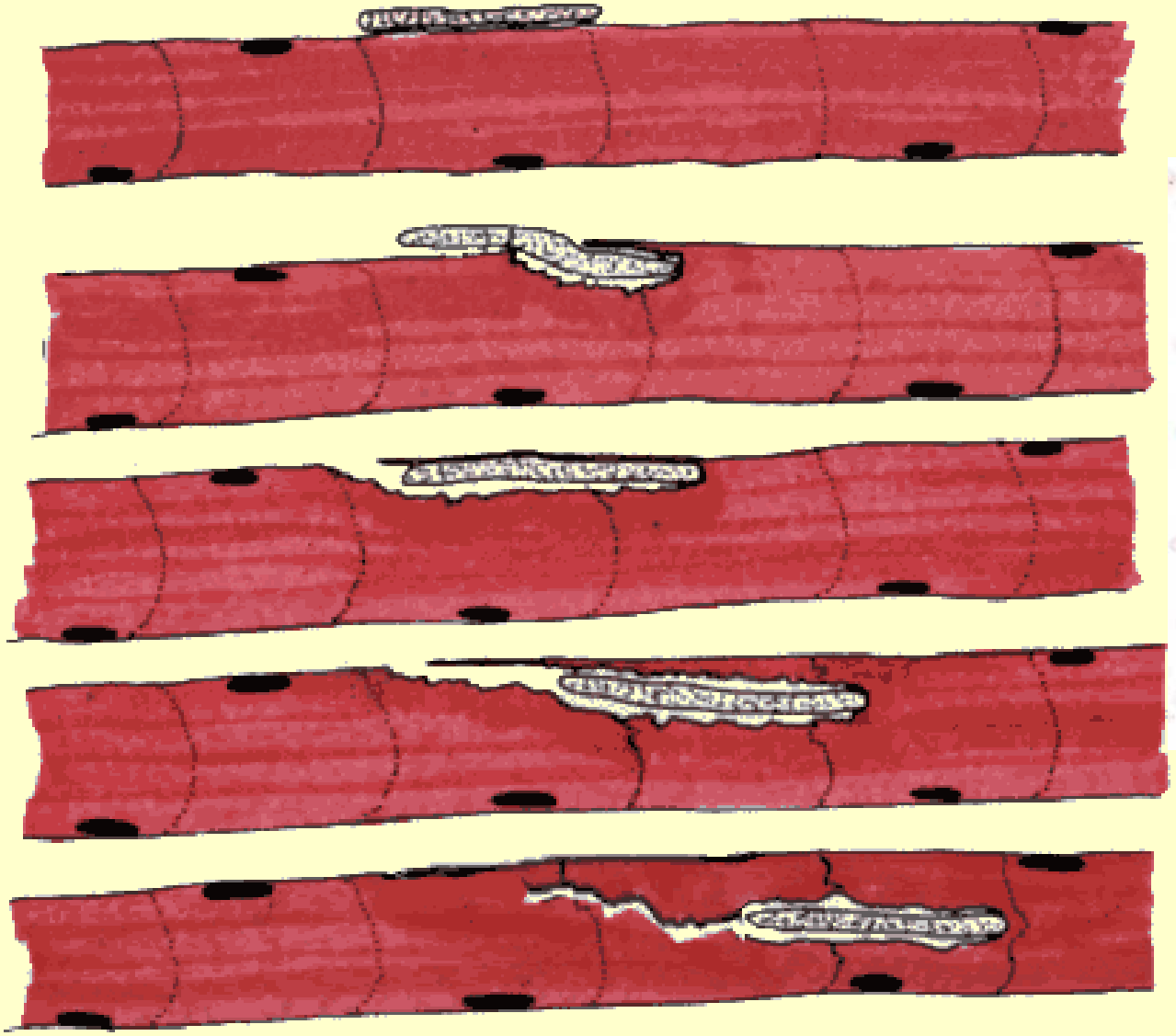
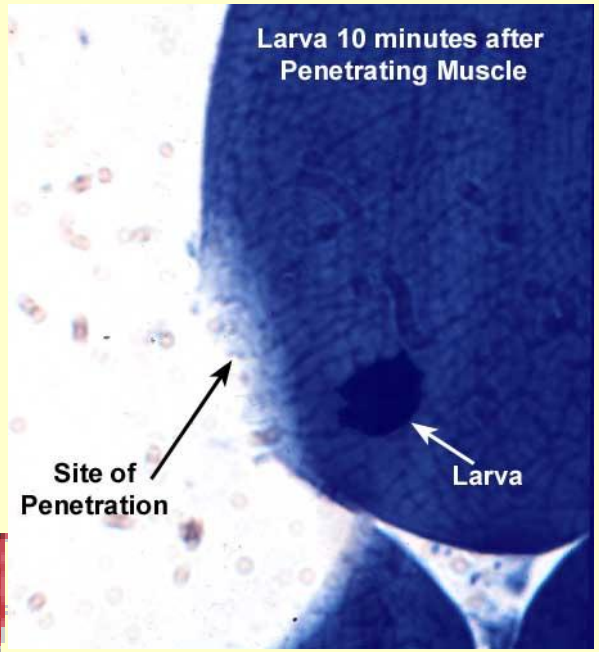
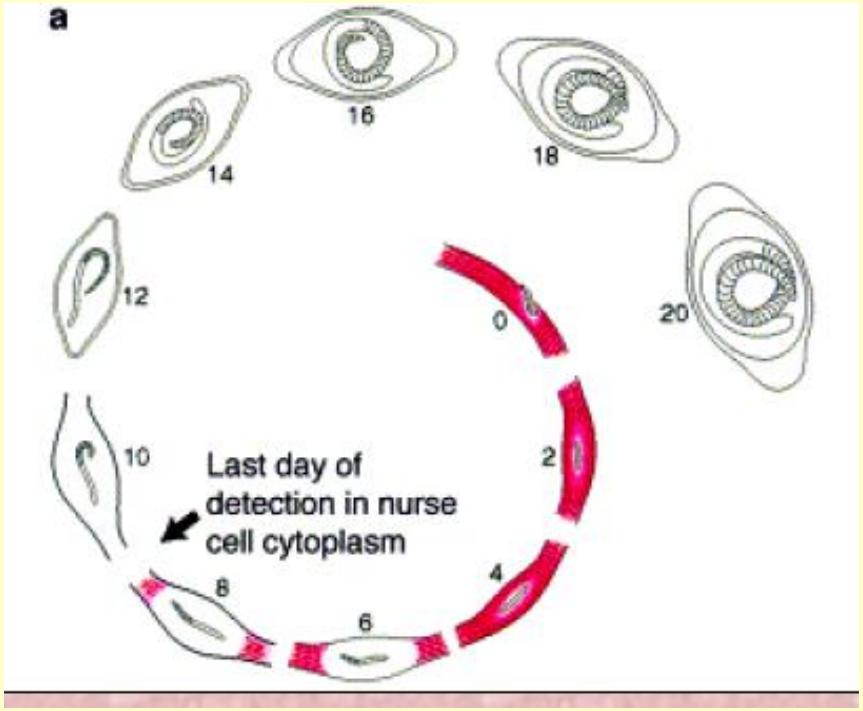
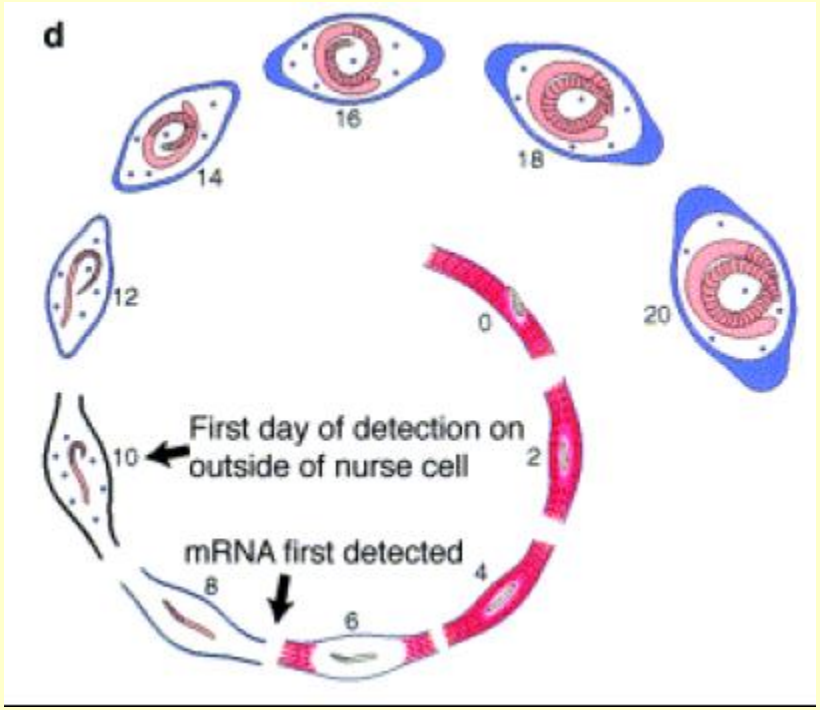
# Invasion of muscle cells





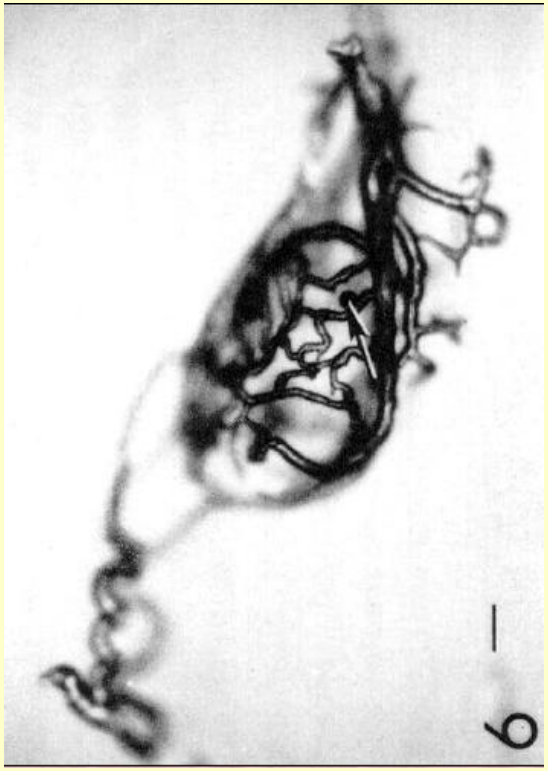
Infection of the muscle cells leads to changes in their function and composition induced by *Trichinella*

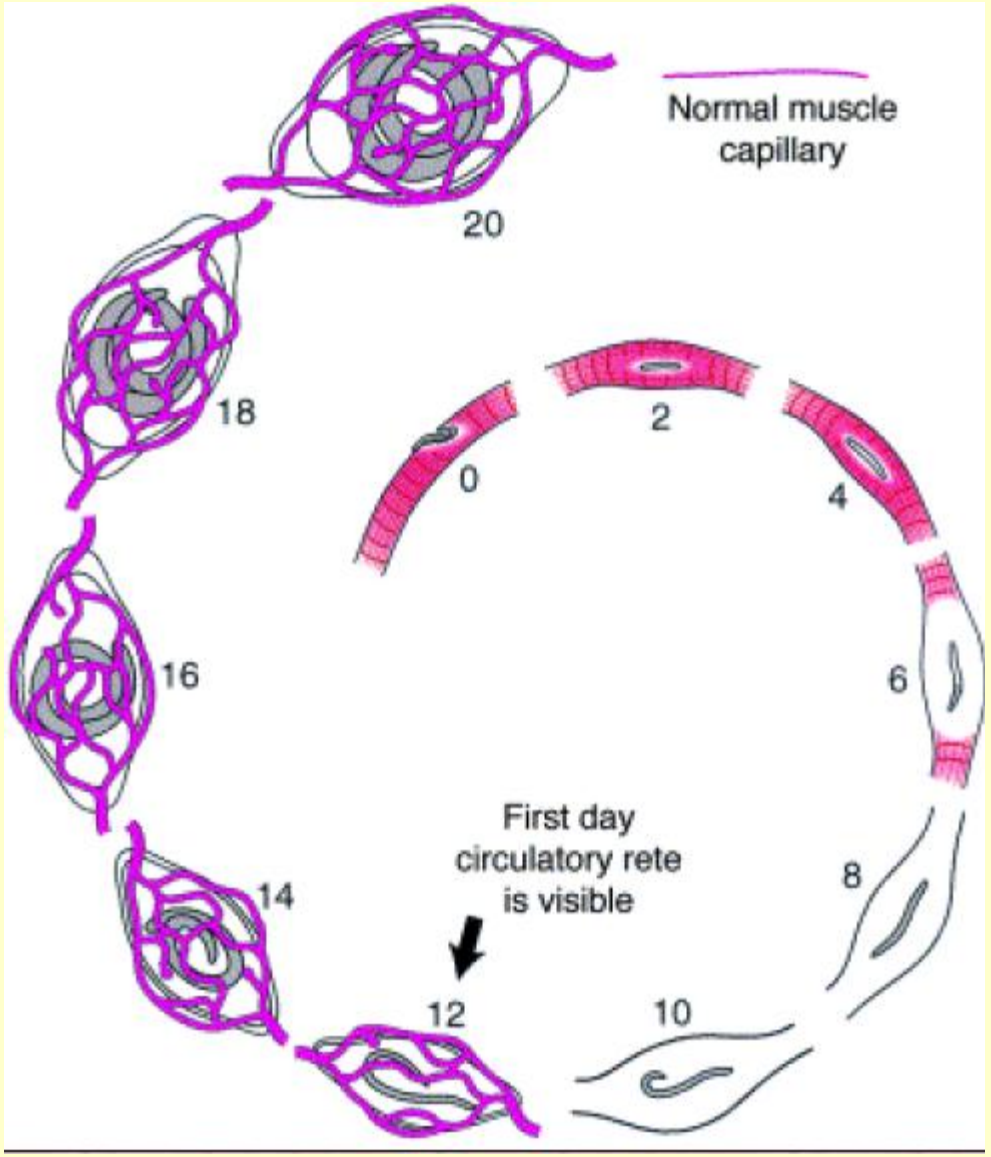



**Loss of contractile elements** and formation of **collagenic capsula**

# Induced angiogenesis in infected cell





# Symptomatology

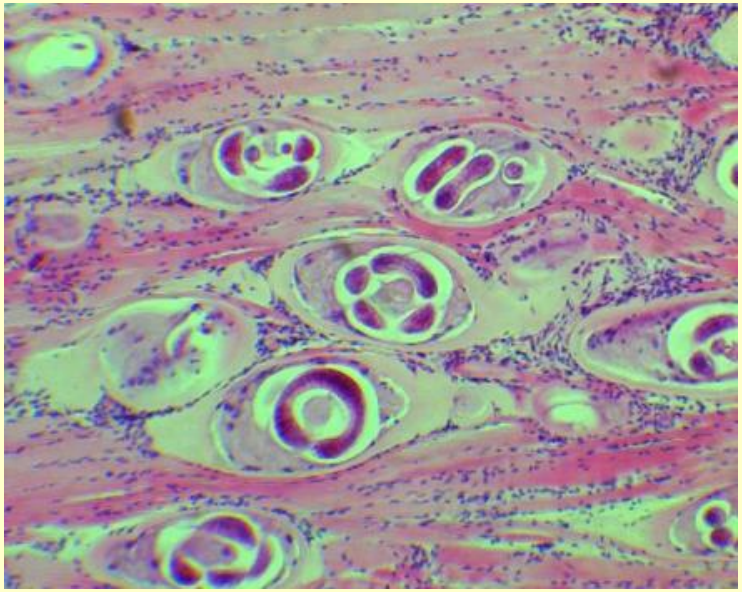
IP: 5-25 days

**Intestinal phase:**

2-10 days pi;

vomiting

diarrhoea



**Muscular phase:**

**fever (40°C),**

myalgia

weakness

tiredness

**periorbital edema**(80-100%)

cefalea,

konjuctivitis,

Oedemas of limbs

**maculopapul. exantema** (20-50%)

Lab.: eosinophilia, IgE,

⇧CK, LDH, AST

Periorbital oedema; konjuctivitis

Subungual haemorrhagie

Periorbitel oedema

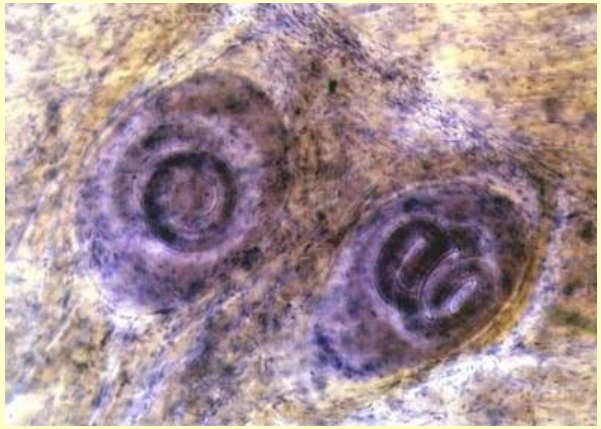
**Diagnostics of the infection mainly by serology**

Serology: antibodies against E/S antigen

Biopsy

PCR

Veterinary control: trichinoscopy

# Therapy

**Tiabendazolum**

- 25-50 mg/kg/day in 2 doses (max. 3 g/day)
- Within 1 week after infection, affects the adults

**Albendazolum**

- 1.-3. day: 100-200 mg 3x per day
- 4.-14. day: 400-500 mg 3x per day

**Mebendazolum**

**Albendazolum**

- muscle phase
- 400 mg per day in 2 doses for 3 weeks

**Cortikosteroids**

Symptomatic treatment

In new infection it is possible to use albendazolum and anticonstipacy treatment every other day for 10 days

# *Taenia saginata*

Cestoda

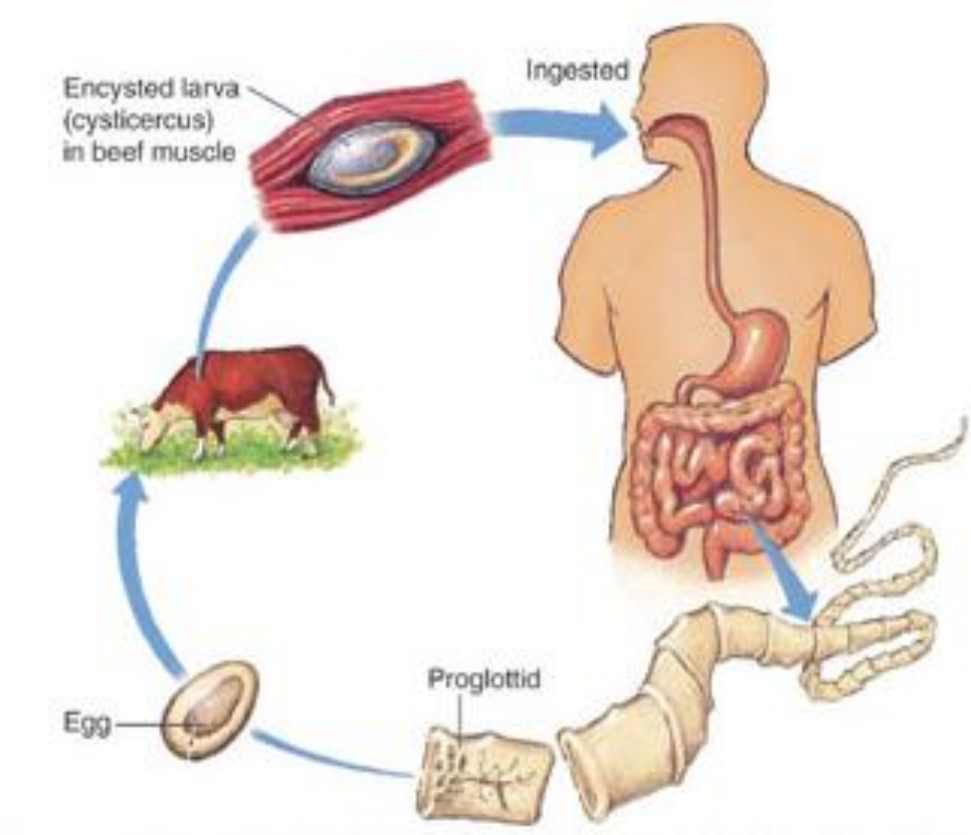
**Distribution**: geopolit, typical food habits

**Source of the infection**: raw or uncooked beef

Final host: **human**

Intermediate host: **cattle**

# Life cycle

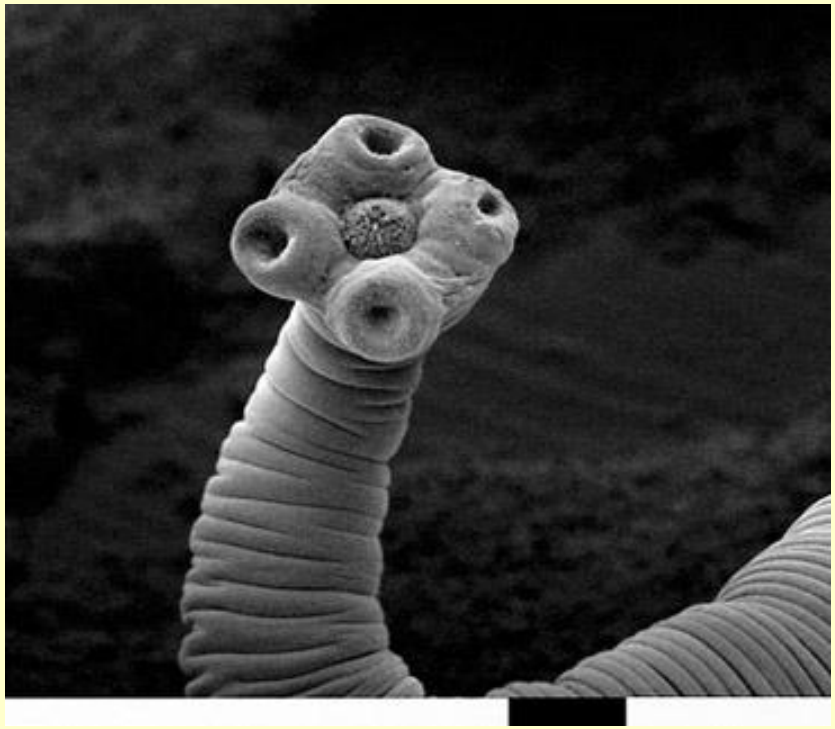



In the muscles of cattle:

**cysticerkus bovis**

(5-10 mm)

Final host is discharging **proglottids** containing eggs



Adult measures 3-10 m

Prepatent period:

**6-12 months**

Female releases: 1000-2000 proglottids (80-100 th. Eggs per day)

**Life expectacy: 20 years**

# Symptomatology

Usually asymptomatic

Malnutrition in heavy infection

Atypic migration of proglottids - apendicitis

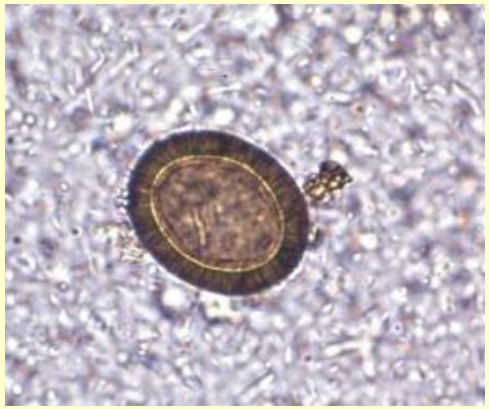
*Cysticercus bovis* **only in ruminants**: muscles, myocardium, diaphragma, oesophagus

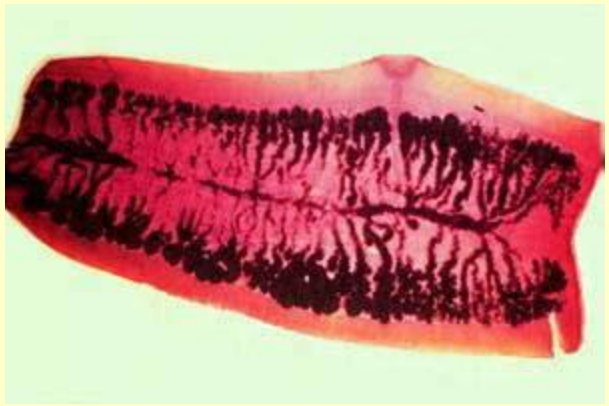
# Diagnostics

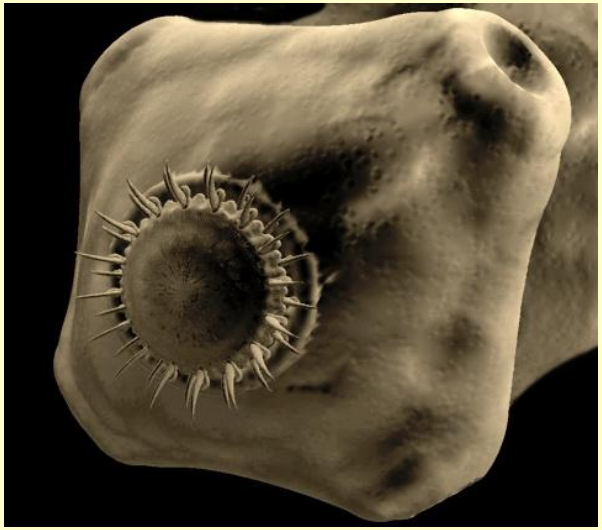
**Proglottids in stool**

(also discharged with no relation to defecation)

Eggs in anal swabs







# *Taenia solium*

Cestoda

Distribution: **cosmopolite**

**Transmission - alimentary**:

undercooked **pork meat** –
human as **final host**

**food contaminated by eggs** –
human as **intermediate host**

# Epidemiology

Cysticercosis – 60% CNS; 3% eye

Common asymptomatic infection

Prevalence of neurocysticercosis

Mexico City 1.4 - 3.6% (autopsy)

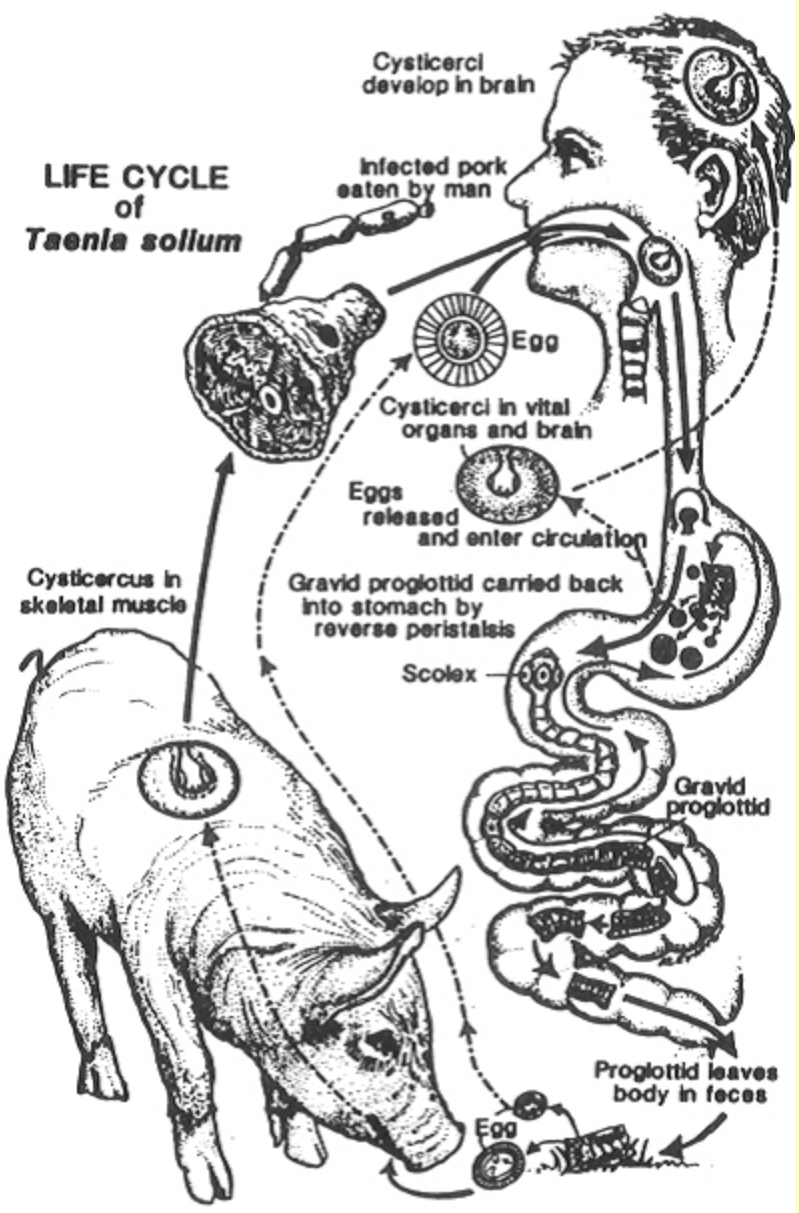
Bolívia 22% (seropositivity)

Peru 8%

Rwanda 21%

Bombay 47%

(Seropositivity in orthodox Jews in USA?)




# Life cycle

**Final host: human** (proglottids)

**Intermediate host**: **swine** (human) – *cysticerkus cellulosae*

Inhabitates **the intestine**

Adults measure **2-3 m**

Scolex with suckers and hooks

**Prepatent period: 11-12 months**

# Human as final host: symptomatology

Usually asymptomatic

Irritating movement of parasite, toxins – unspecific GIT problems


# Cysticercosis

***Cysticercus cellulosae*:**

**swine, human**

Localisation in host:

**muscles, brain, subcutaneous infection**

Symptoms are dependent on:

**lasting of infection**

**number of cysticerci**

**their localisation**

**immune response of host**

# Neurocysticercosis (active disease)

Arachnoiditis

**Meningeal localisation:**

Obstructive hydrocephalus

intrakranial hypertension

**Parenchymatic localisation:**

asymptomatic;

Brain oedema, seizures, focal neurologic deficiency, intracranial hypertension

# Neurocysticercosis – inactive disease

Most common form of disease

60% of cases parenchymatic localisation

**Seizures**

**Headache**

**Vomiting**

Changes of intelect, ataxy….

Neurocysticercosis

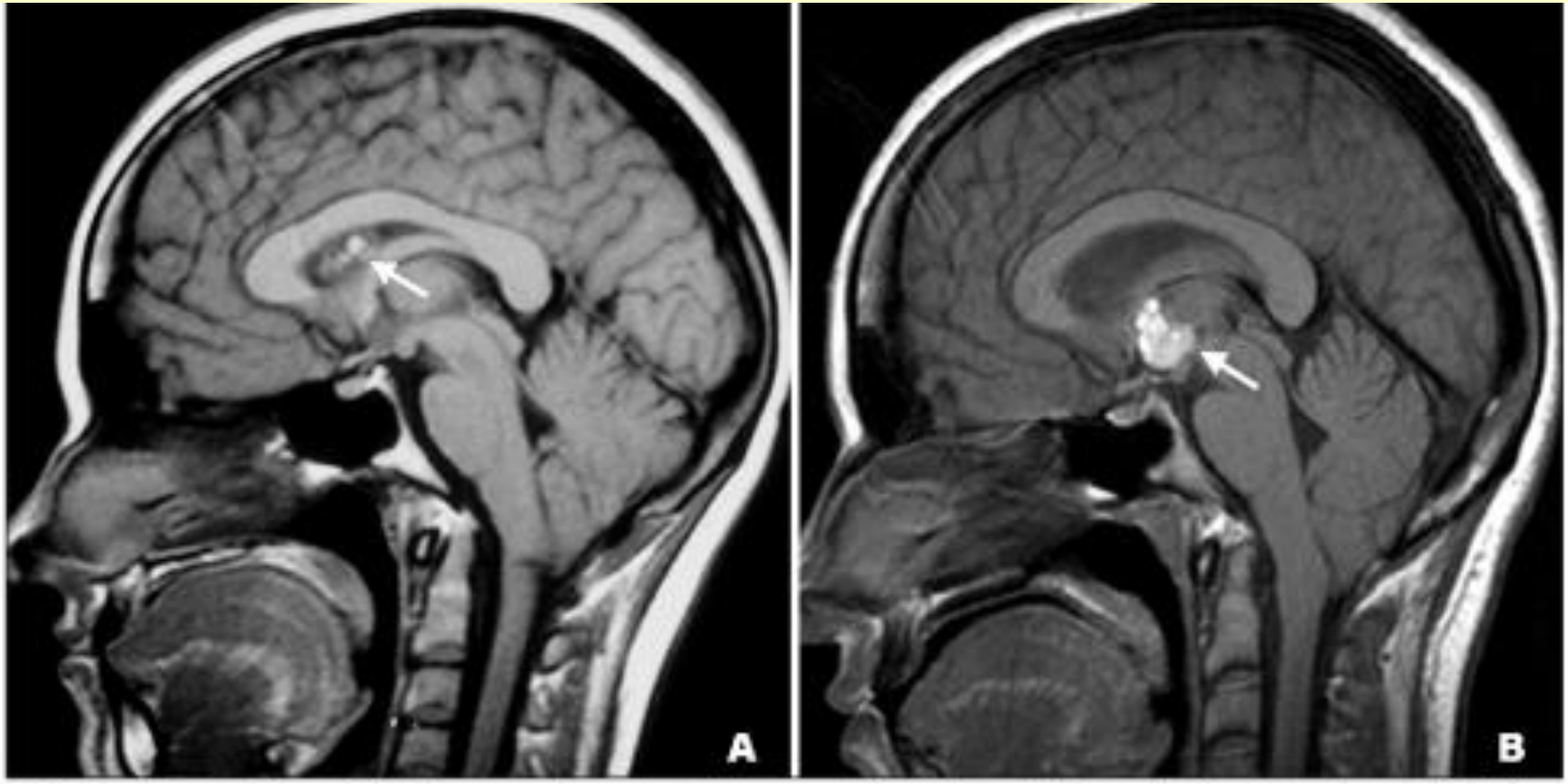



*Fig 3. Sagittal T1-weighted MR images demonstrate a multiloculated lesion in the lateral ventricle (arrow) in the first exam (A), and the lesion migrating to the third ventricle (arrow) on the follow-up (B).*

**Eye** – (ophtalmocysticercosis)

– frontal chamber, vitreous humour, below retina: inflammatory changes, atrophy of retina, chorioretinitis, iridocyklitis, catarakta

**Subcutaneous** –

Solitary or multiple; resembling neurofibromatosis

# Subcutaneous cysticercus

# Cysticercosis of muscles

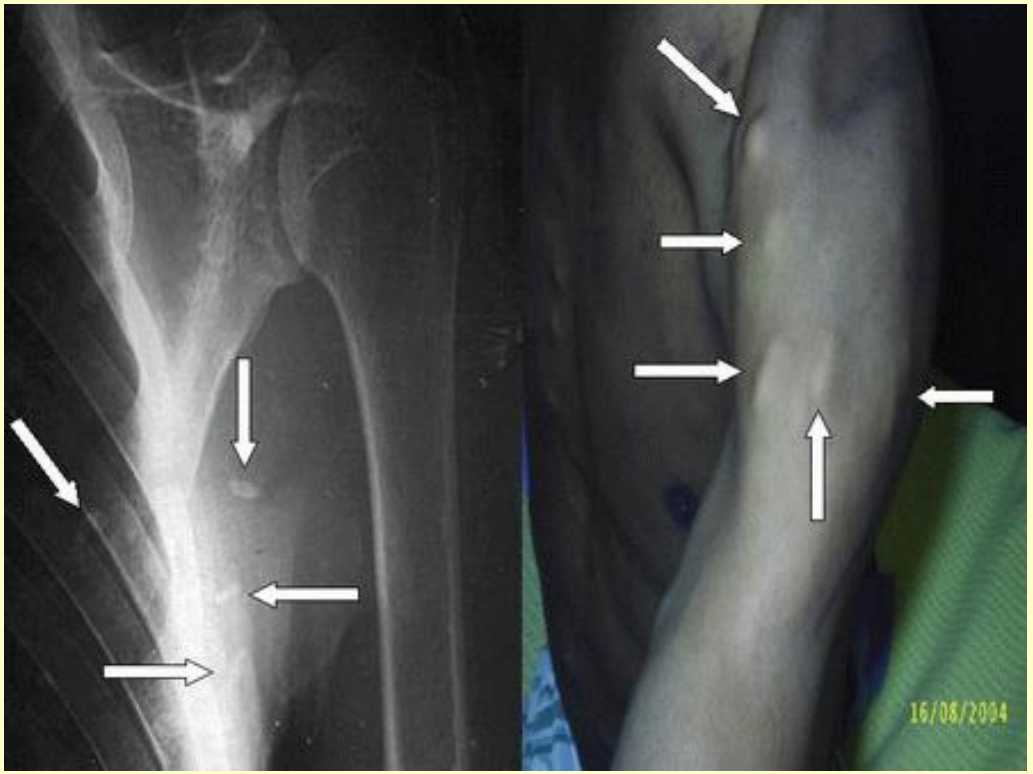


**Fig. 1 -** Submucous nodule on the left dorsal aspect of the tongue (arrow).

**Fig. 2 -** Trans-operative aspect of the cysticerci, revealing an encapsulated lesion on the submucosa.

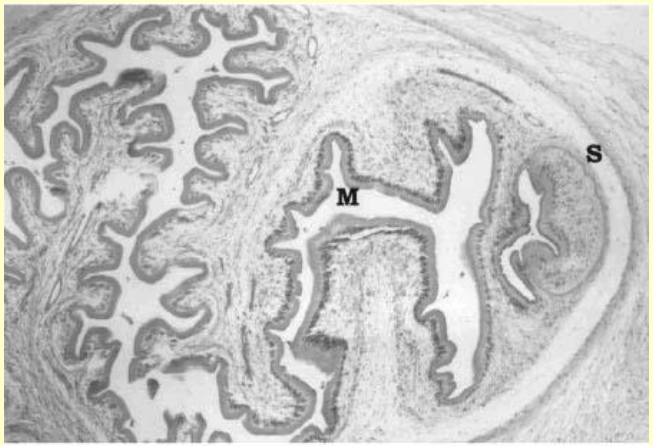
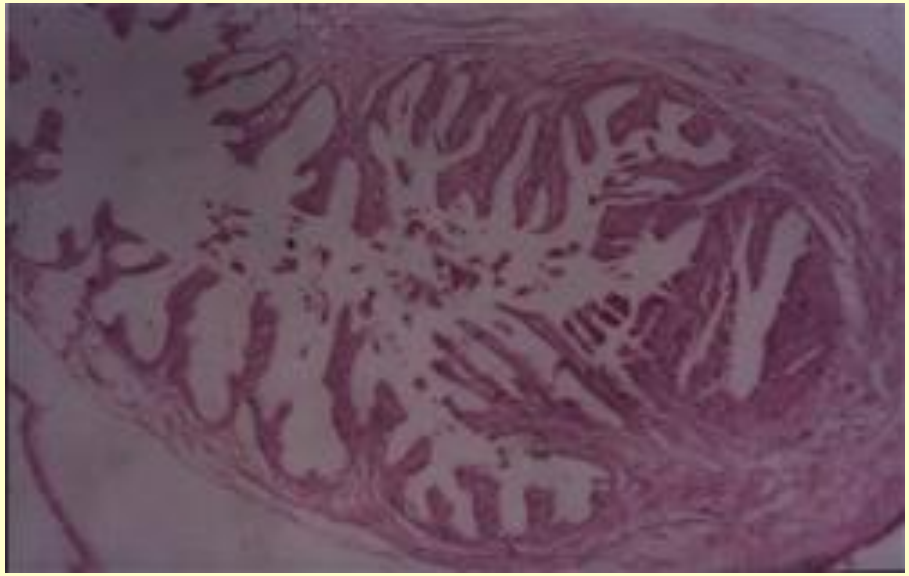
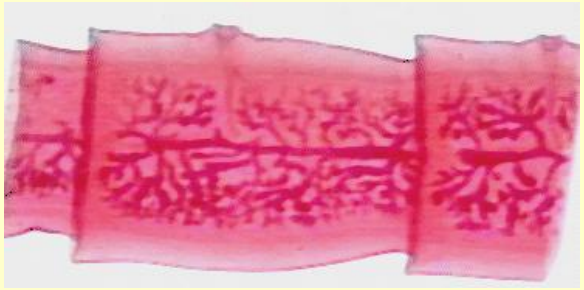
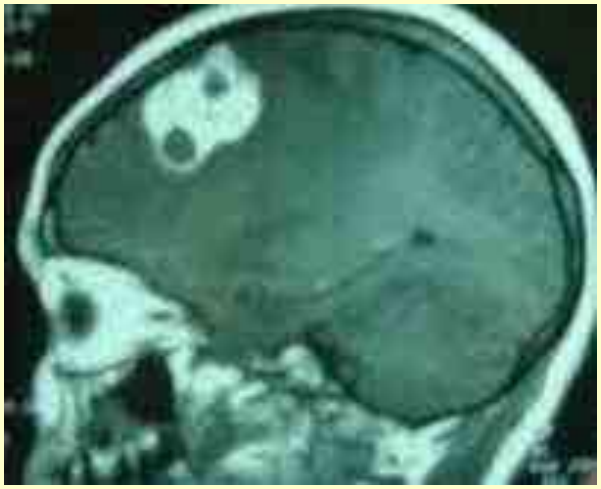



**Fig. 4 -** The duct-like invagination, which composes the caudal end of the larva, lined by the homogeneous membrane (M). Scolex (S) at the cephalic end. Haematoxylin and eosin x 12.5.





# Diagnostics

**Final host**

**Proglottids in stool**

Eggs in perianal swabs

**Intermediate host**

**Imaging techniques**

(US, CT, NMR),

calcificated, hypodense leasions

**Serology**

ELISA (3 months pi)

# Final host therapy

Niklosamid (YOMESAN- Merck, tbl. 500 mg):

Side effects: mild; headache, abdominal pain, fever

Doses: 2 g p.o. in a single dose, after fasting

children: < 11 kg = 0,5 g

11 – 34 kg = 1,0 g

> 34 kg = 1,5 g

Praziquantel (CESOL 150 mg; BILTRICIDE 600 mg)

doses:

– 5-10 mg/kg in a single dose, after meal

# Intermediate host therapy:

- CHEMOTERAPEUTICS:
  - Praziquantel 10 – 25 mg/kg 3x per day, 2-3 weeks
  - Albendazol um 7,5 - 15 mg/kg/day (max. 800 mg) in 2 doses., 2-4 weeks
  - Cortikosteroid therapy for supression of oedema and intracranial hypertension
- Chemotherapy is not indicated in severe active neurocysticercosis,(could lead to life threatening inflammatory reaction), symptomatic therapy
- Solitary cyst with symptoms of epilepsy – anticonvulsive therapy
- Surgery in subarachnoideal and intraventricular cysts, causig compression or hydrocephalus
- Ocular cysts are treated surgically with no chemotherapy

# Prevention

- Sufficiently cooked pork meat

**Freezer:**

- 5 C 4 days
- 15 C 3 days
- 24 C 1 day

# Toxocara canis/cati

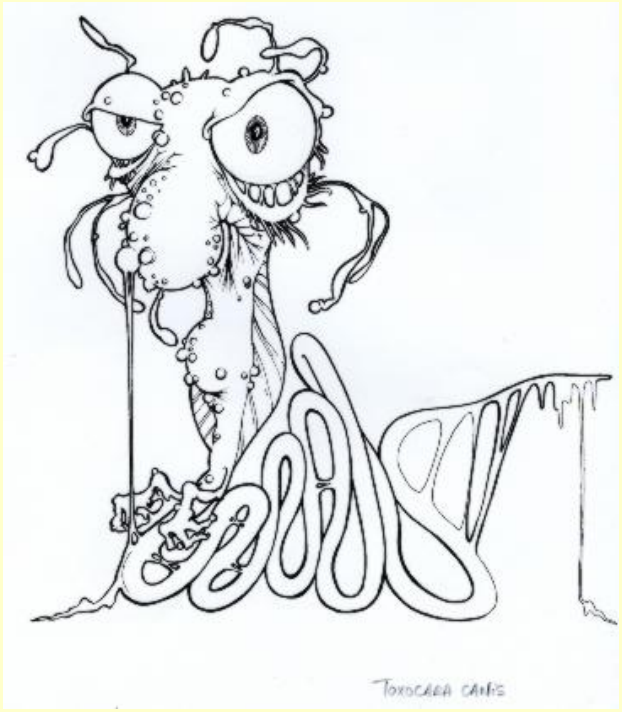
Nematoda

Cosmopolite distribution

Seroprevalence USA: 2-10%

Transmission: – eggs in soil, sand, larvae in paratenic host

Most common: children




# Epidemiology

2-5% positive in cities of developed world

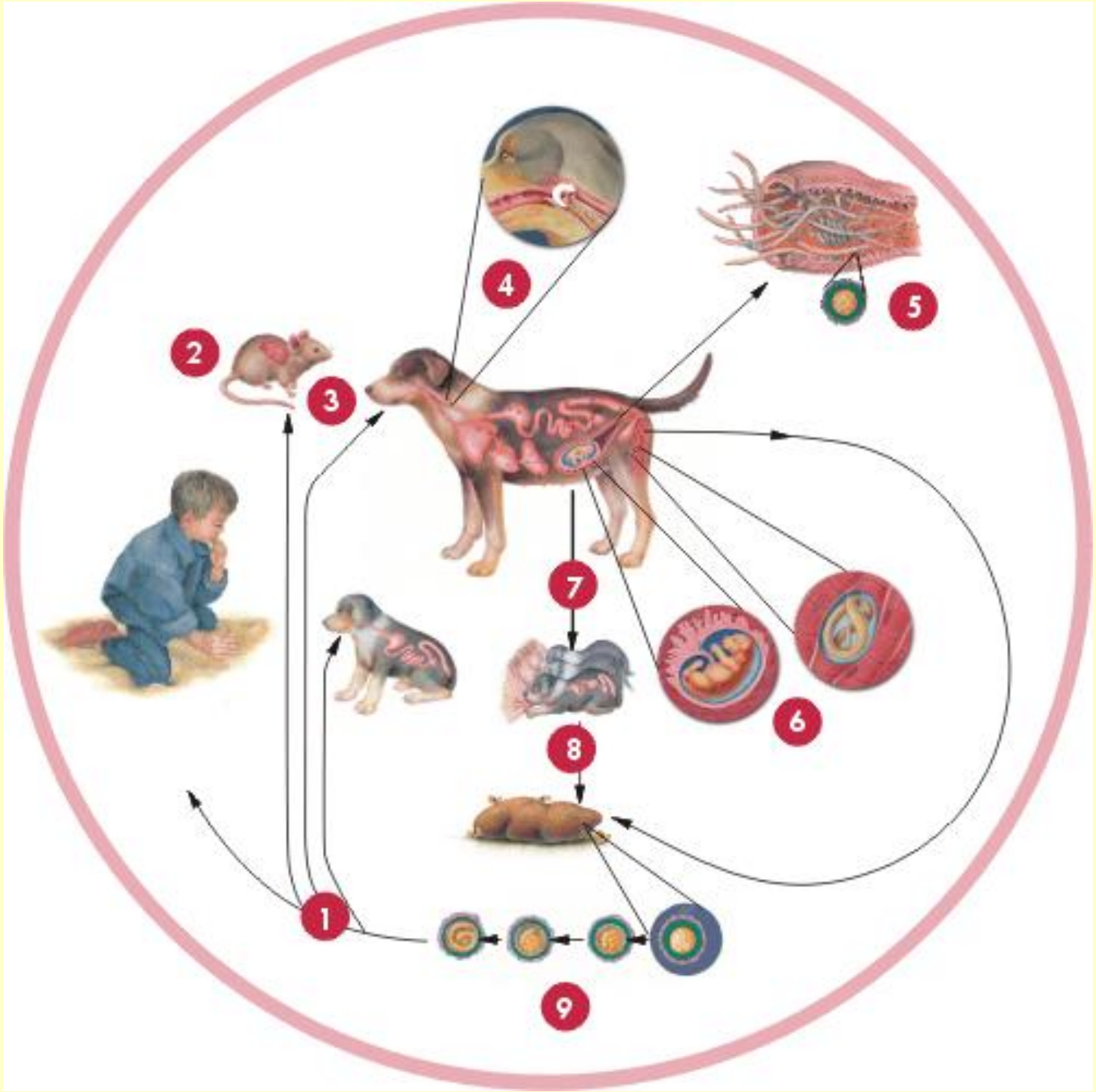
14.2-37% positivie in villages in developed world

Tropical countries:

63.2% Bali,

86% Santa Lucia (West Indies)

92.8% La Reunion (French Overseas Territories, Indian Ocean)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# Symptomatology

Asymptomatic seroconversion

Larva migrans visceralis

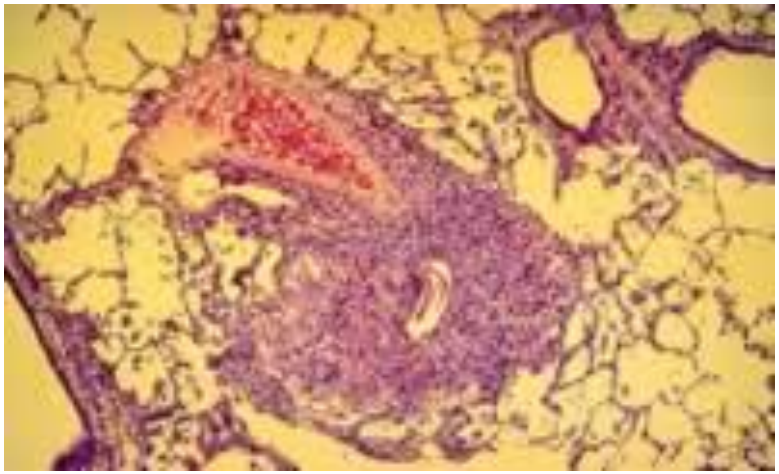
Larva migrans ocularis

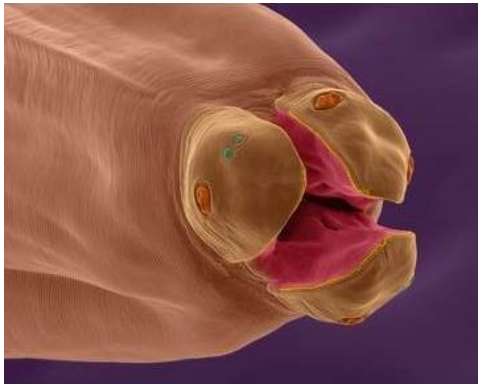
# Symptomatology is dependent on

Number of larvae in host and immune response

Allergic reaction!!!

Granuloma formation





# Larva migrans visceralis – symptomatology due to the migration of larvae in host

Abdominal pain, nausea, vomiting

Exanthema, pruritus

Hepatomegaly

Pneumonia (cough, fever)

Letargy, difficulties in sleeping

Headache

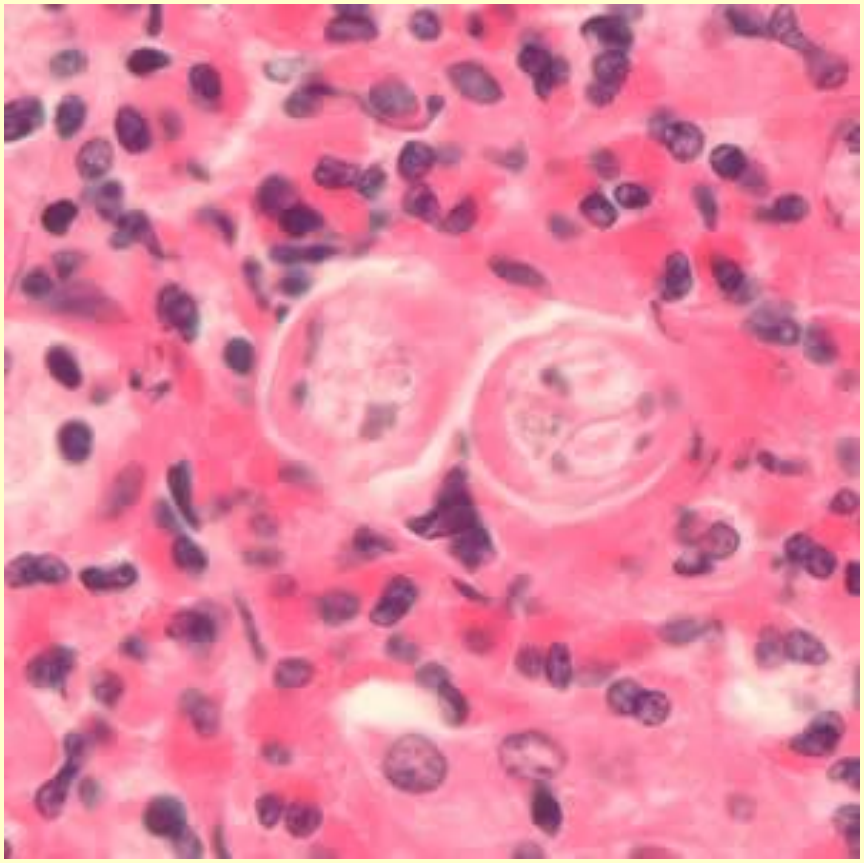
Myositis

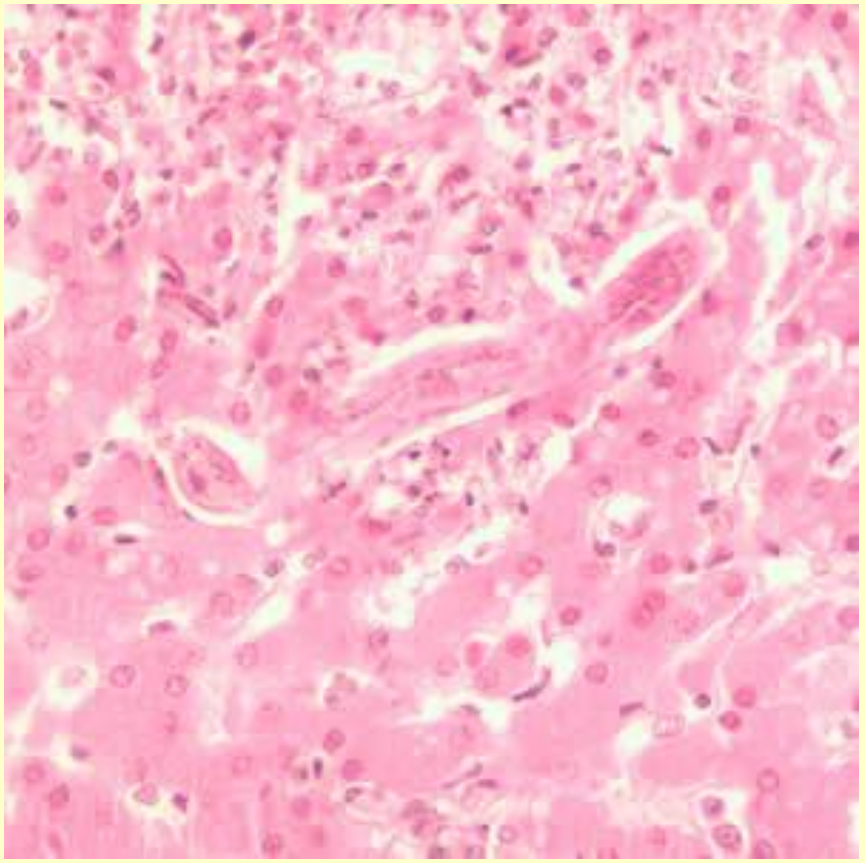
Rarely: seizures, myocarditis

**EOSINOPHILIA!!!**

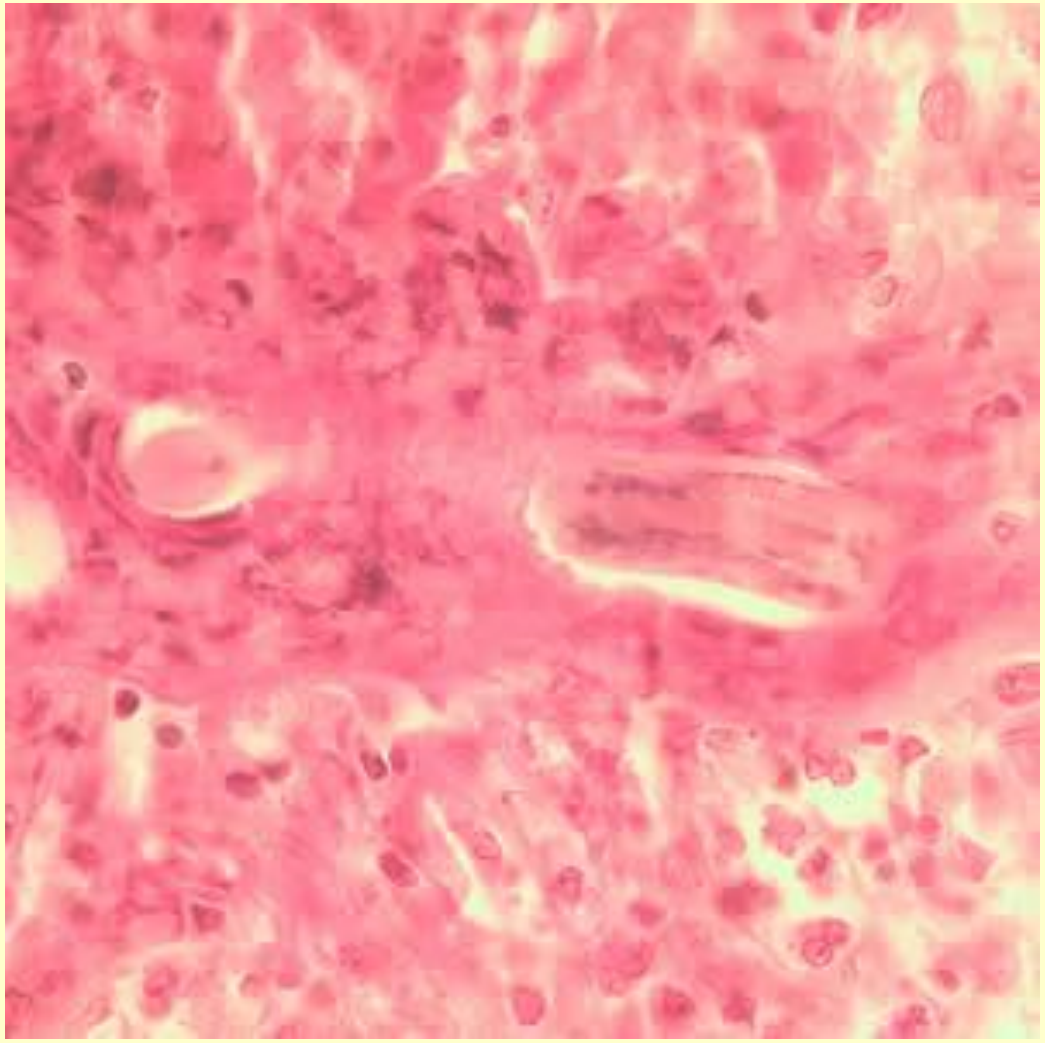
# Exanthema; larva migrans visceralis

# Larva migrans visceralis - hepar





# Larva migrans visceralis - lungs

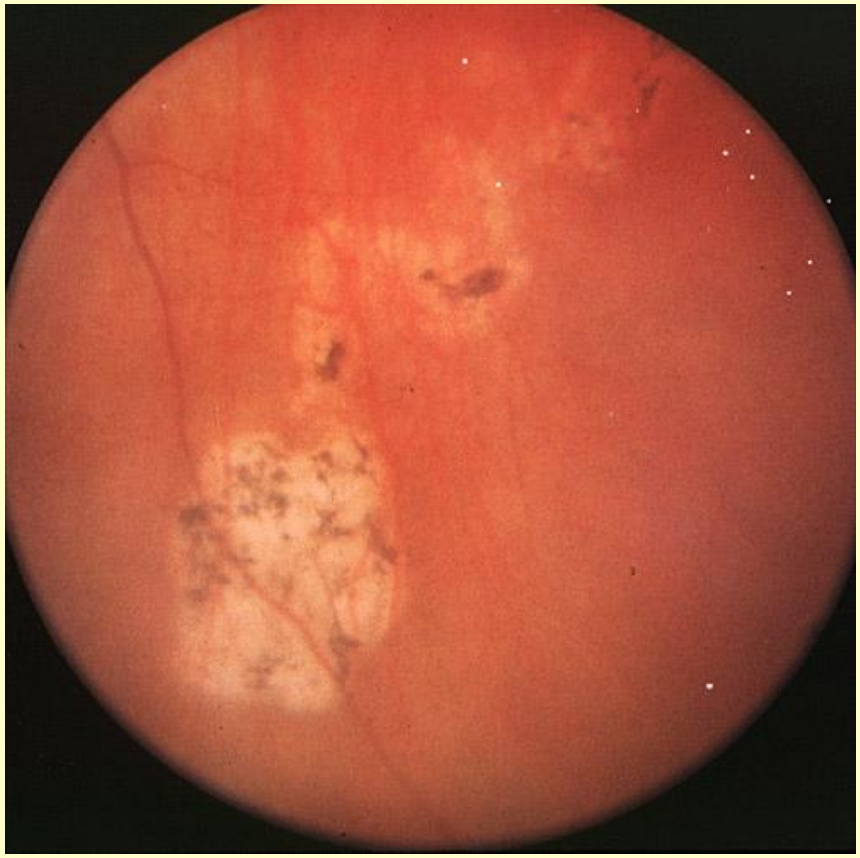


# Larva migrans ocularis

Visual disturbances usually unilateral

Strabism

Leucokoria



# Disease in dogs

5-50% seropositive in Europe

Tissue and GIT phase

**Sleeping larvae**

(transplacentary, transmammary infection)

**Eggs shed into the environment not mature**

# Diagnostics

Leukocytosis

Eosinophilia

+ symptomatology

**Definitive diagnostics:**

Positive serology, biopsy

# Therapy

Positive serology with no symptomatology dont treat!!!!!

Larva migrans visceralis – corticoids (Prendison)

## Ocular form:

Albendazole (Albenza) - 10 mg/kg/d PO single dose for 4 weeks

Mebendazole (Vermox) - 25 mg/kg/d PO single dose for 4 weeks

# Echinococcosis

Trematoda

*Echinococcus granulosus, multilocularis, vogeli*

**Distribution:** cosmopolite (Australia, New Zealand)


**Definitive host**

dog, wolf, coyote (granulosus)

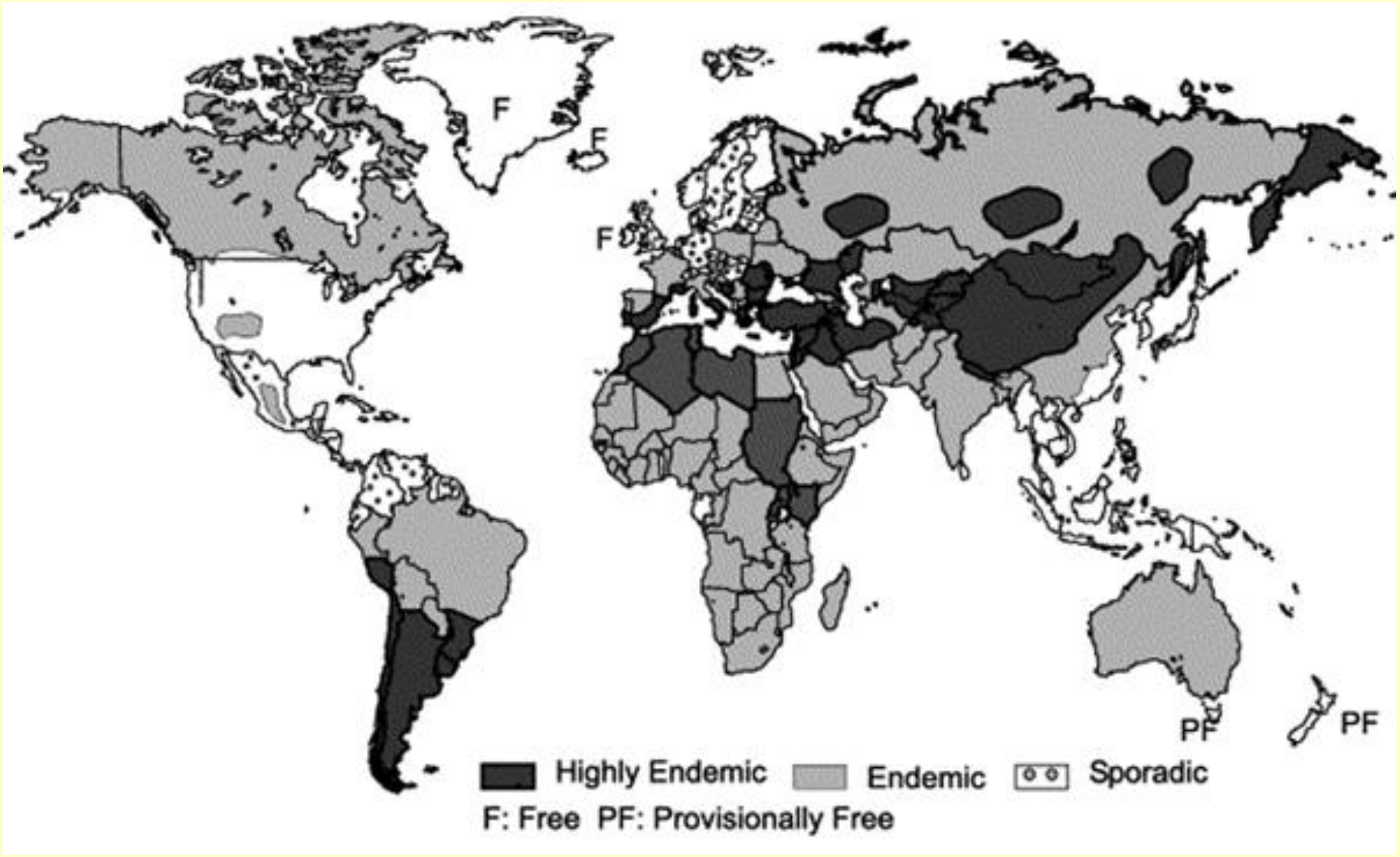
dog, wolf, fox, cat (multilocularis)

**Intermediate host:**

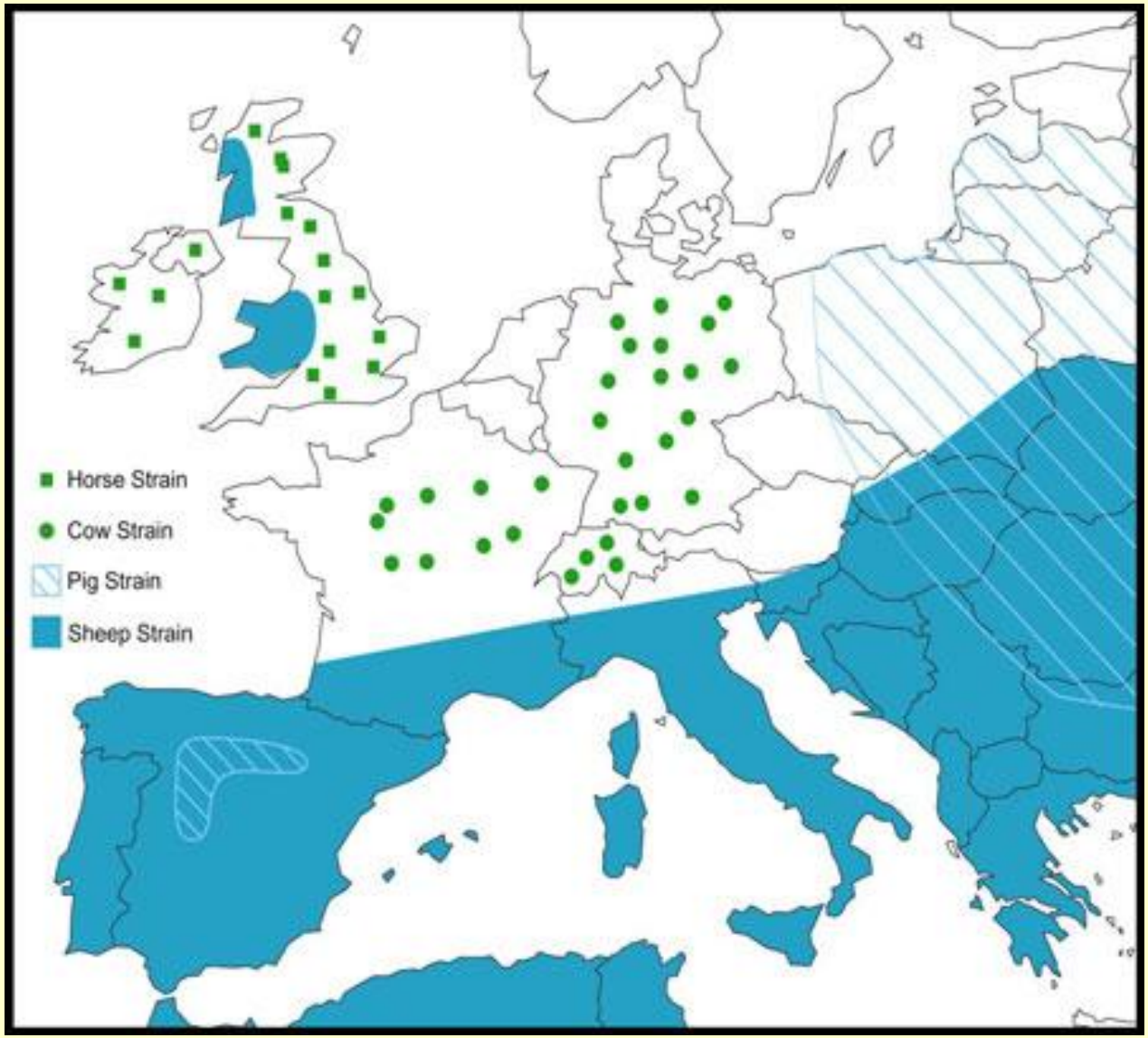
sheep, swine, deer (granulosus);

rodents (multilocularis)

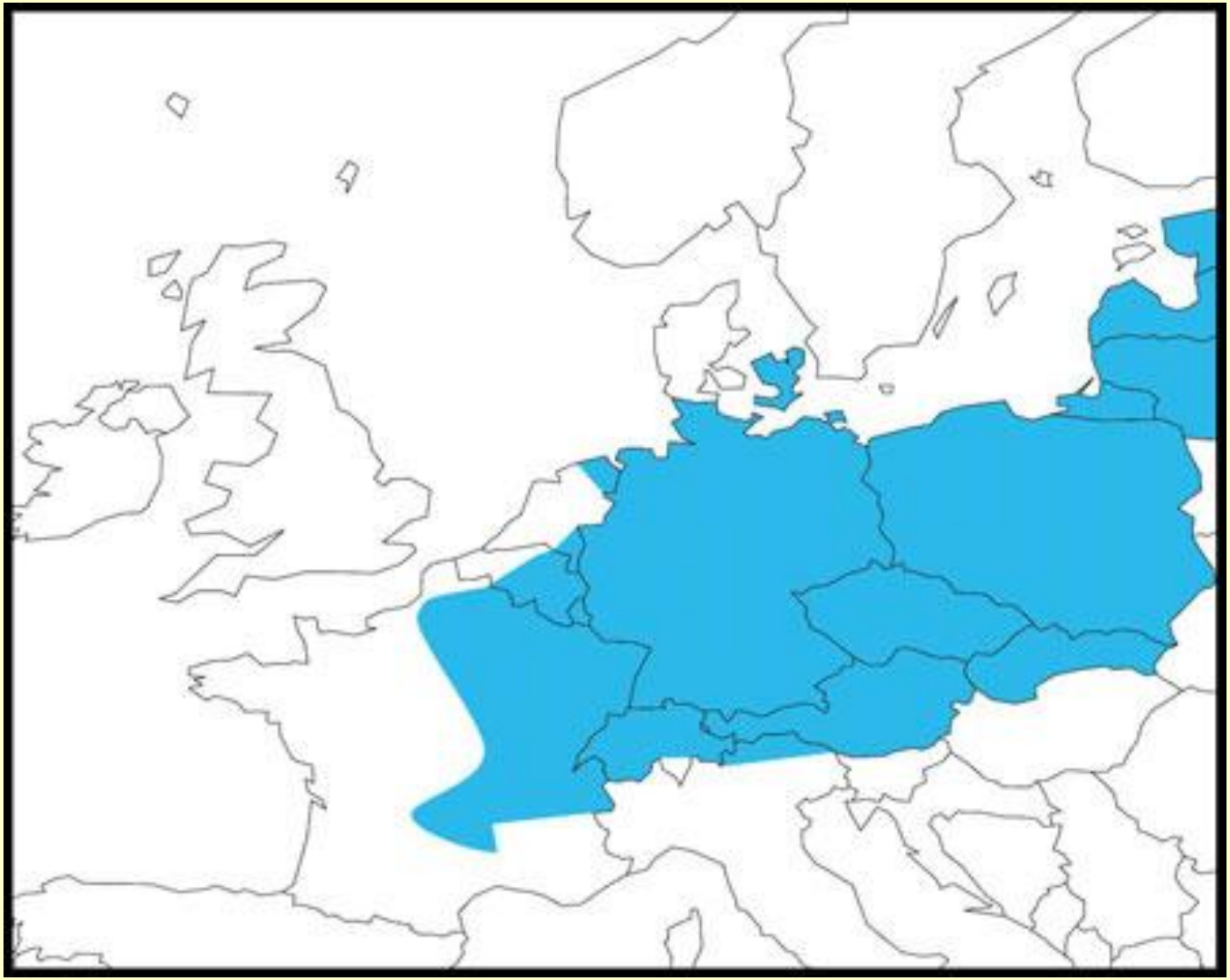
# Distribution of *E. granulosus*; 2004, CDC

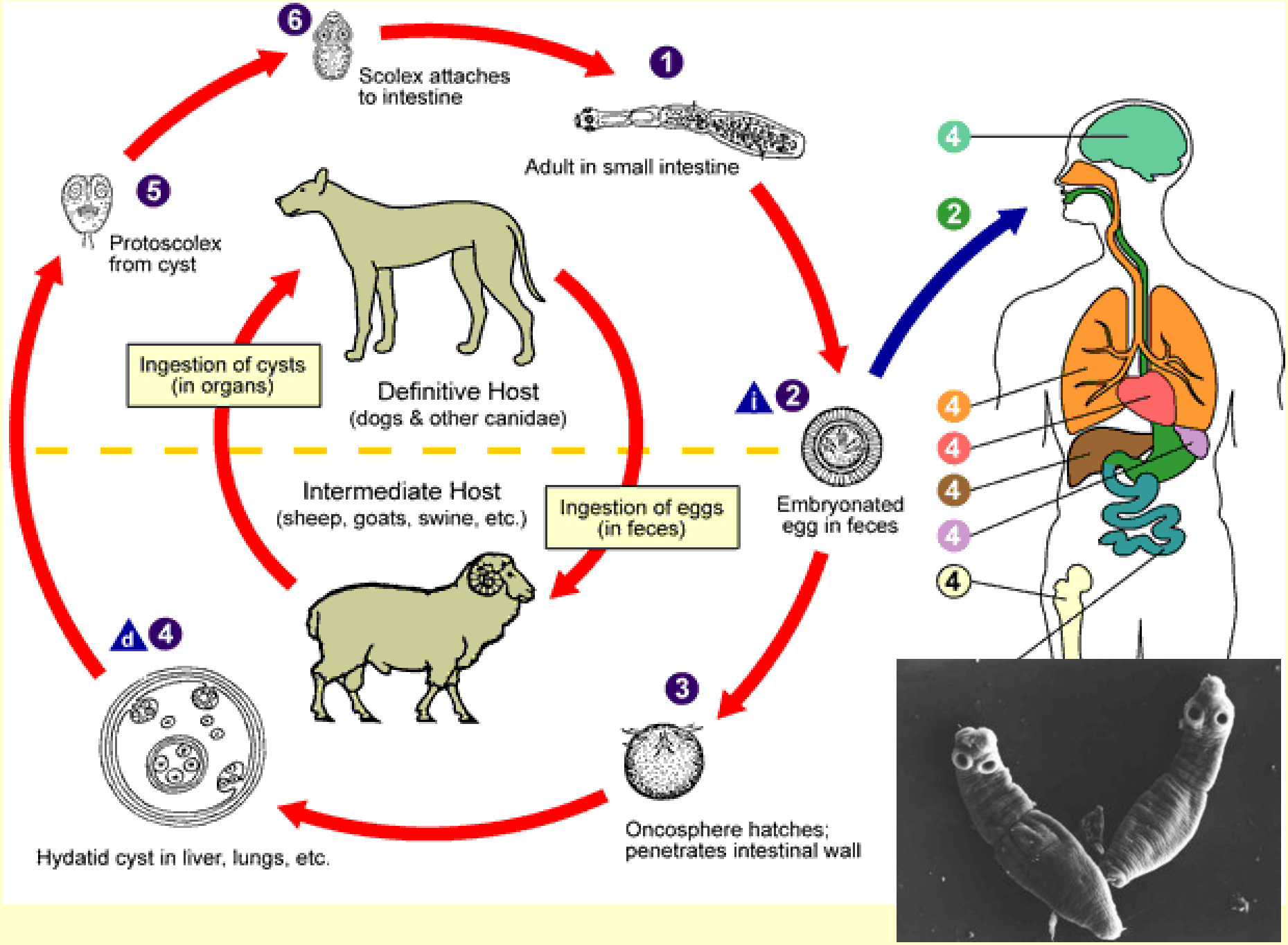


# *E. Granulosus* in Europe



# *E. Multilocularis* in Europe




6
Scolex attaches to intestine
1
Adult in small intestine
5
Protoscolex from cyst
Ingestion of cysts (in organs)
Definitive Host
(dogs & other canidae)
i 2
Embryonated egg in feces
Intermediate Host
(sheep, goats, swine, etc.)
Ingestion of eggs (in feces)
d 4
Hydatid cyst in liver, lungs, etc.
3
Oncosphere hatches; penetrates intestinal wall
4
2
4
4
4
4
4

# Human serves as accidental intermediate host

Egg

↓

Onkosphera (hexacant)

↓

Hydatidous cyst

Disrupted by juices of GIT

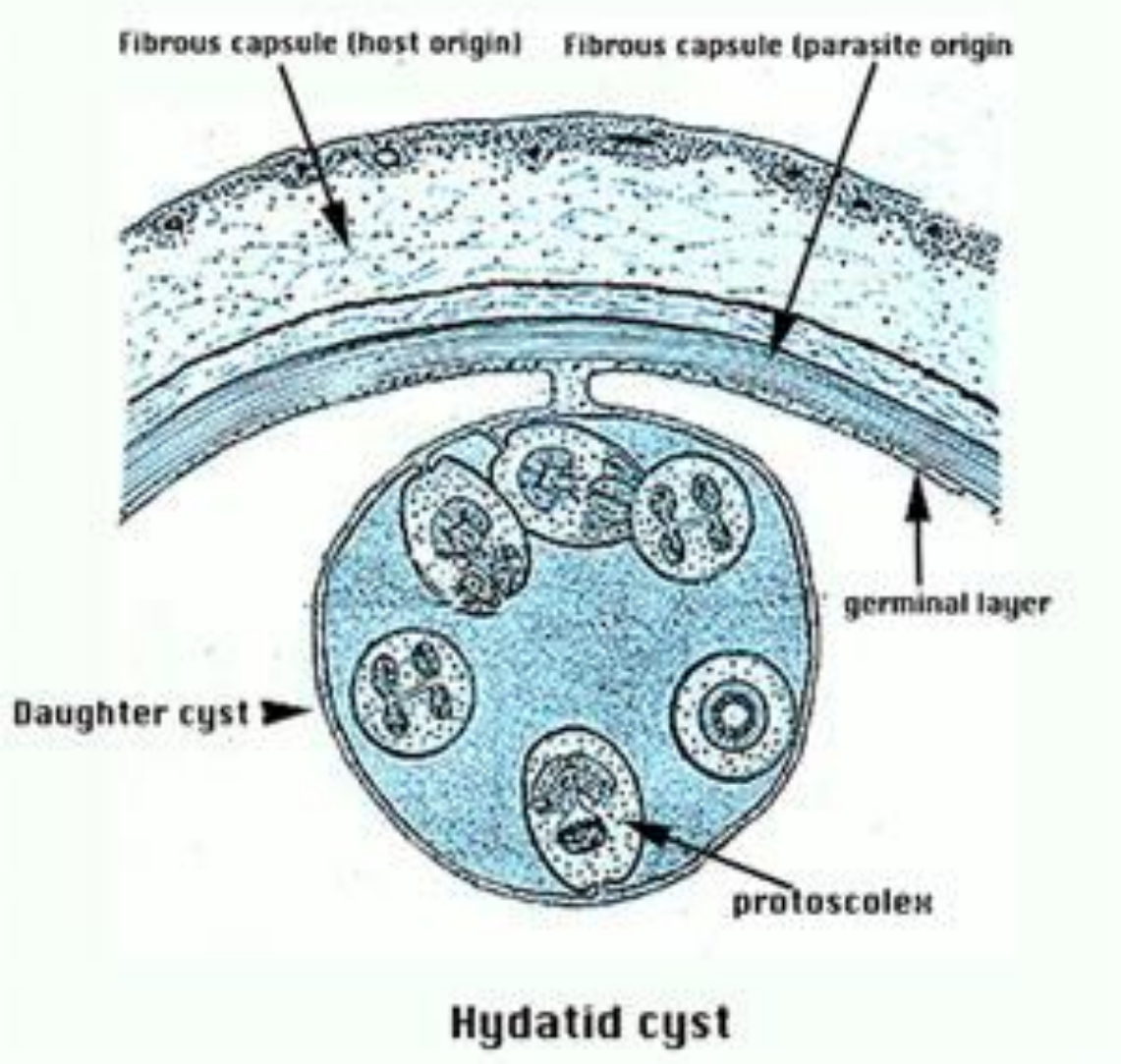
↓

Invades the wall of GIT, hematogenous spread

↓

Final site of development – most common lungs, hepar

The cyst has **three walls**: germinal, fibrous, fibrous (host)



# Disease

Cystic echinococcosis (*E. granulosus*)

Alveolar echinococcosis (*E. multilocularis*)

Polycystic echinococcosis (*E. vogeli*)

## Cystic echinococcosis

***E. granulosus***

Grows appr. 1-5 cm/year

inside

## Alveolar echinococcosis

***E. multilocularis***

grows appr. mm/year

outside

Protoscolexex grow from inner wall of the cyst, the daughter cells and protoscolexes = **Hydatidous sand**

# Symptomatology

**Localisation**

**Size of cyst**

**Relationship of expansive cyst to surrounding environment** (bile duct, vascular system)

**Complications due to the rupture of cyst**

**Secondary bacterial infection**

**Reaction of immune system**

(asthma, anaphylactic shock, nephropathy)

**Infection: primary and secondary**

# Hepatic involvement

- Usually **asymptomatic for long time**
- Accidental findings
- Abdominal discomfort, pain, decreased apetite
- Hepatomegaly
- Icterus
- Biliary colic

- Biliary colic
- Cholangiitis
- Pancreatitis
- Abscessus
- Portal hypertension
- Ascites
- Compression; trombosis of *v. cava inferior*
- Budd-Chiarri syndroma
- Rupture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SPI 3
R
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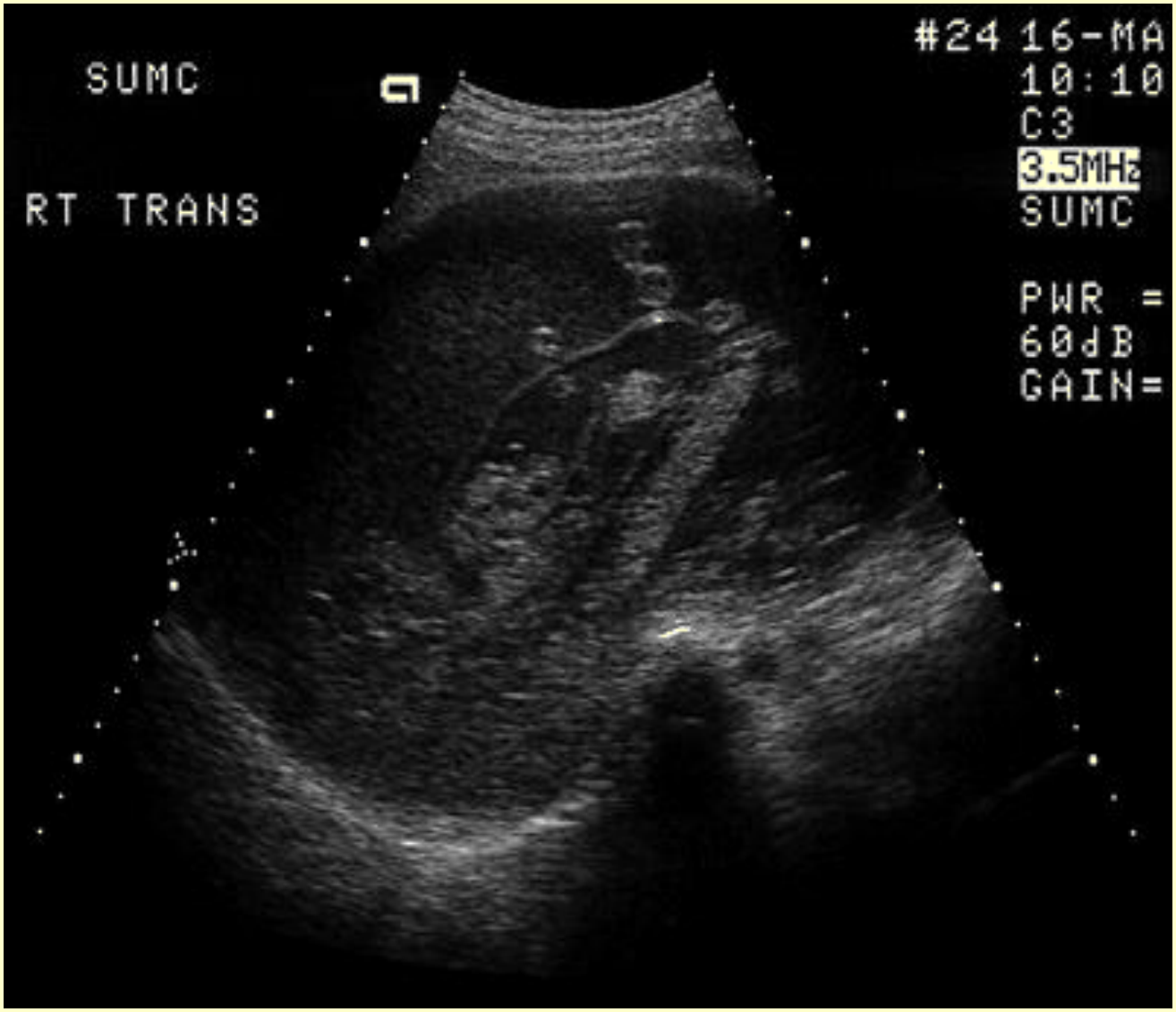
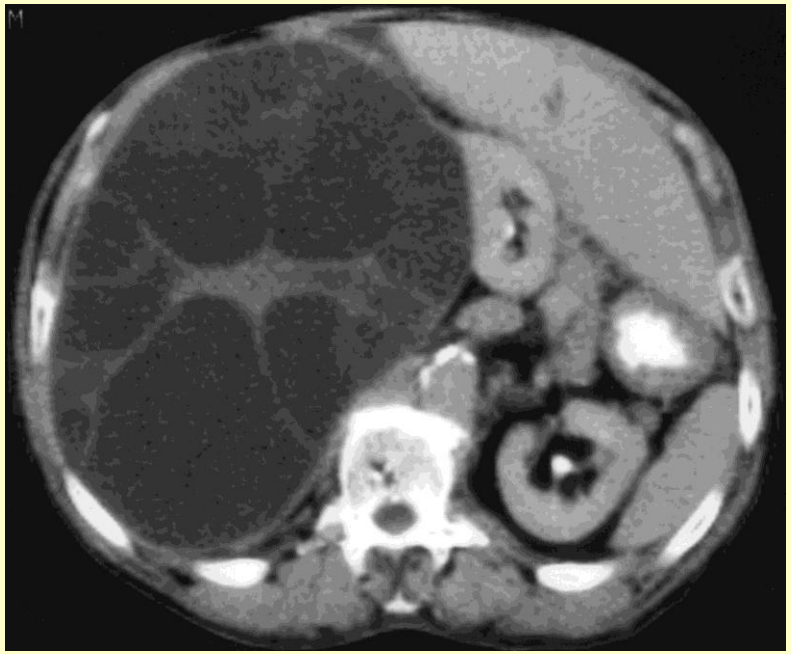
kV 120
mA 220
TI 0.75
GT 0.0
SL 8.0/12.0

# *E. granulosus;* hydatic sand



*E. Multilocularis* – cyst is devided by septae, it grows outside, inside necrotic tissue



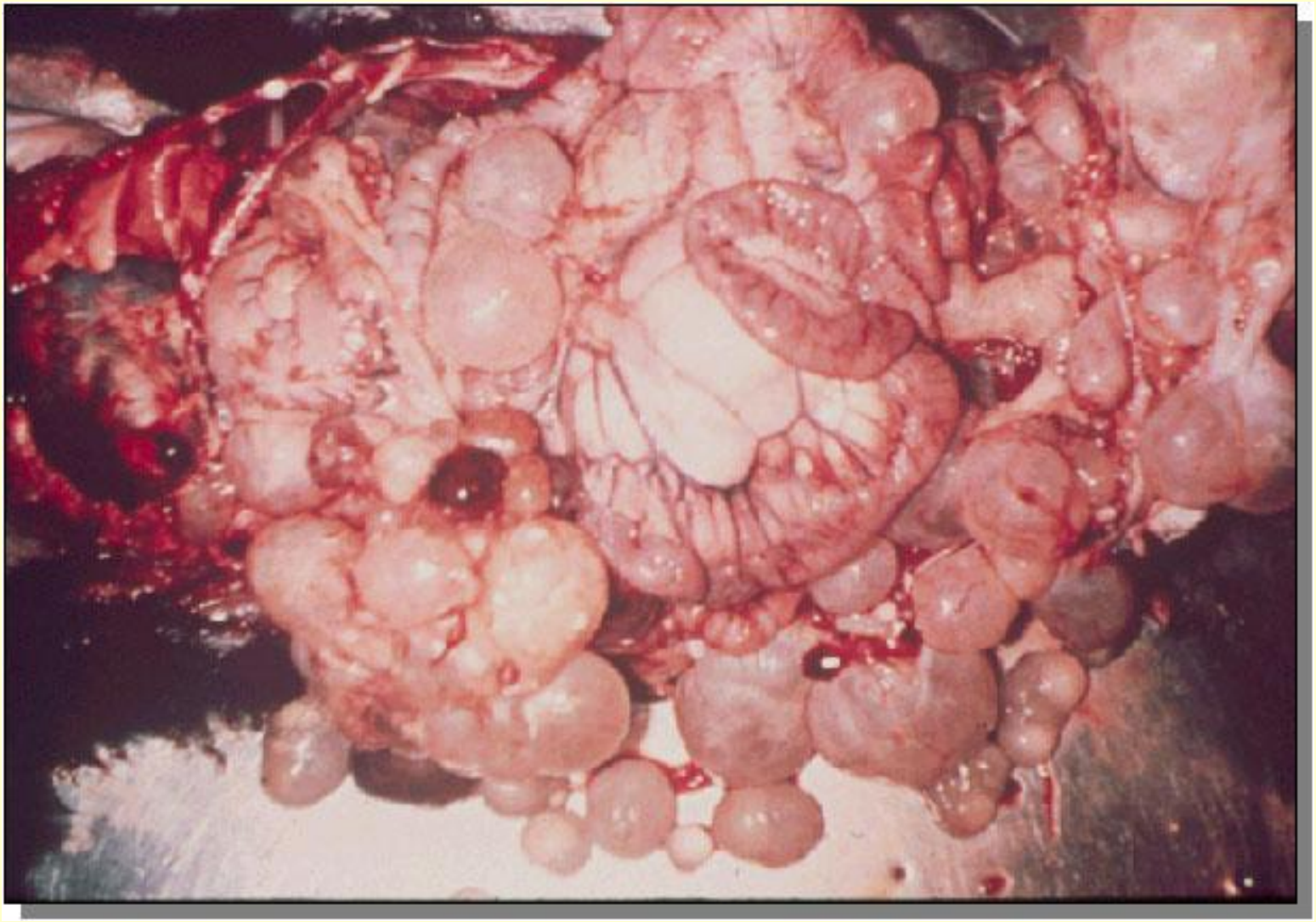
**Obr. 2.** CT – stejný nález v sagitální rovině
**Fig. 2.** The same picture in sagital plane

# *E. multilocularis*, central necrosis


**Obr. 4.** Resekát jater s hydatidovou cystou larválního stadia *Echinococcus multiloculanis*

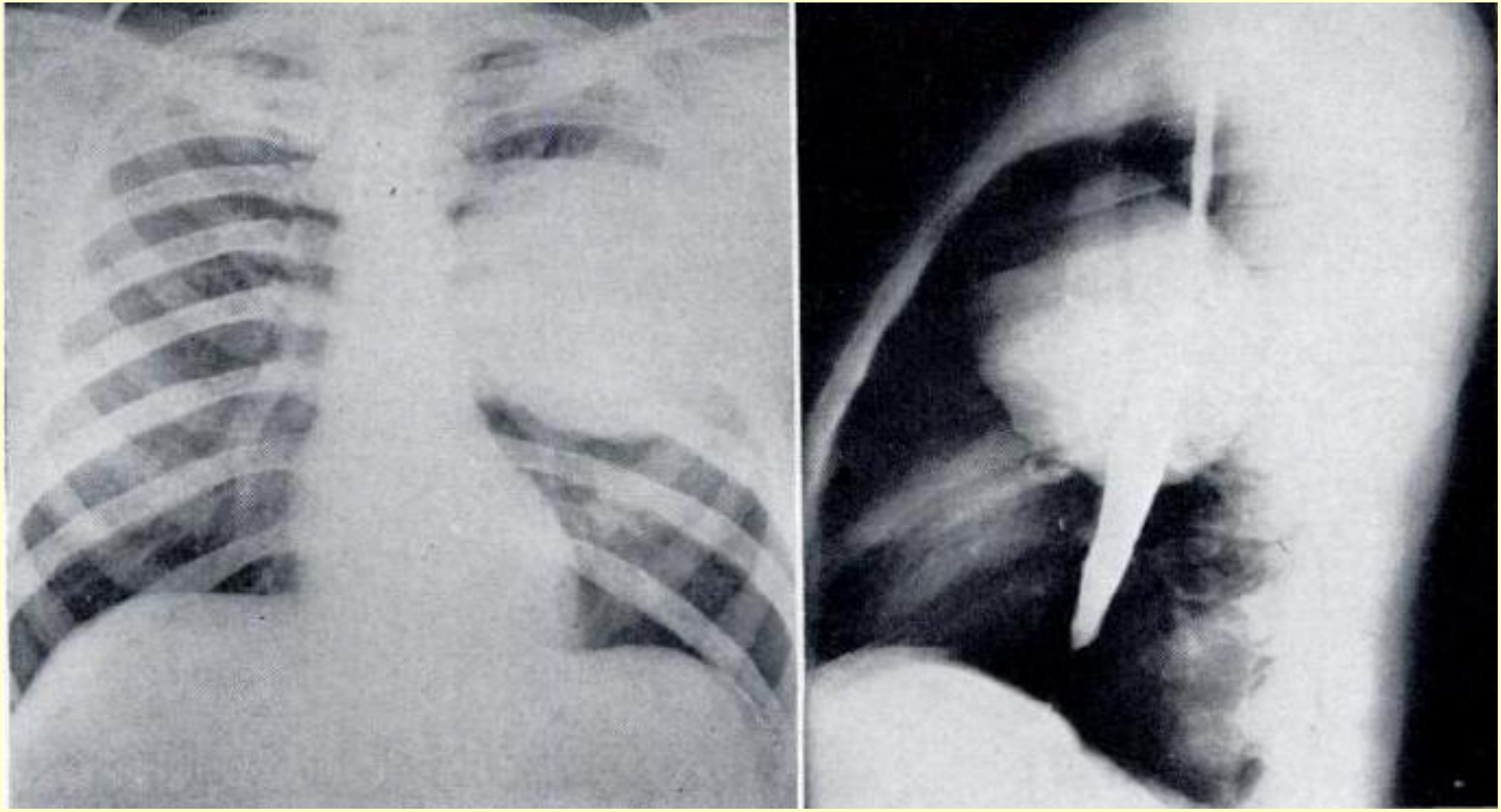
**Fig. 4.** Resected liver specimen with hydatid cyst of larval stadium of *Echinoccus multiloculanis*

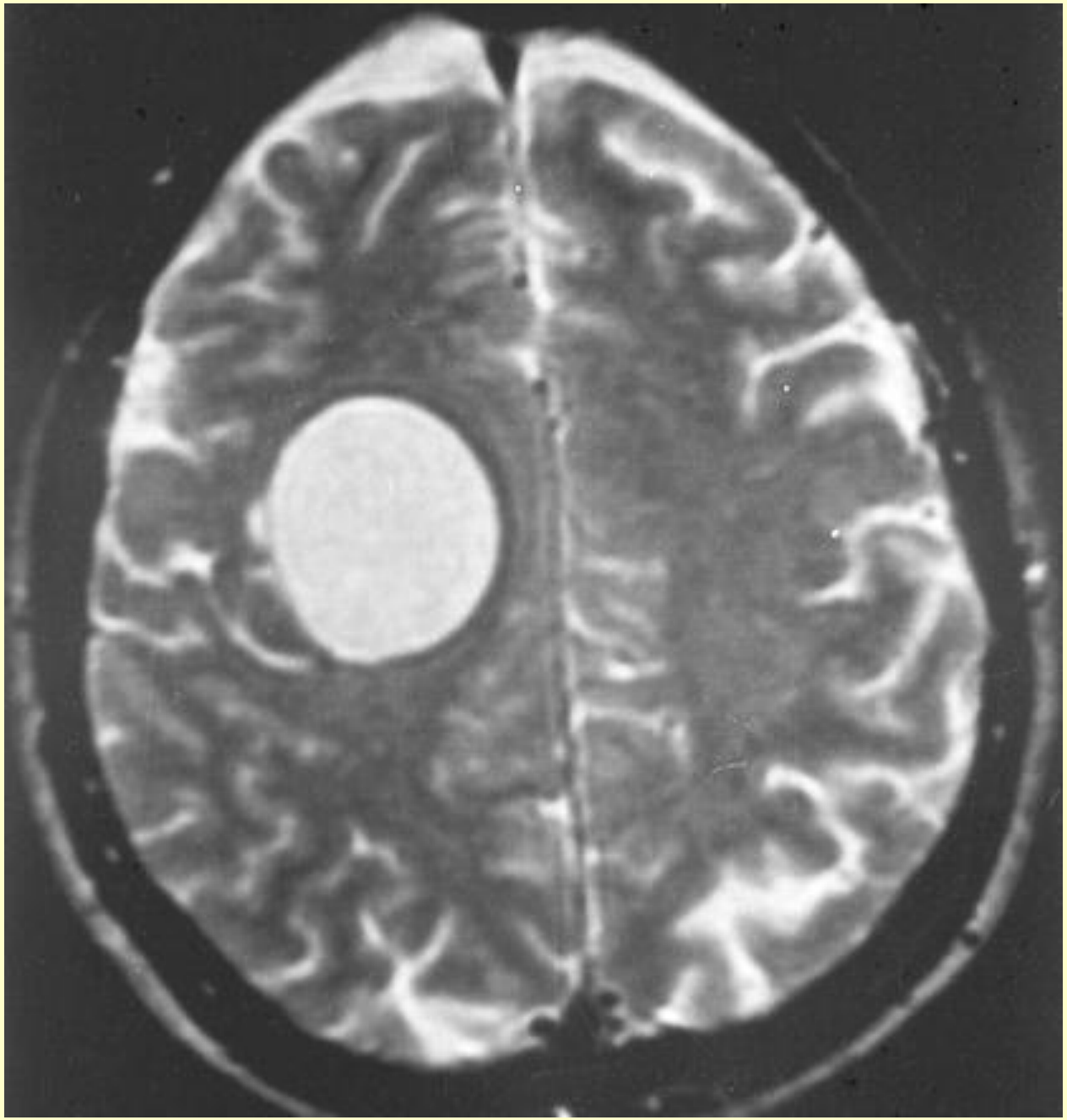
# Hydatid cyst



# Involvement of lungs

„Tumour“ of lungs
Chest pain
Chronic cough, expectoration, dyspnoe
Pneumothorax
Eosinophillic pneumonitis
Pleural effusion
Parasitic pulmonary embolus
Hemoptysis
Biliptysis





# Rupture of cyst

Spontaneous vs evoked (trauma)

Dissemination of infection; anaphylactic shock

# Diagnostics

- Eosinophilia not remarkable: up to 15%
- **Serology:**

**Limitations:**

- 10% patients with hepatic cyst and 60% with pulmonary cyst – false negative result
- Children up to 3 years – false negative result

# Imaging techniques – interpretation

- Simple cyst with clearly defined wall and uniform anechogenous composition - unlikely
- Cysts with remarkable different structure of wall - likely
- Cysts with septae – likely
- Solid heterogenous mass difficult to distinguish from granuloma or tumour, calcification – points out to echinococcosis

# Casoni skin test, replaced currently by serology

# Hydatic sand
# (movement of protoscolexes in cyst)

# Hydatid cyst, histology

# Therapy

Albendazole – 10 mg/kg 4 weeks, 12 cycles with 2 weeks breaks (sono, CT)

Praziquantel

Surgical removement

**PAIR** – Percutaneous Aspiration Injection (hypertonic saline, skolicidal solution, alcohol)