

***Ascaris lumbricoides***  
***Toxocara* spp.**

# SECERNENTEA (PHASMIDIA)

## CHARACTERISTICS NOTES :

- having caudal chemoreceptor organs or **Phasmids**
- caudal **papillae (numerous)**
- excretory system (**lateral canals present**)
- eggs **without bipolar plugs**



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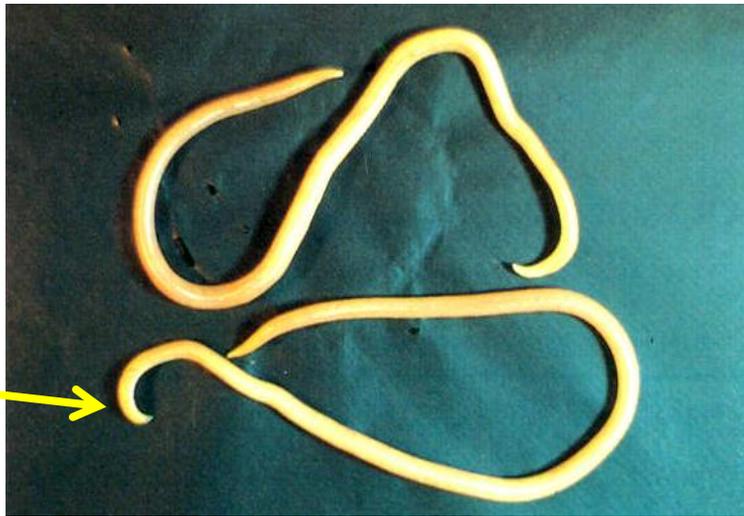
# *Ascaris lumbricoides*

(The large intestinal roundworm)

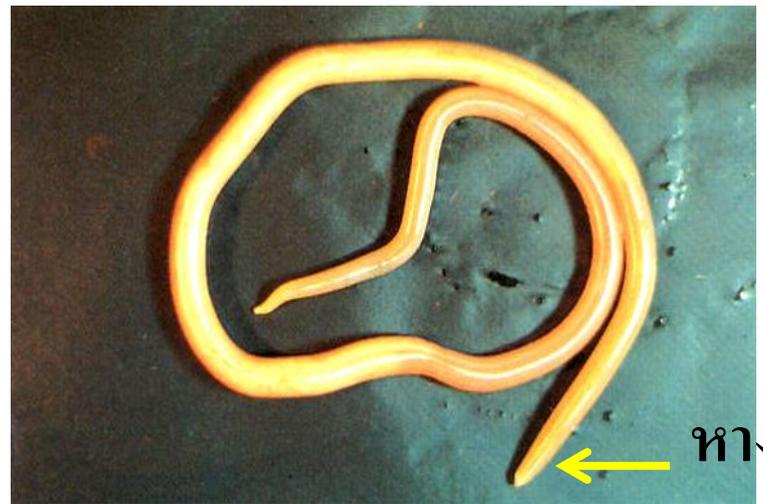
## **DISTRIBUTION :**

- **cosmopolitan**
- **common in warm, moist climate regions**

# พยาธิไส้เดือน : *Ascaris lumbricoides*



**Male**

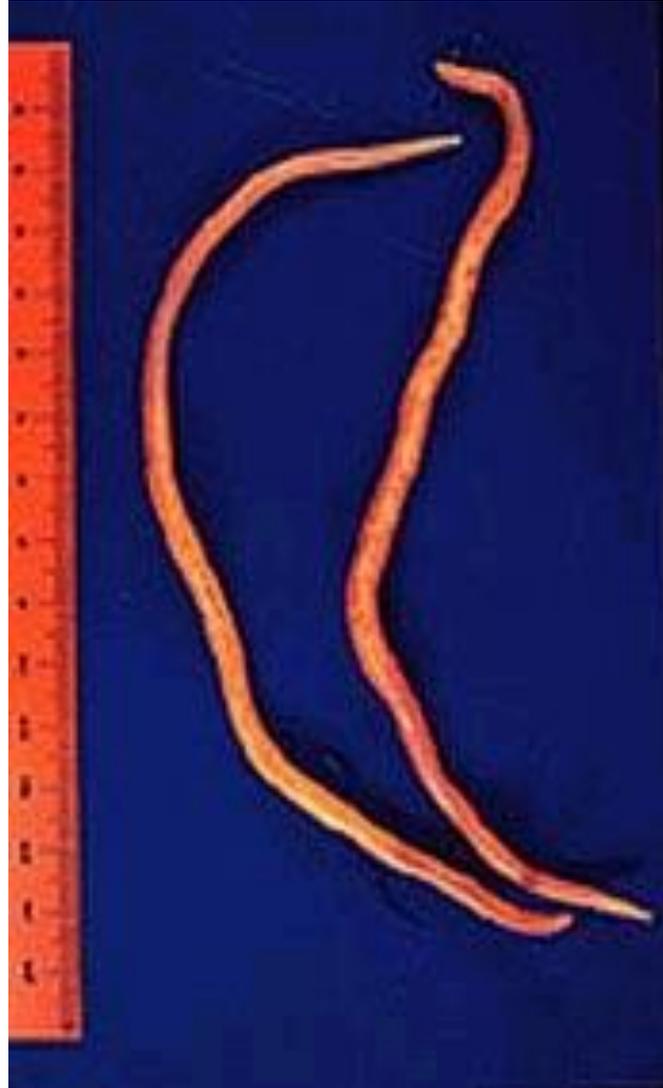


**Female**

# *Ascaris lumbricoides*

**adult**

**15-30 cm**

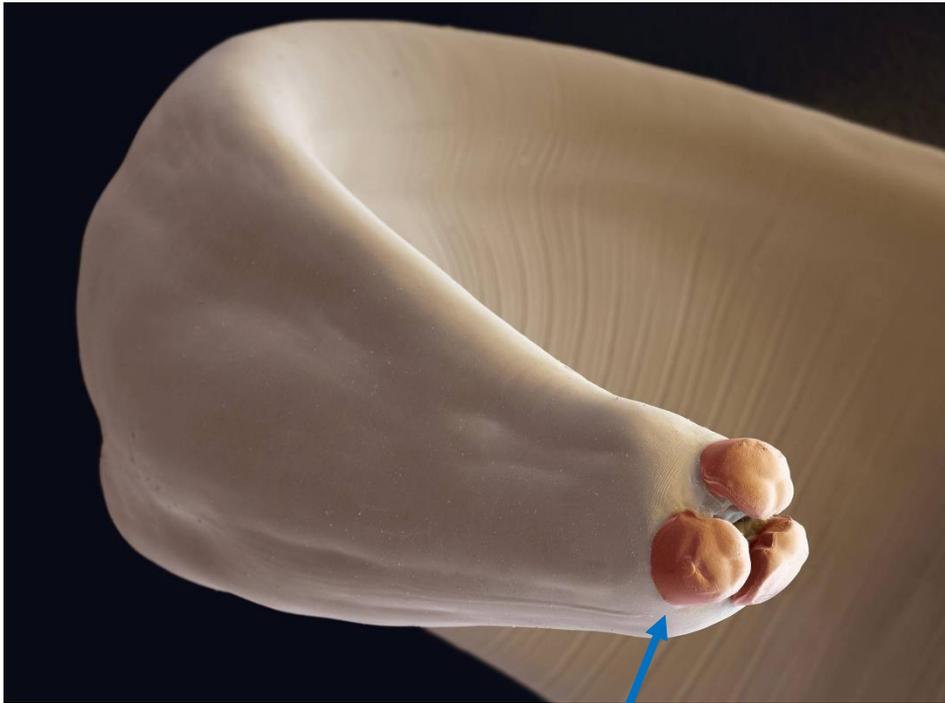


## **GENERAL CHARACTERISTICS:**

- **cylindrical, tapering at anterior end**
- **having 3 lips**
- **male worm is curved ventrad having two equal spicules**

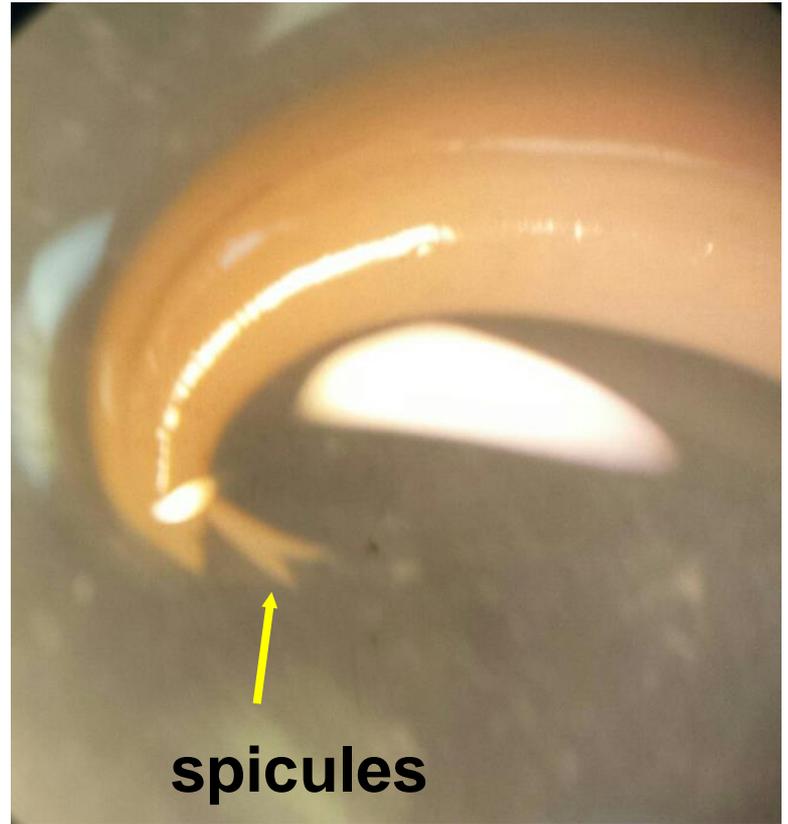
# *Ascaris lumbricoides*

anterior end



3 lips

tail end of male



spicules



# Egg

4 layer : lipid – chitinous – vitelline – albuminous

## 1. Fertilized egg

- broadly avoid, 75 X 50 um

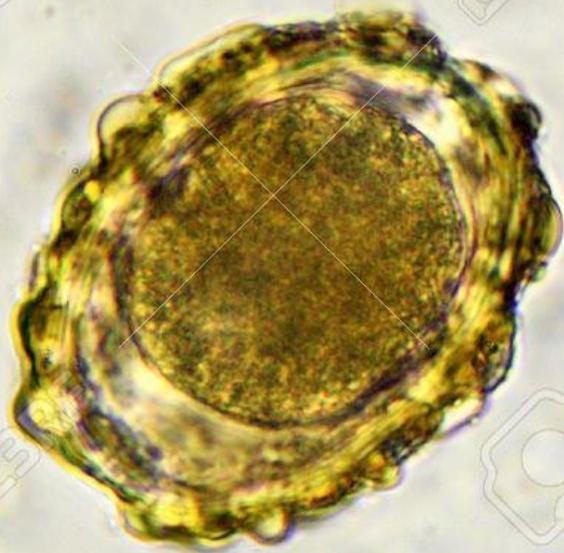
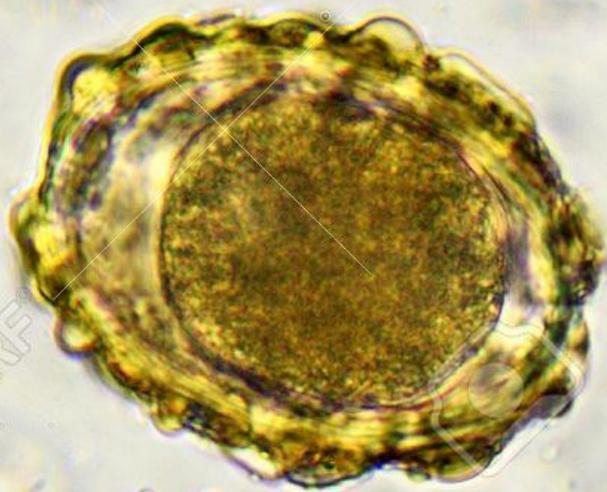
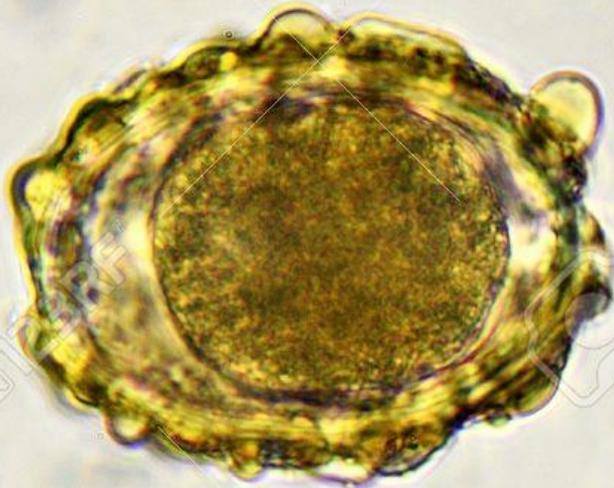
## 2. Unfertilized egg

- elongate 90 x 40 um with thin middle

layer

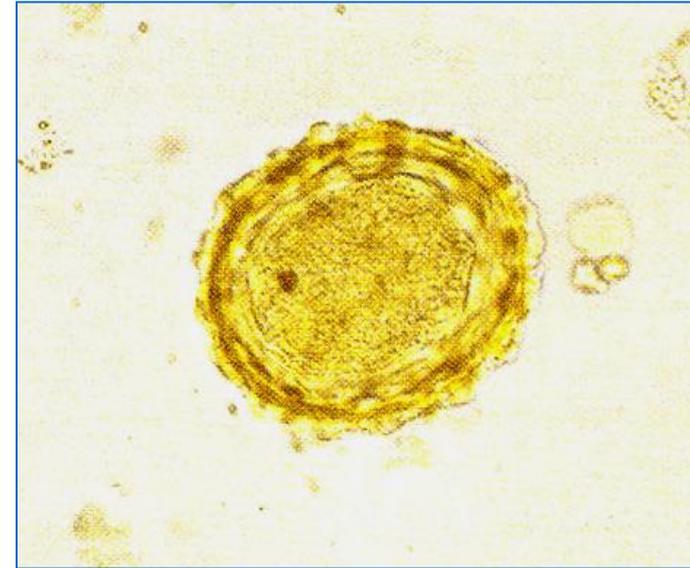
## 3. Decorticated egg

- both eggs without albuminous layer



# ***Fertilized egg***

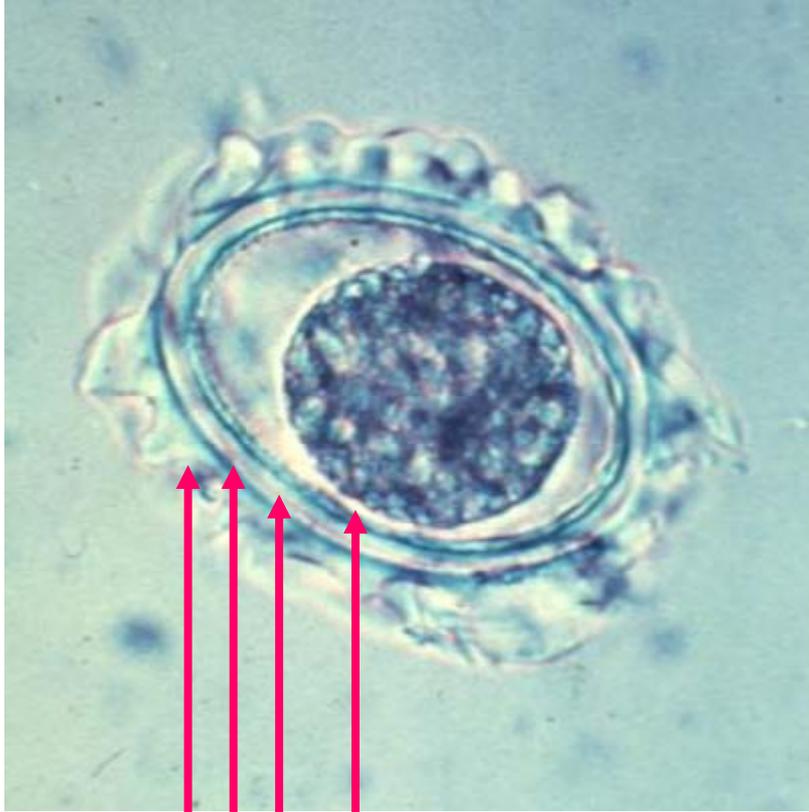
- **75 x 50 um, brownish to the bile pigment**
- **Outermost egg shell layer is a albuminous coat**
- **Thick egg shell especially chitinous layer**
- **Usually find a one-cell stage in freshly passed faeces**



## ***Fertilized egg, decorticated egg***

- Broadly ovoid with a thick shell transparent
- No outer albuminous layer





1 2 3 4

1. Uterine layer
2. Vitelline layer
3. Chitinous layer
4. Lipid layer



2 3 4



# ***Unfertilized egg***

- **90X60 um, brownish**
- **Elongated ovoidal in shape**
- **Egg shell is thinner than the fertilized of *Ascaris* egg**
- **It contains a mass of disorganized, highly refractive granules of various size**



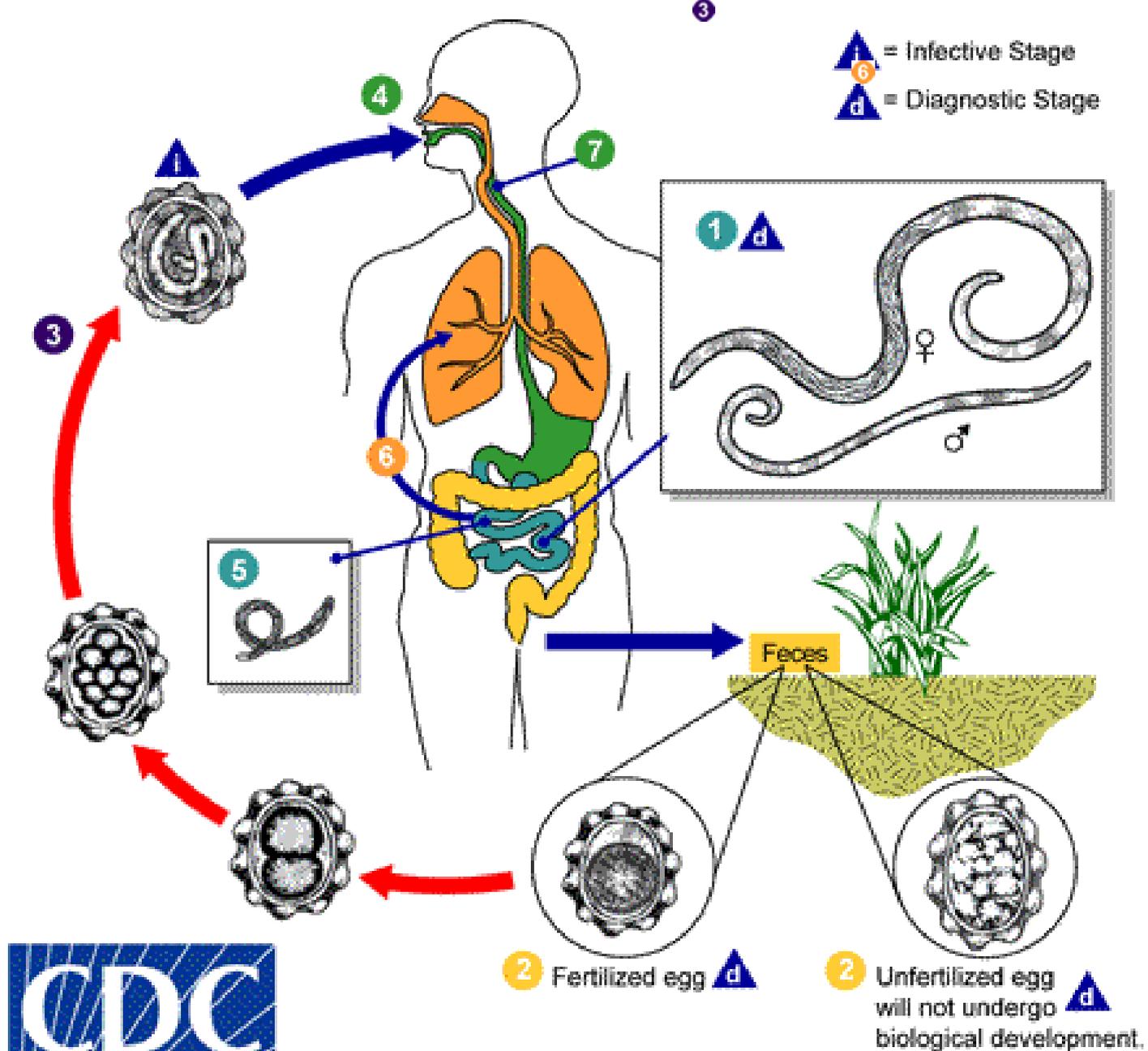
*Ascaris lumbricoides* Eggs



FERTILIZED

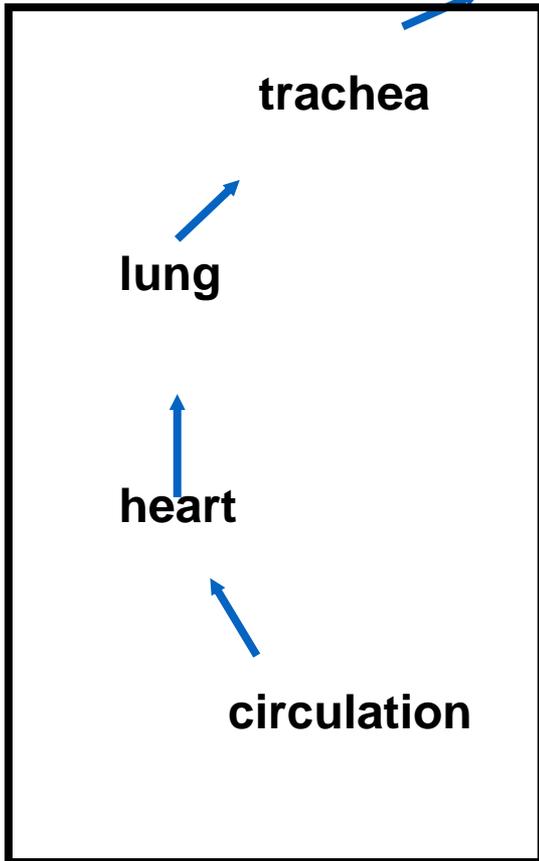


UNFERTILIZED



# *Life cycle*

Adult in small intestine

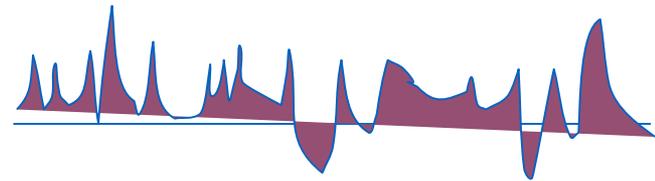


Human

feces



Maturation in soil  
Egg (L<sub>3</sub> inside)



ingested

Larva hatch in small intestine

## Life Cycle:

Adult worms live in the **lumen** of the small intestine.

A female may produce approximately **200,000 eggs per day**, which are passed with the feces.

Unfertilized eggs may be ingested but are not infective.

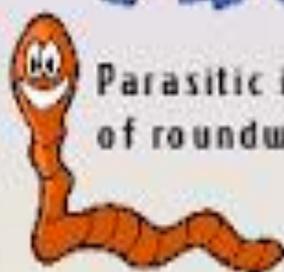
Fertile eggs embryonate and become **infective after 18 days** to several weeks, depending on the environmental conditions (optimum: moist, warm, shaded soil).

After infective eggs are **swallowed**, the larvae hatch , invade the intestinal mucosa, and are **carried via the portal**, then systemic circulation to the lungs.

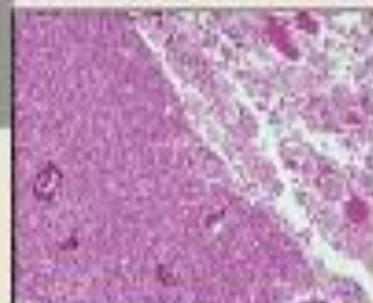
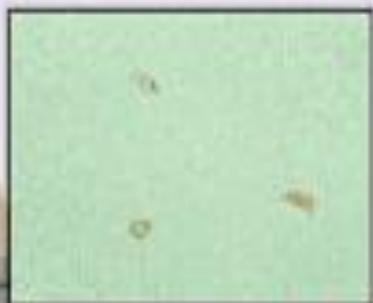
The larvae **mature further in the lungs (10 to 14 days)**, penetrate the alveolar walls, ascend the bronchial tree to the throat, and are **swallowed**. Upon reaching the **small intestine**, they develop into **adult worms** .

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**.

# ASCARIASIS



Parasitic infection caused by a type of roundworm *Ascaris lumbricoides*



Ascariasis is caused by ingesting eggs



Children more often infected than adults



Most prevalent in warm moist climate (as in tropics and subtropics)



Fingers or hands with contaminated dirt are put in the mouth



Eggs live in soil contaminated by feces



Risk factors:



Fruits and vegetables not properly cooked, washed or peeled

#roypath

histopathology-india.net

# **Pathology:**

**due to immune response of host &  
mechanical effect of worms**

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## **Larvae in lung:**

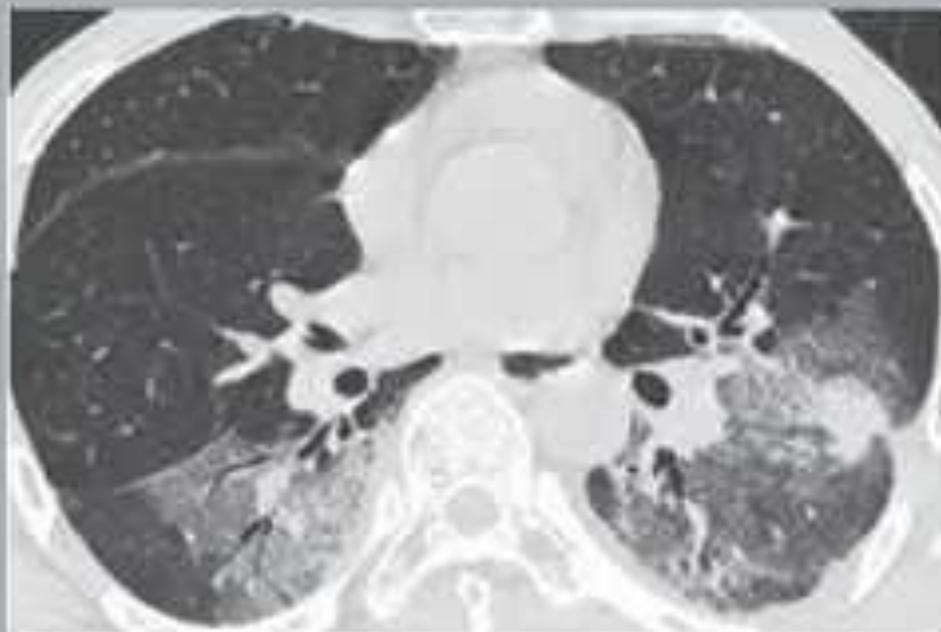
**--> bronchial damage**

**--> pneumonia (Loeffler's syndrome)**

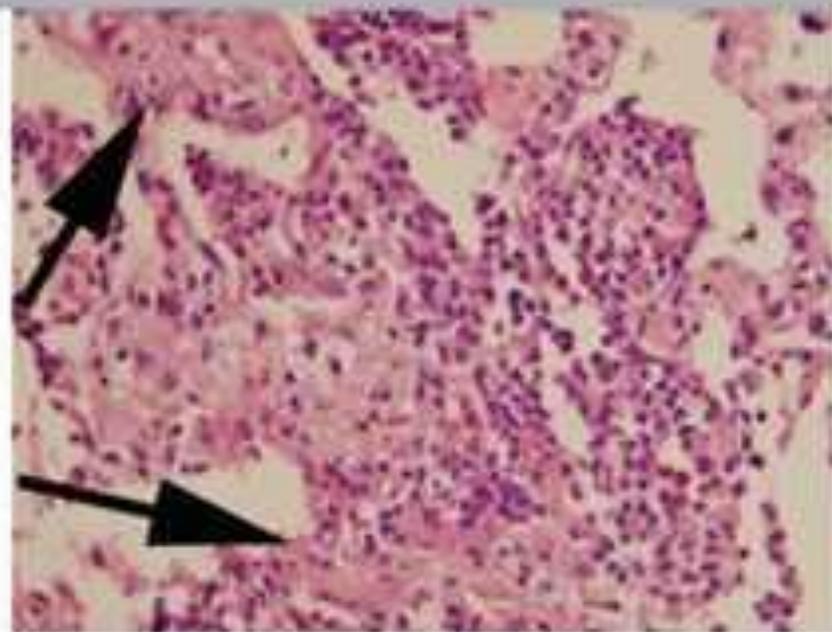
# Loeffler's syndrome

Simple **pulmonary eosinophilia** is inflammation of the lungs associated with an increase in Eosinophils.

**Causes:** Most cases of simple pulmonary eosinophilia are due to an **allergic reaction**, either from a **drug**, such as sulfonamide, or infection from a fungus or **parasite**, including *Ascaris lumbricoides*



a.



b.

**CEP. (a)** CT scan (lung windowing) shows ground-glass opacities with intralobular interstitial thickening in both lower lobes. **(b)** High-power photomicrograph of a transbronchial lung biopsy specimen shows infiltration of eosinophils and polymorphous inflammatory cells into the alveolar lumen and interstitium and a varying degree of interstitial fibrosis (arrows).



# Pathology:

## Adult:

- Malnutrition
- Migration of adult worms
- Adults impacted in many organs

# Migration of adult worms

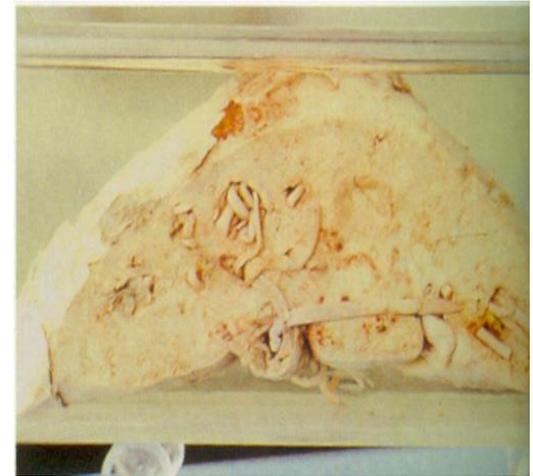


# Pathology

***Intestine***



***Liver***



**Adult worms of *Ascaris lumbricoides* obstruct in the small intestine and liver**



# ***Pathology***



**A great number of *Ascaris lumbricoides* parasitic  
in an 8 year-old boy.**

# Epidemiology

Eggs become infectious after 2 weeks in soil;  
they can persist in soil for 10 years or more.

## 2 factors:

- soil: - humidity  
- temperature
- habit of host



# Diagnosis

- feces (egg)
- adult worm
- clinical
- X-ray

## ***Mebendazole***

- 100 mg twice daily for 3 days
- 600 mg single dose

## ***Albendazole***

- 400 mg single dose

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# *Toxocara* spp.

\* species that are known to cause disease in man are

*Toxocara canis*

*Toxocara cati*

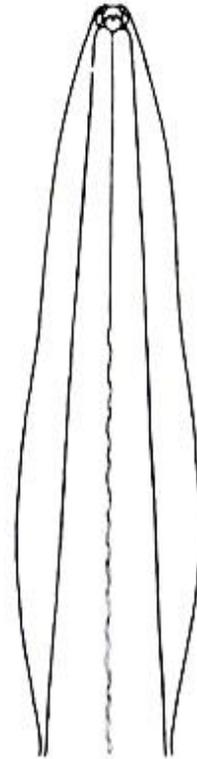
# *Toxocara canis*



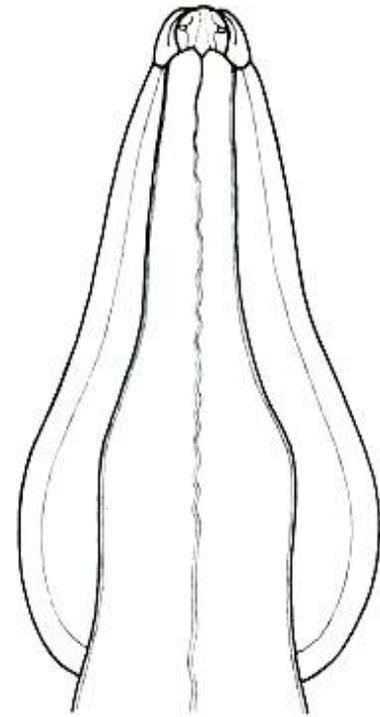
# *Toxocara* spp.

## Adult

- smaller than human *Ascaris*
- 4-6 x 7-12 cm
- cervical alae

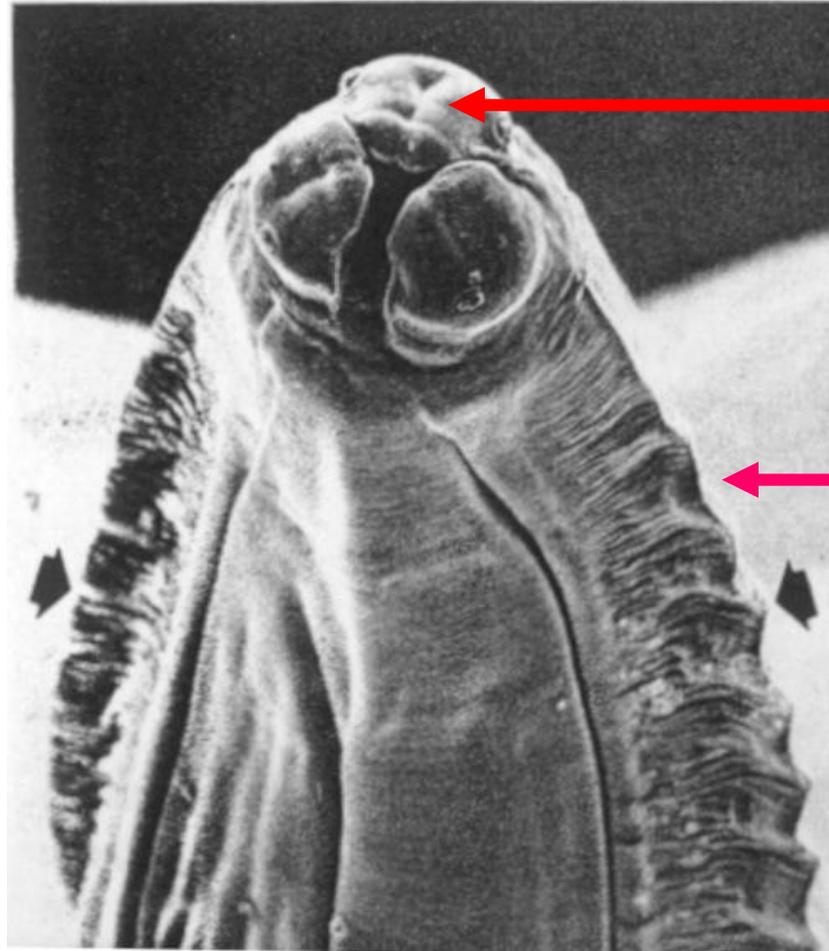


*T. canis*



*T. cati*

# *Toxocara* spp.



**3 lips**

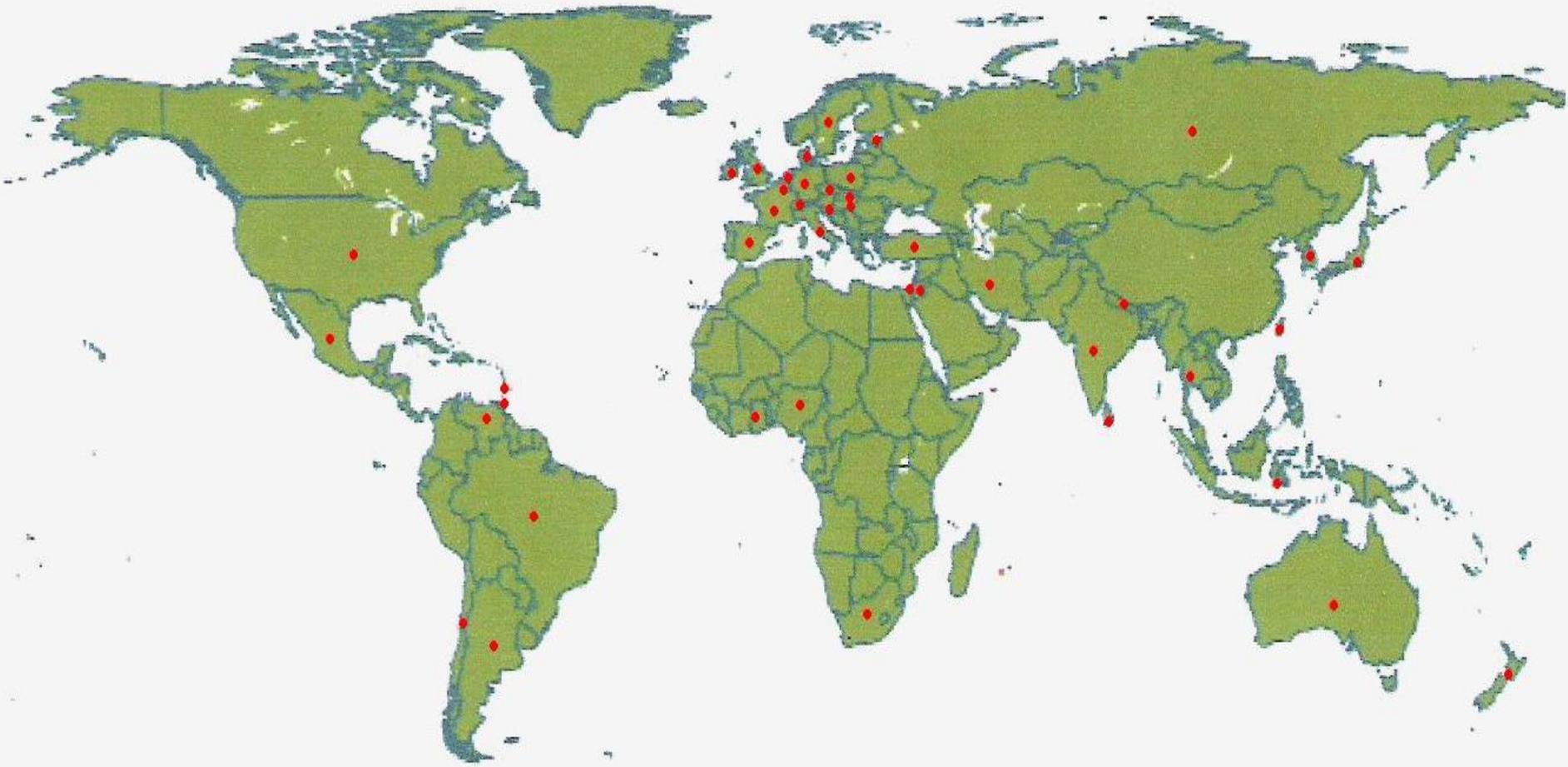
**Cervical alae**

*Toxocara canis*  
(The dog ascarid)

**Distribuion:** cosmopolitan

**Typical characteristics:** cervical alae are much longer than broad

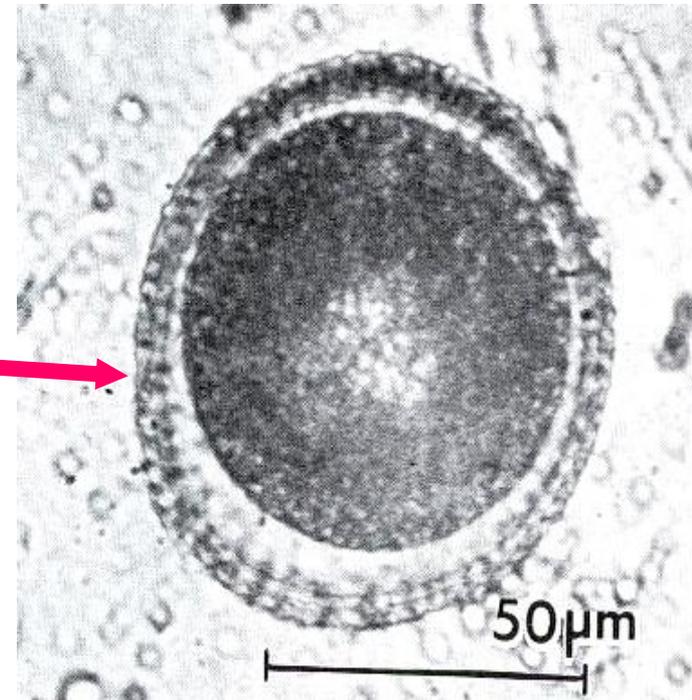
**Disease is found worldwide or in virtually every country**



# EGG

- subglobose
  - pitted shell
  - unembryonated
  - infective stage in 3-4 weeks
- \*(3<sup>rd</sup> stage larvae in eggs)

**pitted surface of  
egg shell**

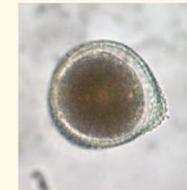




adult worms establish in the small intestine of dogs



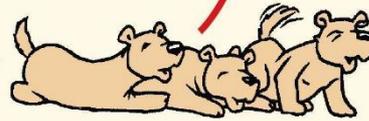
unembryonated eggs are shed in the environment with the feces of the canine host



eggs embryonate and become infective in the environment



transplacental and transmammary infection of puppies



encysted larvae are reactivated during late pregnancy of the bitch



in adult dogs: the development of the larvae is arrested (larval encystment)



dogs get infected by contact with contaminated soil and ingestion of embryonated eggs

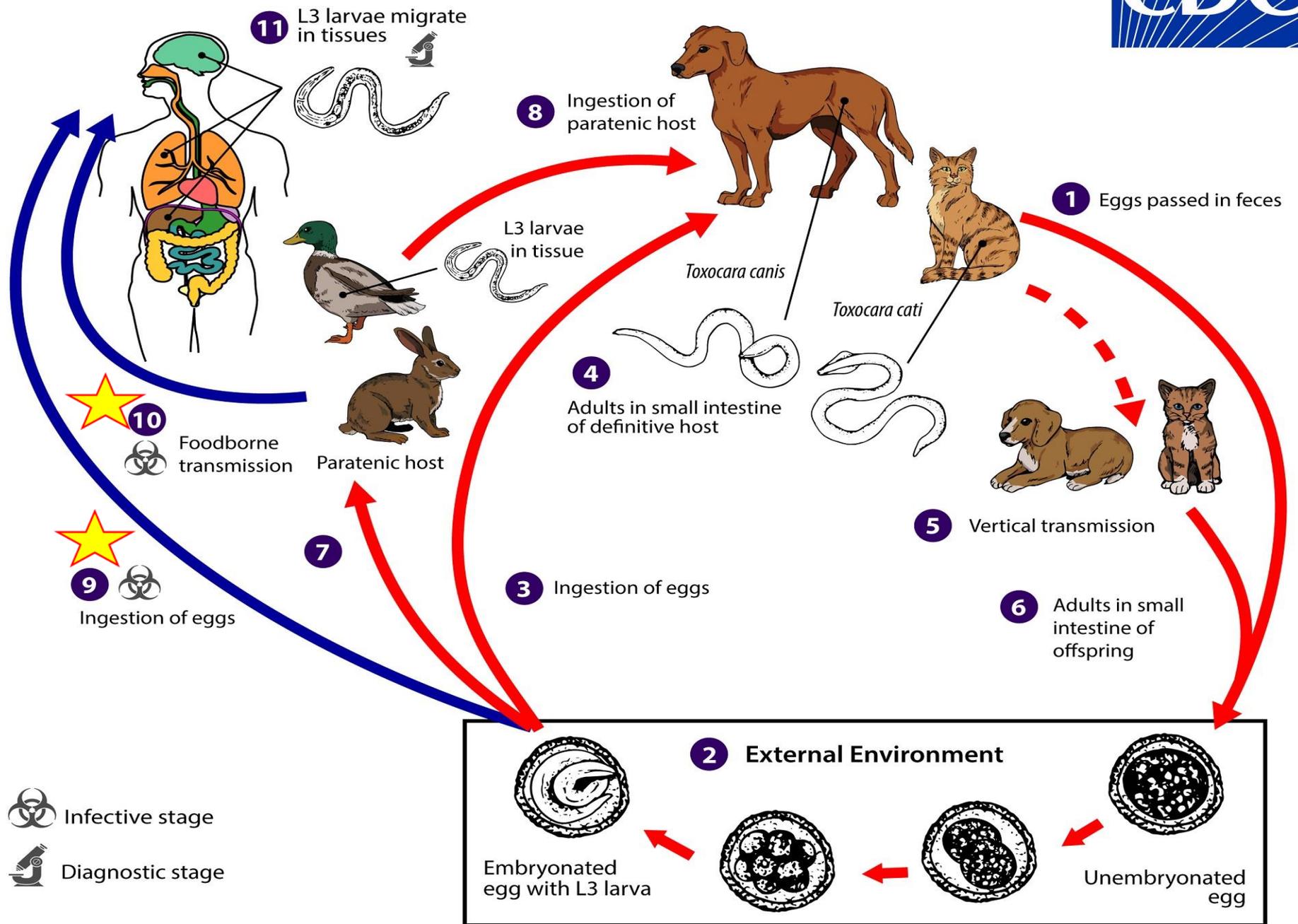


humans get infected by contact with contaminated soil and ingestion of embryonated eggs



in puppies: larvae migrate through lung, bronchial tree and esophagus; adult worms develop and ovoposit in the small intestine

## Life cycle of *Toxocara canis*



## **Human infection** with

- ingestion of **infective eggs** from soil
- possible **larvae** in uncooked tissue of a **paratenic host**

**Caused:**

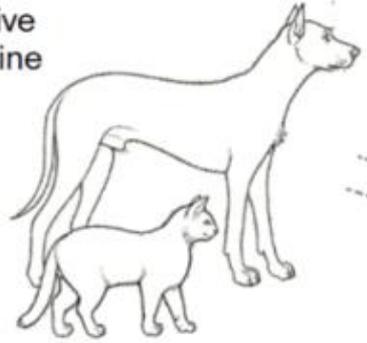
*Visceral larva migrans*

*Ocular larva migrans*

# Visceral Larva Migrans (VLM)

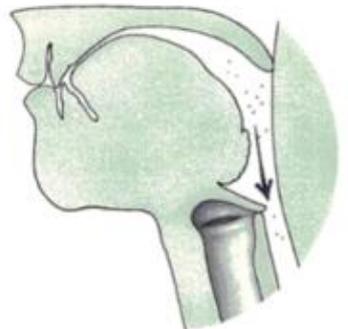
**VLM: is a syndrome caused by the migration of the larva of *Toxocara* spp. or other parasitic helminths in deeper parts of body**

Adult worms live in small intestine

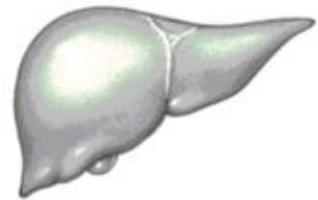


Dogs and cats pass eggs in feces

Embryonated eggs ingested



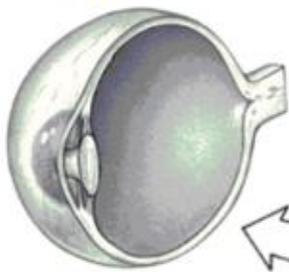
Hepatosplenomegaly



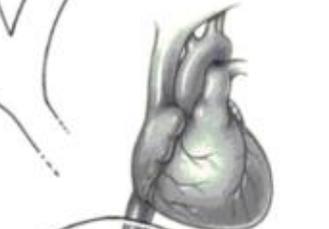
Neuropsychological



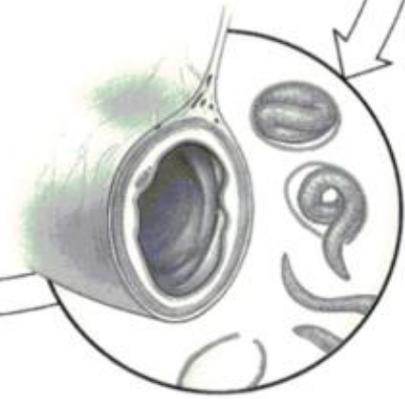
Retinal granuloma



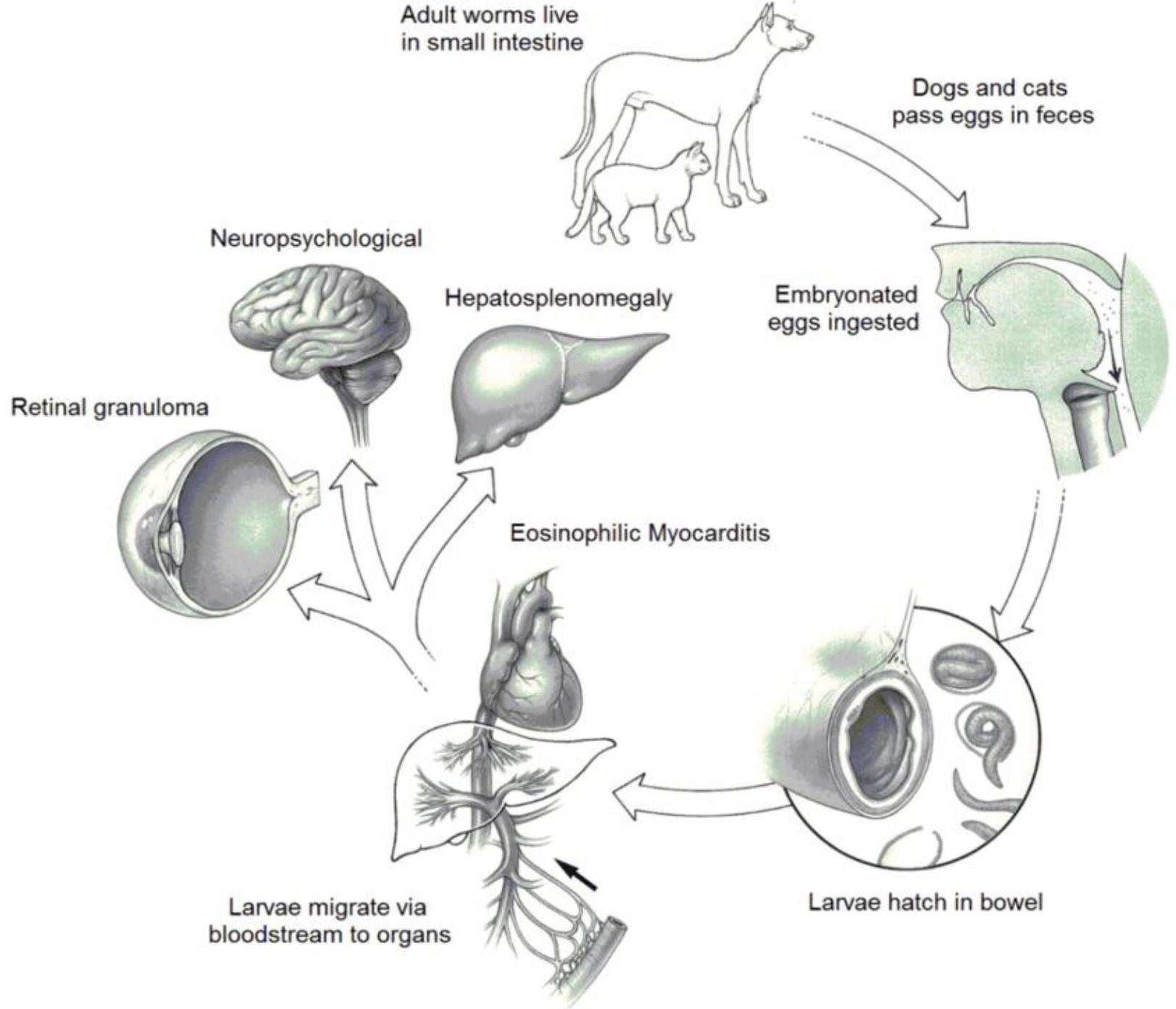
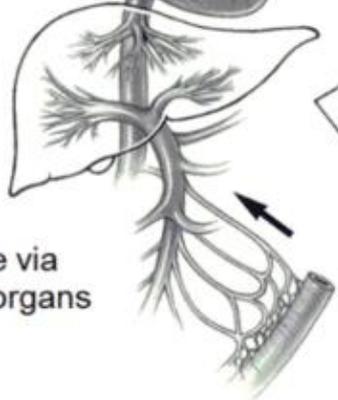
Eosinophilic Myocarditis



Larvae hatch in bowel



Larvae migrate via bloodstream to organs

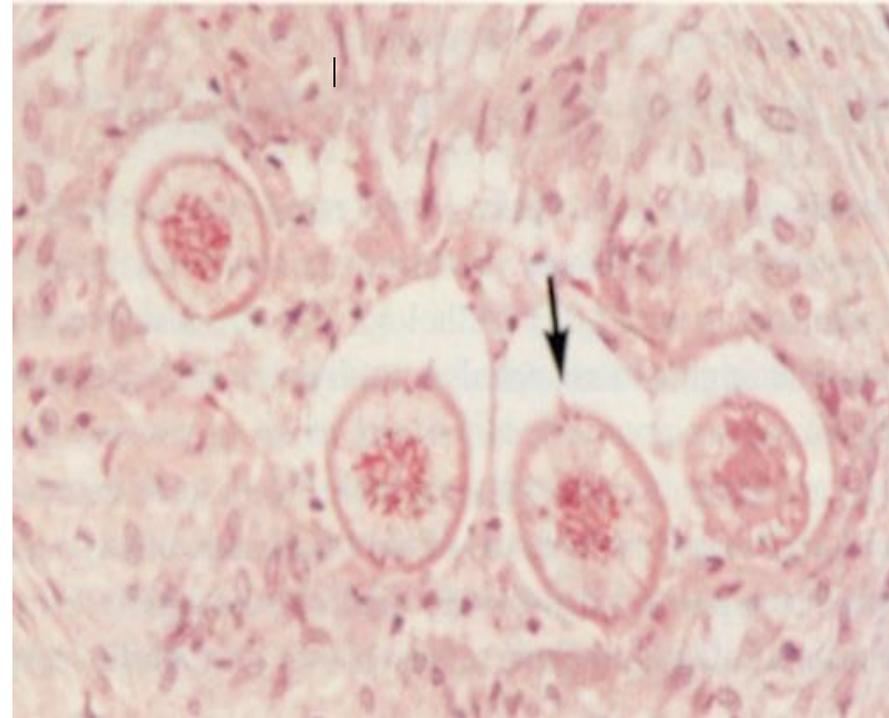
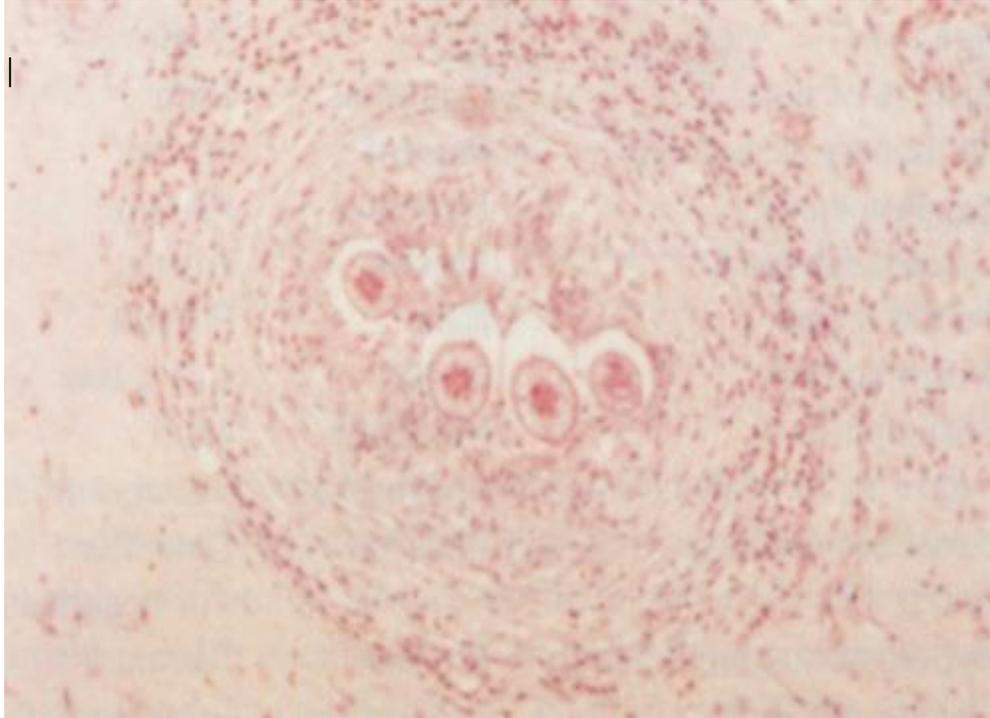


# VLM

- Symptoms **depend on the organ(s) affected.**
- Patients can present with pallor, fatigue, weight loss, anorexia, fever, headache, skin rash, cough, asthma, chest tightness, increased irritability, abdominal pain, nausea, and vomiting.
- Sometimes the **subcutaneous migration tracks** of the larvae can be seen.

- Patients are commonly diagnosed with **pneumonia**, **bronchospasms**, **chronic pulmonary inflammation**, **hypereosinophilia**, **hepatomegaly**, **hypergammaglobulinaemia** (IgM, IgG, and IgE classes)
- Severe cases -> **hypersensitive** to allergens; in rare cases, **epilepsy**, **inflammation of the heart**, **pleural effusion**, **respiratory failure**, and **death have resulted from VLM**.

# Pathology



**A lung section from  
patient with VLM**

# Ocular larva migrans (OLM)



# Ocular larva migrans (OLM)

- Toxocara damage in the eye -> **blindness.**
- often occurs in just **one eye** and from **a single larva** migrating into and encysting within the orbit.
- **Loss of vision** occurs over days or weeks.
- Other signs and symptoms: red eye, white pupil, fixed pupil, retinal fibrosis, retinal detachment, inflammation of the eye tissues and **retinal granulomas**
- Ocular granulomas resulting from OLM are frequently **misdiagnosed as retinoblastomas.**

# Epidemiology

- Eggs can mature to the **infective stage after two weeks** outside of a host.
- **Fresh eggs** cannot cause toxocariasis.
- *Toxocara* eggs can **remain infectious for years**, as they are very resistant to the effects of chemicals, as well as changes in temperature.
- **Defecation habits of dogs** cause *T. canis* transmission to be **more common** than that of *T. cati*.
- **Flies** can act as mechanical vectors for *Toxocara*

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→ Biopsy or surgical operation  
if larvae excised in tissue

→ Serological: ELISA  
PCR (research)

→ The degree of contact with dog

# Prevention and control

- **Washing hand well after playing with dogs or cats**
- **Eat cooked meat**
- **Dogs or cats should be treated with drug**



A friend is  
someone who is genuinely happy for you  
when things go well

*Freeman*