



# *Dracunculus medinensis* and *Trichinella spiralis*

**Presented by: Dr. Asma**

# *Dracunculus medinensis*

# INTRODUCTION

## Parasite

- *Dracunculus medinensis* (Guinea Worm).

## Means of Human Infection

- Infect small Crustaceans, called *Cyclops* which dwell in water supplies.
- Infection in human due to drinking of unfiltered water supply, which contains infected water fleas.

## Location of Larvae in Humans

- Intestinal tract, deep connective tissue.



## Location of Adults in Humans

- Deep connective tissues, subcutaneous tissue, dermis.

## Clinical Features

- Pruritus, blister, ulcer, eosinophilia, secondary infection.

## Laboratory Diagnosis

- Adult worm in lesion.

### Blister formation



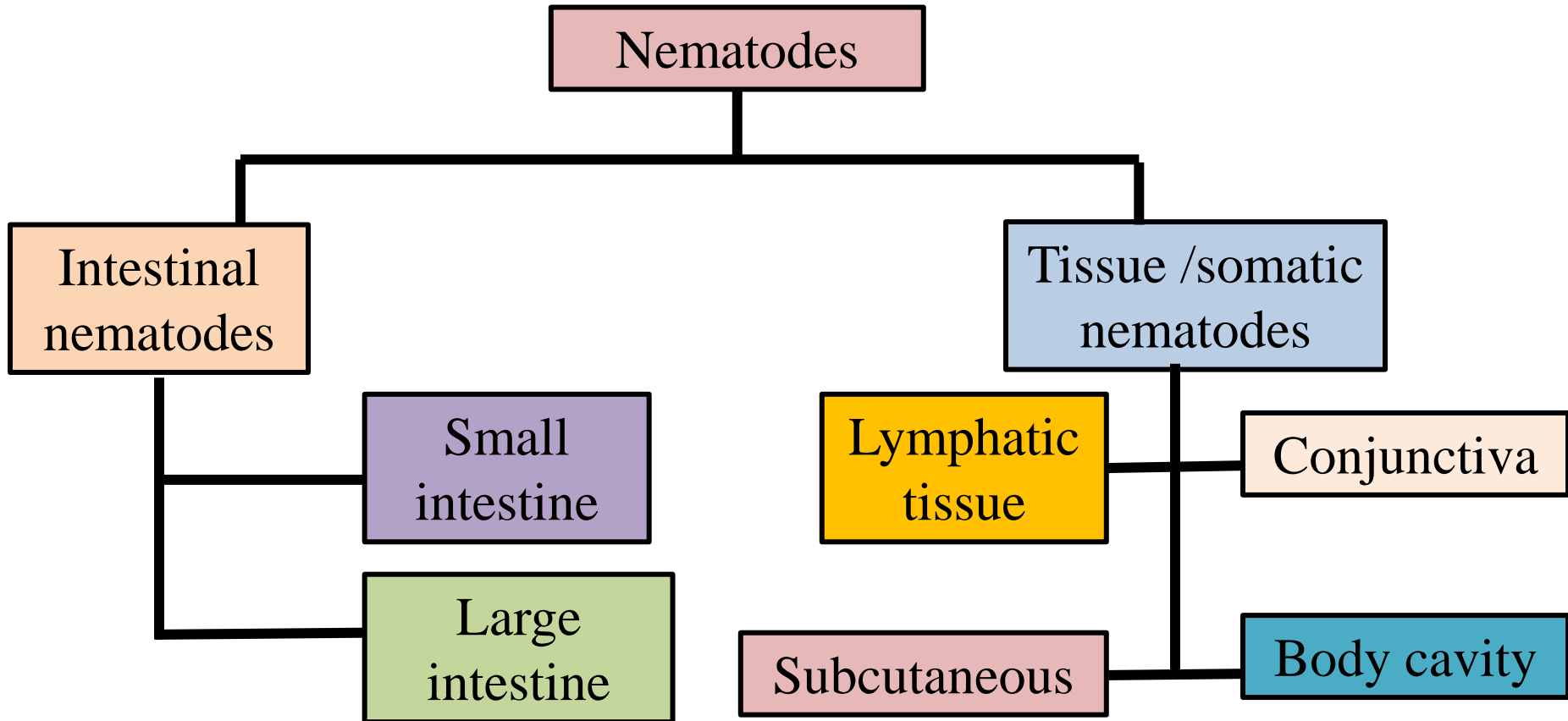
### Pruritus



### Leg ulcer

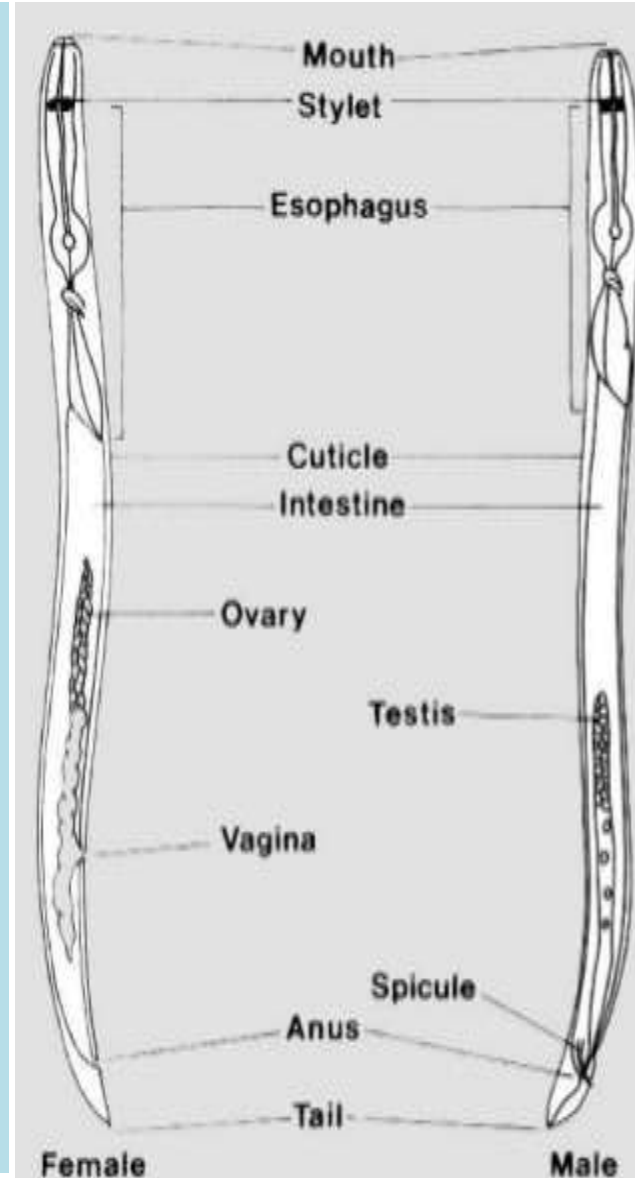


# CLASSIFICATION



# MORPHOLOGY

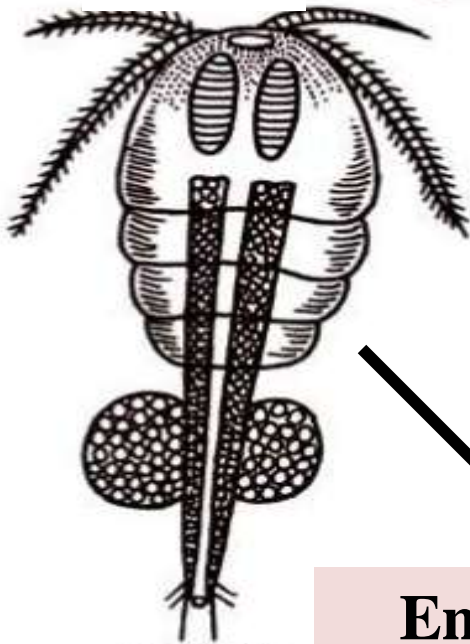
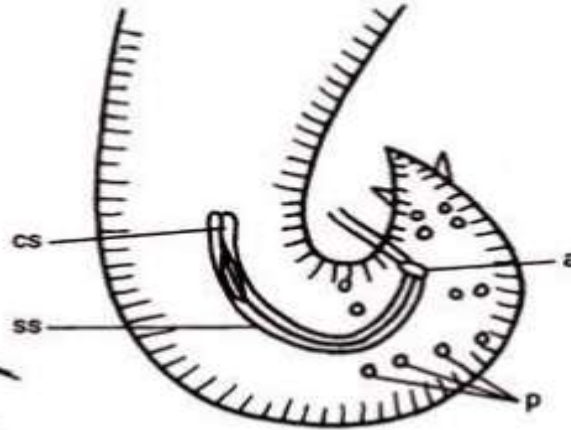
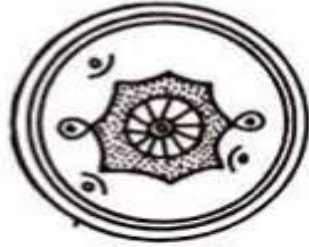
- It is the largest milky white human trematode.
- **Male:** 30 mm in length 0.4 mm in diameter with unequal spicules.
- **Female:** Female 120 cm x 1.7 mm with tapering end and contain thousands of embryos. In young females, the vulva is located around the mid body but it becomes atrophied and non-functional in adults, as does the intestine due to the high internal pressure generated by the gravid uterus.



**Anterior end**

**Head end of female adult**

**posterior end of male**

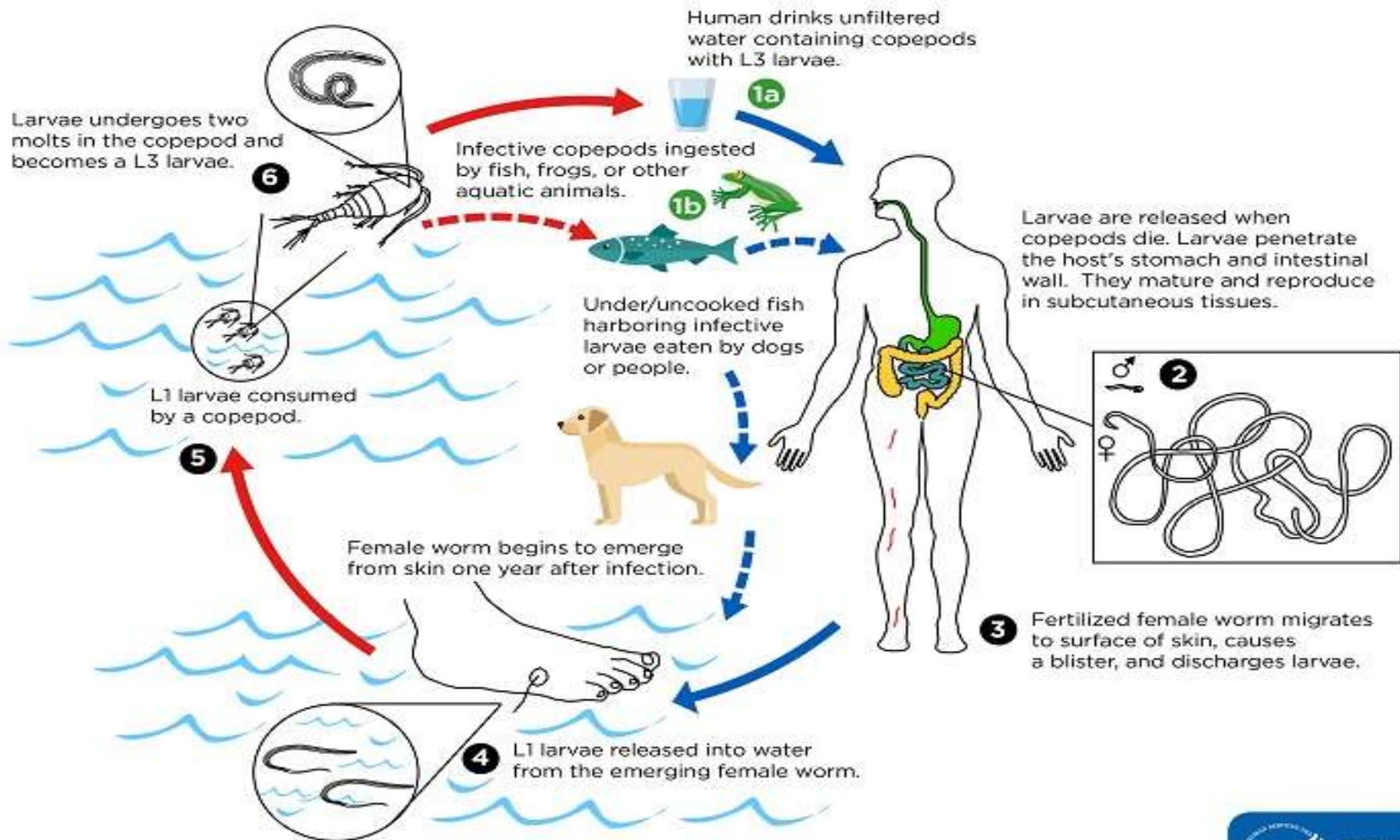


**Embryos (750  $\mu$ x 25  $\mu$ ) are wiry, coiled with a round head.**





# LIFE CYCLE





# Transmission, life-cycle and incubation period

- About a year after infection, a painful blister forms 90% of the time on lower leg and one or more worms emerge accompanied by a burning sensation.
- To soothe the burning pain, patients often immerse infected part of body in water.
- Worm(s) then releases thousands of larvae (baby worms) into water.
- These larvae reach infective stage after being ingested by tiny crustaceans or copepods, also called water fleas.

- People swallow the infected water fleas when drinking contaminated water. The water fleas are killed in the stomach but the ineffective larvae are liberated. They then penetrate the wall of the intestine and migrate through the body.



- The fertilized female worm (which measures 60–100 cm long) migrates under the skin tissues until it reaches its exit point, usually at the lower limbs, forming a blister or swelling from which it eventually emerges.
- The worm takes 10–14 months to emerge after infection.



July 4<sup>th</sup>

July 6<sup>th</sup>

July 8<sup>th</sup>

July 9<sup>th</sup>

July 10<sup>th</sup>

July 10<sup>th</sup>

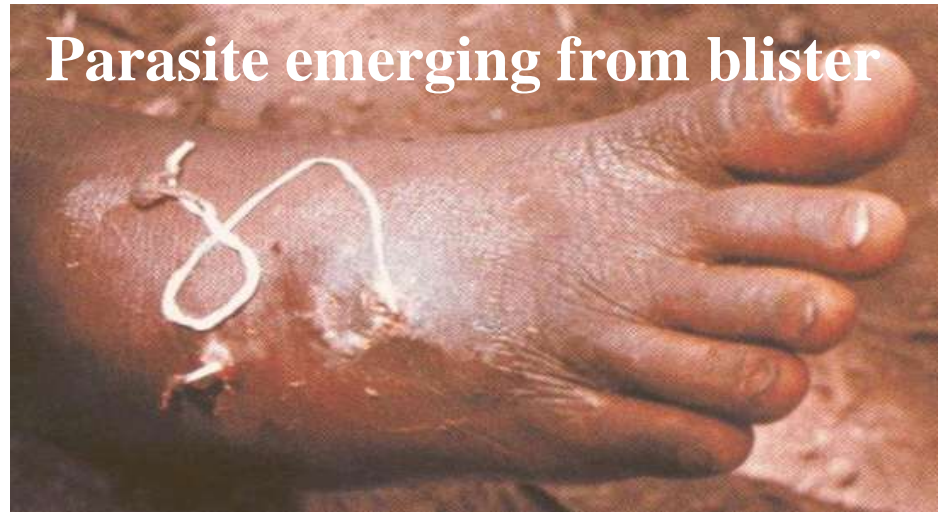
July 11<sup>th</sup>



**Blister formation**



**Parasite emerging from blister**



**White color worm**



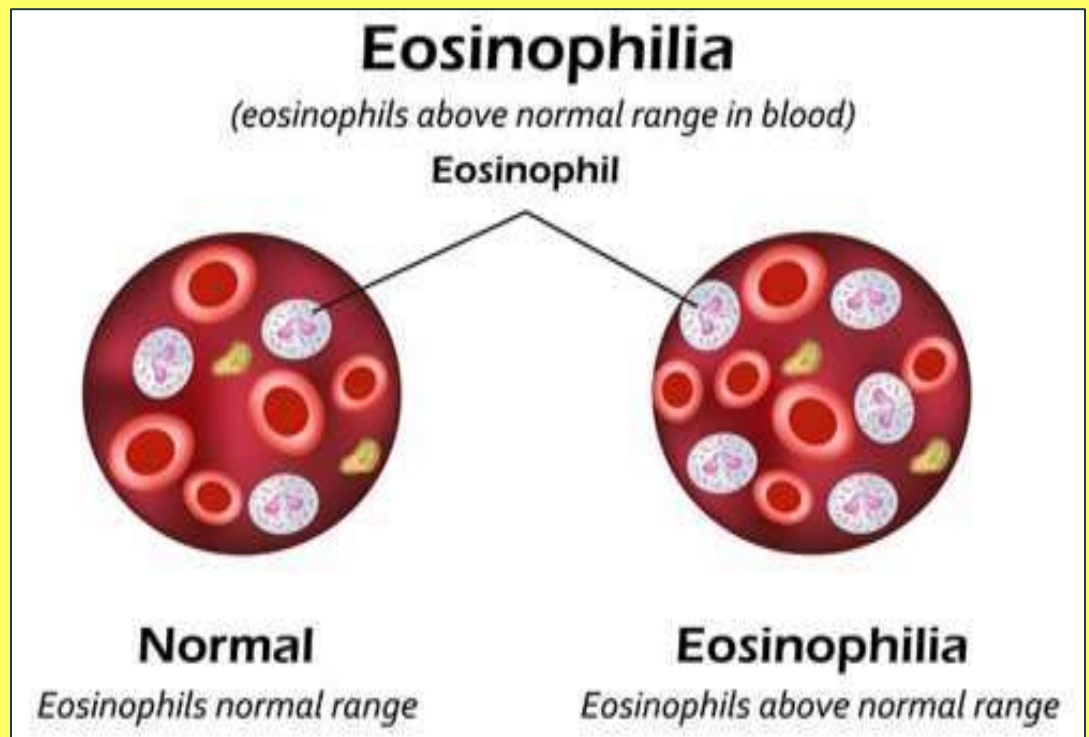
# EPIDEMIOLOGY

- It is surprising that life cycle of *D. medinensis*, which is very much dependent on water, is most successfully completed during the dry season. For instance, people in some areas of Africa depend on rivers for their water.
- During periods of normal river flow, dracunculiasis cases are very few or don't exist at all, but when dry season comes, number of cases dramatically increases.
- Warm and semi-stagnant pools favors population explosion of intermediate hosts: cyclopoid crustaceans.
- Because of the hot weather, people frequently visit the standing pools for drinking, bathing, and washing; these activities increase their chances of being infected by juveniles shed by crustaceans.
- Drinking the water is most effective way of acquiring the parasites.

- In many areas of India, constructing a step well has been an effective method of exposing the groundwater for centuries, but it has also been an effective way of completing the life cycle of *D. medinensis* parasites.
- Infected women release juveniles every time they walk on the running water of the step wells.
- People living in desert areas usually construct ponds that are filled during the rainy season. These ponds become sources of infection with *D. medinensis*.
- During the mid 1980s an estimated 3.5 million cases of dracunculiasis occurred in 20 countries worldwide, 17 countries of which were in Africa.
- Number of reported cases fell to fewer than 10,000 cases first time in 2007, dropping further to 542 cases in 2012, 28 in 2018 and a slightly higher number of 54 human cases in 2019.

# Symptoms

- People do not usually have symptoms until about one year after they become infected. A few days to hours before the worm comes out of the skin, the person may develop:
- Fever
- Swelling
- Pain in joints
- Nausea
- Pruritus
- Blisters
- Ulcers
- Eosinophilia and secondary infections.





# LABORATORY DIAGNOSIS

- Detection of adult worm in the ulcer and embryo discharged in the water;
- Skin test;
- Calcified worm by X-ray.
- Falcon Assay Screening test (FAST ELISA) is most recent serology for diagnosis of dracunculiasis.



# TREATMENT

- Extraction of adult worm from patient using a stick at skin surface and wrapping or winding the worm a few centimeters per day. Because the worm can be as long as one meter in length, full extraction can take several days to weeks.
- Affected body part is immersed in a container of water to encourage more of worm to come out.



**Worm extraction using stick from foot**

- The drugs (Niridazole, thiobendazole, mebendazole, metronidazole) reduce duration of emergence and associated pain, Ivermectin is under trial.
- Medicine, such as [aspirin](#) or [ibuprofen](#), can help reduce pain and swelling.
- Antibiotic ointment can help prevent secondary [bacterial infections](#).
- The worm can also be surgically removed by a trained doctor in a medical facility before a blister forms.

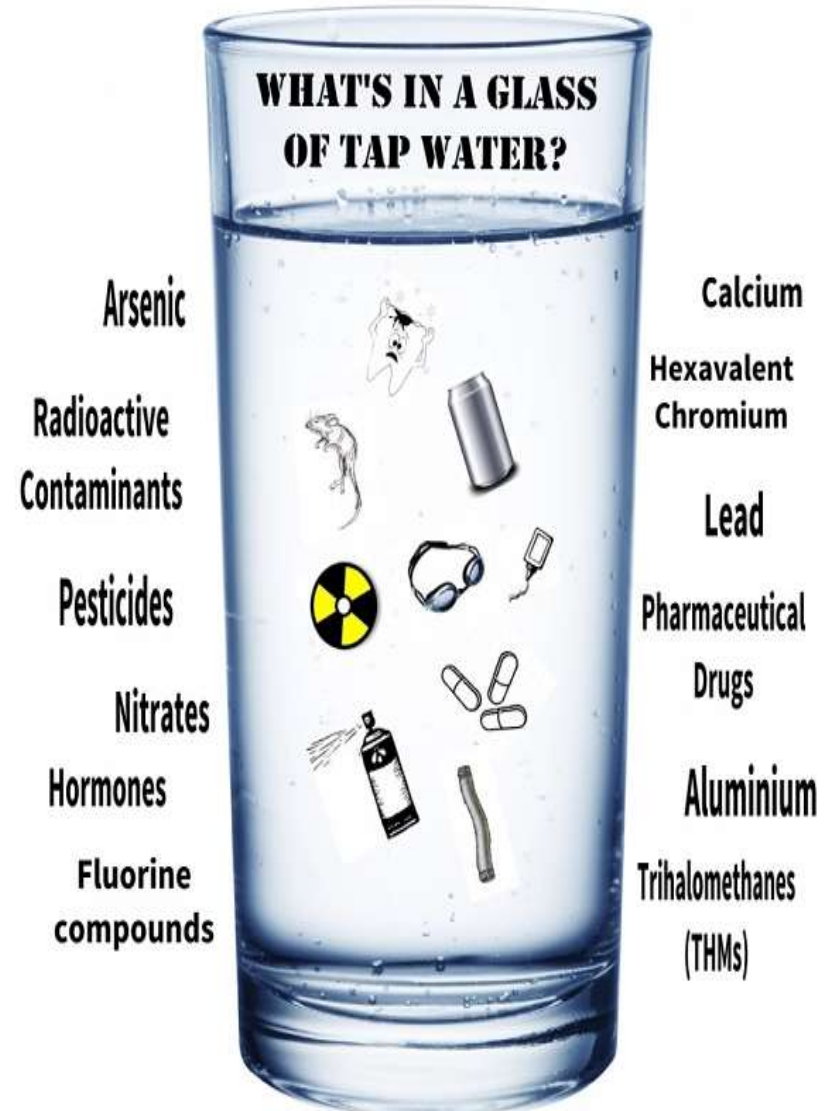
Removal of parasite by surgery





# Prevention

- Prevent contamination of drinking water by infected persons or animals.
- Provision of safe drinking water
- Vector control
- Health education and community mobilization.

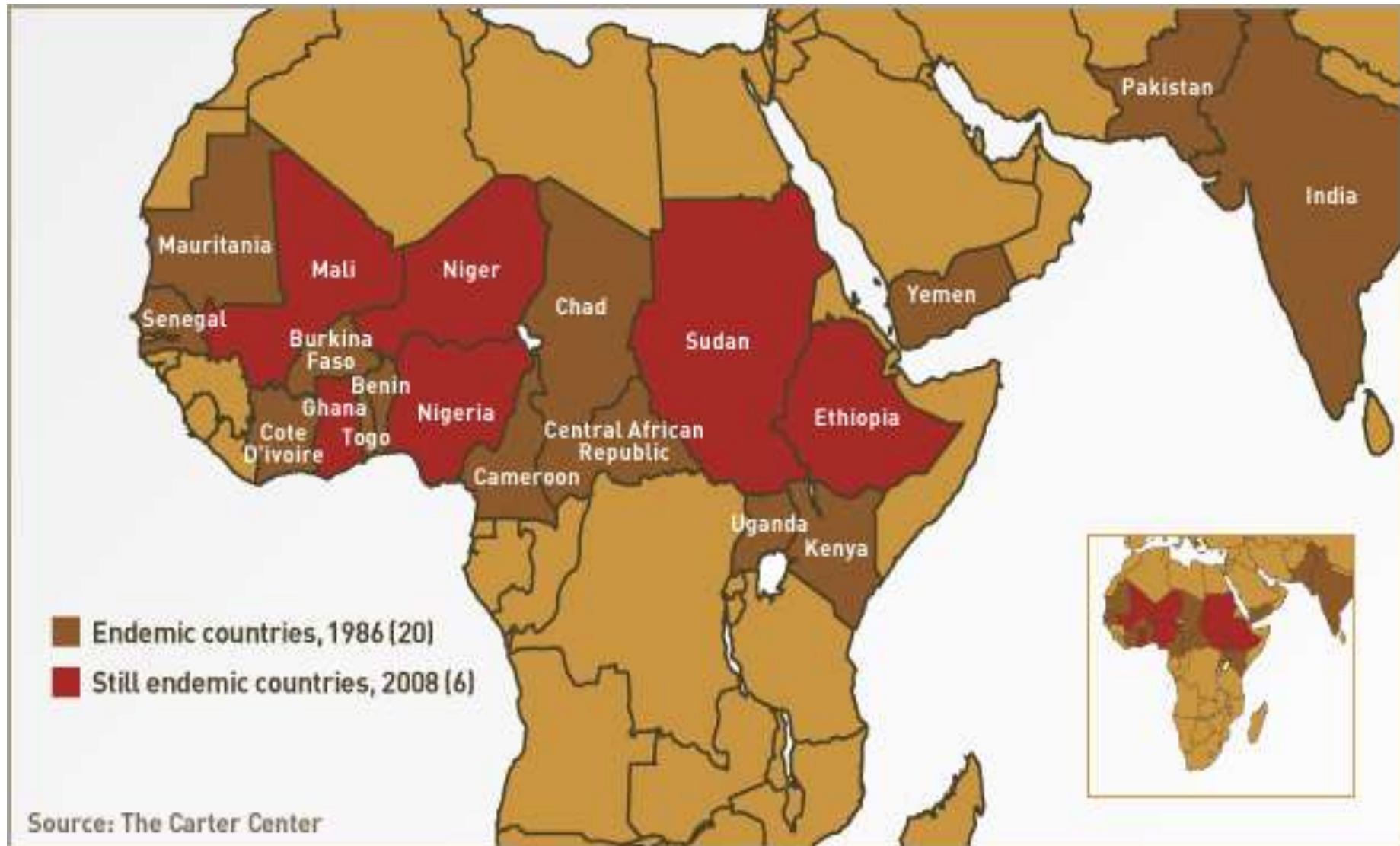


# CONTROL

- Patient identified within 24 hours of worm emerging.
- The person receives proper treatment and case management by a local health provider, by cleaning and bandaging the wound until the worm has been fully removed manually and by providing health education to discourage the patient from contaminating any water .
- The approved chemical temephos is used to treat potentially contaminated surface water if there is any uncertainty about contamination.



# DISTRIBUTION MAP

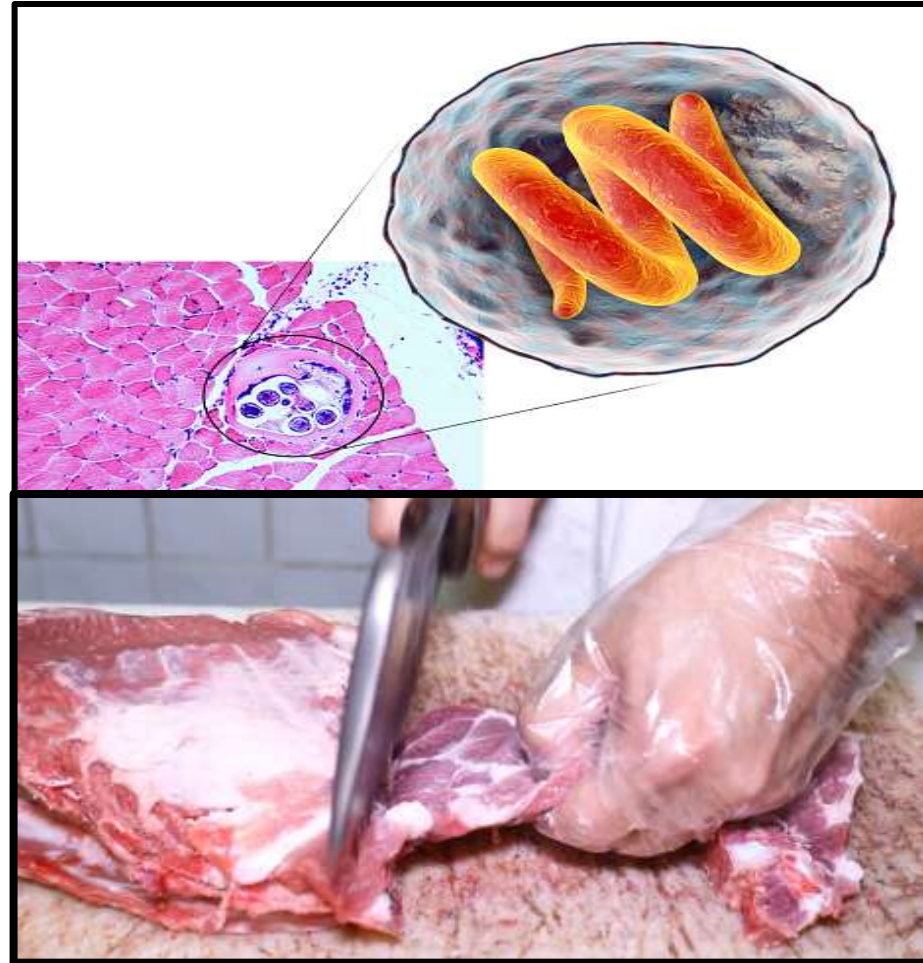


# ***Trichinella Spiralis***



# INTRODUCTION

- Trichinellosis is caused by nematodes (roundworms) of the genus *Trichinella*.
- Trichinosis occurs with the ingestion of undercooked meat contaminated with infective larvae of *Trichinella* species.
- Adult *Trichinella* live in the duodenal and jejunal mucosa of flesh-eating animals throughout the world, particularly swine, rodents, bears, canines, felines, and marine mammals.



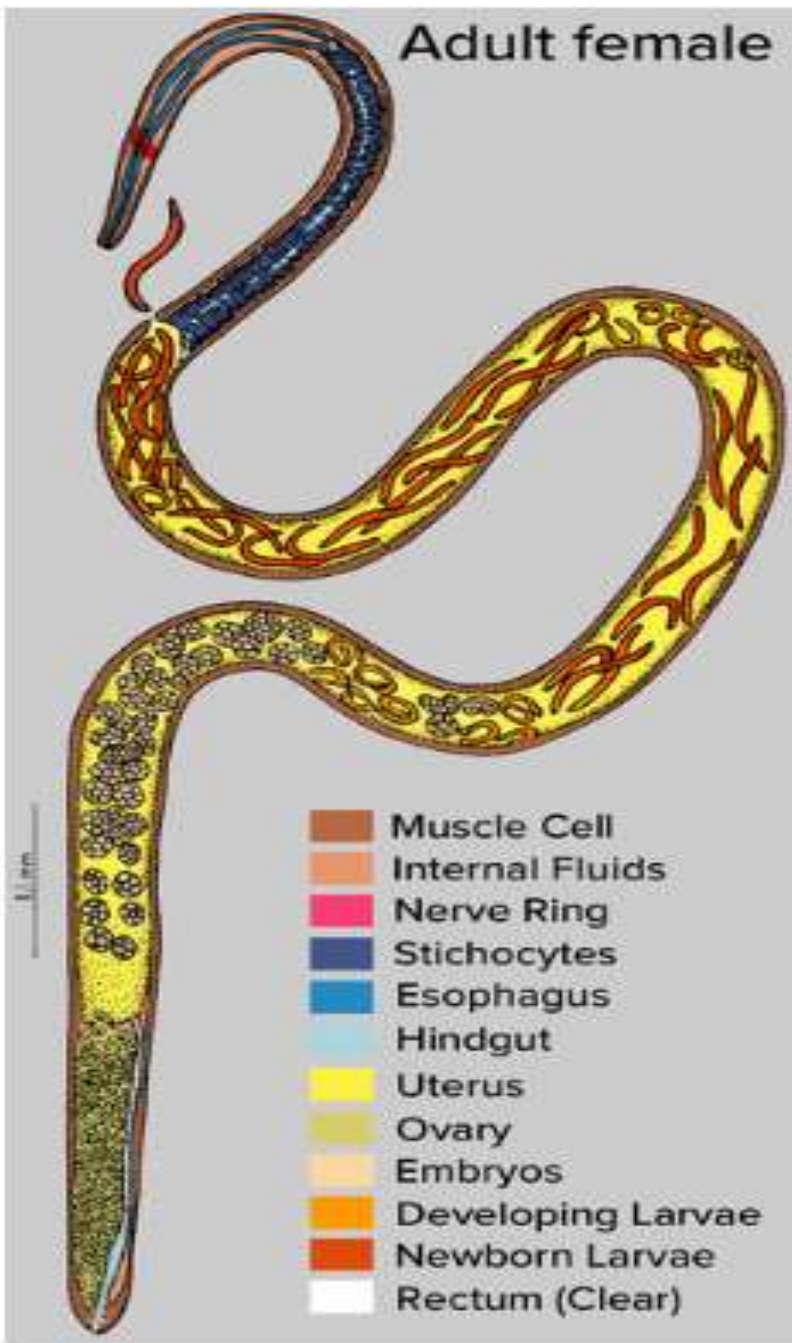
*Microscopic examination of Trichinella spiralis in raw meat.*

- Reclassified into seven distinct species on the basis of epidemiologic and biologic differences.
- *T. spiralis* (most common) found worldwide in many carnivorous and omnivorous animals.
- *T. nativa* (Arctic bears).
- *T. nelsoni* (African predators and scavengers).
- *T. britovi* (carnivores of Europe and western Asia).
- *T. pseudospiralis* (mammals and birds worldwide).
- *T. murelli* (sylvatic hosts in temperate North America).
- *T. papuae* (wild and domestic pigs of Papua New Guinea and Thailand).
- Only two species, *T. spiralis* and the arctic species *T. nativa*, display a high level of pathogenicity for humans.
- Species differ in infectivity for humans, host reservoirs, pathogenicity and resistance to freezing.

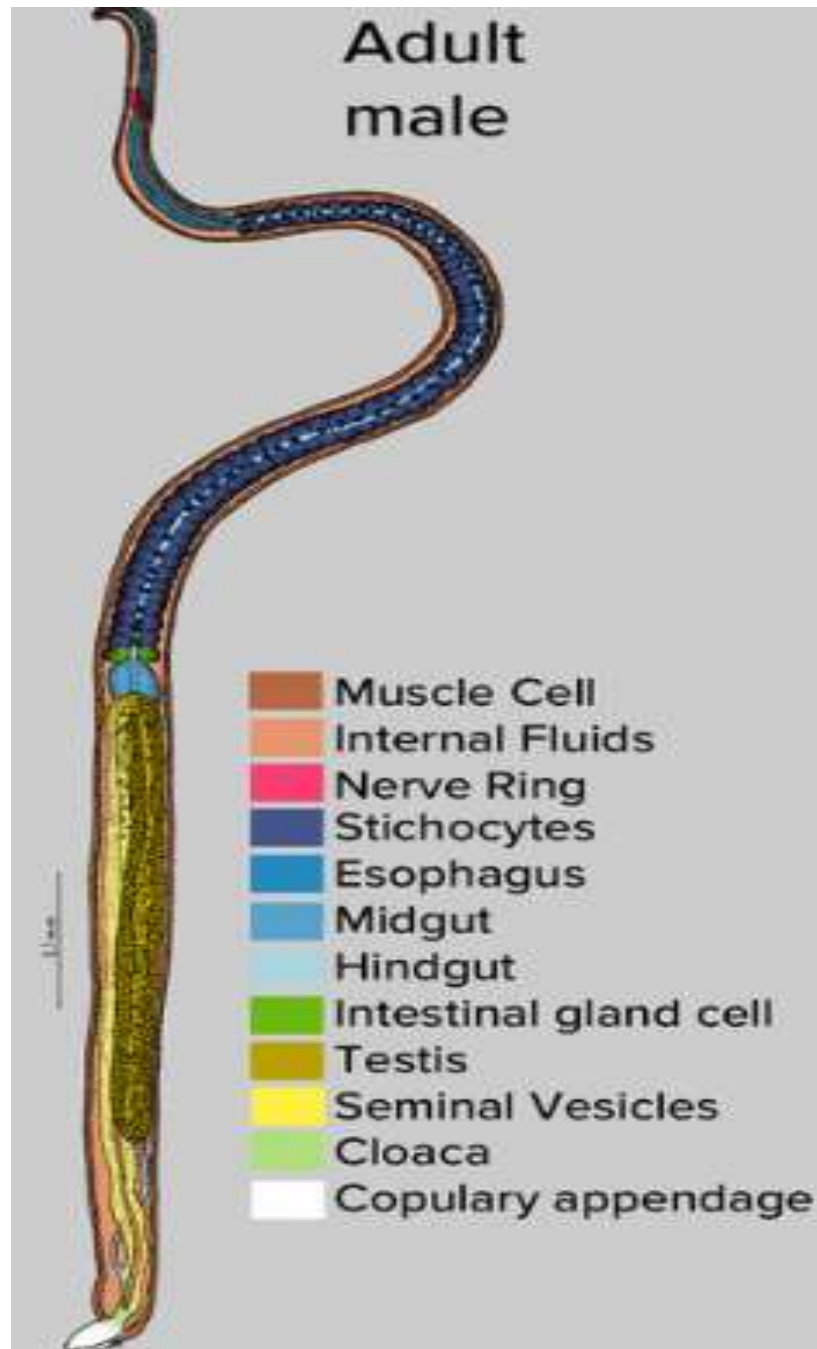
# MORPHOLOGY

- Male larva has 50  $\mu\text{m}$  rectum, and anterior part of testis is curved posteriorly.
- Female larva has a shorter rectum 25  $\mu\text{m}$ , a telogonic ovary, coiled uterine and seminal receptacle primordia, and a vaginal primordium. Males can be recognized by the spermatocytes which are of same size. The oocytes vary in size: smallest are located in ventral portion, largest on dorsal portion of ovary.
- Sex of larvae can be differentiated by length of rectum as early as tenth day, by curvature of anterior part of testis and by uterine primordium by eleventh day, and by presence of vaginal primordium by thirteenth day of intramuscular development.
- Farre's Organ is believed to be the primordium of seminal receptacle.

Adult female

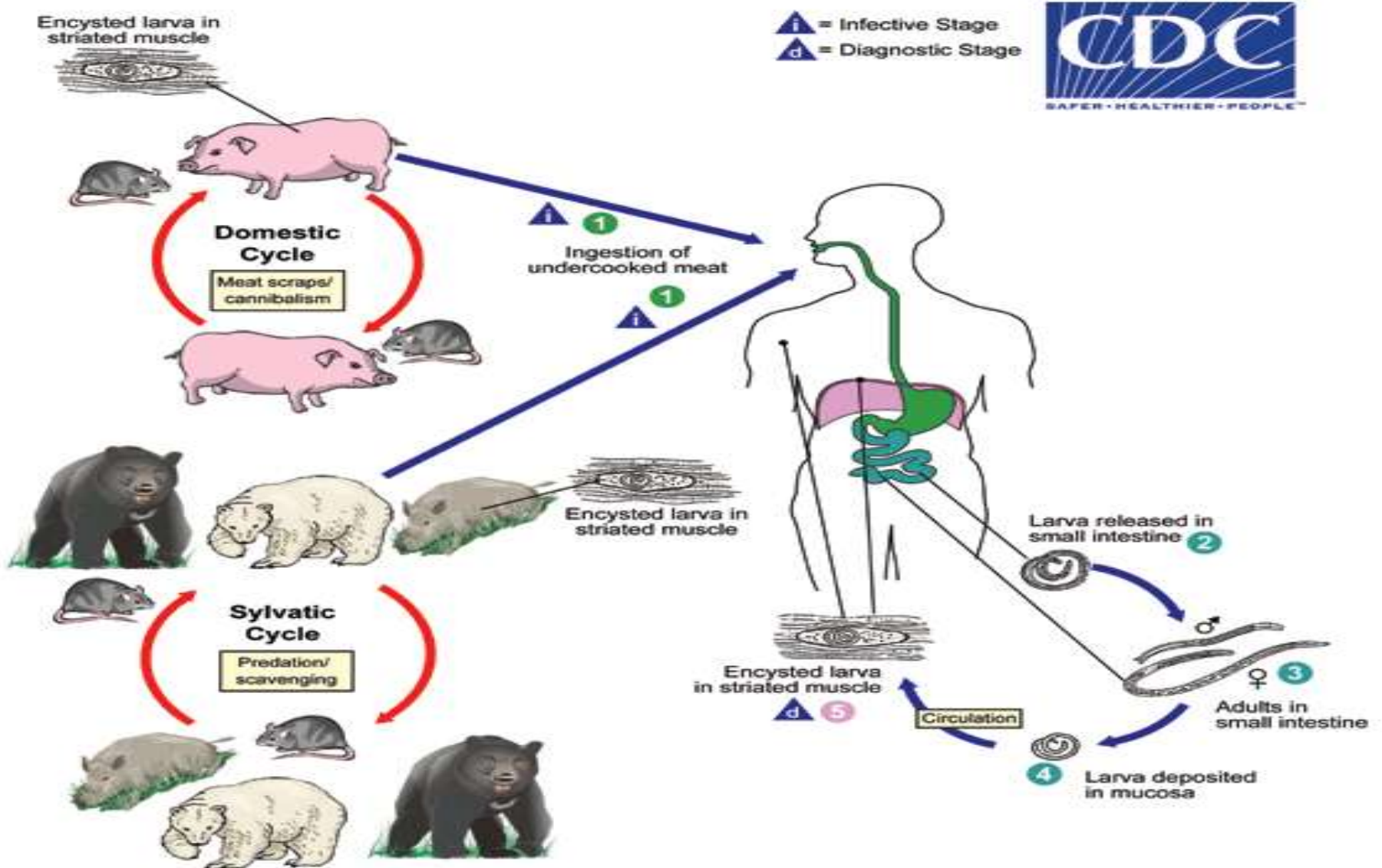


Adult male





# LIFE CYCLE



# Transmission, life-cycle and incubation period

- Undercooked meat containing [encysted larvae](#) is eaten.
- Larvae are released from the cysts with exposure to gastric acid and pepsin.
- Larvae invade the small bowel mucosa, where they mature into adults.
- Adult females release larvae that migrate to striated muscle where they encyst and may remain infective for years.
- Adult worms are 1.5 x 0.05mm (male) and 3.5 x 0.06mm (females).
- Carnivorous animals keep the life cycle going by feeding on infected rodents or meat from other animals.
- Common hosts: pigs (most common source for human infection worldwide, but most U.S. swine fed grains and therefore uninfected), bears (most common source in the U.S.), walrus, foxes, birds, horses, hyenas, lions, and panthers.

# EPIDIMOLOGY

- Worldwide, an estimated 10,000 cases of trichinellosis occur every year.
- From 1986-2009, there were 65,818 reported cases across 41 countries
- Widespread in carnivores. Among domestic animals, swine are most frequently involved. They acquire infection by eating rats or garbage containing cyst-laden scraps of uncooked meat.
- Human infection, in turn, results largely from the consumption of improperly prepared pork products.
- Disease incidence highest in Americans of Polish, German, and Italian de-scent, presumably because of their custom of producing and eating such sausage during holidays.
- Recent outbreaks have been reported among Indochinese refugees due to undercooking of fresh pork.



- In United States, prevalence of cysts found in diaphragms of patients at autopsy has declined from 16.1 to 4.2% over a period of 30 years.
- It is estimated that more than 1.5 million Americans carry live *Trichinella* in their musculature and that 150,000 to 300,000 acquire new infection annually.
- Fortunately, majority are asymptomatic, and only about 100 clinically recognized cases are reported annually to federal officials.

# Symptoms

- Nausea, abdominal pain, diarrhea, fever, muscle pain, muscle tenderness, and weakness are most prominent manifestations.
- Patients may also display eyelid swelling, a maculopapular skin rash, and small hemorrhages beneath conjunctiva of eye and nails of digits.

**Maculopapular skin rash**

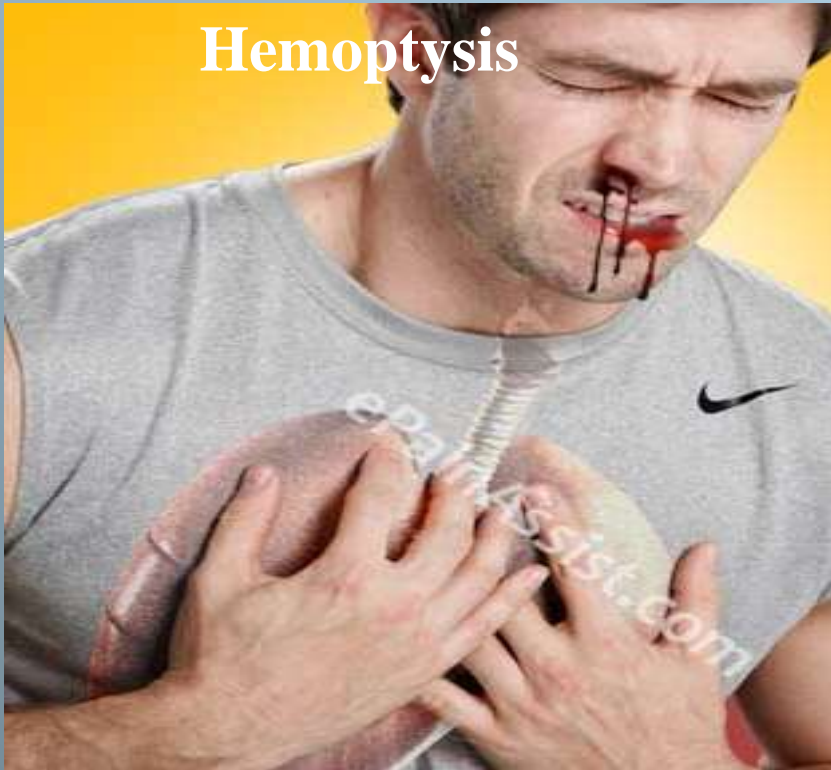


**Conjunctivitis and periorbital edema**



- Hemoptysis and pulmonary consolidation are common in severe infections.
- Patients in whom 10 or fewer larvae are deposited per gram of tissue are usually asymptomatic; those with 100 or more generally develop significant disease; and those with 1000 to 5000 have a very stormy course that occasionally ends in death.

**Hemoptysis**



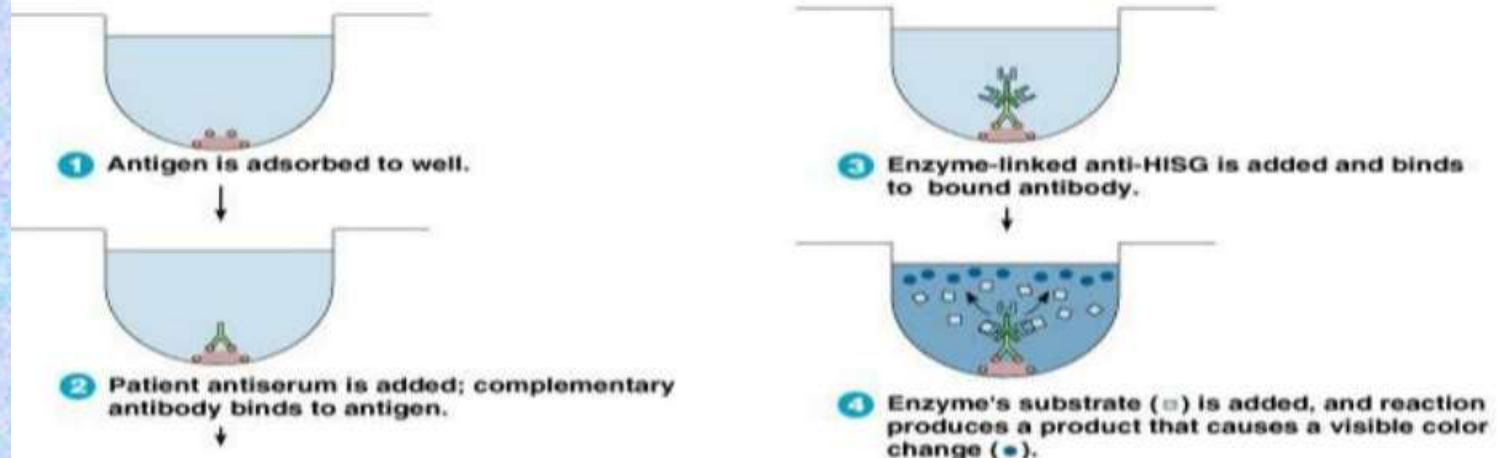
**Larvae in patient tissues**



# LABORATORY DIAGNOSIS

- Serologic tests, including indirect fluorescent anti-body, bentonite flocculation, and enzyme-linked immunosorbent assay.
- Biopsy of the deltoid or gastrocnemius muscles during the third week of illness often reveals encysted larvae.

## Enzyme-Linked Immunosorbent Assay (Indirect ELISA)





# TREATMENT

- Patients with severe edema, pulmonary manifestations, myocardial involvement, or central nervous system disease are treated with **corticosteroids**.
- Mebendazole and albendazole halt the production of new larvae.

# PREVENTION

- By limiting contact between domestic pigs and wild animals, particularly rodents, who might be carry trichinella larvae in their tissues.
- Domestically, care should be taken to cook pork to an internal temperature of at least 76.6°C, freeze it at -15°C for 3 weeks, or thoroughly smoke it before it is ingested.
- All strains may survive apparently adequate cooking in microwave ovens due to variability in internal temperatures achieved.

# DISTRIBUTION MAP

