Nematodoses

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What signs or symptoms could indicate helminths contamination?

In the most cases,
diagnosing helminths infections
- just based on clinical signs
- is really impossible

Difficulties of diagnosis:

- ✓ **Most of those infected have no clinical signs;**
- ✓ **The same clinical symptoms may occur in case of infection with different types of helminths;**
- ✓ **Often clinical signs are to the signs of various diseases;**
- ✓ **The same type of helminth can cause different symptoms depending on the stage of its development in the human body;**

His first great publication was a study of parasitic worms, the *"Enterozoorum Sive Vermium Intestinalium Historia Naturalis"*. This is the first publication to describe the *Nematoda*.

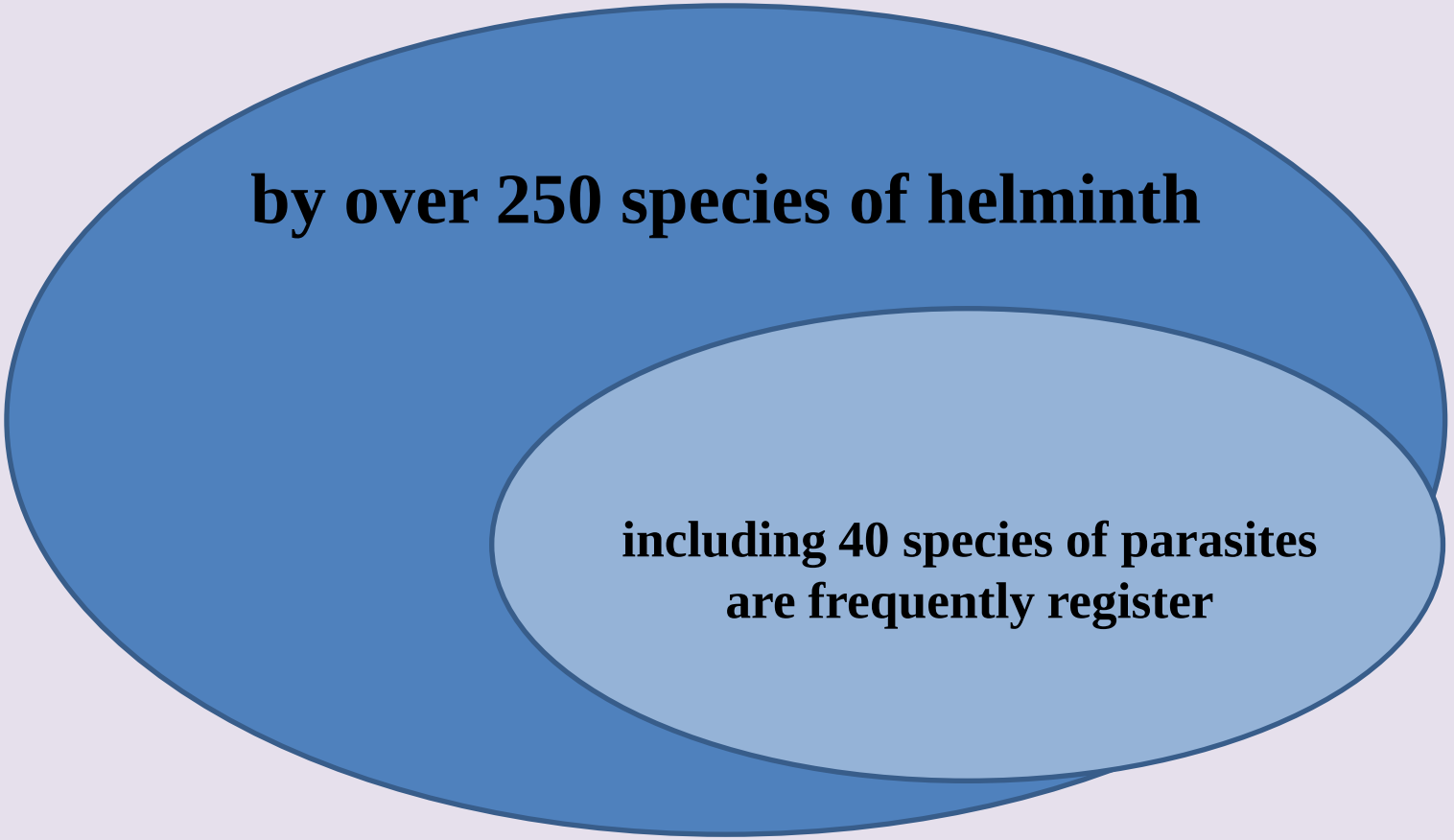
His second, the *"Synopsis cui accedunt mantissima duplex et indices locupletissima"* was the first work to detail the life cycle of important nematode parasites of humans, such as *Ascaris lumbricoides*.

Karl Asmund Rudolphi

(14 July 1771 – 29 November 1832) was a Swedish-born naturalist, who is credited with being the "father of helminthology".

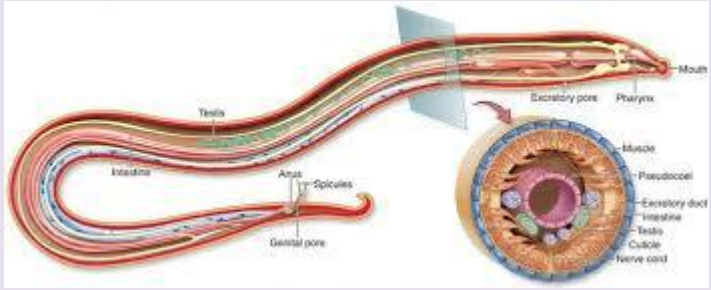
General particularities
of helminthiasis

The human body can be affected

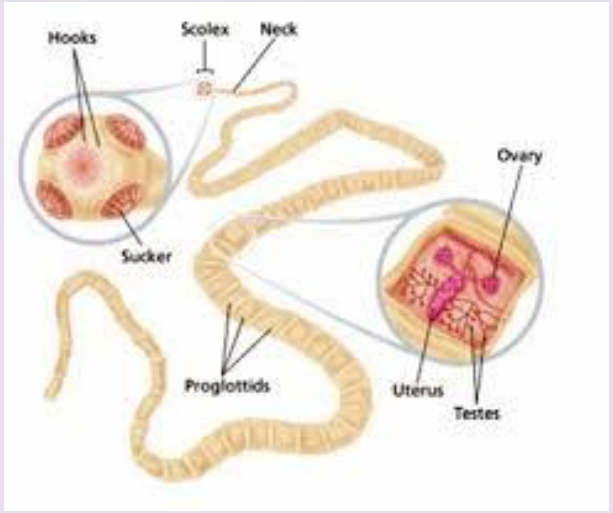


General particularities
of helminthiasis

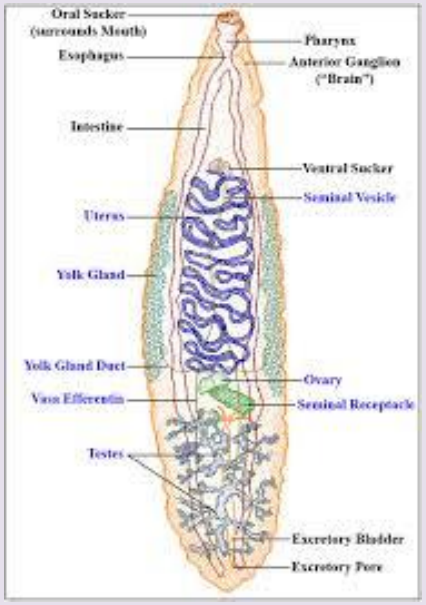
Parasitic helminthes are 3 types



Nematoda



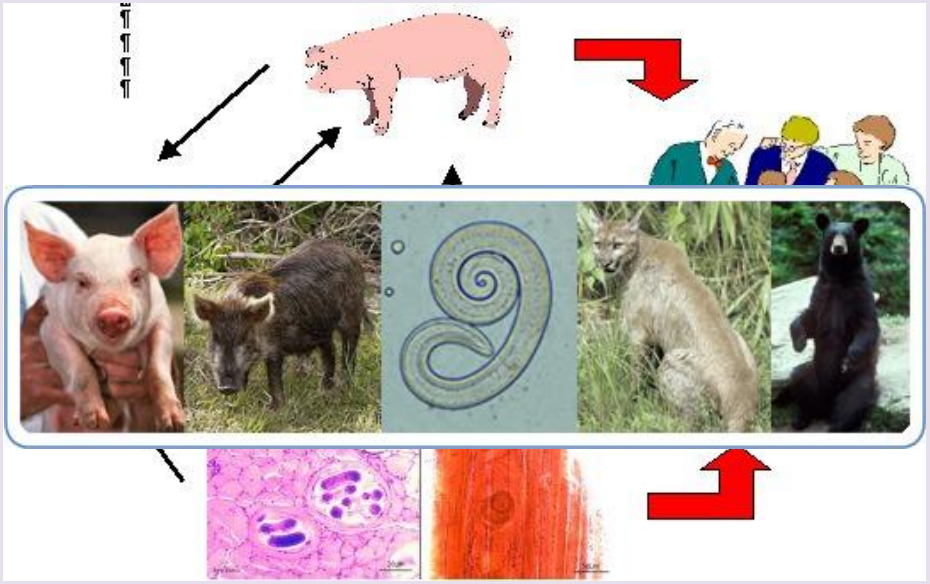
Cestoda



Trematoda

Classification of helminthiasis

based on the source of invasion



Antroponoses

Zooantroponoses

Classification of helminthiasis

based on the the particularities of the biological cycle

The pathological actions of helminths on the human body

Alergic reaction

Intoxication with anaerobic oxidation products

Mechanical action (compression) on the affected organ

Inhibition of immune system function

Affecting metabolic processes

Cancerous action

Clinical presentation

6-year-old daughter of seasonal farm worker

presents with malnourishment;

Abdominal swelling;

Cough;

Wheeze;

Fever;

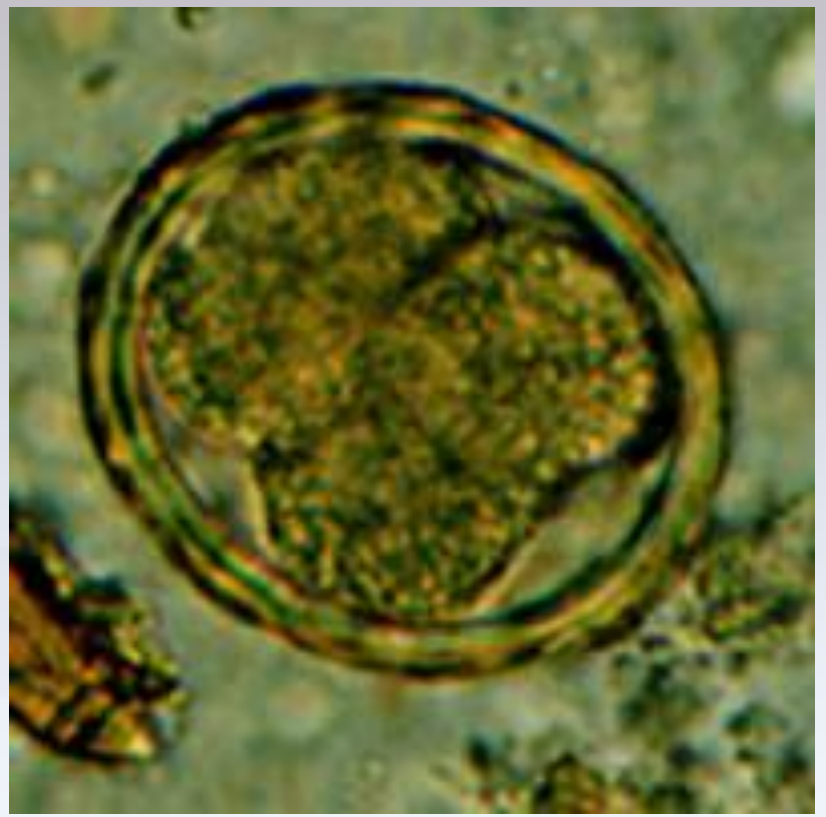
CXR reveals a lobar pneumonia

X-rays plain abdomen show suspicion of worms

Stool exam reveals:

Diagnosis?

A female may produce approximately 200.000 eggs per day



- ✓ **are remarkably resistant to environmental stresses;**
- ✓ **become infective after several weeks of maturation in the soil;**
- ✓ **can remain infective for years;**

Ascaris lumbricoides

The largest nematode parasite in the human intestin;

Adult worms reaching up to 40 cm in length, can live 1 to 2 years;

Ascaris lumbricoides

Life cycle

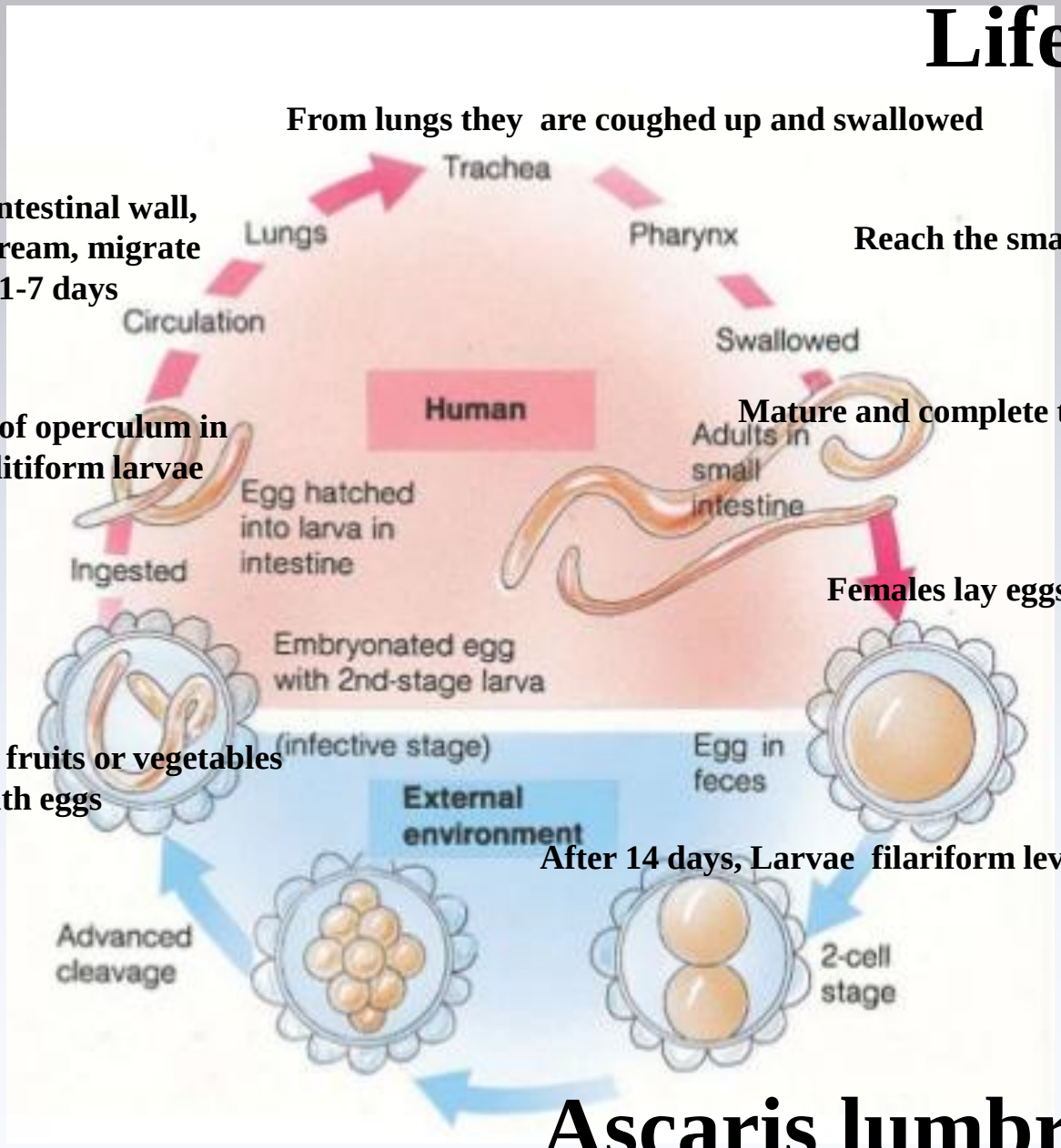
From lungs they are coughed up and swallowed

Larvae penetrate the intestinal wall, enter in portal blood stream, migrate to liver, heart, lungs in 1-7 days

Reach the small intestine

Larvae escape by way of operculum in small intestine rhabditiform larvae

Mature and complete their life cycle



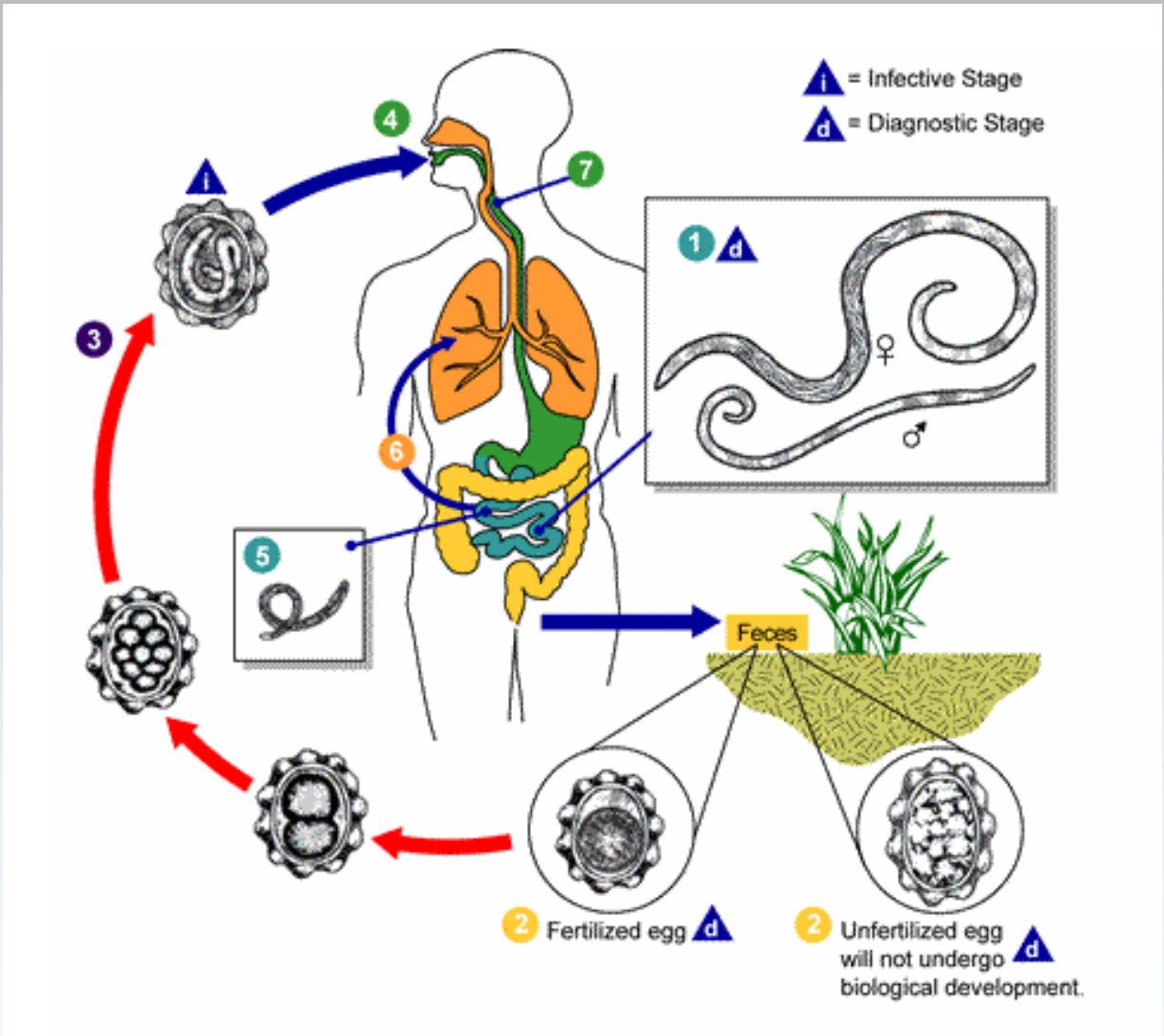
Females lay eggs in small intestine

Ingestion of raw fruits or vegetables contaminated with eggs

After 14 days, Larvae filariform levelop in eggs

Ascaris lumbricoides

Life cycle



Between 2 and 3 months elapse between initial infection and egg production

Ascaris lumbricoides

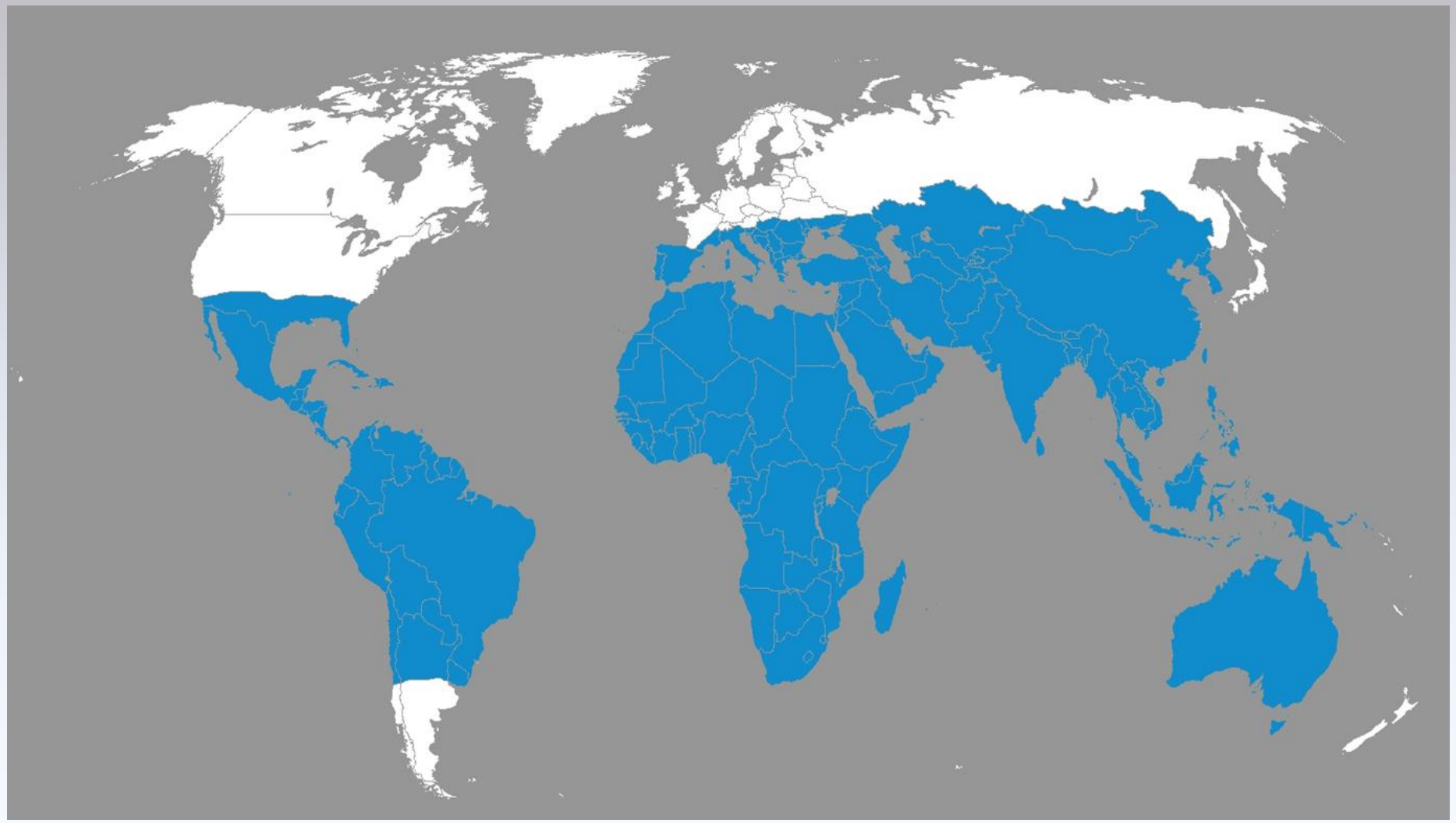
Modes of transmission

s

Ascaris lumbricoides

How many people in the world are estimated to be infected with Ascaris lumbricoides?

An estimated 1 billion people are infected
x 1 out of 4 in the world



Ascaris lumbricoides

Most common helminthic human infection – Wordwide;

High prevalence in underdeveloped countries that have poor sanitation;

Occurs during rainy months, tropical and subtropical countries;

Rural >urban; **Children >adults;**

Ascaris lumbricoides

Clinical Features

during the lung phase of larval migration

about 9 to 12 days

after egg ingestion,

patients may develop an:

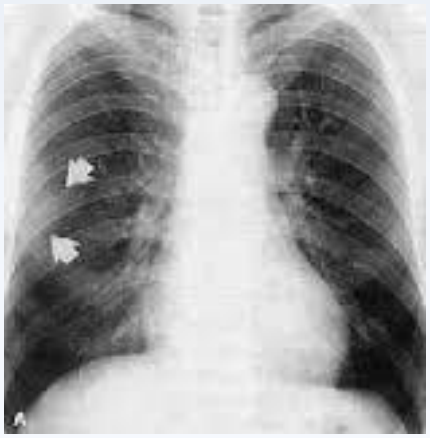
- ✓ **irritating nonproductive cough;**
- ✓ **burning substernal discomfort;**
- ✓ **deep inspiration;**
- ✓ **dyspnea;**
- ✓ **blood-tinged sputum;**

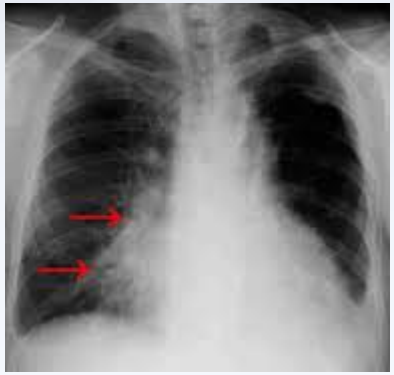
Ascaris lumbricoides

Symptoms

associated with larval migration in the lungs

- ✓ **Some larvae migrate to ectopic sites and depend upon and location , cause various inflammatory and severe allergic reactions;**
- ✓ **Worms destroy capillaries in the lungs, causing hemorrhage;**
- ✓ **Migration of white blood cells lead to more congestion - Loeffler‘s pneumonia;**
- ✓ **Breathing difficulties, fever, asthmatic attacks, urticaria;**
- ✓ **Lung tissue destroyed and bacterial infection occur, me be fatal;**
- ✓ **Aspiration of a vomited worm can result in death;**





Ascaris lumbricoides

These are caused by inflammatory infiltrates and small areas of necrosis and pulmonary hemorrhage. In severe larval *Ascaris* infections, there may be a disseminated bronchopneumonia with diffuse small nodular infiltrates (**Figs. 10.32** and **10.33**). Blockage of a bronchus by an adult worm may precipitate collapse and pneumonia distal to the obstruction (**Fig. 10.34**). The death of a migrating larva within the lung may result in a pulmonary granuloma as fibrosis forms around it; the roentgen appearance will be that of a solitary pulmonary nodule.

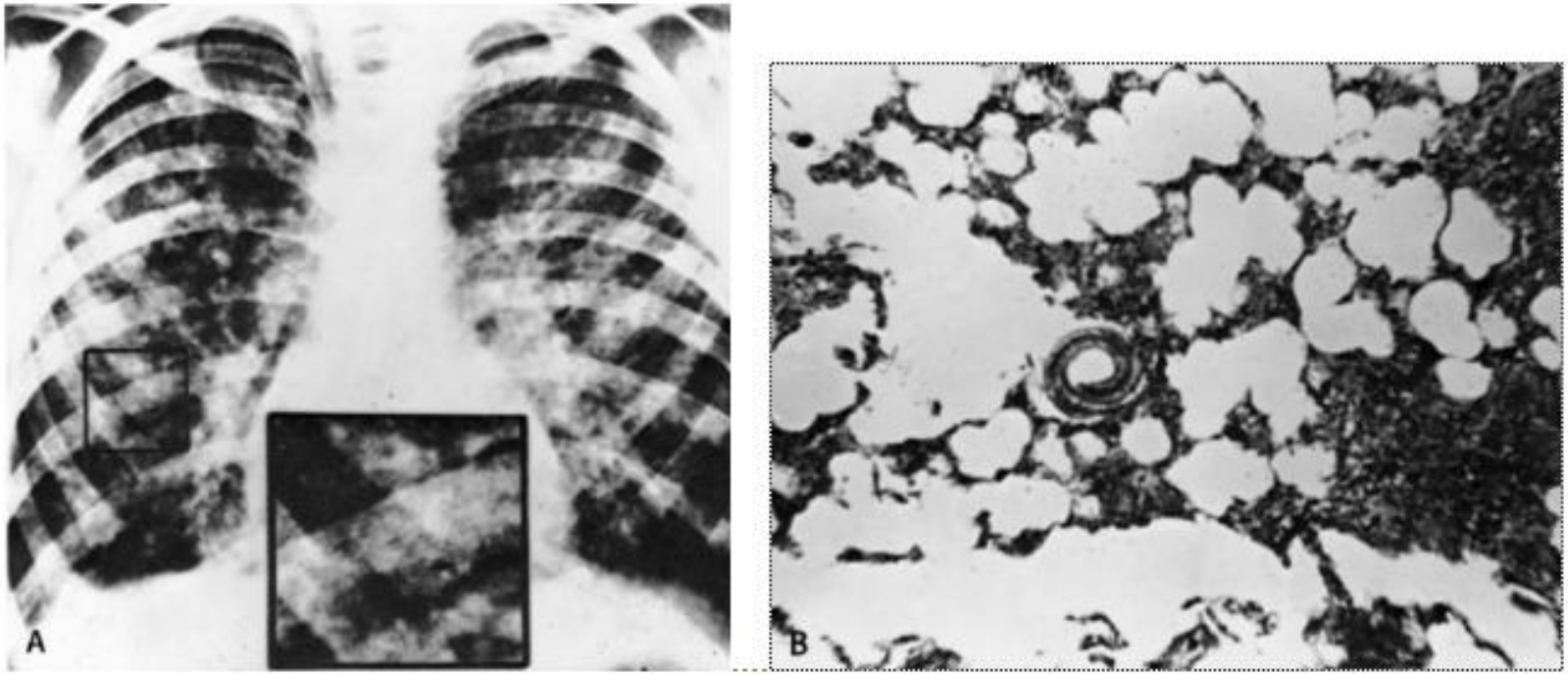


Fig. 10.32. (A) *Ascaris* bronchopneumonia in an African child with a severe larval infection. Small nodular infiltrates are seen throughout both lungs. (Courtesy of the late Dr. Benjamin Felson, Cincinnati, Ohio.) (B) Coiled *A. lumbricoides* larva in an alveolus of an experimentally infected guinea pig. The surrounding interstitial infiltrate contained eosinophils and histiocytes.

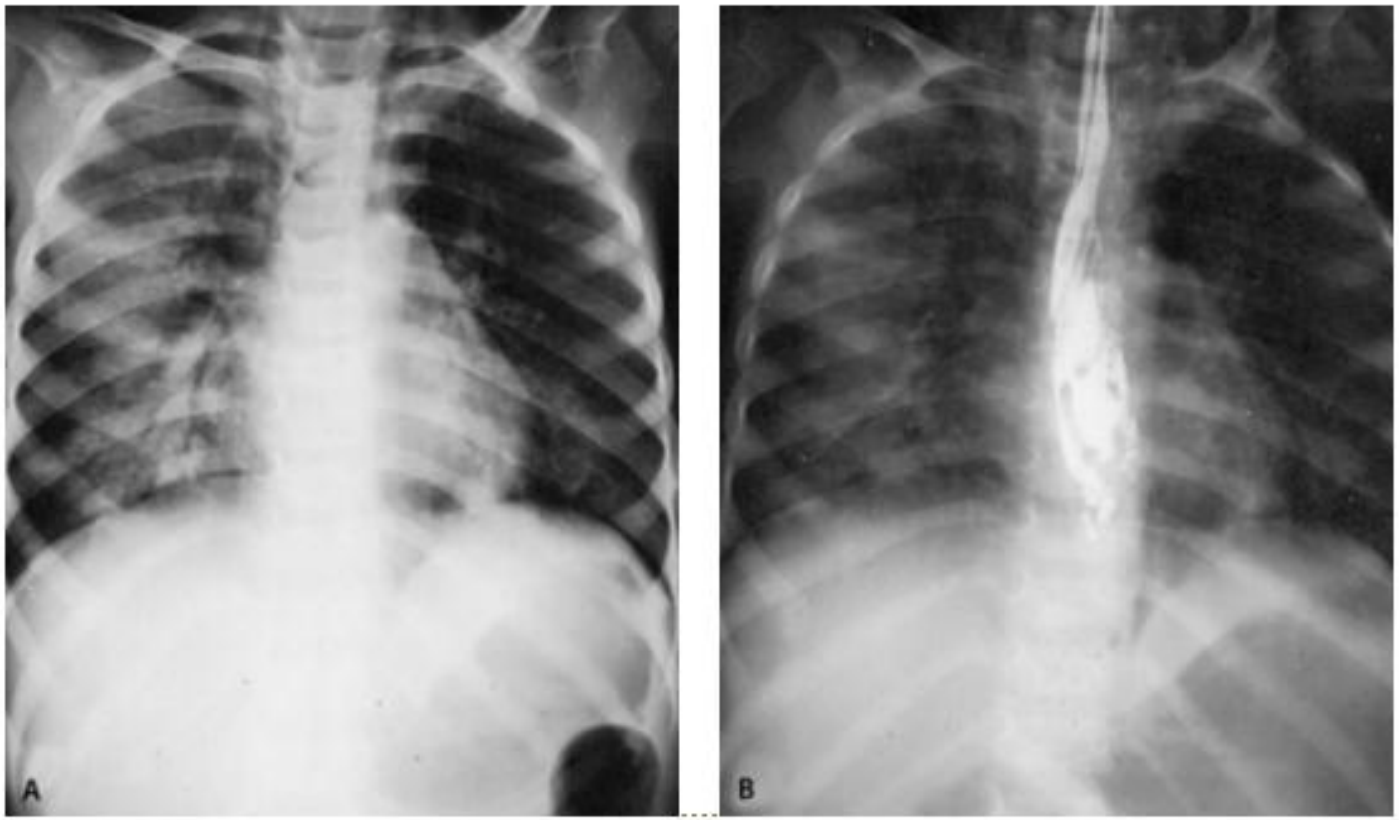


Fig. 10.33. Ascariasis of the lungs, esophagus, stomach and intestines of a 6-year-old Puerto Rican boy, who was coughing up and vomiting ascarids. There is a bilateral pneumonitis caused either by migrating larvae of *Ascaris* within the lungs or by aspiration (**A**). The outlines of several adult ascarids can be seen within the stomach and splenic flexure of the colon (**A** and **B**). When contrast media is instilled into the esophagus, several ascarids are outlined in this unusual location (**B**).

Fig. 10.34 Adult *Ascaris* blocking the left main stem bronchus in a young child from Alabama with intestinal ascariasis. There is complete collapse of the left lung with shift of the heart, mediastinum, and trachea towards the left side and elevation of the left hemidiaphragm. (Courtesy of Dr. Longstreet C. Hamilton, Fairhope, Alabama).

Symptoms

associated with adult parasite in the intestine

- ✓ **Usually asymptomatic – 85%;**
- ✓ **Normal worm activities – rob the host of nutrients, malnutrition especially in children in severe cases;**
- ✓ **Heavy worm load can retard physical and mental development;**
- ✓ **If worms migrate to stomach, acid irritates them leading to nausea, abdominal pain, restlessness and allergic reactions;**
- ✓ **Penetration of the intestine or appendix can be lead to peritonitis which is often fatal;**
- ✓ **Sometimes fatality may occur when mass of worms cause extrahepatic biliary and intestinal obstruction;**

Ascaris lumbricoides

Complications

- ✓ Intestinal obstruction;
- ✓ Obstruction of intrahepatic and extrahepatic bile ducts;
- ✓ Peritonitis caused by intestinal perforation;
- ✓ Chronic pancreatitis;
- ✓ Acute and chronic appendicitis;
- ✓ Pneumonitis, bronchitis and asthma;

Ascaris lumbricoides

Laboratory diagnosis

Macroscopic identification
of adults passed in stool
or through the mouth or nose;

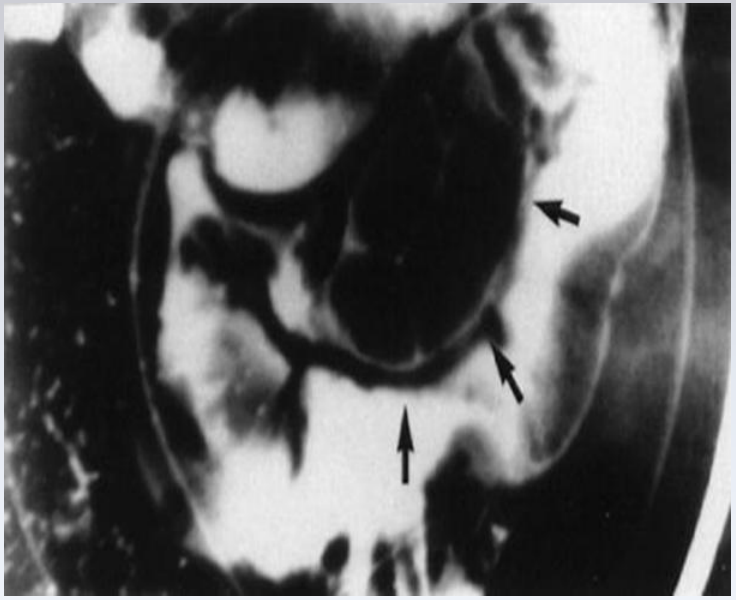
Larval worms
detection in sputum

Stool microscopy
Eggs may be identified on direct stool examination

Ascaris lumbricoides

Imaging and ultrasound exams

In heavily infested individuals particularly children, large collection of worms may be detectable on plain film of the abdomen;



Ultrasound exams can help to diagnose:

- ✓ **hepato-biliary ascariasis;**
- ✓ **single worms, bundles of worms, or pseudo-tumor;**
- ✓ **individual body segments of worms;**

Ascaris lumbricoides

Endoscopic exams

Endoscopic Retrograde Cholangio-pancreatography:
a duodenoscope with a snare to extract the worm out of the patient

Ascaris lumbricoides

Clinical case

11-year-old female

Doing poorly in school

Anorectic

Complains of itching in rectal region throughout the day

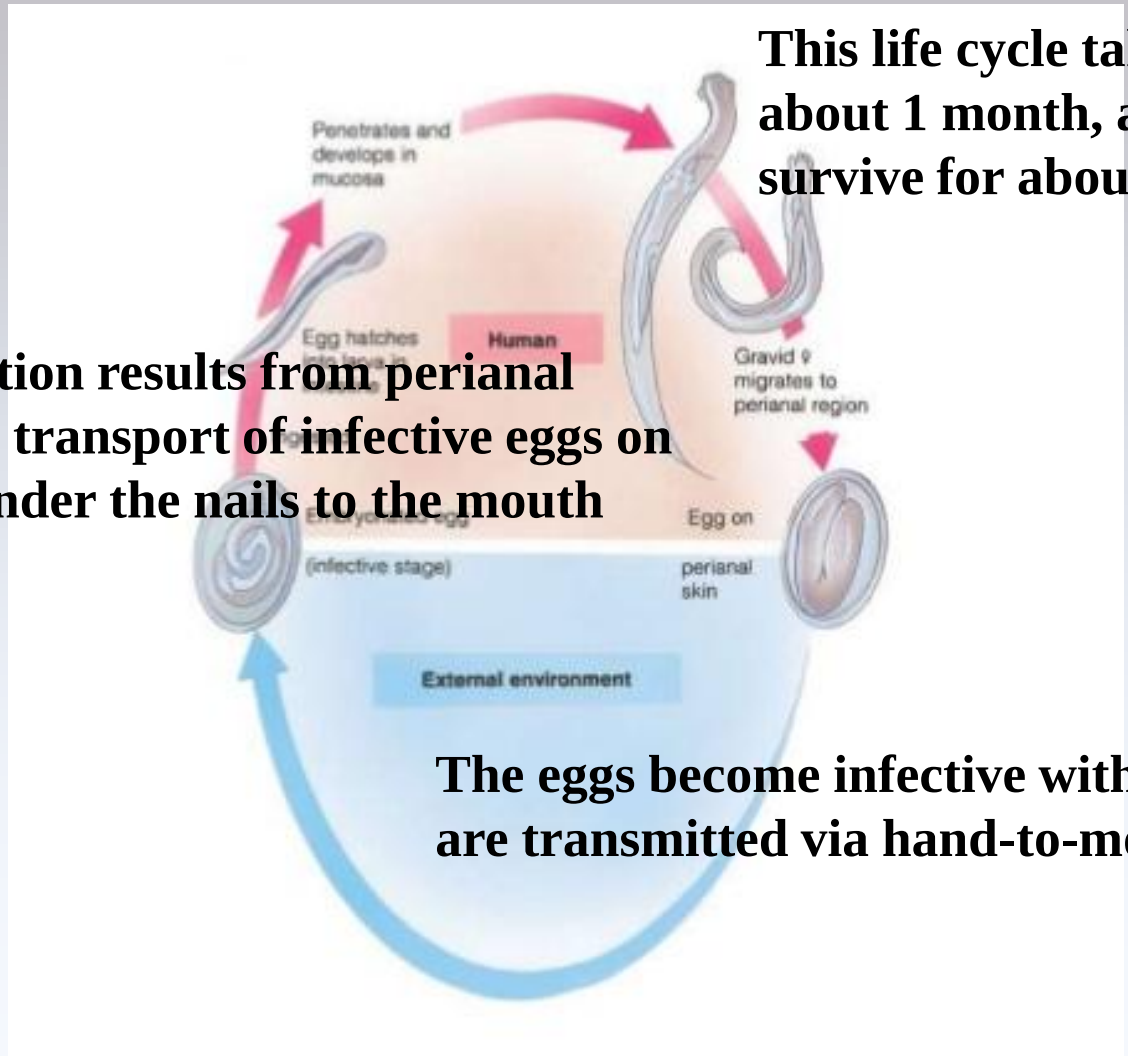
A scotch – tape test reveals

Diagnosis?

Enterobius vermicularis

Life cycle

This life cycle takes about 1 month, and adult worms survive for about 2 months

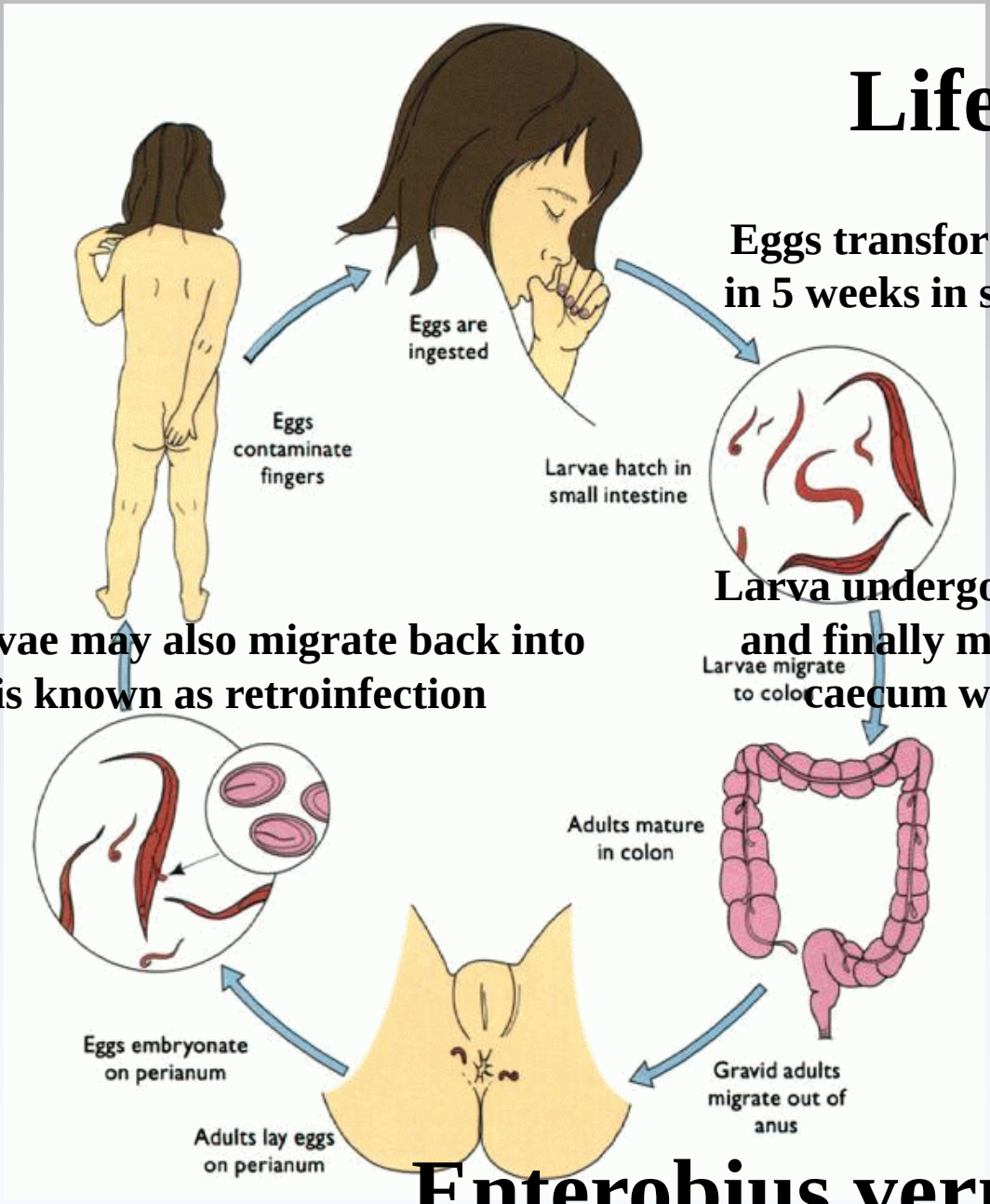


Life Self- infection results from perianal scratching and transport of infective eggs on the hands or under the nails to the mouth

The eggs become infective within hours and are transmitted via hand-to-mouth passage

Enterobius vermicularis

Life cycle



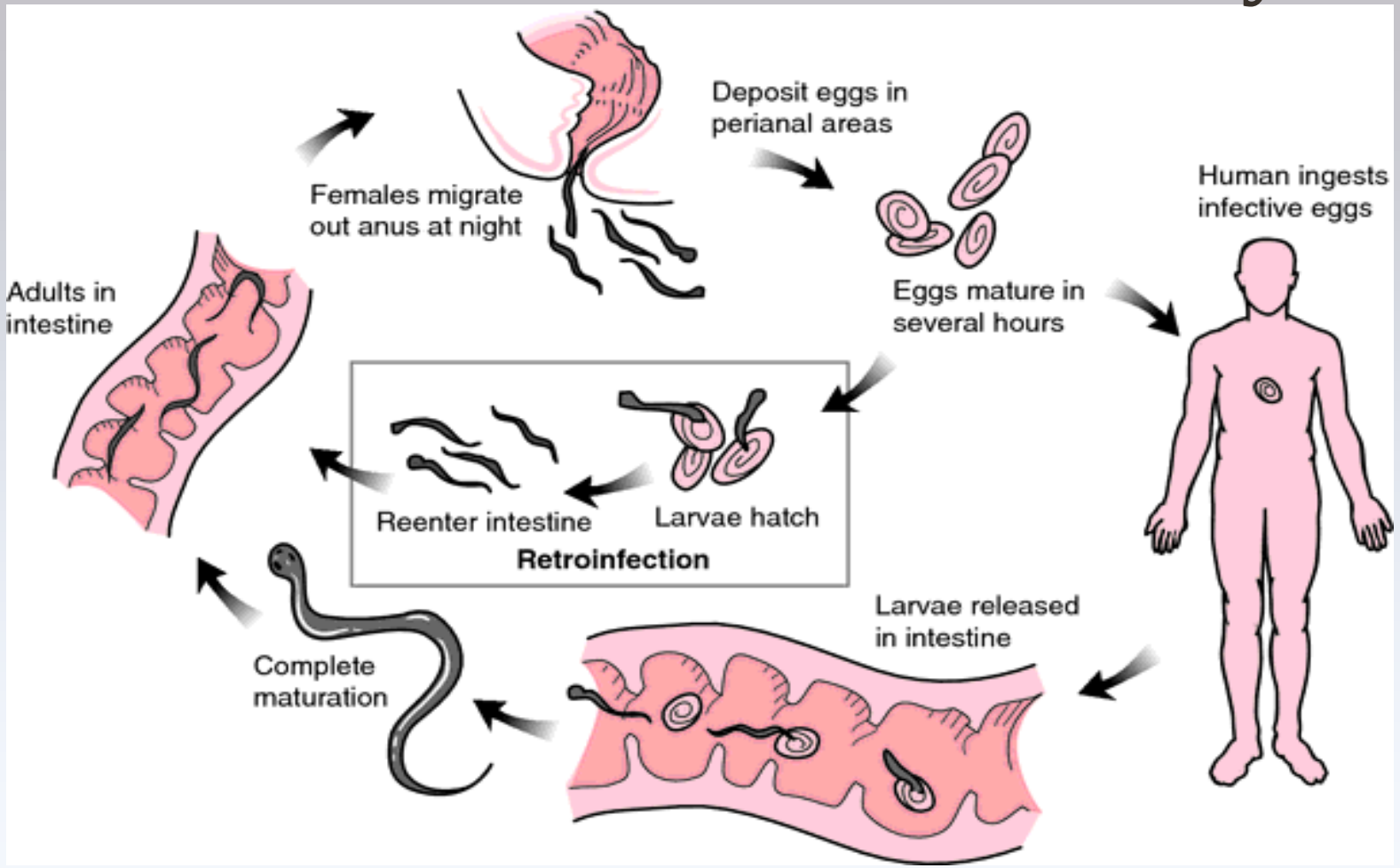
Eggs transform in to larvae in 5 weeks in small intestine

Larva undergo moulting in ileum and finally mature in to adult in caecum with in 15 to 30 days

Newly hatched larvae may also migrate back into the anus, and this is known as retroinfection

Enterobius vermicularis

Life cycle



In *Enterobius vermicularis* infestations there is auto-inoculation: humans reinfect themselves continuously and can carry a large number of worms inside.

Enterobius vermicularis

The transport of infective eggs on the hands or under the nails to the mouth.

Enterobius vermicularis

Geographical distribution

Enterobius vermicularis is more common in temperate countries than in the tropics

In temperate zones with about 30~50% of the population infected

It is estimated that 500 million people are infected Worldwide

Enterobius vermicularis

Clinical Features

- ✓ **Most pinworm infections are asymptomatic;**
- ✓ **Perianal pruritus is the cardinal symptom;**
- ✓ **The itching is often worse at night owing to the nocturnal migration of the female worms, and it may lead to excoriation and bacterial super-infection;**
- ✓ **Heavy infections have been claimed to cause abdominal pain and weight loss;**
- ✓ **Eosinophilia or elevated levels of serum IgE are rare;**

Enterobius vermicularis

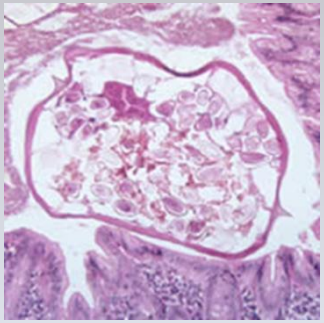
Symptomatology

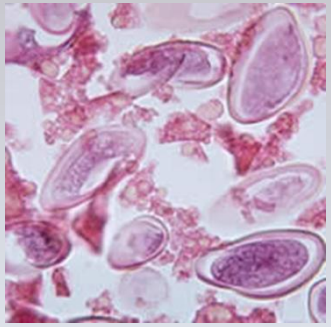
Children may experience loss of appetite, abdominal pain, insomnia and restlessness are the usual symptoms associated with pin worm infections.

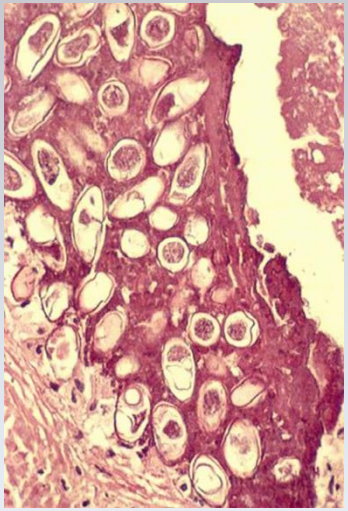
Enterobius vermicularis

Complications

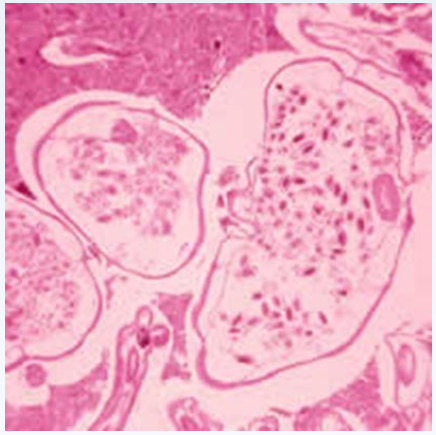
<u>Sometimes</u>: Pinworm may migrate up the reproductive tract, cause:







- ✓ **Vaginitis;**
- ✓ **Salpingitis;**
- ✓ **Endometritis;**
- ✓ **Granuloma in uterus and fallopian tubes;**
- ✓ **Prostatitis;**
- ✓ **Urethritis;**



<u>Occasionally</u>: Invasion of the female:

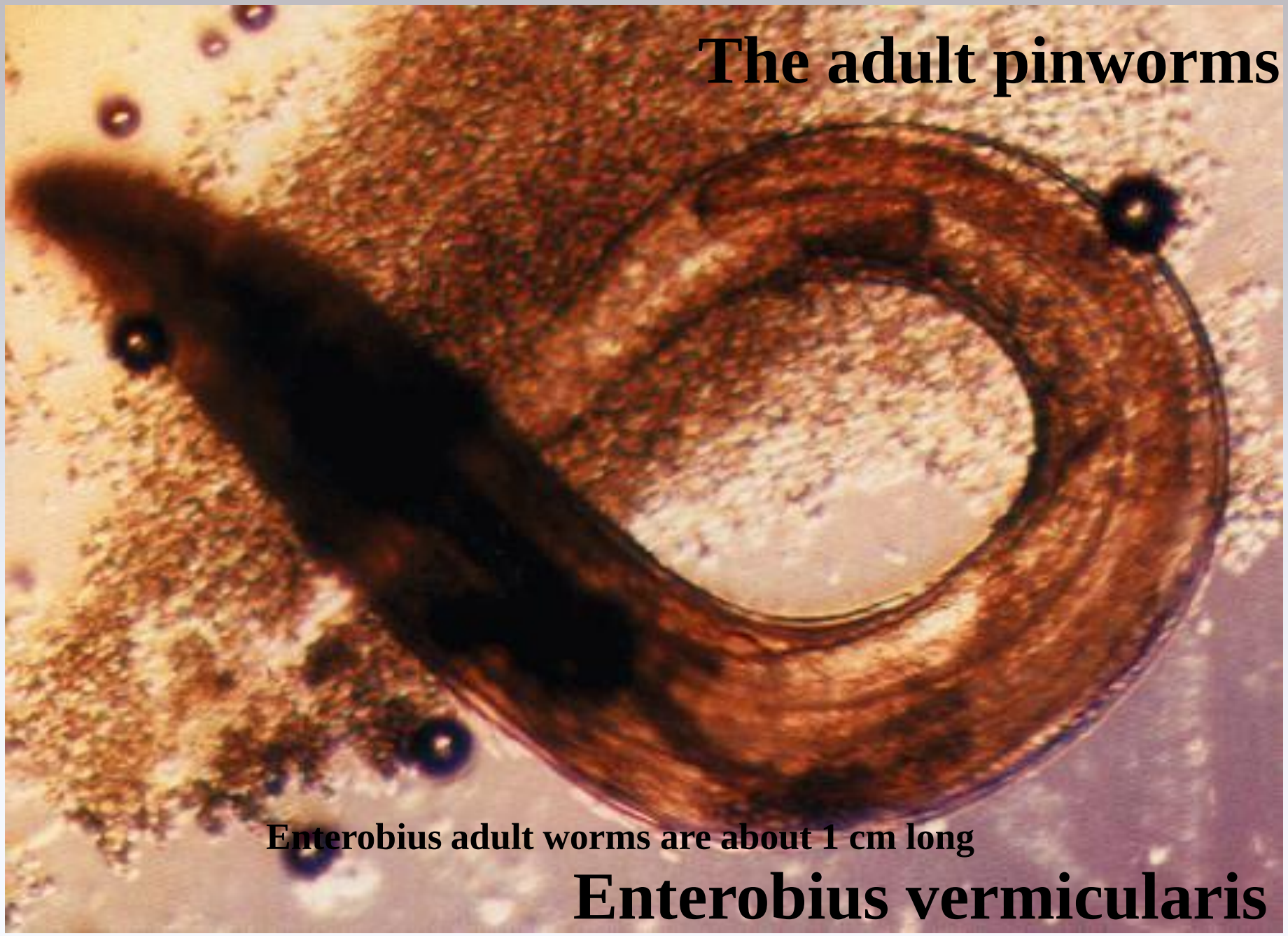
- ✓ **to the appendix;**
- ✓ **the peritoneal cavity;**
- ✓ **or the urinary bladder may occur;**

Enterobius vermicularis

Multiple adult pinworms on perianal skin

Enterobius vermicularis

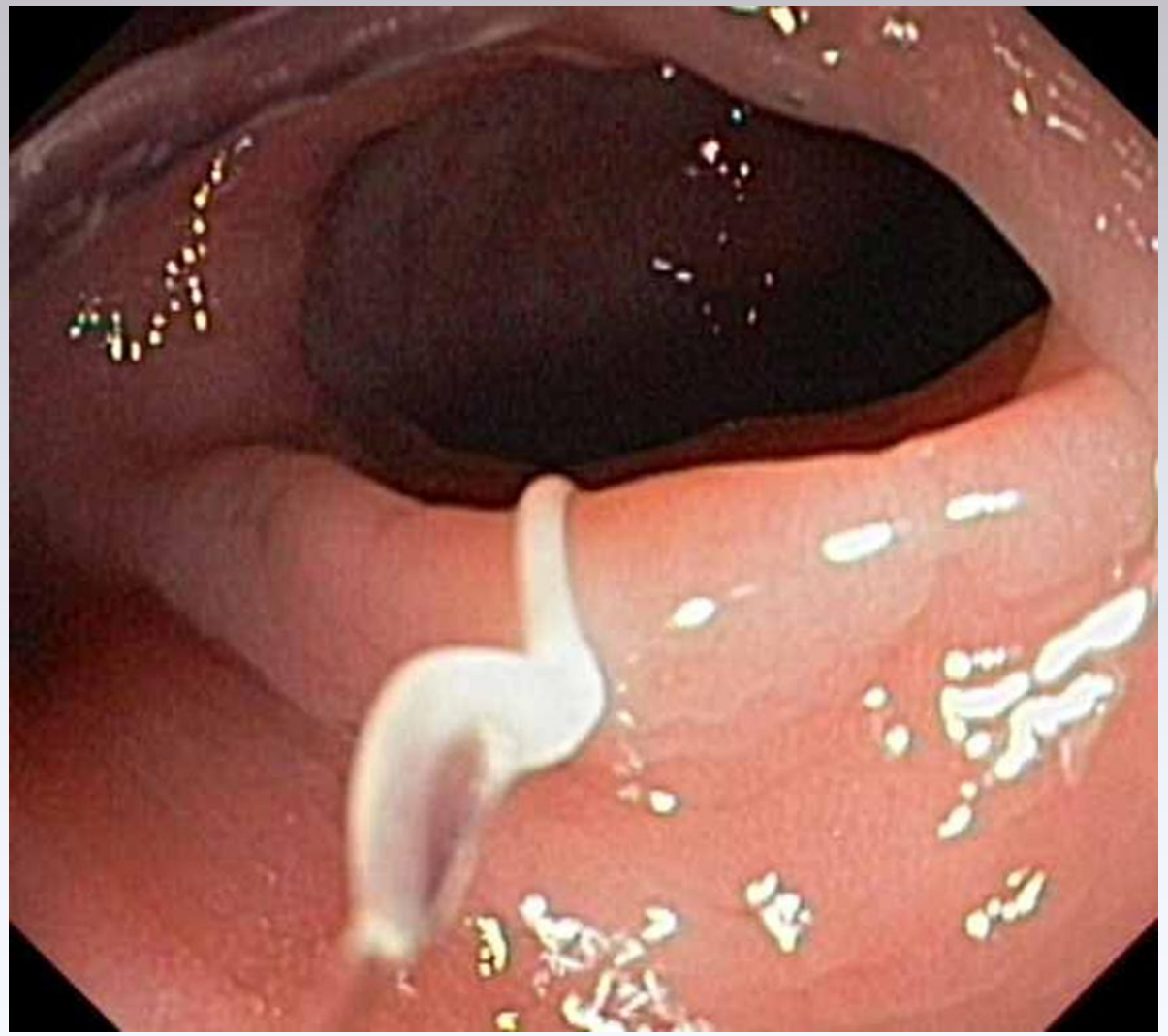
The adult pinworms



Enterobius adult worms are about 1 cm long

Enterobius vermicularis

Pinworm in sigmoid colon



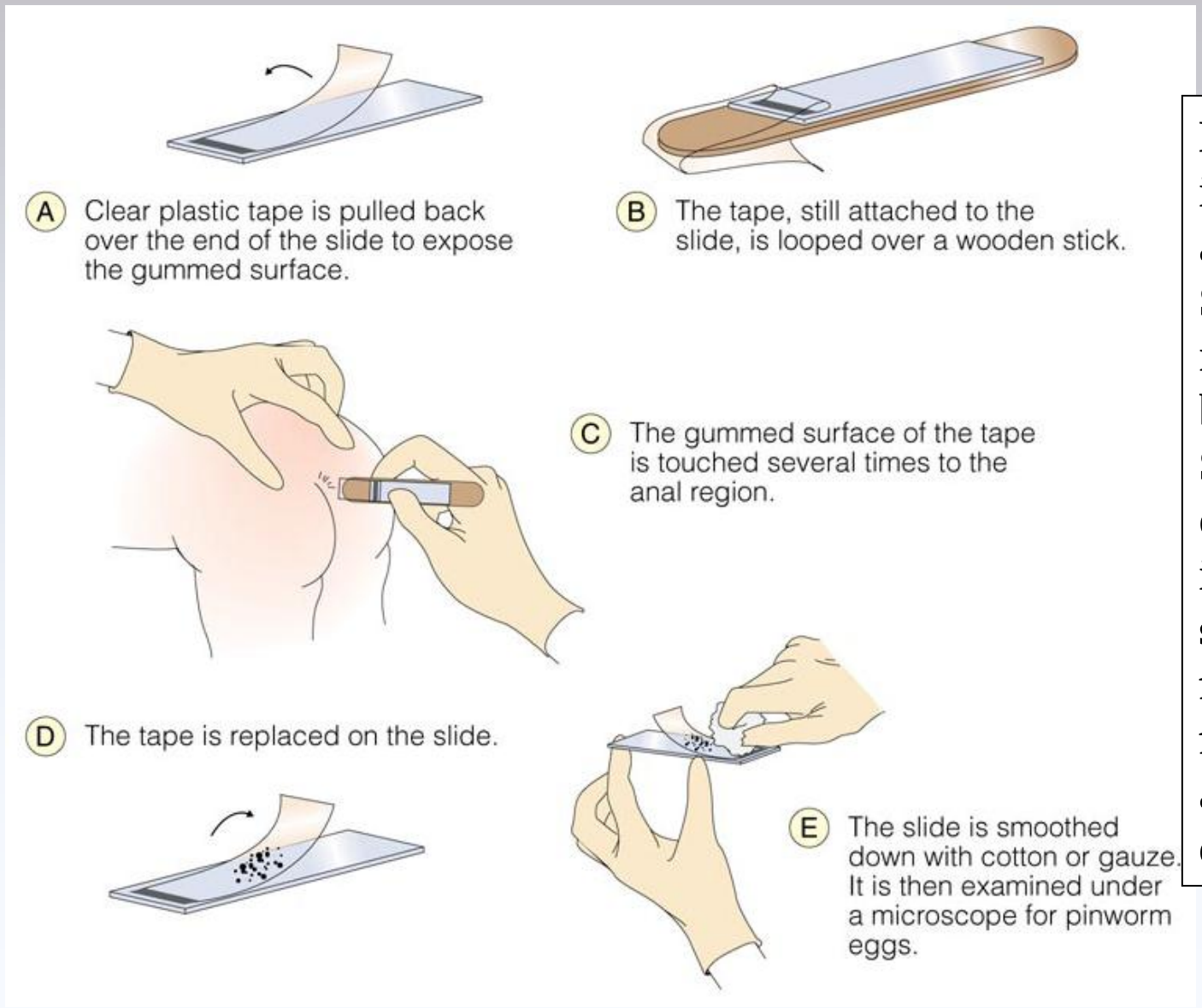
Enterobius vermicularis


DR MURRA

Diagnosis

- ✓ **Since pinworm eggs are not usually released in the bowel, the diagnosis cannot be made by looking for eggs in the feces.**
- ✓ **Instead, eggs deposited in the perianal region are detected by the application of clear cellulose tape to the perianal region in the morning. After the tape is transferred to a microscope slide, will reveal the characteristic pinworm eggs.**

Diagnosing Pinworm Disease



Do test immediately after waking up. Several samples might need to be examined. Since scratching of the anal area is common, samples taken from under the fingernails may also contain eggs.

Clinical case

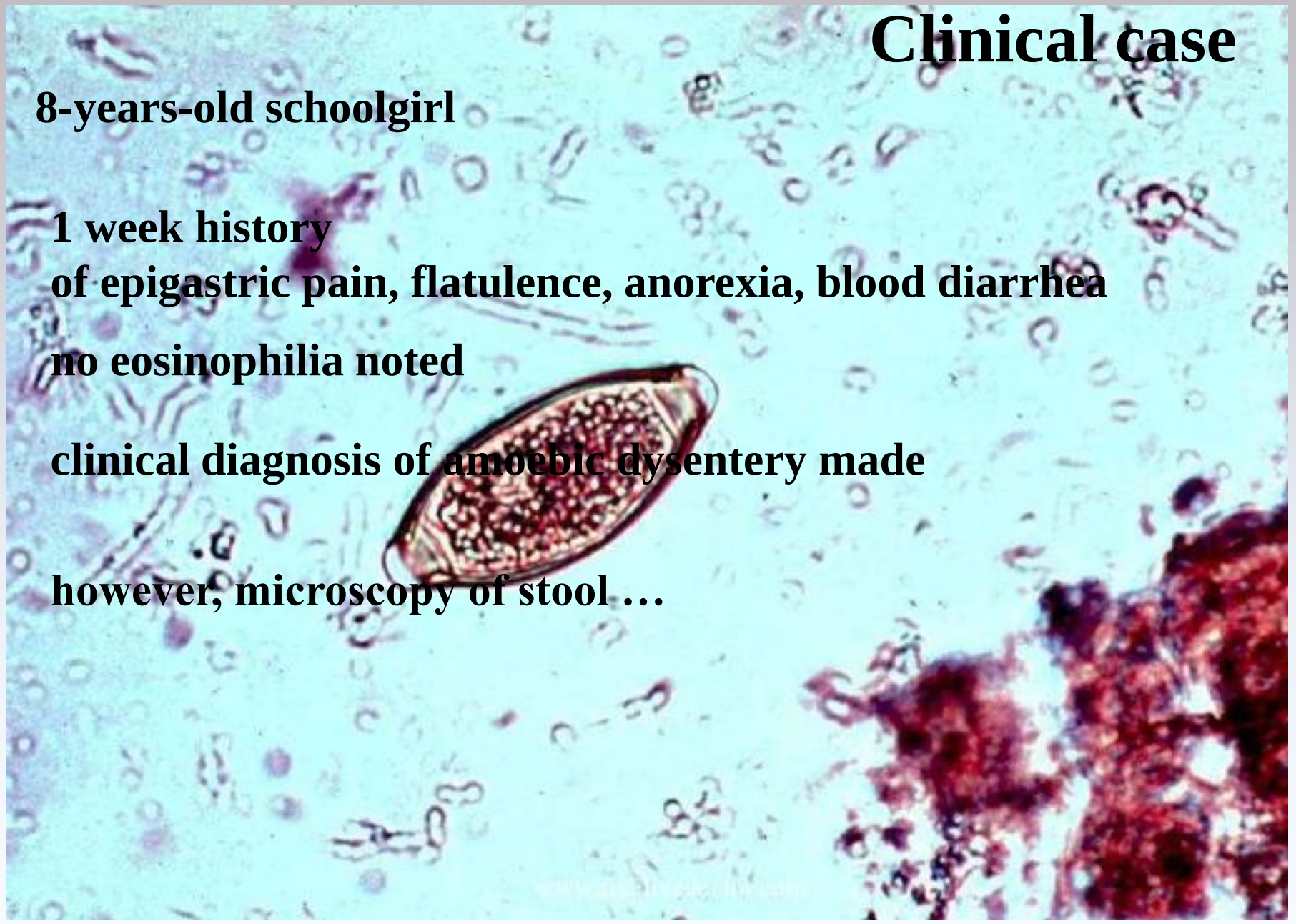
8-years-old schoolgirl

1 week history
of epigastric pain, flatulence, anorexia, blood diarrhea

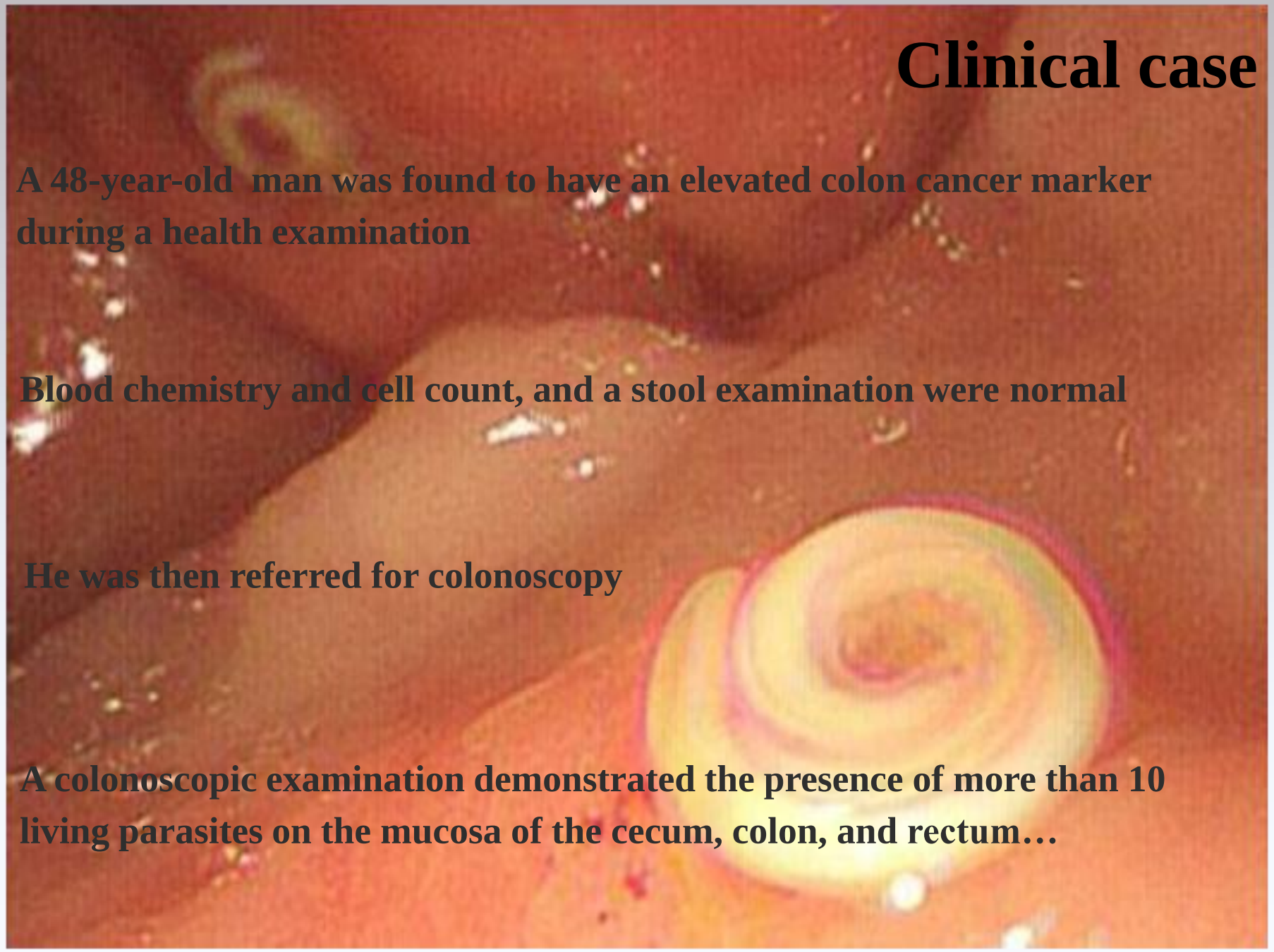
no eosinophilia noted

clinical diagnosis of amoebic dysentery made

however, microscopy of stool …



Clinical case



A 48-year-old man was found to have an elevated colon cancer marker during a health examination

Blood chemistry and cell count, and a stool examination were normal

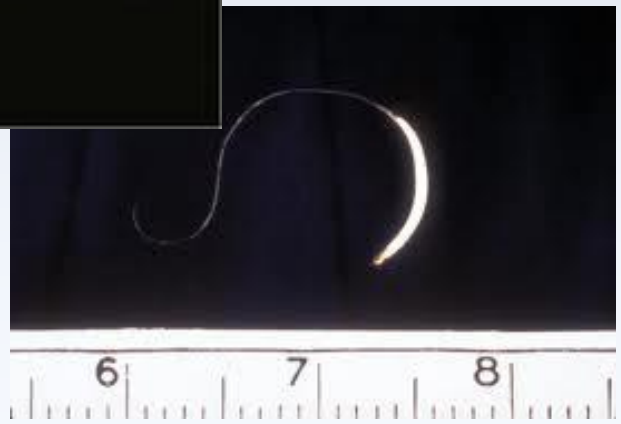
He was then referred for colonoscopy

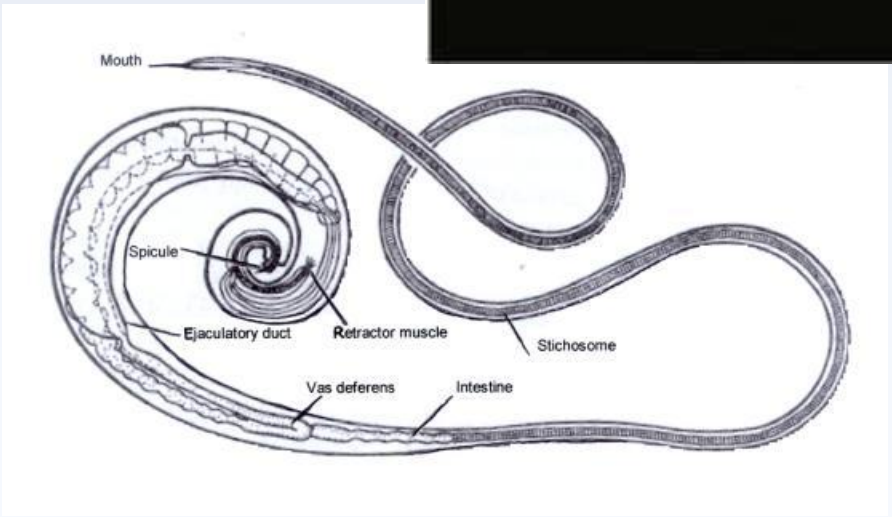
A colonoscopic examination demonstrated the presence of more than 10 living parasites on the mucosa of the cecum, colon, and rectum…

Diagnosis?

Etiology

Adult worms are 30 to 50 mm long with a large, thread-like anterior end that is embedded in the mucosa of large intestine.

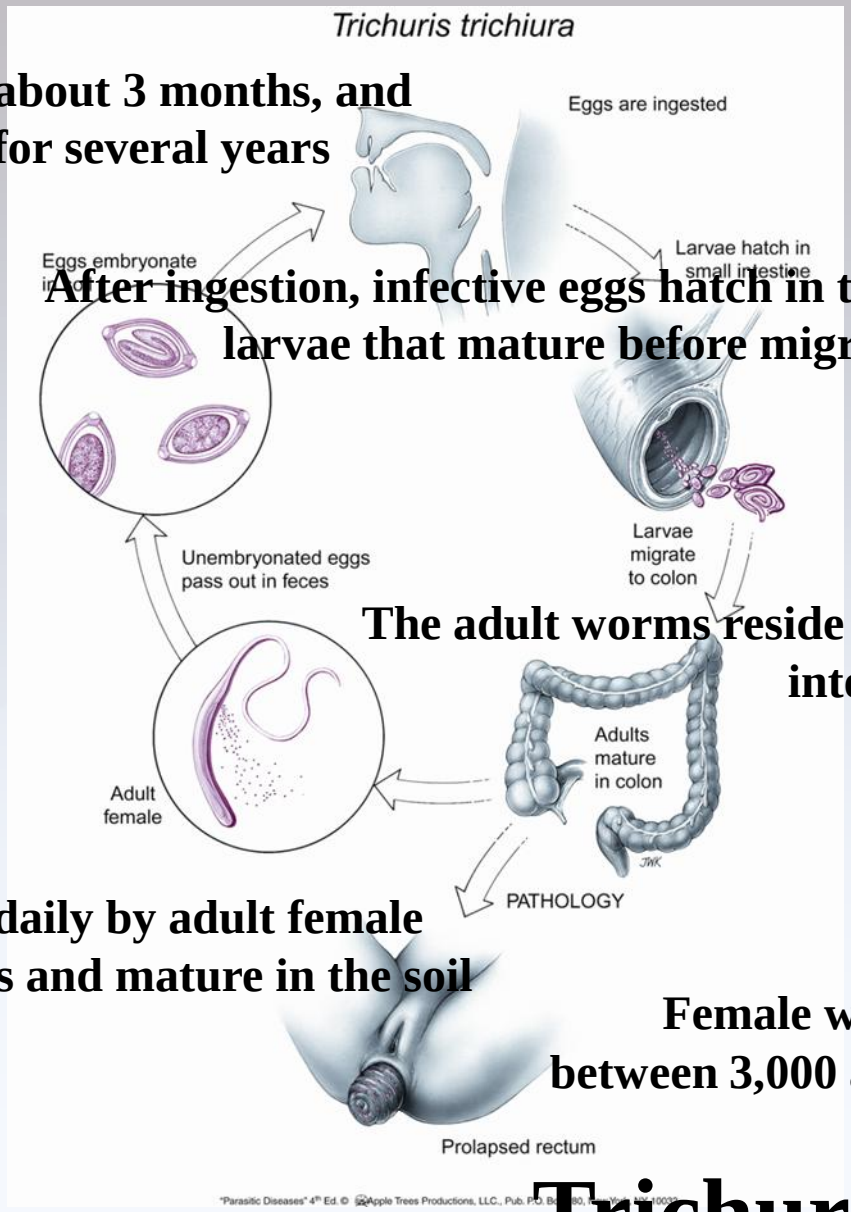




Trichuris trichiura

Life cycle

The entire cycle takes about 3 months, and adult worms may live for several years



After ingestion, infective eggs hatch in the duodenum, releasing larvae that mature before migrating to the large bowel

The adult worms reside in the colon and cecum, into the superficial mucosa

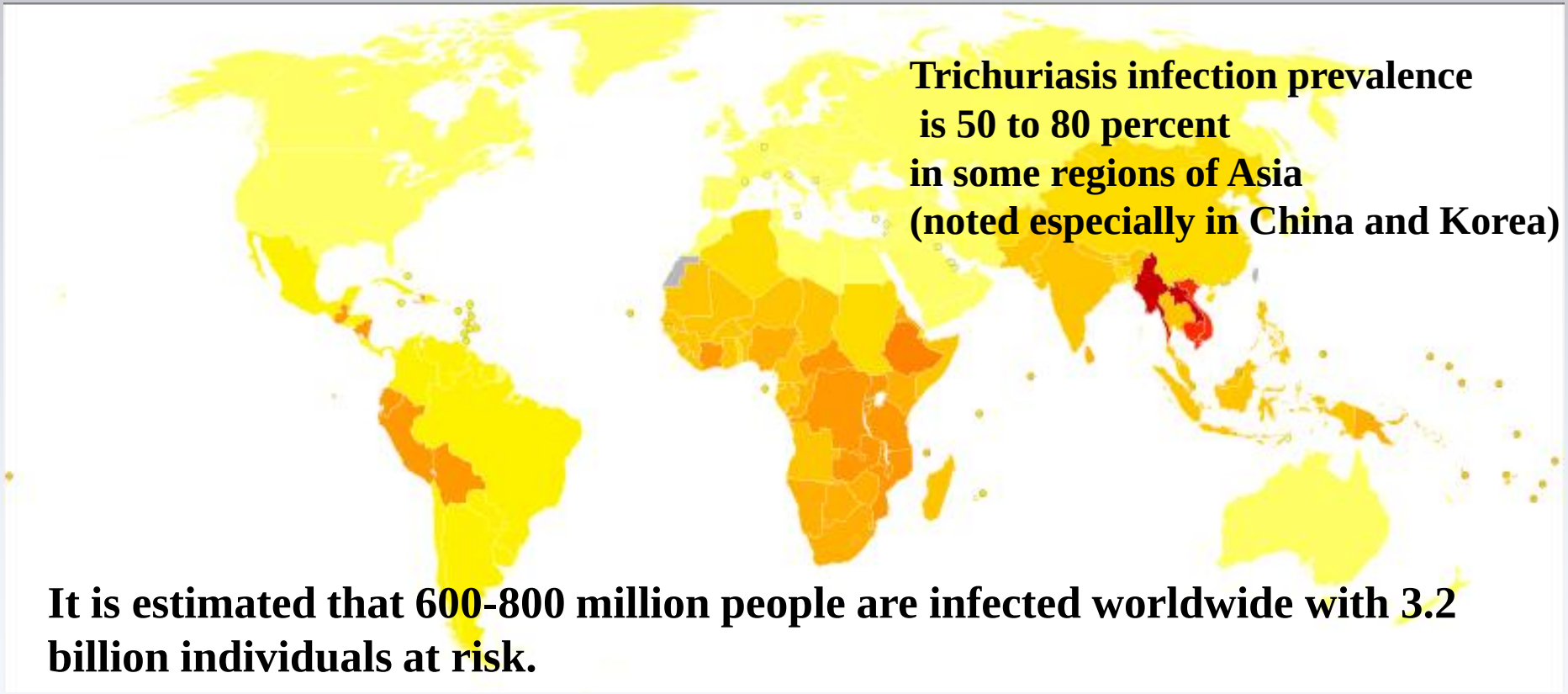
Thousands of eggs laid daily by adult female worms pass via the feces and mature in the soil

Female worms in the cecum shed between 3,000 and 20,000 eggs per day

Eggs become infective in 15 to 30 days

Trichuris trichiura

Trichuris trichiura is the third most common nematode of humans



Trichuriasis infection prevalence is 50 to 80 percent in some regions of Asia (noted especially in China and Korea)

It is estimated that 600-800 million people are infected worldwide with 3.2 billion individuals at risk.

The parasite is more common in the tropics and in areas of poor sanitation. It is coendemic with ascaris and hookworm species.

Clinical manifestations

Children with heavy infestations can develop *Trichuris trichiura* colitis that mimics inflammatory bowel disease and leads to anemia, physical growth restriction.

In severe it can lead to clubbing of fingers

Trichuris trichiura

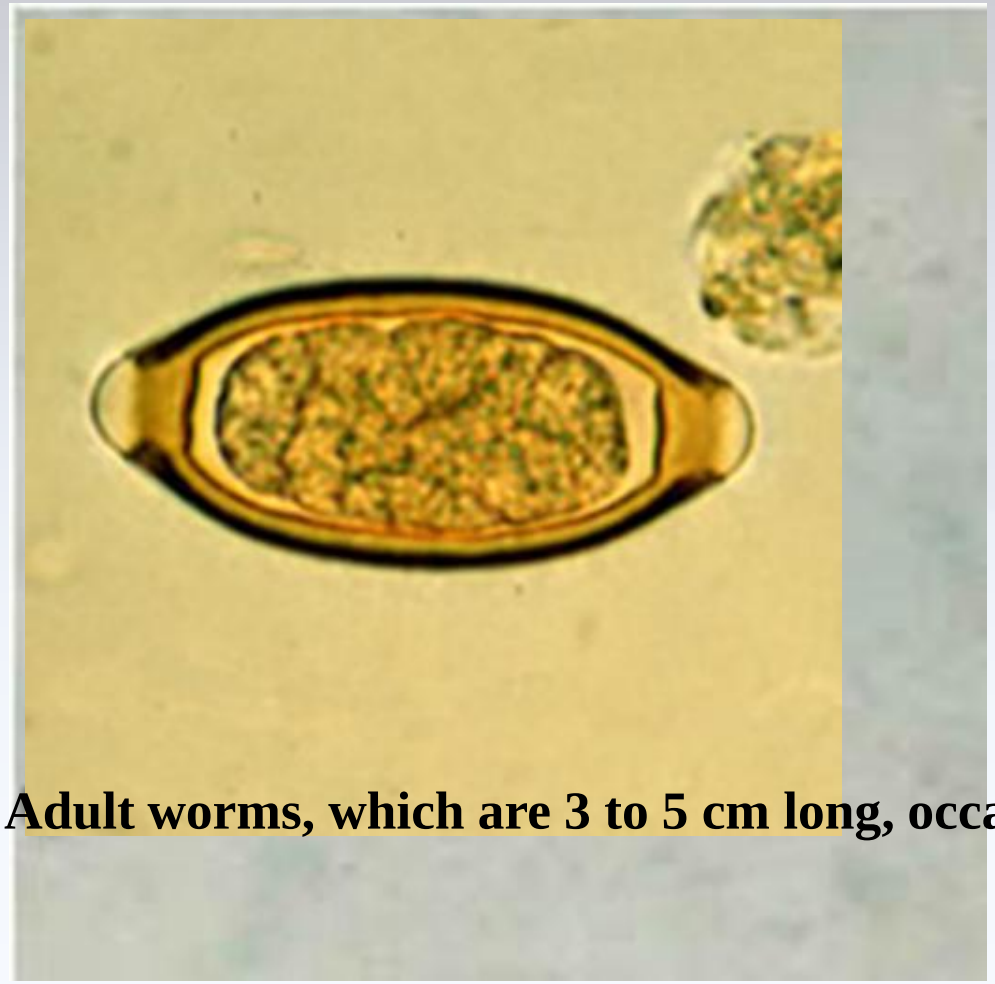
Clinical manifestations

T trichiura **dysenter**
abdominal pain, ten
can be associated w

Trichuris trichiura

Diagnostic tests

The characteristic - 50- by 20-um lemon-shaped whipworm eggs are detected on direct examination of stool or by using concentration techniques.



Adult worms, which are 3 to 5 cm long, occasionally can be seen on proctoscopy

Trichuris trichiura


DR. MURRA

The two primary drugs used to treat Trichuriasis are albendazole and mebendazole

Clinical case

A 56-year-old female

about 3 weeks before the hospitalization the patient had suffered from nausea, vomiting, epigastria pain, and non-bloody diarrhea

the following week, increasing muscular pain, weakness, arthralgia, oedema and fatigue resulted in severe walking difficulties and difficulty in chewing and swallowing

the symptoms did not respond to non-steroidal anti-inflammatory drugs

her temperature was 38 °C, and she was conscious and cooperative, but in a poor general condition with trismus, severe muscle pain and tenderness, diffuse weakness and generalized edema

and she was unable to move her lower extremities

Diagnosis?

Clinical case

The patient admitted to have eaten pork a few days before the onset of abdominal symptoms

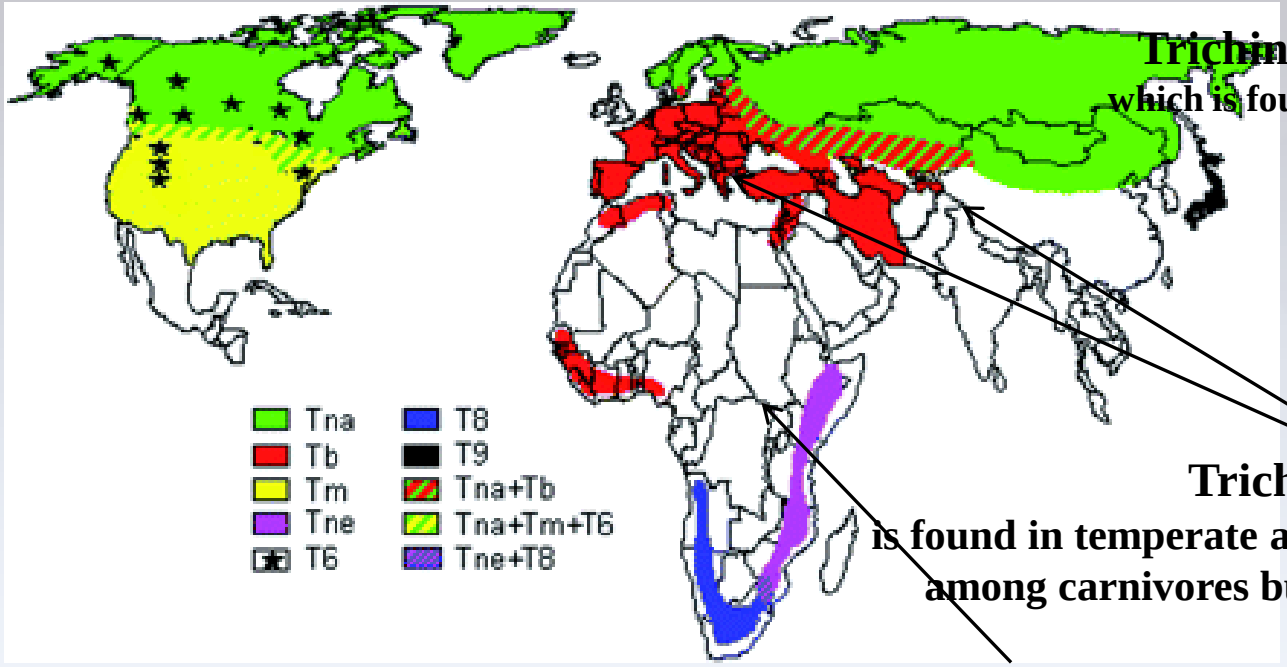
Serum Trichinella antibodies obtained on day 9 were positiv;

A femoral muscle biopsy performed on day 16 showed numerous non-encapsulated motile larvae Trichinella species on microscopy, with diffuse muscle inflammation

Two species are distributed worldwide

Trichinella spiralis

which is found in a great variety of carnivorous and omnivorous animals,



Trichinella pseudospiralis,

which is found in mammals and birds

Trichinella britovi

is found in temperate areas of Europe and western Asia among carnivores but not among domestic swine;

Trichinella nelsoni

is found in equatorial Africa,

where it is common among felid predators and scavengers such as hyenas and bush pigs

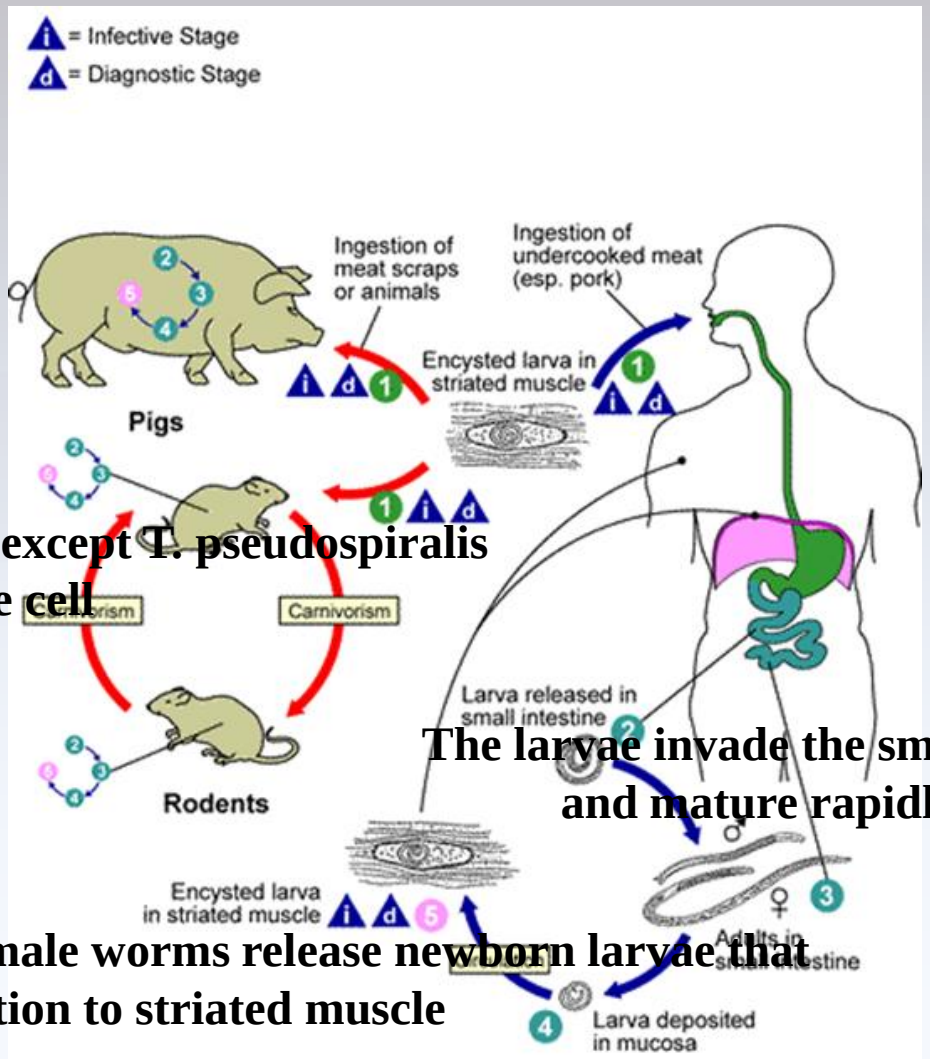
Trichinella nativa

is present in Arctic regions and infects bears

Five species of Trichinella are now recognized as causes of infection in humans

Life cycle

Develops after the ingestion of meat containing larves of Trichinella spiralis - pork or meat from a carnivore



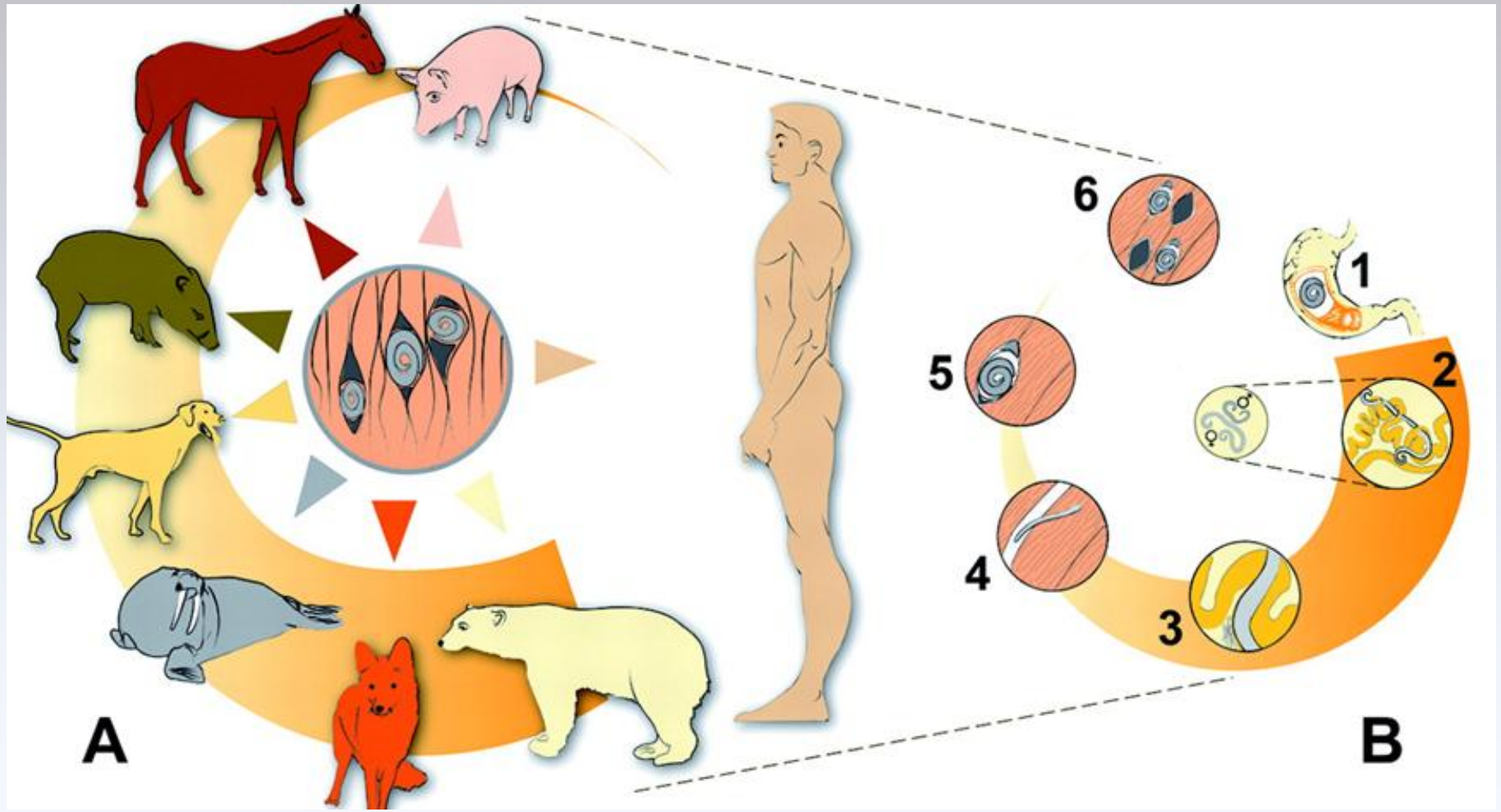
The larvae of all species except T. pseudospiralis then encyst in the muscle cell

The larvae invade the small – bowel mucosa and mature rapidly into adult worms

After about 1 week, female worms release newborn larvae that migrate via the circulation to striated muscle

Trichinella spiralis

Life cycle



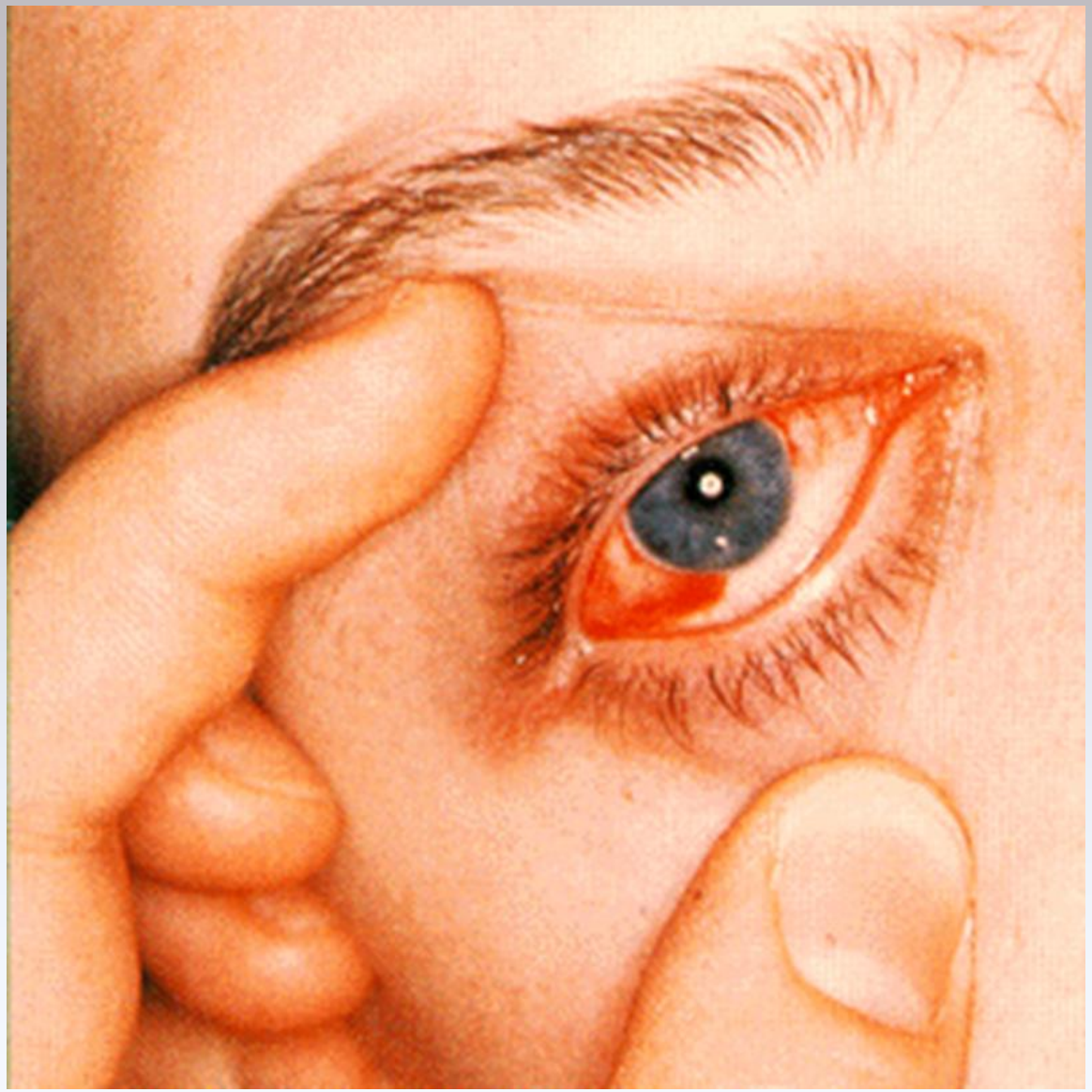
Trichinella spiralis

Clinical symptoms of trichinosis

Successive phases of	Clinical simptoms
enteric invasion	diarrhea during the first week after infection; abdominal pain, constipation, nausea, or vomiting; prolonged and fulminant diarrhea noted probably reflects a response to repeated infection;
parasite larval migration	marked local and systemic hypersensitivity reaction: fever, hypereosinophilia, periorbital and facial edema, hemorrhages in the subconjunctivae, retina, nail beds ("splinter" hemorrhages);
muscle encystment	myositis with myalgias, muscle edema, weakness develop, usually with the inflammatory reactions to migrating larvae;

Periorbital and eyelid edema in acute trichinosis

Periorbital edema is considered a classic sign of parenteral trichinellosis, however it is not pathognomonic;



Subconjunctival hemorrhages in trichinosis

Trichinosis is manifested by splinter hemorrhages under the finger nails

Complications

In case of heavy infection

larvae can migrate to vital organs

causing potentially dangerous complications

Encephalitis

Myocarditis

Meningitis

Bronchopneumonia

Sinusitis

Nefritis

Trichinella spiralis

Laboratory findings and diagnosis

Blood eosinophilia

develops in more than 90 % of patients with symptomatic trichinosis and may peak at a level of greater than 50 %

Serum levels of IgE

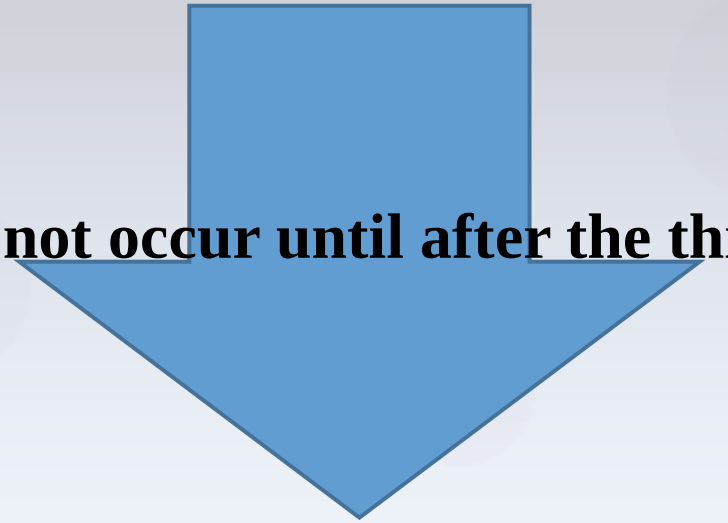
Muscle enzymes

(Creatine phosphokinase, Lactate dehydrogenase and Aspartate aminotransferase)

Trichinella spiralis

Imuno-Diagnosis

The titer of parasite-specific antibody



which usually does not occur until after the third week of infection

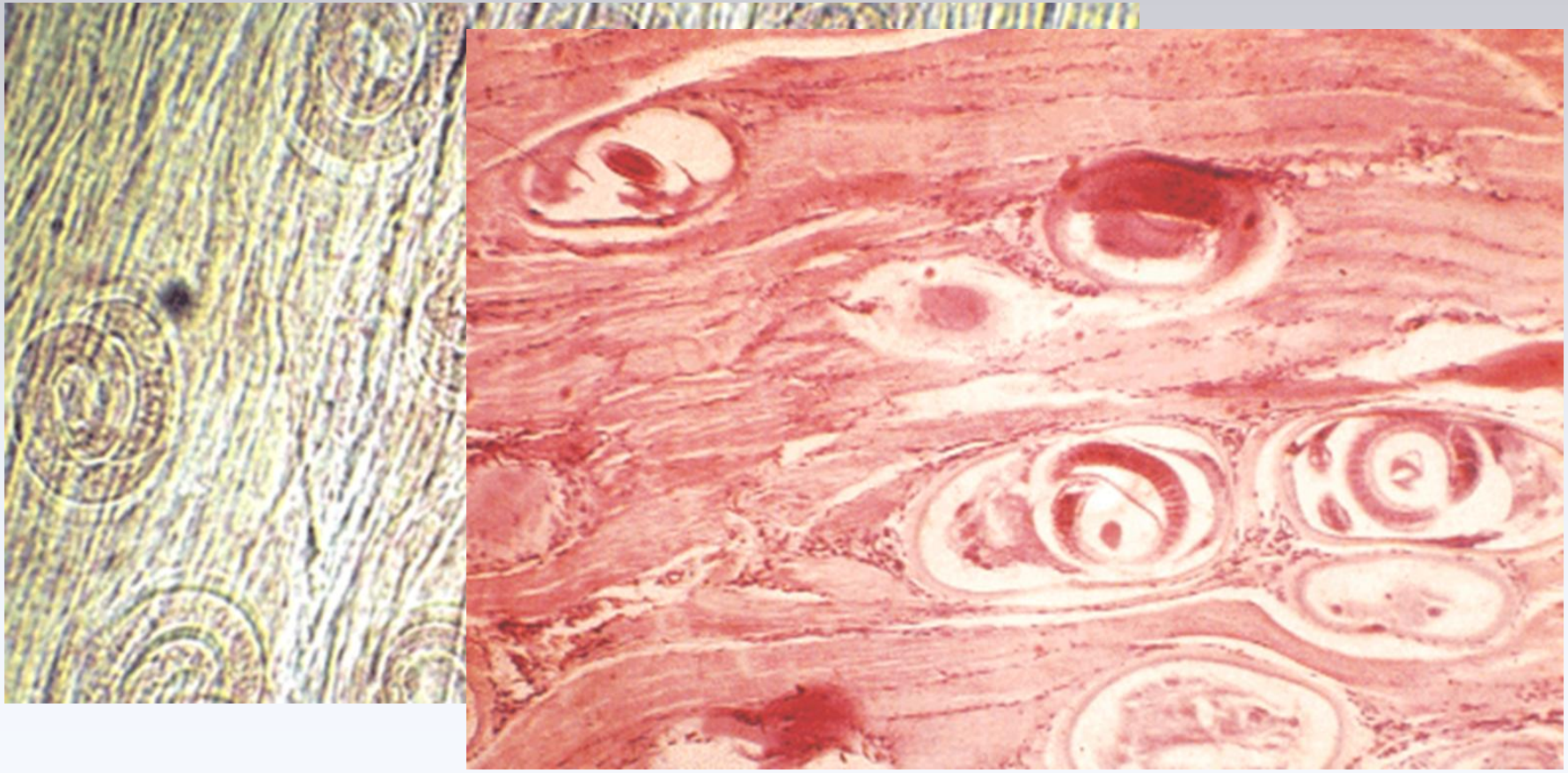
confirms the diagnosis

Trichinella spiralis

Diagnosis

Muscle biopsy

demonstration of free or encapsulated Trichinella larvae in the skeletal muscles



Trichinella spiralis

Clinical case

The case of a six years old boy from rural area, whithout significant past medical history

The symptoms for which he was admited, were: vomiting, nausea, fatigue, malaise and loss of apetite

During hospitalisation the 6 years old patient presented clinically: scleral icterus, hepathomegaly (1.5 cm) with all caracteristics of an acute hepatitis (smooth liver surface, elastic consistency, rounded lover margin and without tenderness) and spenomegaly

In the third day of hospitalisation, the patient presented abdominal pain with diarrhea, free from mucus and blood. Theese were acompanied with feverish (37,4-37,5 0C), chills and pruritis

Clinical case

The paraclinical examination evidenced

A moderate hepato-citolitic syndrome with ALT= 78 u/l and AST= 71 u/l

A normal biliary excretory syndrome with BiT=0,9 mg%

A normal imunologic syndrome for all the viruses:

-IgM VHA = (-)
-Ag HBs = (-)
-IgM HBc = (-)
-Ac VHC = (-)
-IgM CMV = (-)
- IgM EBA = (-)

Diagnosis?

Clinical case

In the hemo-leucogram

A high number of the leucocytes (14.000/mm3)

A high number of eozinofiles (15%)

The copro-bacteriological and copro-parasitological tests were negative

Clinical case

The patient had at home 2 dogs who play with him

We suspected an infection with Toxocara canis

The antibody against toxocara canis was positive (IgM Toxocara canis +)

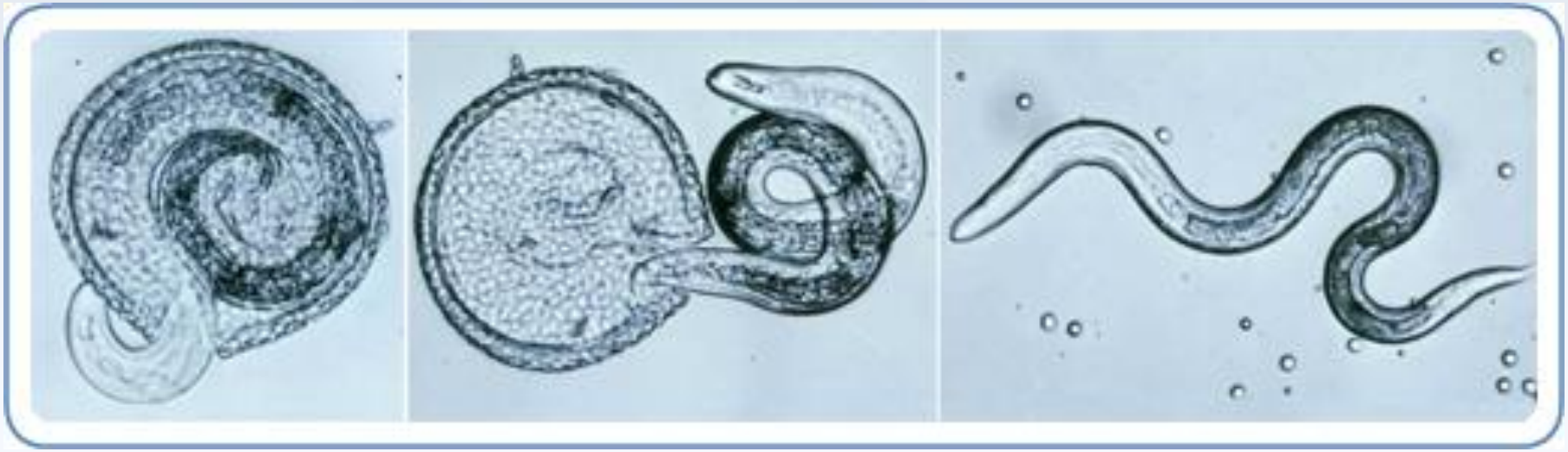
Morphology

Toxocara canis

Toxocariasis
is the parasitic disease
caused by the larvae of two species

***Toxocara canis* from dogs**

***Toxocara cati* from cats**



Geographic Range: Worldwide

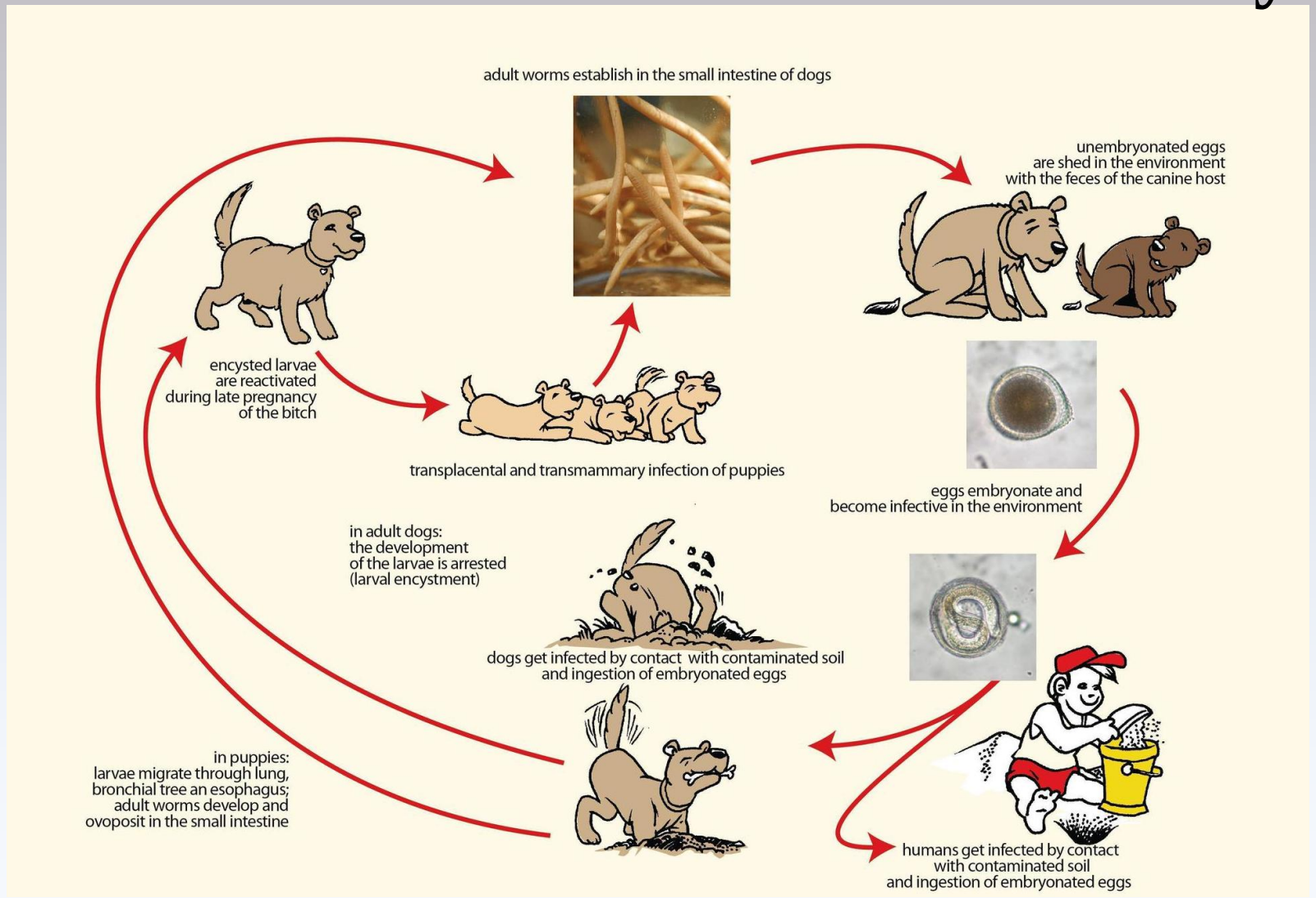
Definitive Host: Dogs

Intermediate Host: None

Accidental Host: Humans and other mammals

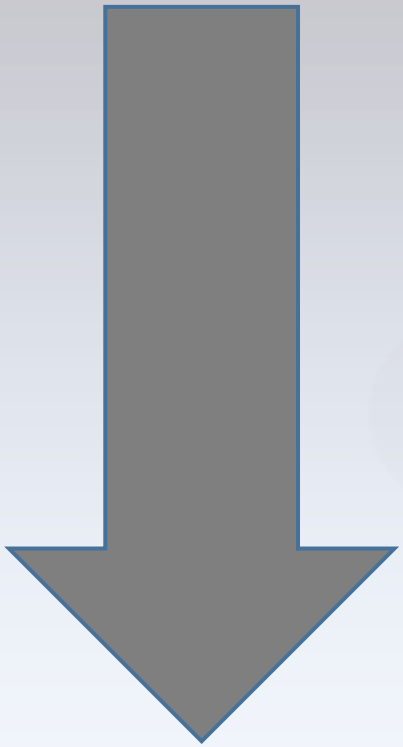
Children more susceptible than adults

Life cycle



Toxocara canis

Accidental Host



Infected by ingestion of infective eggs

Eggs hatch and larvae penetrate the intestinal wall

Carried by Circulatory System to various tissues

Larvae don’t undergo further development but can cause reactions in tissue (toxocariasis)

Toxocara canis

Ocular Larvae Migrations

Caused by larva migration to the retina

Inflammation

Scar formation

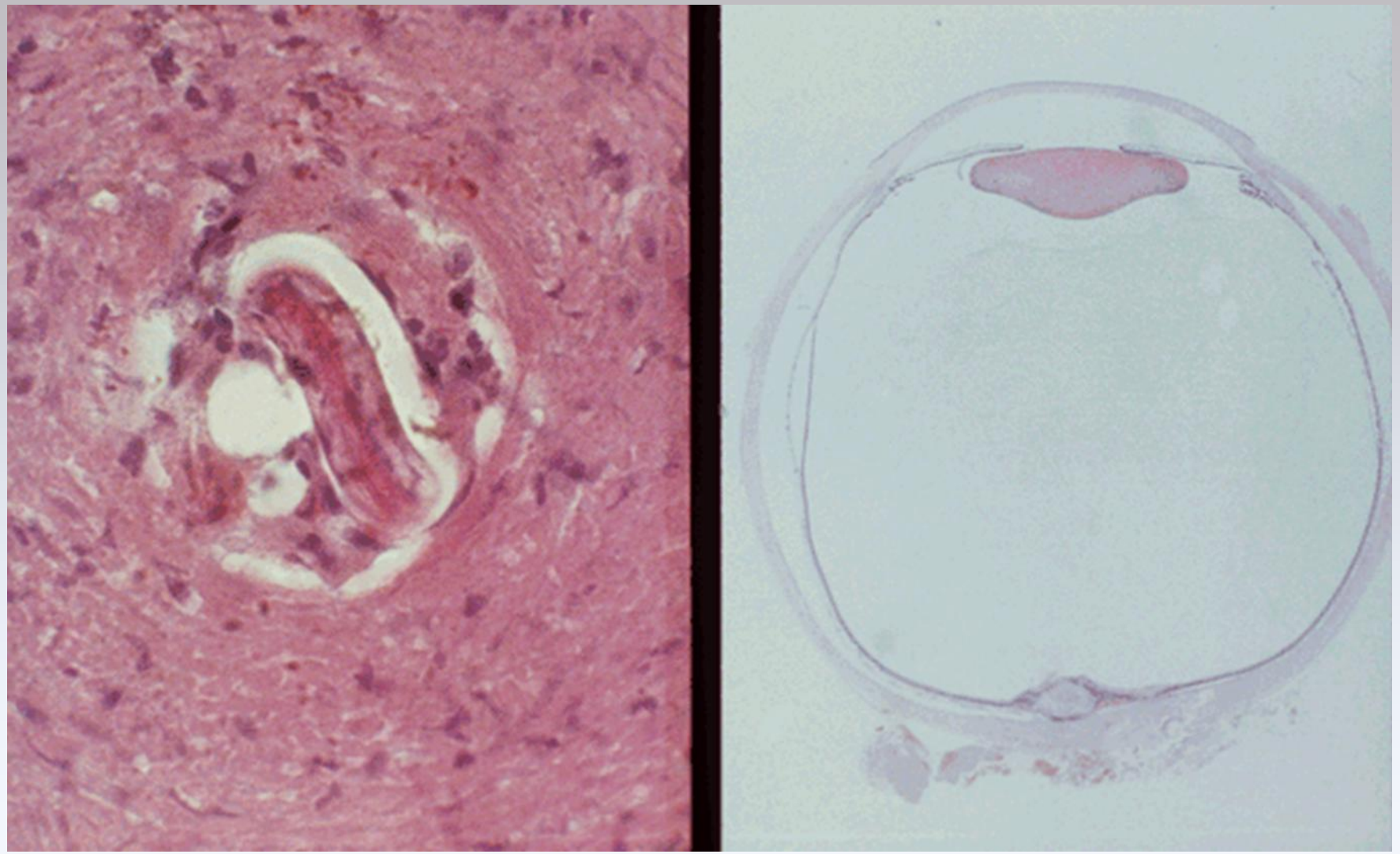
Retinal Detachment

Partial to Full Vision Loss

Toxocara canis

Fundal photograph showing a large central granuloma and traction on the retinal vessels.

Toxocara canis



Hystology shows a granuloma in the posterior pole of an eye. Higer power demonstrates the encysted nematode.

Toxocara canis

Visceral Larvae Migrations

Caused by movement of worm larvae throughout various organs of the body

Fever

Hepatosplenmegaly

Coughing

Asthma

Pneumonia

Toxocara canis

Sectorul CMF _____, fișa medicală a bolnavului de staționar (de ambulator) nr. _____

	Rezultatul	Norma unități SI		Rezultatul	Norma unități SI
Hemoglobina B	100	130,0-160,0 g/l	Cel. blast.		%
F		120,0-140,0 g/l			
Eritrocite B	3,5	4,0-5,0·10¹²/l	Promiel.		%
F		3,9-4,7·10¹²/l			
Hematocrit B		40-48%	Mielocite		%
F		36-42%			
Reticulocite		2-10‰	Metamiel		%
Trombocite 120/	120,0	180,0-320,0·10⁹/l	Nesegment.	3	1-6%
Leucocite	60,0	4,0-9,0·10⁹/l	Segmentate	6	47-72%
VSH B		1-10 mm/oră	Eozinofile	10	0,5-5%
F	21	1-15 mm/oră	Bazofile		0-1%
Morfologia eritrocitelor			Prolimfocite		%
Anizocitoză (macrocite, microcite, megalocite) +			Limfocite	19	19-37%
Poichilocitoză + Megaloblaști hipocromie +			Monocite	2	3-11%
Eritrocite cu granulații bazofile			Cel. plasm.		%
Policromatofile ____ Corpusculi Jolli, inele Kebot					
Eritro-normoblaști (la 100 leucocite)					
Morfologia leucocitelor					
Hipersegmentarea nucleelor					
Granulația toxică					

"_____" _____ 20 ____
data eliberării rezultatului analizei

Semnătura

		Rezultatul Результат	Referențe Референсные величины	Unitatea de măsură Единицы измерения
Leucocite Лейкоциты			4,0 – 9,0	10^9/л
Neutrofile	**Mielocite** Миелоциты		-	% 10^9/л
	Metamielocite Метамиелоциты		-	% 10^9/л
	Nesegmentate Палочкоядерные	1	1 – 6 0,040 – 0,300	% 10^9/л
	Segmentate Сегментоядерные	4	47 – 72 2,000 – 5,500	% 10^9/л
Eozinofile Эозинофилы		68	0,5 – 5	%-10^9/л %-10^9/л
Bazofile Базофилы			0 – 1 0 – 0,65	%-10^9/л %-10^9/л
Limfocite Лимфоциты		17	19 – 37 1,200 – 3,000	%-10^9/л %-10^9/л
Monocite Моноциты		10	3 – 11 0,090 – 0,600	%-10^9/л %-10^9/л
Celule plasmatice Плазматические клетки			-	%-10^9/л %-10^9/л
Viteza de sedimentare a hematiilor B F Скорость оседания эритроцитов М Ж		28	B 2 – 10 F 2 – 15	mm/oră мм/час
Timpul de sîngerare Время кровотечения			30 – 120	s c
Timpul de coagulare a sîngelui capilar Время свертывания перифер.крови			3 – 5	min мин

Morfologia eritrocitelor
Морфология эритроцитов

Anizocitoză (macrocite, microcite, megalocite) Hipocromie +
Анизоцитоз (макроциты, микроциты, мегалоциты)

Poikilocitoză 1
Пойкилоцитоз

Eritrocite cu granulație bazofilă
Эритроциты с базофильной зернистостью

1. Anti Ascaris lumbricoides IgG _____
2. Anti Taenia solium IgG _____
3. Anti Echinococcus IgG _____
4. Anti Trichinella spiralis IgG _____
5. Anti Toxocara Canis IgG _____
6. Giardia lamblia IgM _____
7. Anti Toxoplasma IgM _____
8. Anti Toxoplasma IgG _____
9. IgE total 439,6 UI/ml (N-0-86,8)
10. Anti HSV tip I IgM _____
11. Anti HSV tip I IgG _____
12. ANA _____
13. AMA _____
14. Anti H.pylori IgG _____
15. Anti H.pylori IgM _____
16. Anti Borelia IgM _____
17. Anti Borelia IgG _____

Valori in afara limitelor admise pentru varsta si sexul respectiv

Denumire	Rezultat	UM	Interval de referinta
Imunochimie			
*LC **Ascaris lumbricoides - Anticorpi IgG**			
Ser / ELISA	32.303	NTU	< 9: Negativ 9 - 11: Echivoc - se recomanda repetarea recoltarii peste 2-4 saptamini > 11 : Pozitiv NTU= unitati NovaTec
*LC **Toxocara canis - Anticorpi IgG**			
Ser / ELISA	41.734	NTU	< 9: Negativ 9 - 11: Echivoc - se recomanda repetarea recoltarii peste 2-4 saptamini > 11 : Pozitiv NTU = unitati NovaTec

Medic de laborator

Clinical case

69-year-old male

2-month history of nausea, vomiting, anorexia

25 pounds weight loss

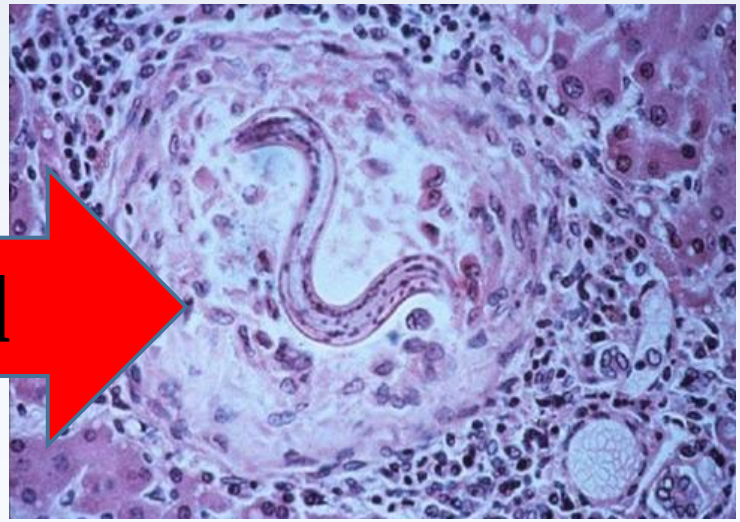
fever, confusion, not able to get out of bed

transported to hospital

Initial blood work:

- ✓ **Elevated WBC;**
- ✓ **Raised eosinophil count 4 times;**

Duodenal biopsy obtained



Diagnosis?

What is Strongyloidis?

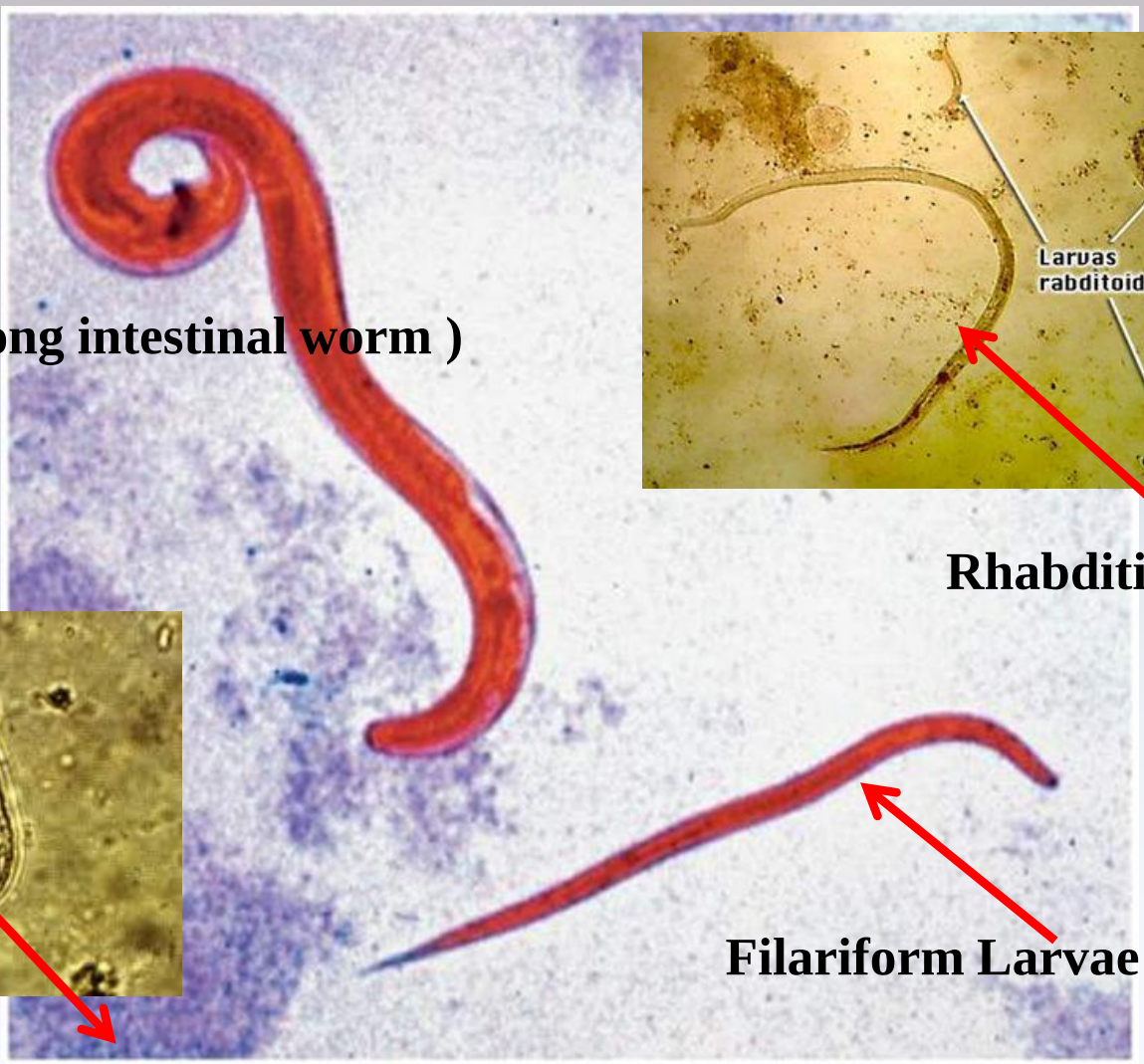
Parasitic infection with a predilection for the intestines

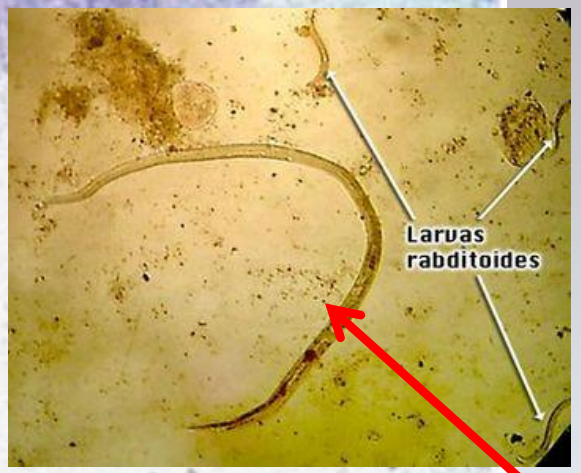
2 most common and clinically relevant species are:

- ***Strongyloides stercoralis;***
- ***Strongyloides fuelleborni;***
  - **Limited to Africa and Papua New Guinea**

Life cycle

Adult (2 mm long intestinal worm)





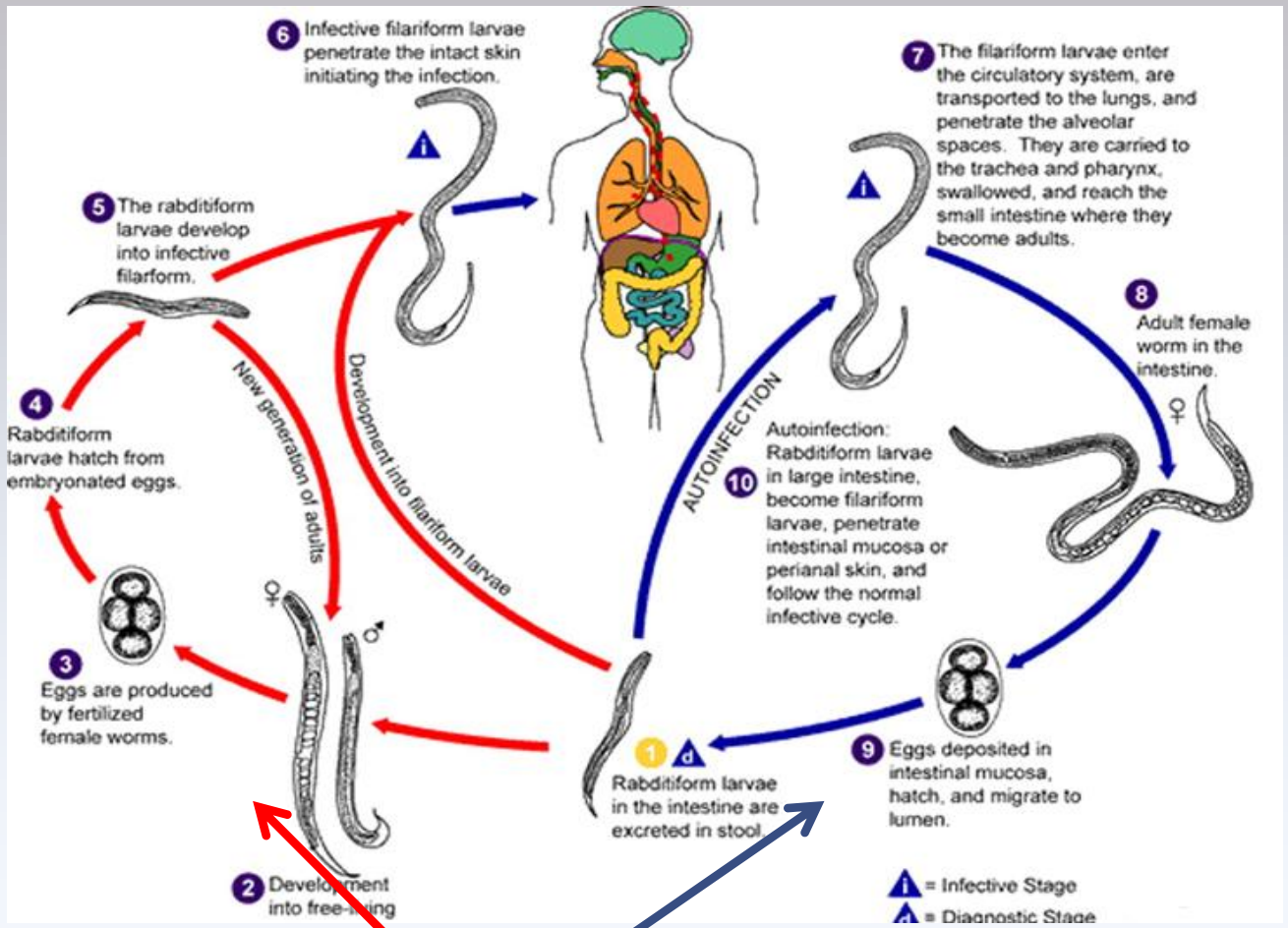
Rhabditiform Larvae

Filariform Larvae (penetrating)

The eggs can survive for 2-4 years in cool, moist areas

Strongyloides stercoralis

Life cycle



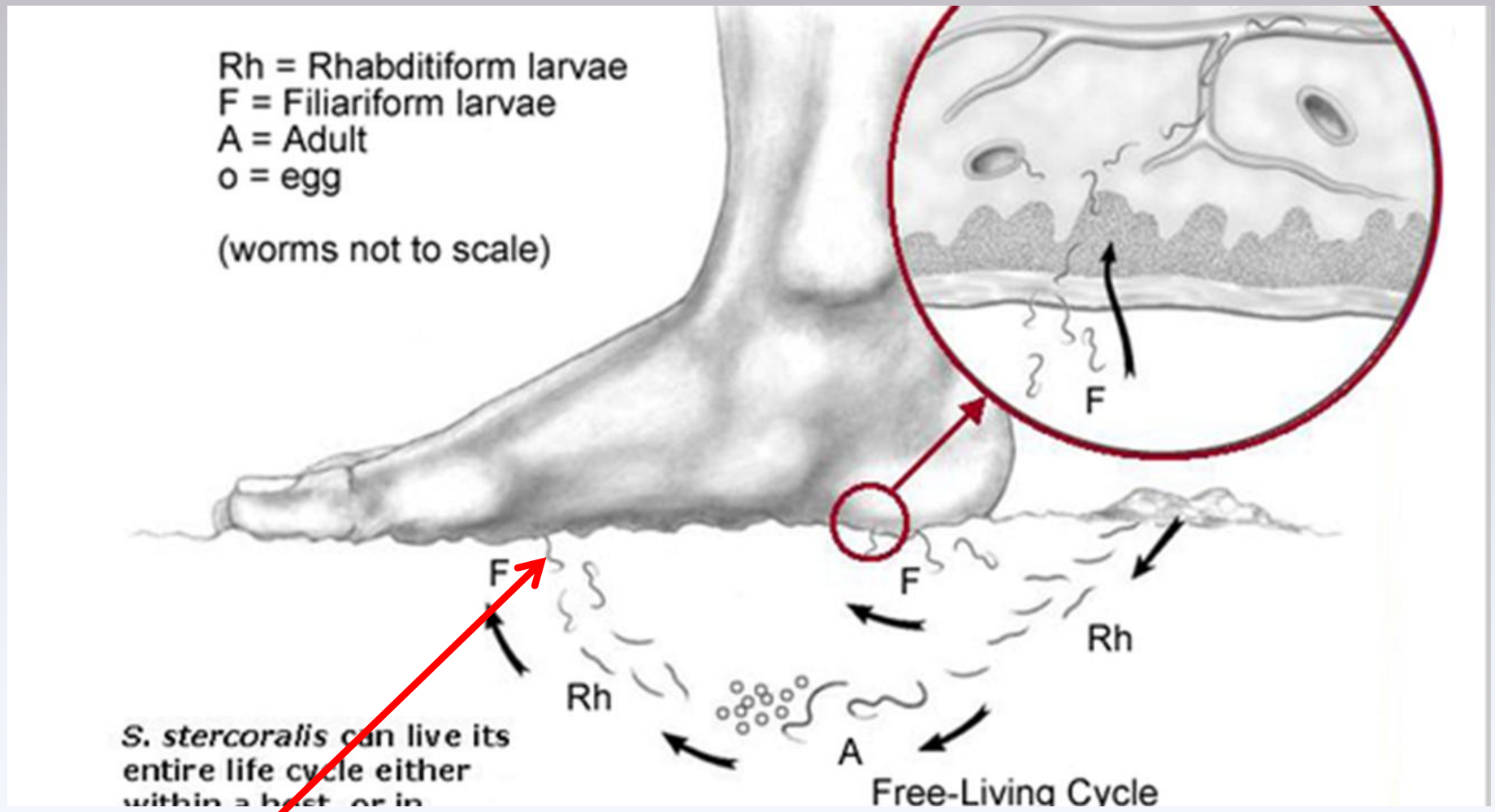
Free life cycle

Parasitic life cycle

has two unique life cycle

Strongyloides stercoralis

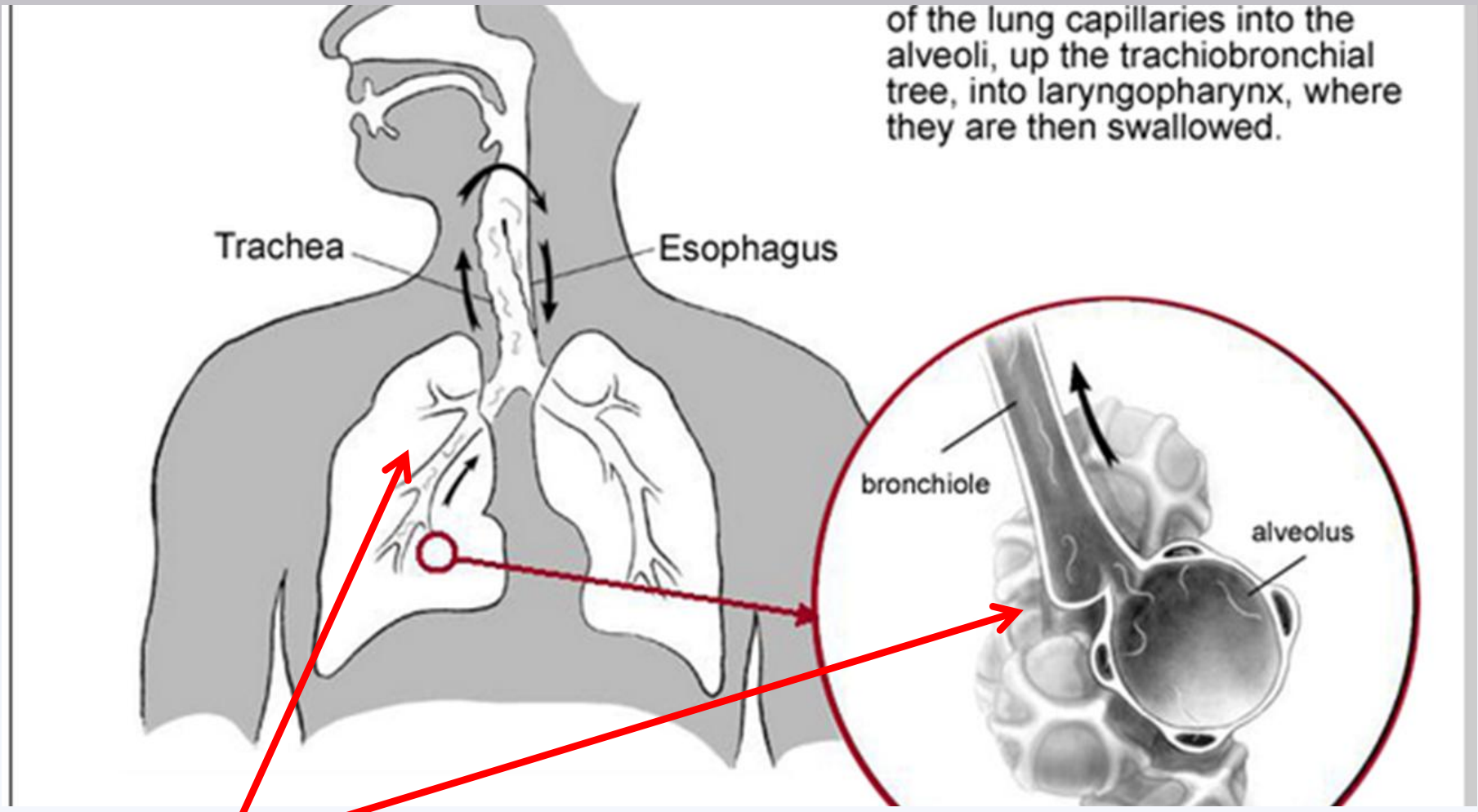
Life cycle



Invasive: Skin Penetration

Strongyloides stercoralis

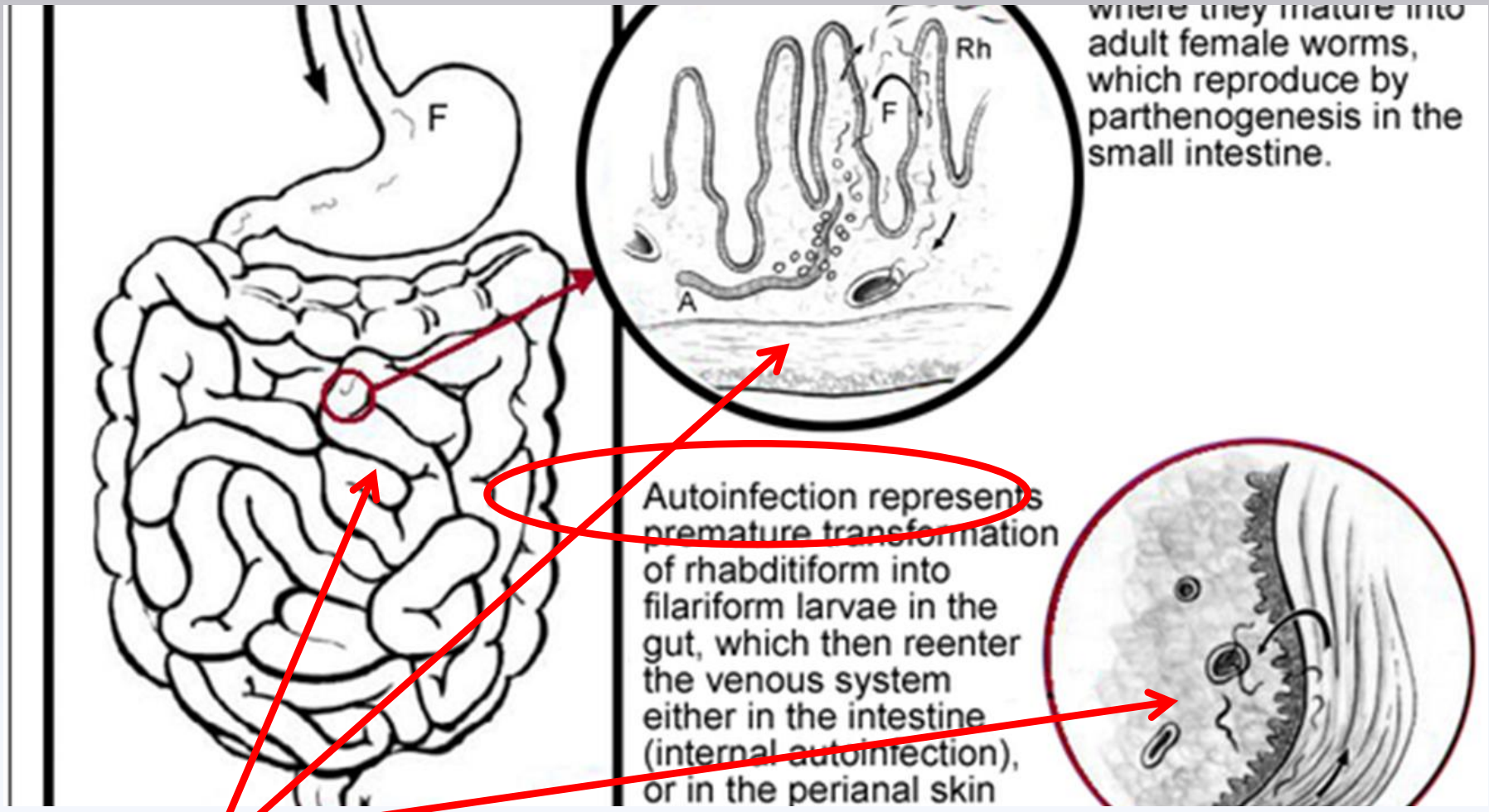
Life cycle



Pulmonary: During Cycle or Immigration

Strongyloides stercoralis

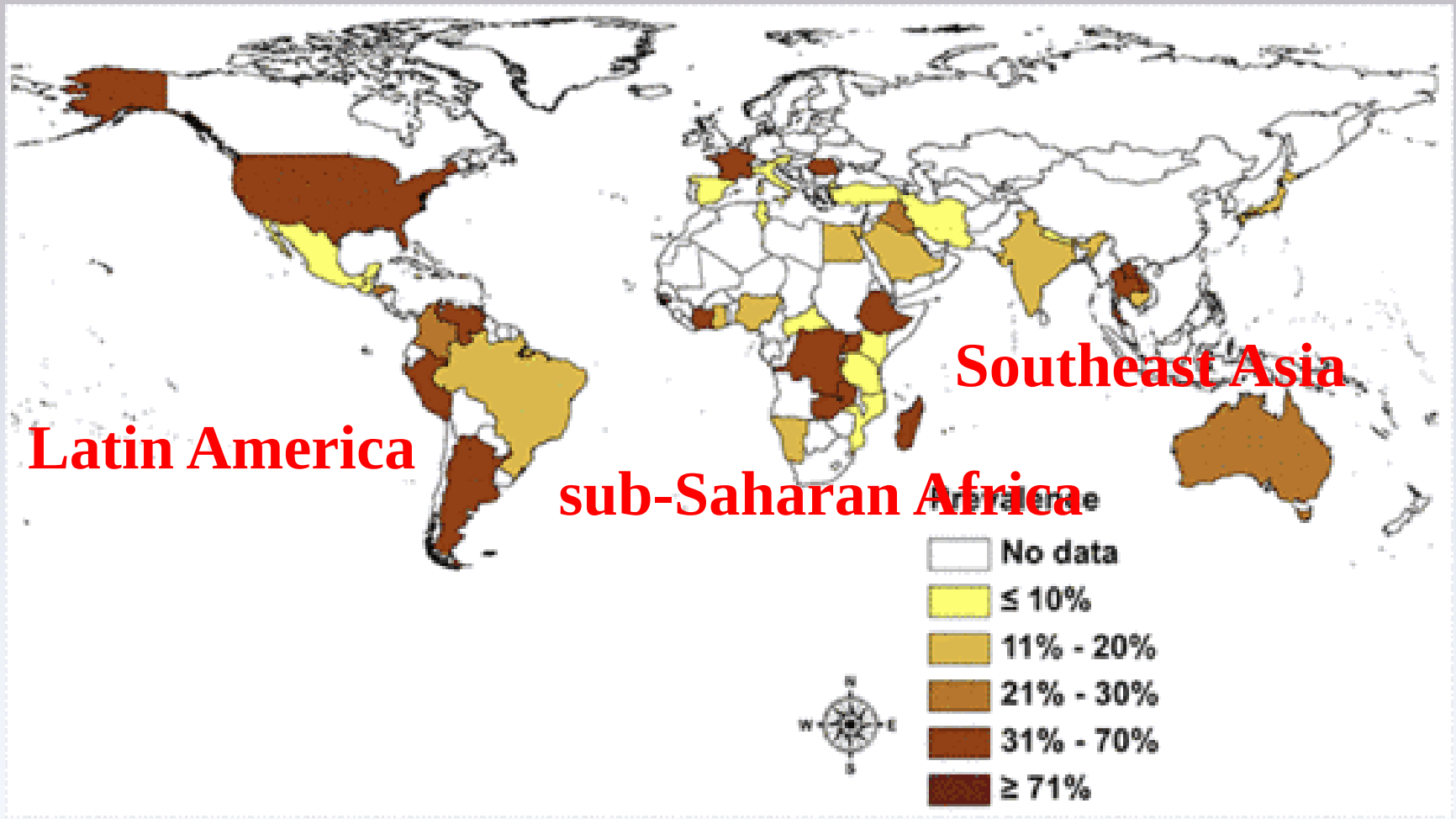
Life cycle



Intestinal: Tissue Destruction

Strongyloides stercoralis

Distribution



Strongyloidiasis affects anywhere from 30 to 100 million people worldwide and is endemic in

Strongyloides stercoralis

Acute infection

Low-grade fevers

Epigastric discomfort

Strongyloides stercoralis

Chronic Infection

Larva currens - maculopapular or serpiginous rash.
Chronic urticaria;

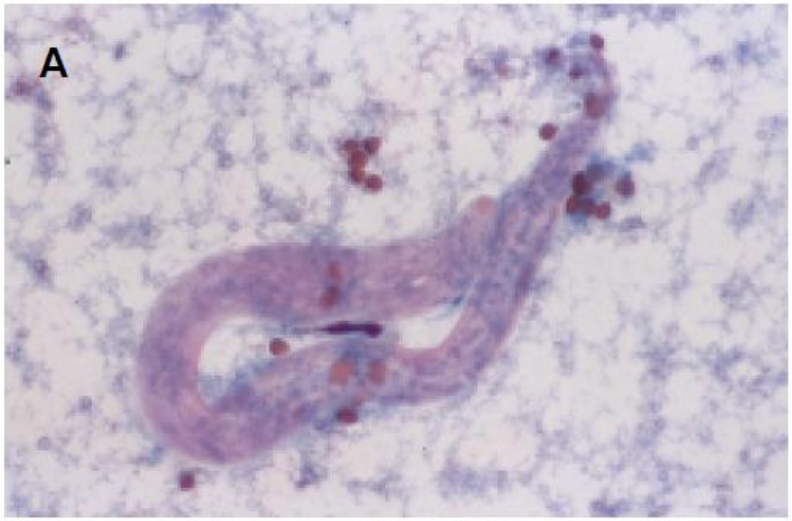
Strongyloides stercoralis

Clinical Presentation

Linear or serpiginous urticaria with flare that moves 5-15 cm/hr

Strongyloides stercoralis

50 Aniversario Archivos de Bronconeumología



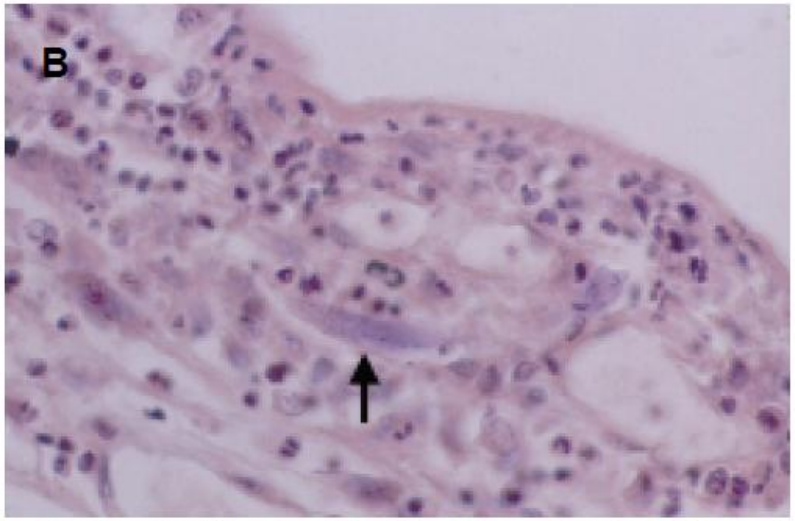


Figure 2. ***Strongyloides stercoralis*** **larvae. A: larva observed in the bronchial brushing (hematoxylin-eosin ×400). B: larva (arrow) found in a lymphatic vessel of the bronchial submucosa. The cellular infiltrates are composed primarily of mononuclear cells (hematoxylin-eosin ×150).**

Figure 1. Radiographic and bronchoscopic images of the patient. A: initial chest x-ray where slight air trapping was observed, especially in the right lung. B: image observed when the fiberoptic bronchoscope was in the main carina. The main right bronchus can be observed at the top right of the image. Main findings were yellowish mucous, engorged vascular bed, widening of the carina and multiple nodules protruding into the airway lumen and partially obstructing the opening to the left bronchus.

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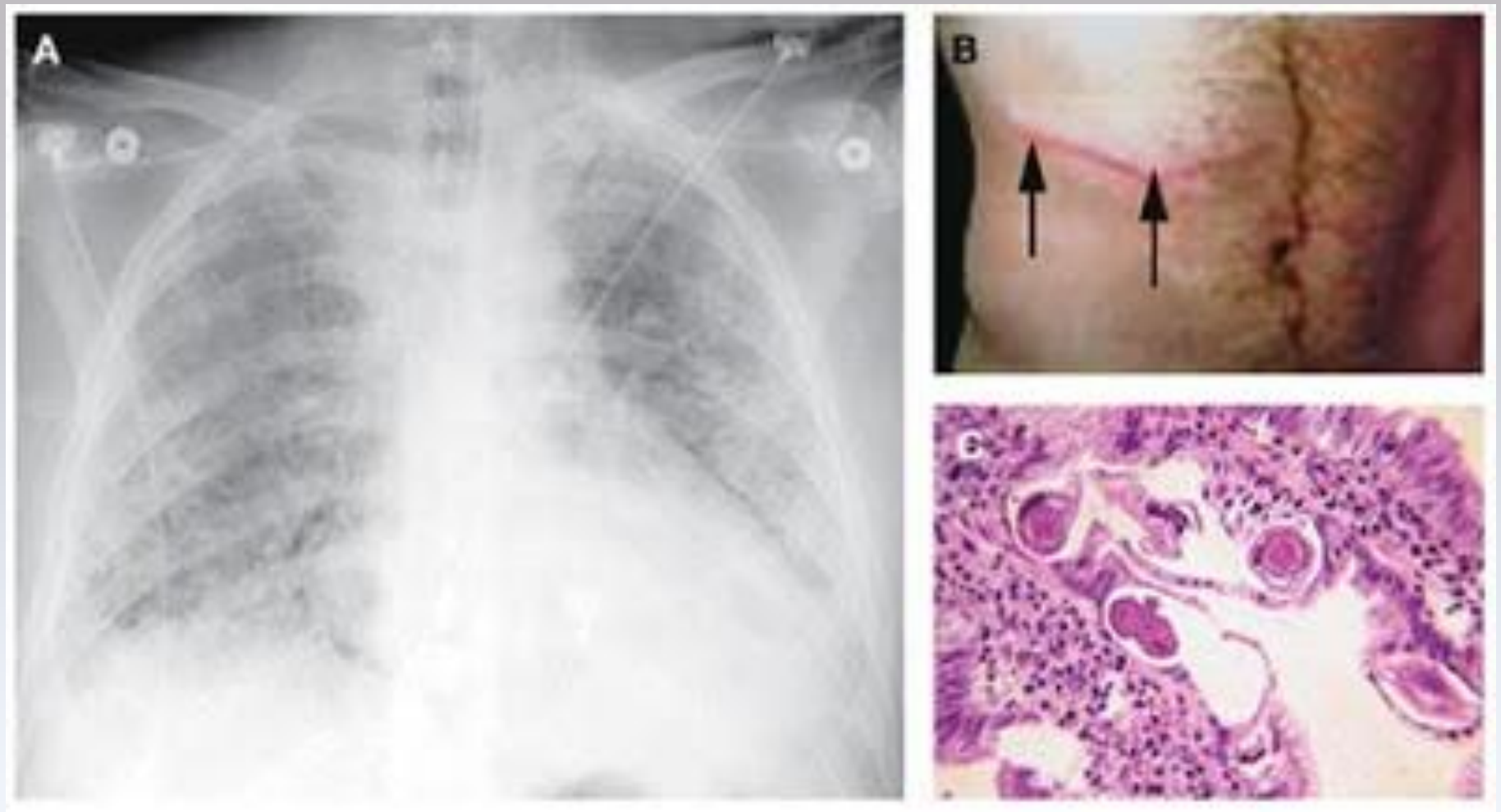
[c]Unidad de Investigación Médica en Epidemiología Clínica, Hospital de Pediatría,
Centro Médico Nacional Siglo XXI, Instituto Mexicano del Seguro Social, México DF, Mexico.
[d]Instituto Nacional de Enfermedades Respiratorias, México DF, Mexico.



(A) Strongyloides pneumonitis associated with hyperinfection in a kidney transplant recipient.
(B) Migrating larvae in subcutaneous lymphatics (arrows).
(C) Hatching eggs in human intestine.
(Published in: Parasitic infections in transplant recipients. Rashad S Barsoum. Nature Clinical Practice Nephrology (2006) 2, 490-503 doi:10.1038/ncpneph0255)

Strongyloides stercoralis

Complications

Hyperinfection Syndrome

Acceleration of the normal life cycle, causing excessive worm burden
Autoinfection (turn into infective filariform larva within the lumen
Spread of larvae outside the usual migration pattern of GI tract and lungs;

Disseminated strongyloidiasis

Widespread dissemination of larvae to extraintestinal organs
CNS (meningitis), heart, urinary tract, bacteremia, etc
Can be complicated by translocation of enteric bacteria
Travel on the larvae themselves or via intestinal ulcers
Mortality rate close to 80%
Due to delayed diagnosis, immunocompromised state of the host at this point

Strongyloides stercoralis

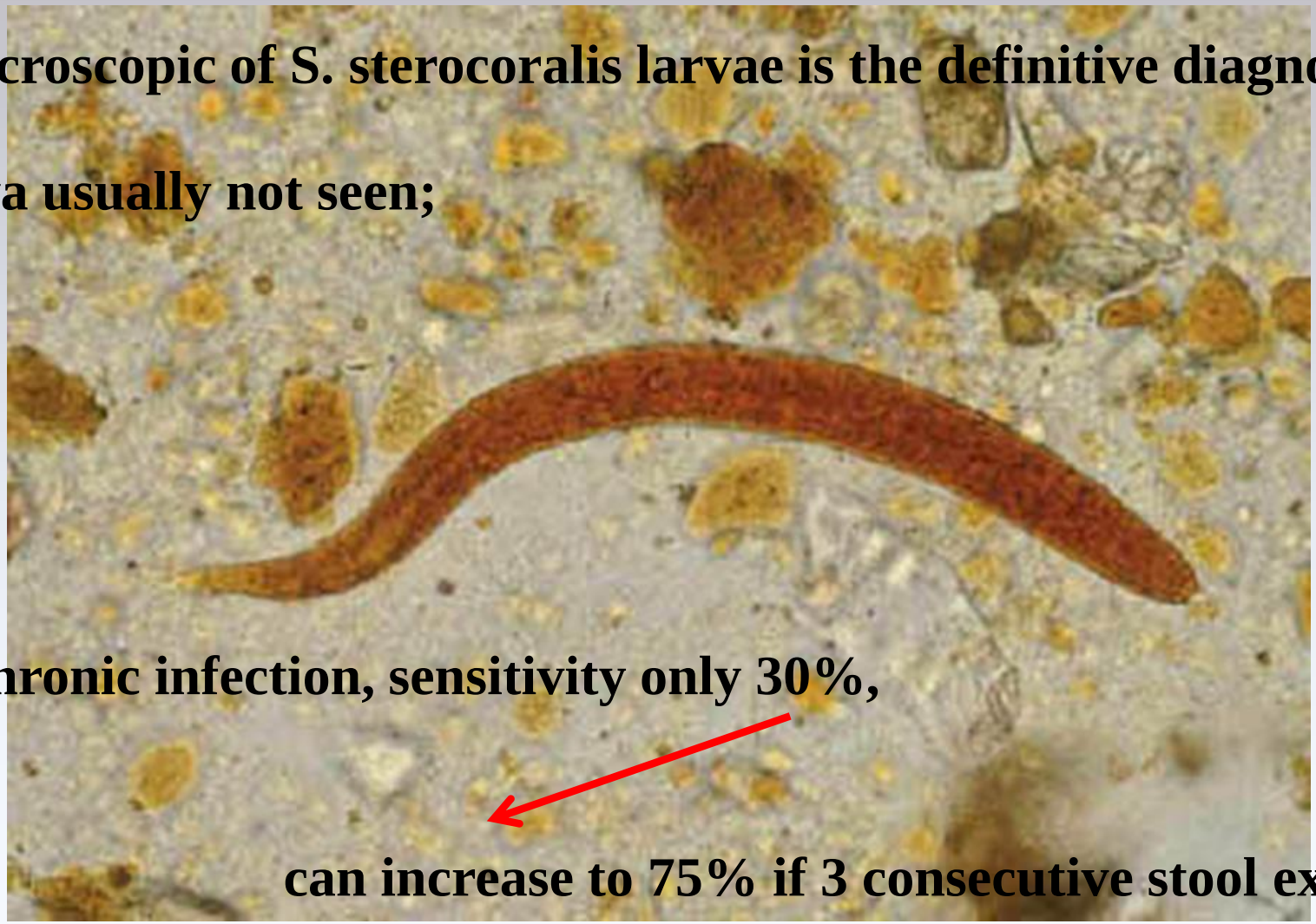
Eosinophilia 60-95%, less it on steroids

Strongyloides stercoralis

Diagnostic Testing

Microscopic of S. sterocoralis larvae is the definitive diagnosis;

Ova usually not seen;



In chronic infection, sensitivity only 30%,

can increase to 75% if 3 consecutive stool exams

Strongyloides stercoralis

Serology ELISA

Most sensitive method (88-95%)

If results are positive

Can move on to try and establish a microscopic exam

Can cross-react with other nematode infections

Can not distinguish between past and present infections

May be lower in immuno-compromised patients

Strongyloides stercoralis

Clinical case

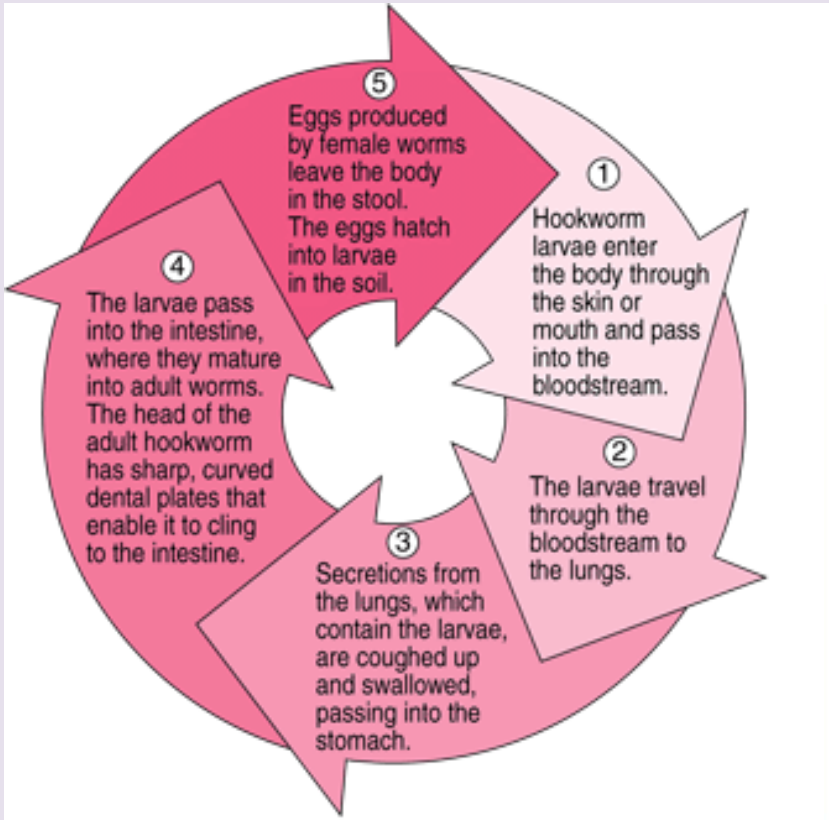
An 8 years old boy

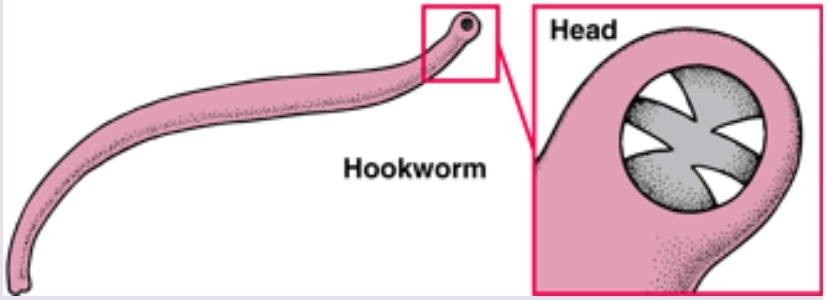
presents with skin lesions and itching

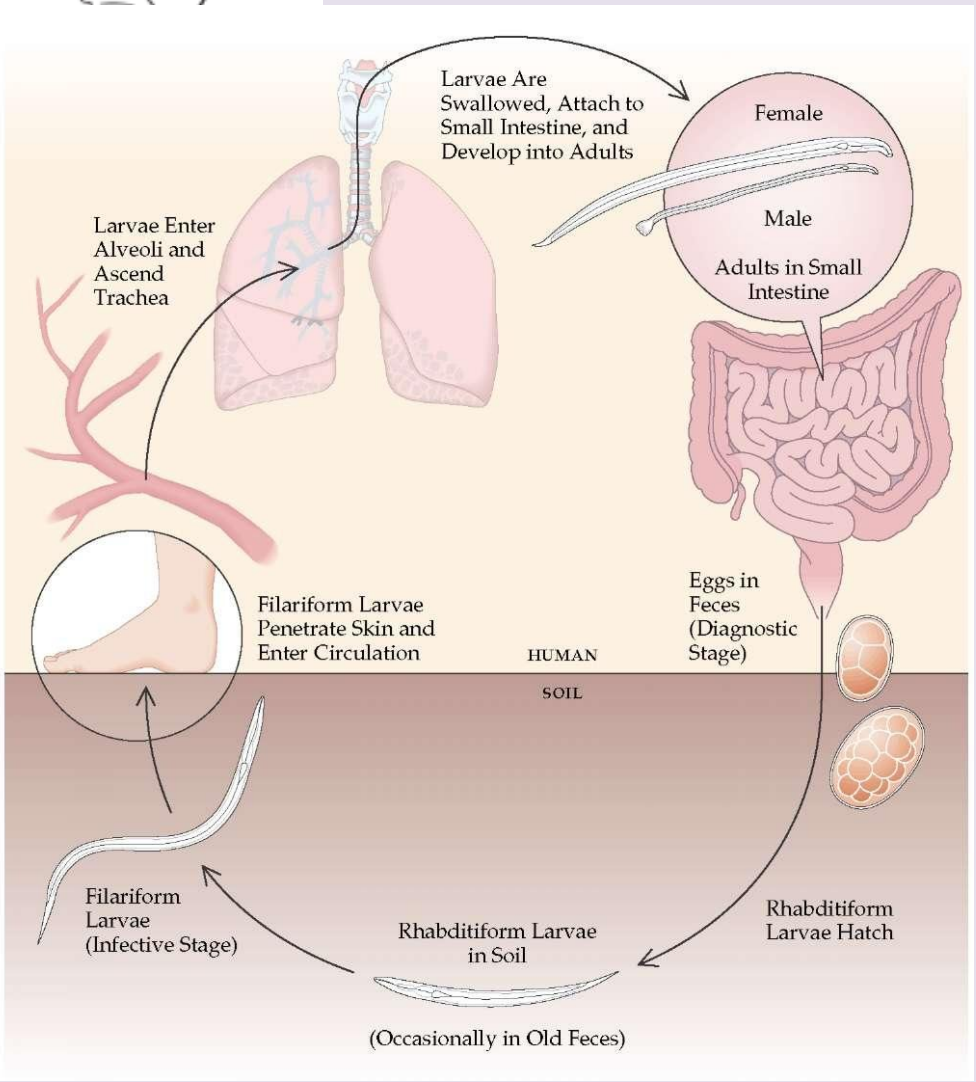
after spending the summer at a beach with his family

Legs show several raised, reddened, serpiginous lesions that are intensely pruritic

Diagnosis?







Lifespan ~ 1 year;

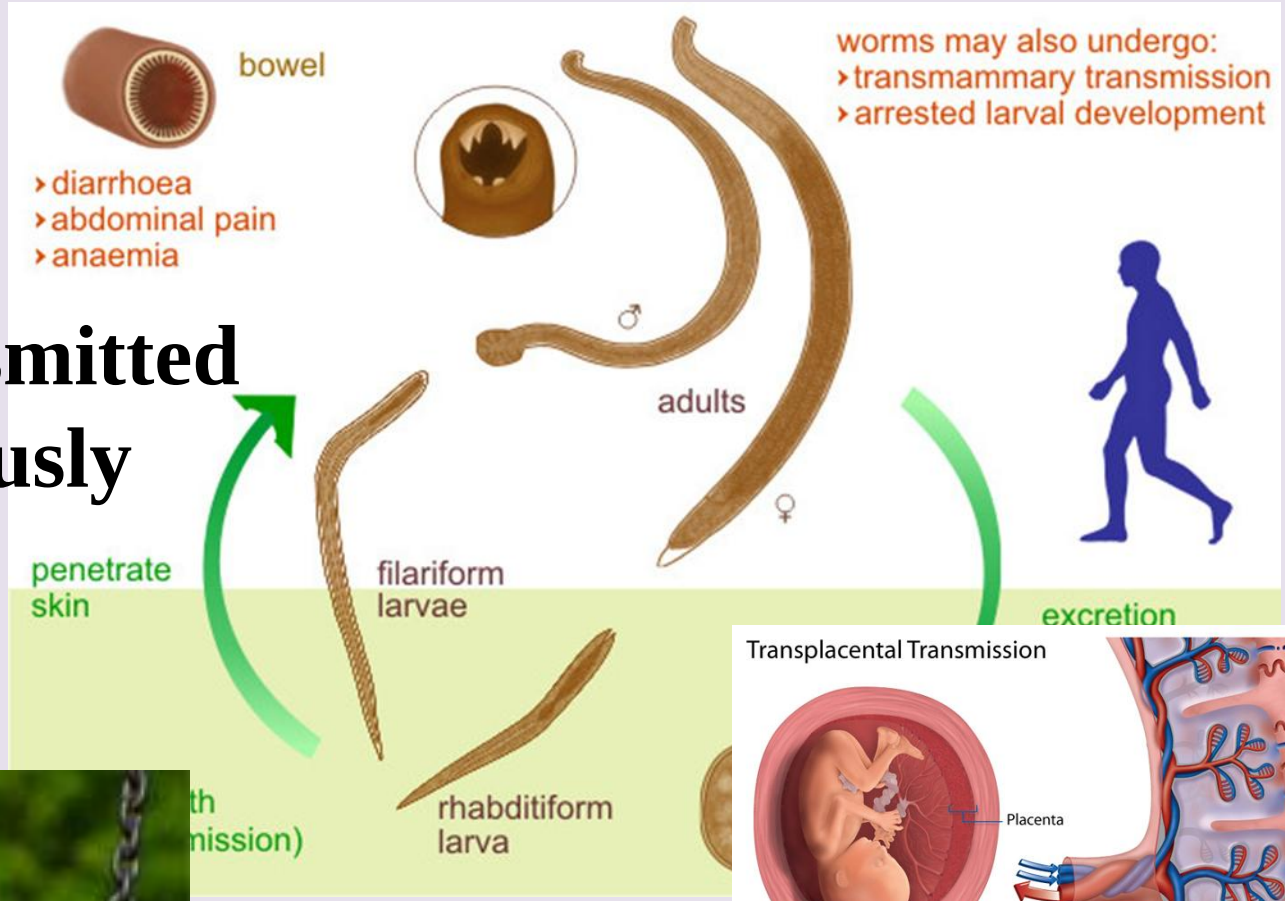
Ancylostoma duadenale

Hookworm rhabditiform larva

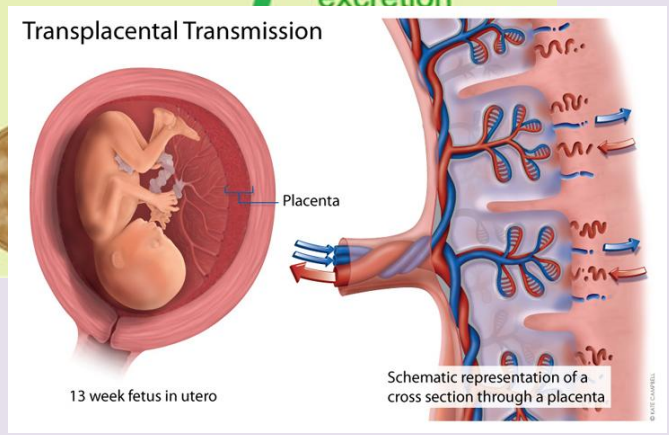
Hookworm filariform larva

Ancylostoma duadenale

can be transmitted per cutaneously



orally

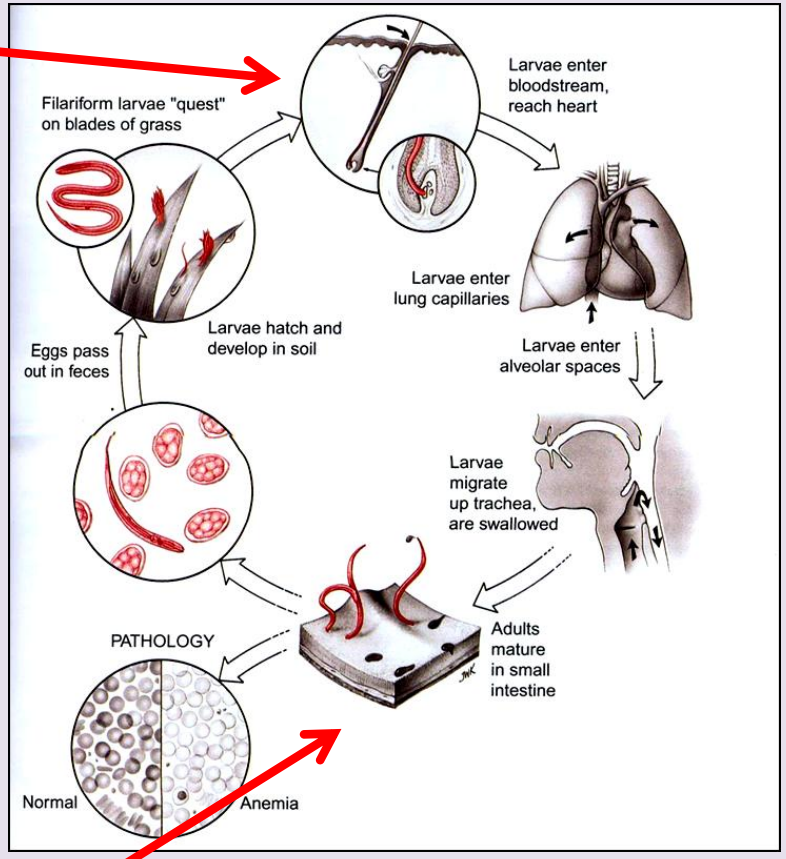


and probably transplacentally

Ancylostoma duadenale

Life Cycle

Contact with contaminated soil for 5 to 10minutes allows the larvae to penetrate the human host's skin



Adult worms live in the small intestine of man, mostly in jejunum, less often in the duodenum and rarely in the ileum

Ancylostoma duadenale

Life Cycle

The route of larvae migrant

Skin

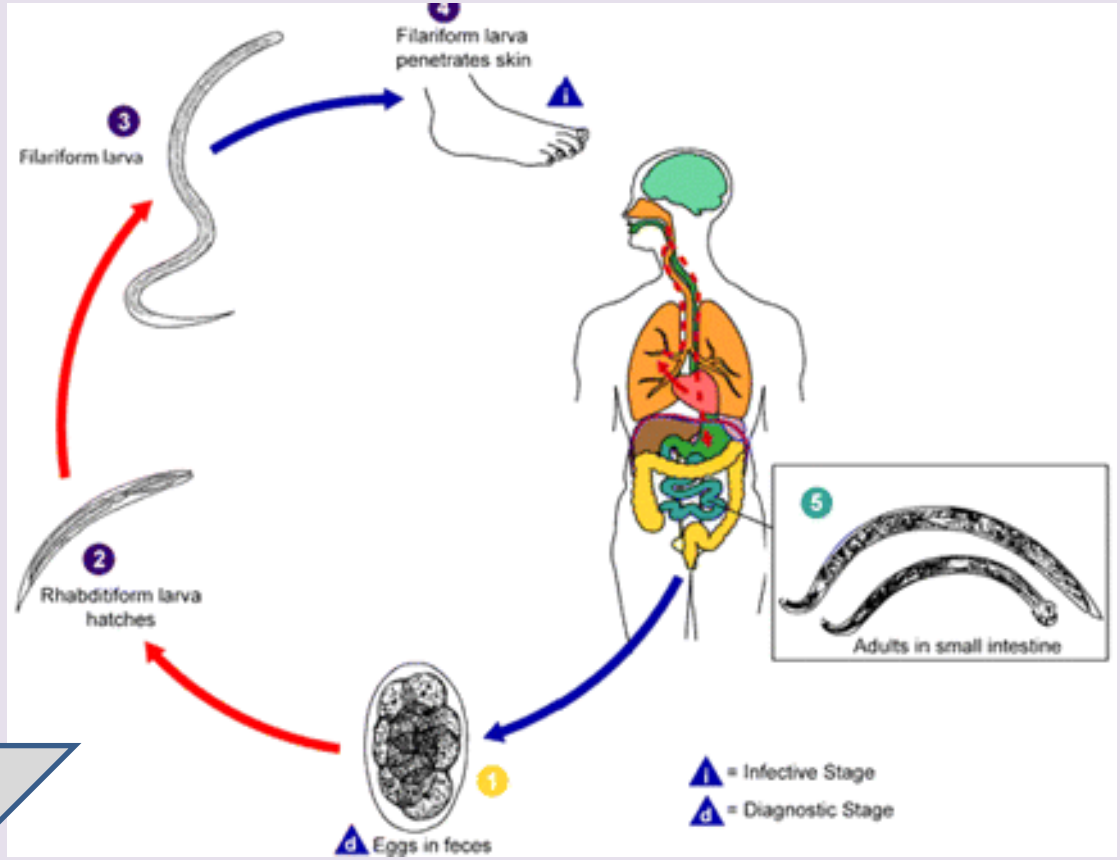
Lungs

Trachea

Esophagus

Stomach

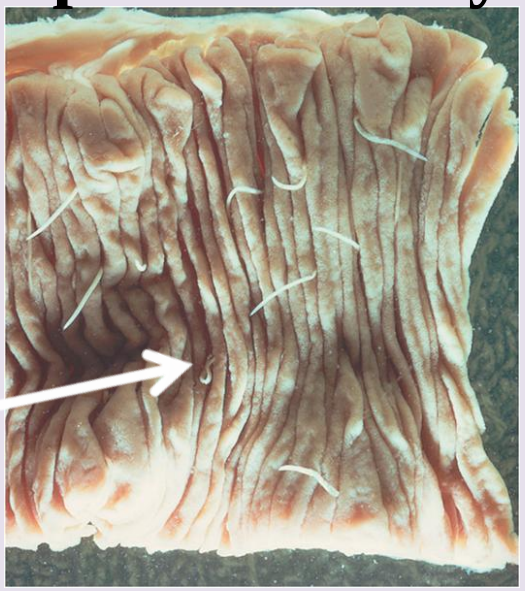
Intestine



Ancylostoma duadenale

Life Cycle

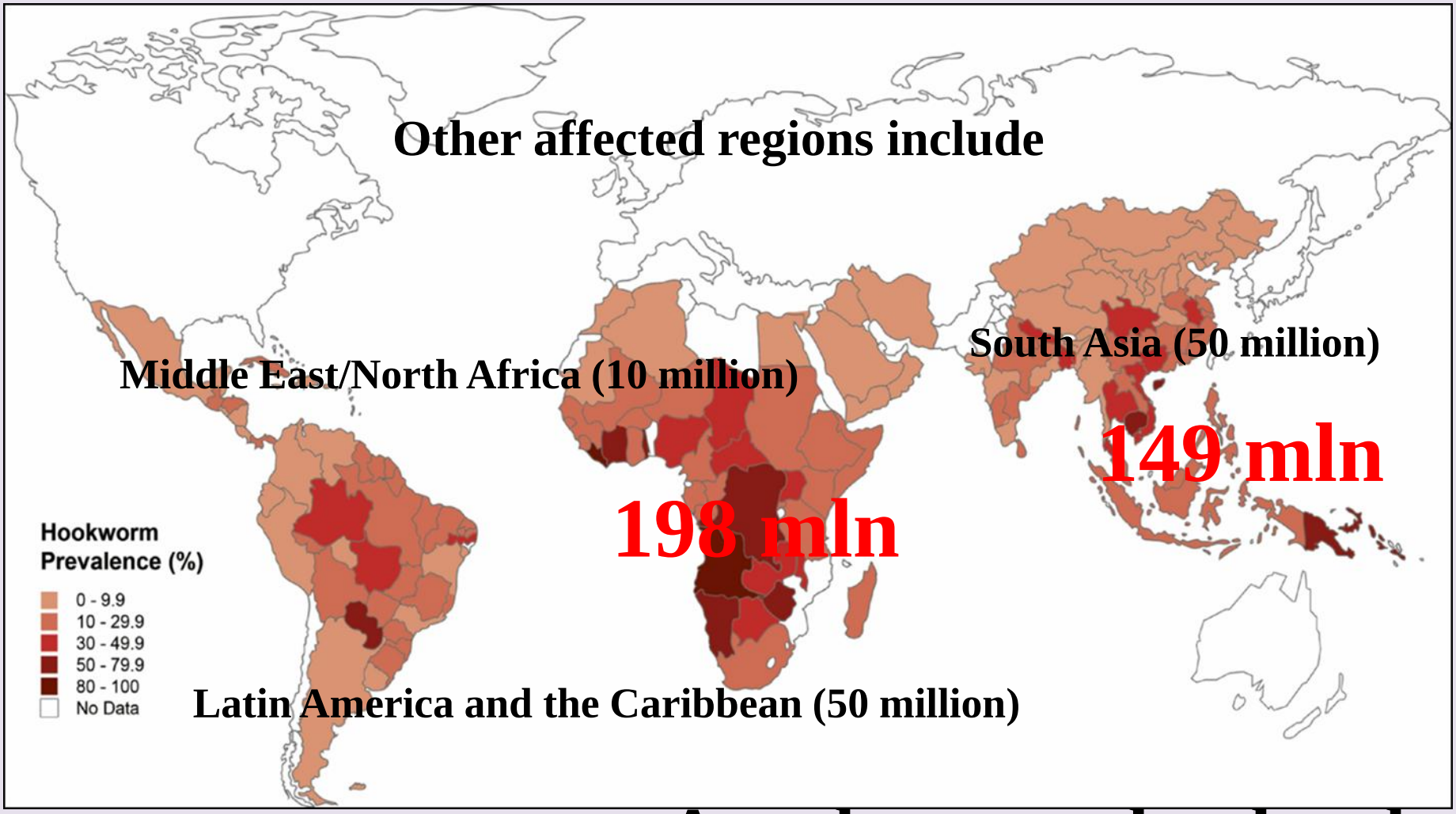
When it reaches the small intestine of the host, the larva molts a fourth and final time and develops to maturity



Ancylostoma duadenale

Distribution

It is estimated that 576-740 million individuals are infected with Hookworm today

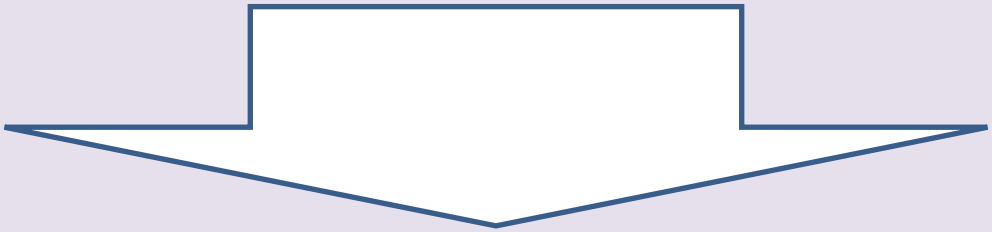


Ancylostoma duadenale

Clinical Presentation in Humans

Hookworm infection

is generally considered to be asymptomatic



is an extremely dangerous infection

because its damage is “silent and insidious”

Ancylostoma duadenale

The symptoms

may be divided into two groups

Those produced by migrating larvae

Those produced by the adult worms

Ancylostoma duadenale

Clinical features of hookworm disease

Site	Symptoms	Pathogenesis
dermal	Erythema, macules, papules (ground itch)	Cutaneous invasion and subcutaneous migration of larva
pulmonary	Bronchitis, pneumonitis, eosinophilia	Migration of larva through lung, bronchi and trachea
gastrointestinal	Anorexia, epigastric pain, gastrointestinal hemorrhage	Atachment of adult worms and injury to upper intestinal mucosa
hematological	Iron deficiency, anemia, hypo-proteinemia, edema, cardiac failure	Intestinal blood loss

Ancylostoma duadenale

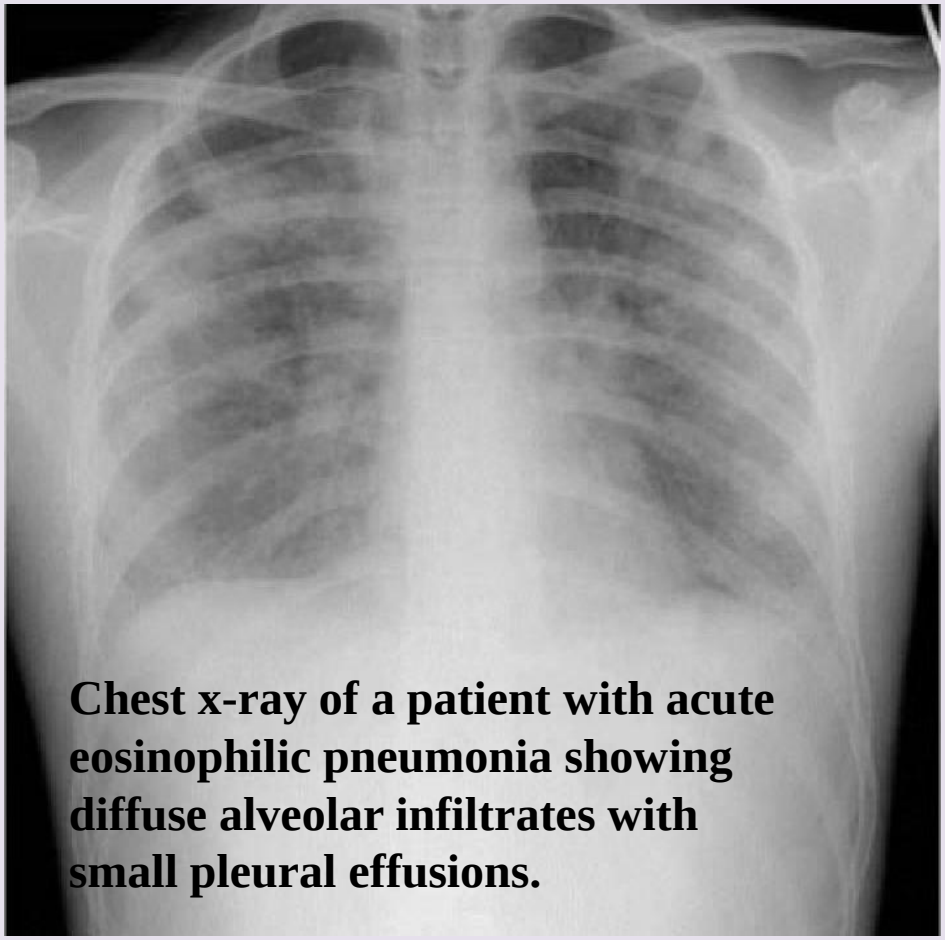
Usually the first sign of infection

is itching and a rash at the site where skin touched contaminated soil or sand, which occurs when the larvae penetrate the skin

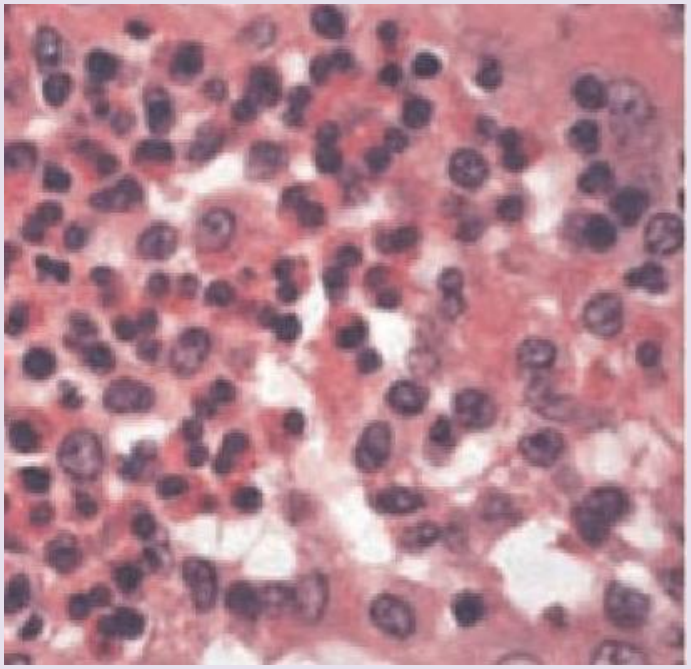
Ancylostoma duadenale

Additionally, cough and pneumonitis

may result as the larvae begin to break into the alveoli and travel up the trachea



Chest x-ray of a patient with acute eosinophilic pneumonia showing diffuse alveolar infiltrates with small pleural effusions.



Lung biopsy.
An alveolus is completely filled with a mixed inflammatory infiltrate composed primarily of eosinophils.

Ancylostoma duadenale

Once the larvae reach the small intestine of the host and begin to mature, the infected individual may suffer from

Figure 1. Child in typical stance as a result of malnutrition and hookworm disease (Tropical Medicine Central Resource: http://tmcr.usuhs.mil/tmcr/chapter12/clinical.htm)

diarrhea and other gastrointestinal discomfort

Ancylostoma duadenale

Hookworm infections causing

iron deficiency anemia

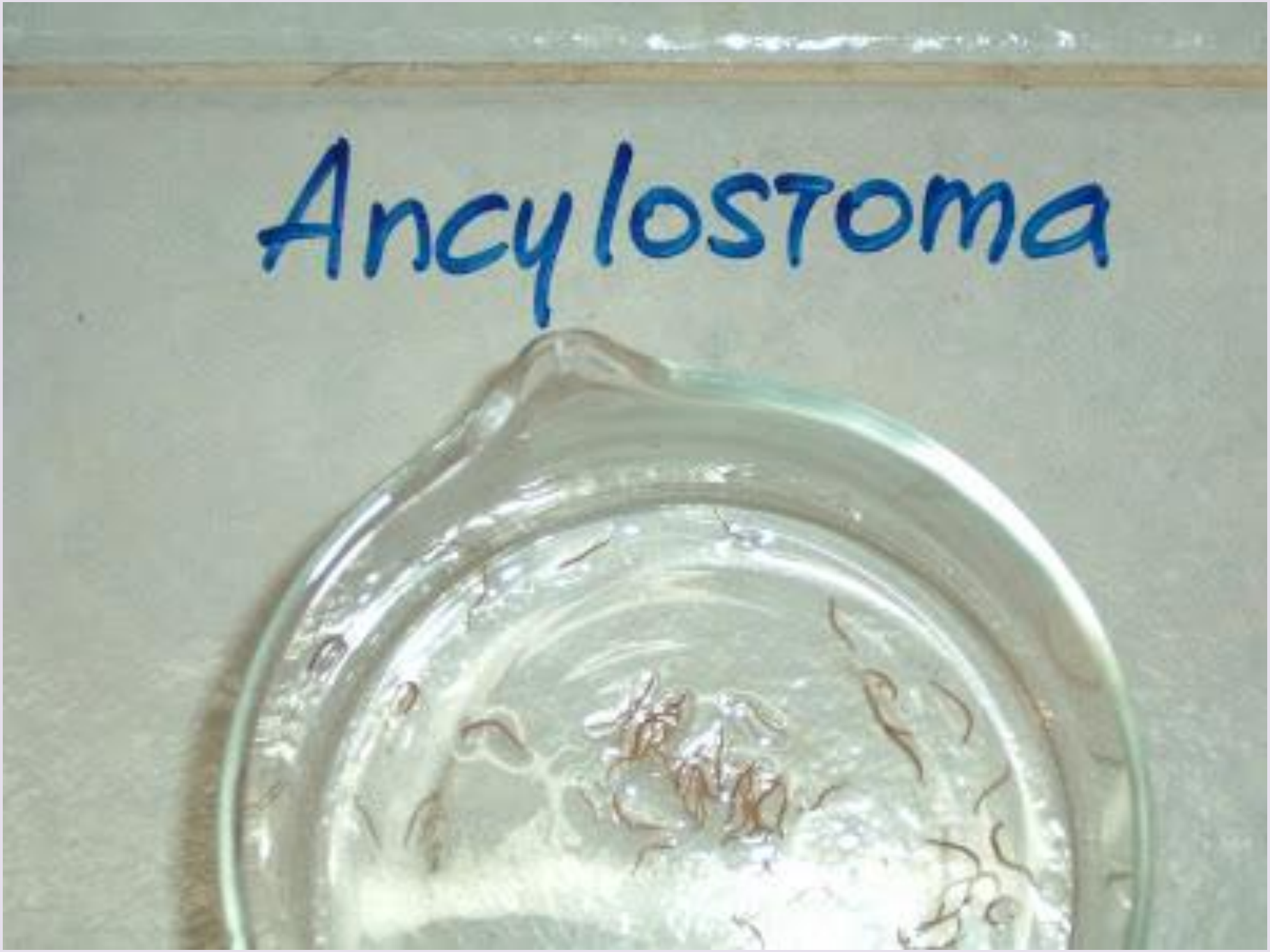
protein malnutrition

stunting of growth and general laziness

often accompanied by acute mental distress

Ancylostoma duadenale

Ancylostoma



Tratamentul

	Albendazol	Mebendazol	Tiabendazol	Pirantel	Invermectin
Oxiuriază	400 mg	100 mg		11 mg/kg	
Ascaridoză	400 mg	500 mg		11 mg/kg	150–200 µg/kg
Anchilostomidoză	400 mg	100 mg x2 ori în zi 3 zile		11mg/kg 3 zile	
Strongiloidoză	400 mg 7 zile		25mg/kg x2 ori zi 3 zile		200µg/kg 2-7 zile
Toxocaroză					
Trichineloză	400 mg 10 zile	500 mg 10 zile			
Trichocefaloză	400 mg 3 zile	100mg 3zile			200 mcg/kg 3 zile

Tratamentul

Doza medicamentului şi durata tratamentului depind de:

- ✓**Diagnostic (tipul helminţilor);**
- ✓**Vărsta pacienţului;**
- ✓**Masa corporală a bolnavului;**


INDIA

Health is the most beautiful and rich gift that nature can do

Michel de Montaigne