Trichinella Spiralis

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TRICHINELLA SPIRALIS

A NEMATODE

HISTORY AND DISTRIBUTION

- First discovered by **James Paget** in 1821 in muscles of patient at autopsy(post mortem)
- **Owen**, in 1835, described the encysted larval form in muscles and named it ***Trichinella spiralis.***
- **Virchow** discovered its life cycle in 1859.
- Major source of infection: **inadequately cooked pork.**
- Trichinosis is most common in Europe and America, less common in tropical and oriental areas.

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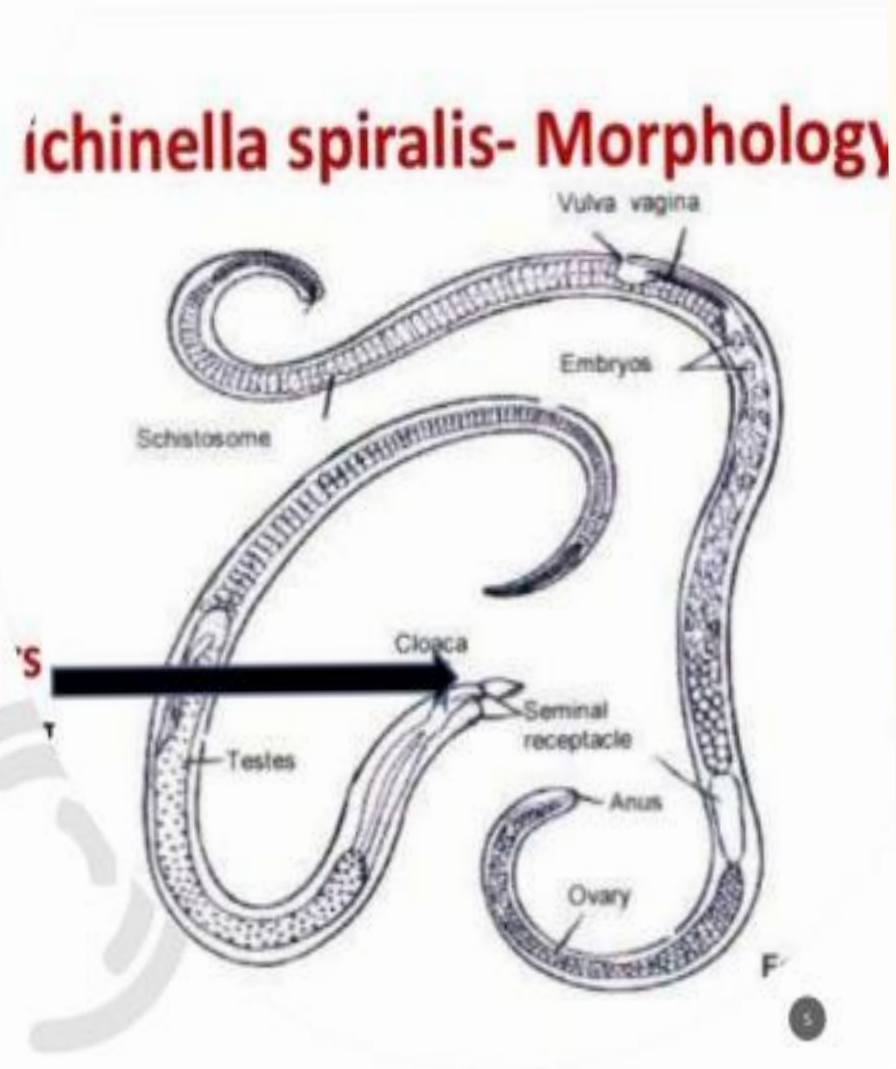
HABITAT

- Adult worms: live deeply buried in mucosa of small intestine (duodenum or jejenum)
- Encysted larvae : present in the **striated** muscles of these hosts.
- There are no free living stages.

MORPHOLOGY

Adult worm

- It is a small white worm just visible to naked eye.
- It is one of the **smallest nematodes** infecting humans.
- The anterior half of the body is **thin and pointed**, well-adapted for burrowing into the mucosal epithelium.



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Male VS Female

- Size: 1.5mm*0.04mm
- **Half** the length of female.
- Presence of **claspers**, a pair of pear shaped clasping papillae, used to hold female during mating.
- The male worm dies soon after fertilizing female,

- Size: 3mm*0.06 mm
- **Twice** the length of male.
- Female worm is **viviparous** and discharges larva instead of eggs.
- Female dies after 4 weeks to 4 months (the time required for discharging the larva)

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LARVAE

- The larva becomes encysted in striated muscle fiber.
- The larva in the cyst is coiled and thus called ***spiralis.***

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CYST

- It is the tissue reaction around the encapsulated larvae.
- It develops preferentially in active muscles like diaphragm, jaw muscles, biceps ,neck, lower back, which are relatively poor in **glycogen** and **hypoxic** environment.
- More abundant near the site if attachment of **muscles to tendons and bones** and lie **longitudinally** in muscle fibres.

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LIFE CYCLE

- It is a parasite with direct life cycle, completes life cycle in a host.
- **Optimum** host: **PIG** (favourable or principle)
- **Alternate** host: **MAN** (other than principle host)
- Man is the **dead-end** of the parasite, as the cysts in human muscles are unlikely to be eaten by another host.
- **Infective form**: Encysted larva found in muscles.
- **MOT**: Man acquires infection by raw uncooked pork or inadequately processed sausages or other meat products containing viable larvae.

CONTINUED....

Meat eaten without adequate cooking

↓

Cysts are digested by the gastric guice and viable larvae are released (excystation) in the stomach, duodenum and jejenum.

↓

Larva immediately penetrate the mucosal epithelium.

↓

They moult **four times** and develop into adults (2nd day of infection).

↓

They become sexually mature (within 6 days)

LIFE CYCLE

Male dies after fertilizing the female but the fertilized female start releasing motile larva by 6th day of infection

↓

Larva continue to discharge during the lifespan (4 week to 4 months)

↓

Larva enter intestinal lymphatics or mesenteric venules and are transported in caiculation to various parts.

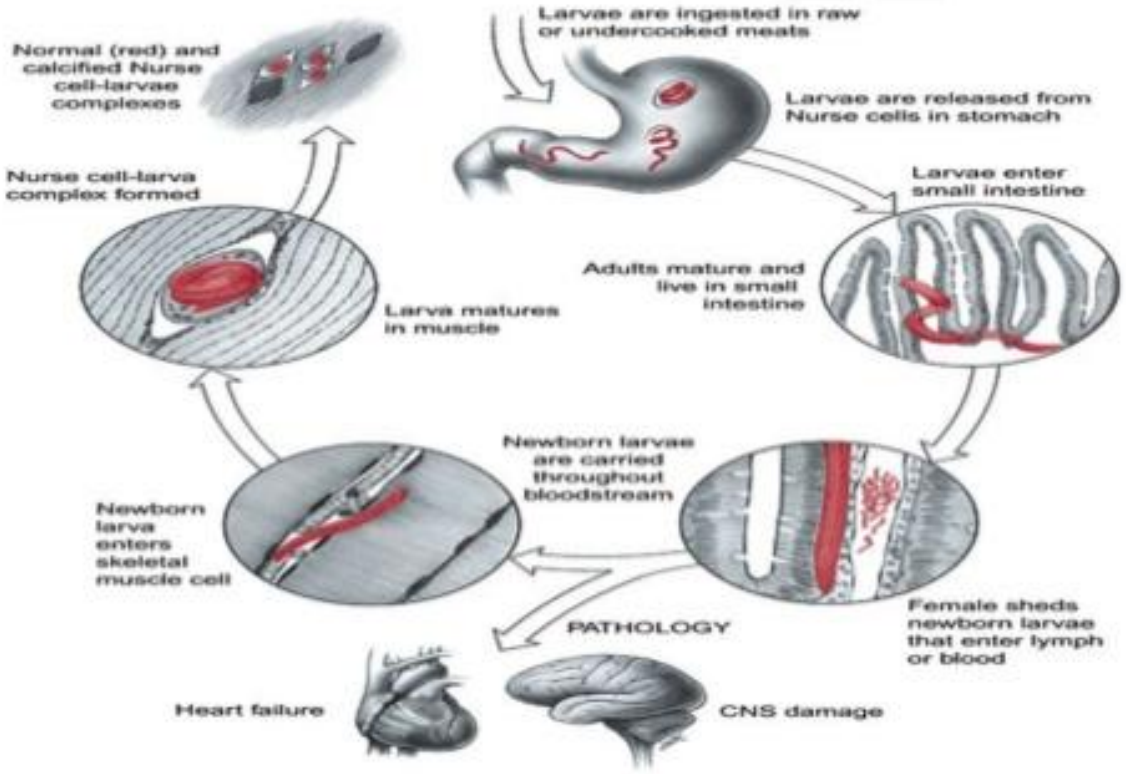
↓

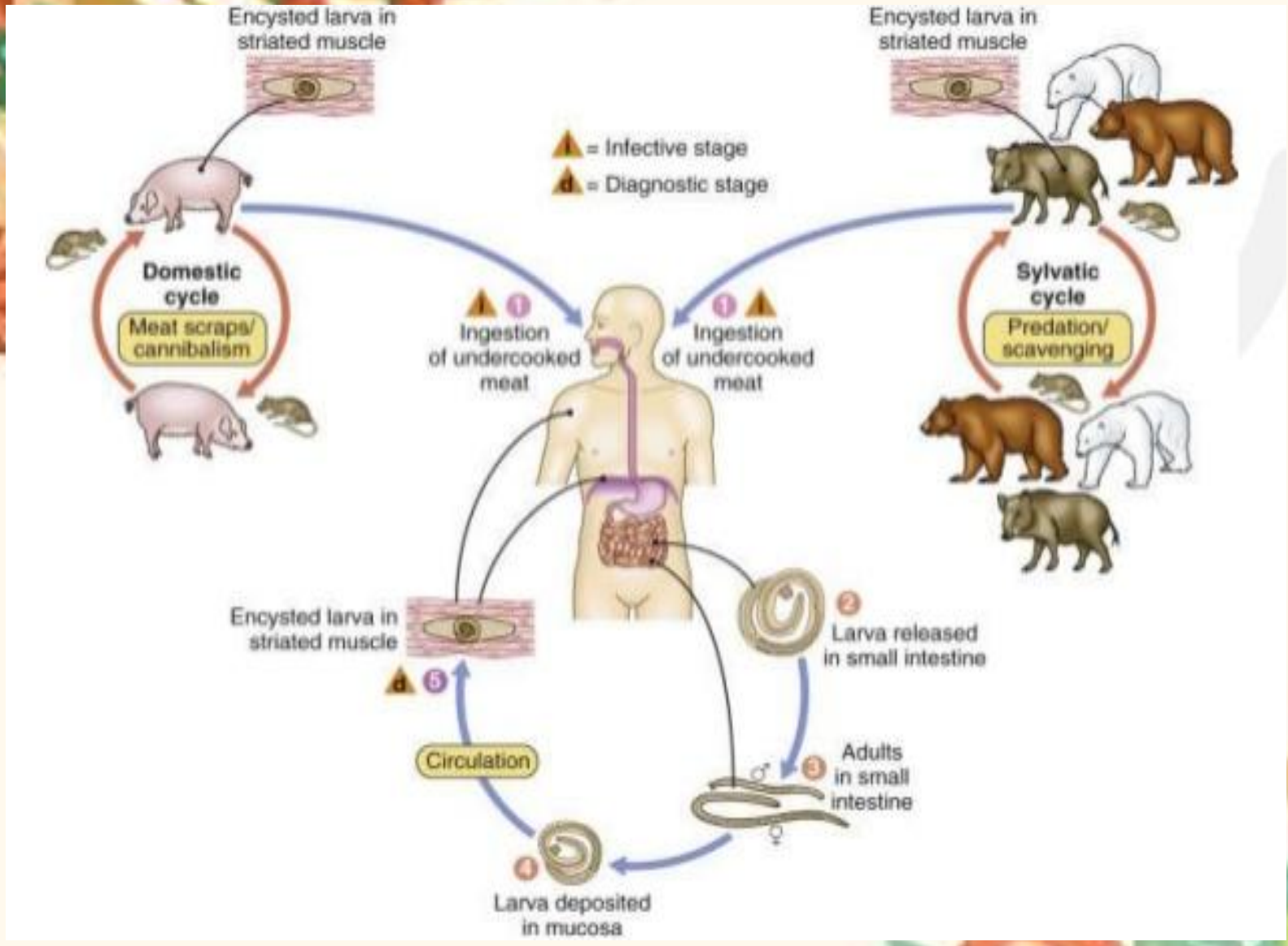
They get deposited in muscles (2nd week), CNS, and other sites. The larva dies in other sites except skeletal muscles, where it grows and develops (3-4 week)

↓

Within 20 days, larva become encysted in muscle cells. A muscle containing ***T.spiralis*** is called **nurse cell.** Encysted larva lies parallel to the muscle fibres.Encysted larva can survive for months and years. In man , the life cycle ends here.

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
Nurse cell-larva complex formed
Larvae enter small intestine
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


Encysted larva in striated muscle
Encysted larva in striated muscle
= Infective stage
= Diagnostic stage
Domestic cycle
Meat scraps/ cannibalism
Sylvatic cycle
Predation/ scavenging
1 Ingestion of undercooked meat
1 Ingestion of undercooked meat
2 Larva released in small intestine
Encysted larva in striated muscle
5
Circulation
3 Adults in small intestine
4 Larva deposited in mucosa

PATHOGENESIS AND CLINICAL FEATURES

- Manifestations vary from asymptomatic infection(common), to an acute fatal illness (extremely rare) .

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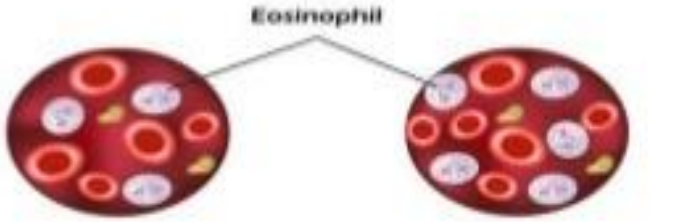
	Stage of intestinal invasion First stage	Stage of muscle invasion Second stage	Stage of encystation Final stage
Pathology	This stage begins with ingestion of raw pork containing larva and ends with invading the intestine and developing into adult.	This stage begins when new infective larvae released from adult female and ends with deposition of the larvae in muscles. Myositis and basophilic degeneration of muscles.	This stage occurs only in striated muscles. The infective larvae become encysted in this stage.
Clinical Features	Malaise, Nausea, Vomiting, Diarrhoea, Abdominal cramps. Onset within 2-30 hours of ingestion of infective food.	Fever, Myalgia, periorbital edema, weakness of affected muscle, myocarditis (if heart muscle is involved), encephalitis (if CNS is involved).Eosinophilia is a constant feature.Onset within 1-4 weeks after infections.	

Eosinophilia

(eosinophils above normal range in blood)



Normal

Eosinophils normal range

Eosinophilia

Eosinophils above normal range

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DIAGNOSIS

DIRECT

- Muscle Biopsy
- Stool examination
- Xenodiagnosis

INDIRECT

- History
- Blood examination
- Serology
- Radiological examination
- PCR
- Bachman intradermal test

DIAGNOSIS

- **DIRECT**
- **Muscle biopsy**: Detection of larvae in muscle tissue.Deltoid, biceps, gastrocnemius, or pectoralis are usually selected for biopsy.
- **Stool Test**: detection of adult worms during the diarrhoeic stage
- **Xenodiagnosis**: Biopsy bits are fed to laboratory taits, which are killed in a month or so,later. The larvae can be demonstrated more easily in the muscled of such infected rats.
- **INDIRECT**
- **History**: History of eating of raw or uncooked pork 2 weeks earlier
- **Blood examination**: Eosinophilia, raised creatine phosphokinase.
- **Serology**: Detection of antibody by ELISA, Bentonite flocculation test, Latex fixation test,

- **Radiological**: Calcified cysts can be seen on X-ray.
- **Molecular**: PCR
- **Bachman intradermal test**: It uses 1:5,000 or 1:10,000 dilution of larval antigen. An erythematous wheal appears in positive cases within 15-20 minutes. The test remains positive for years after infection.

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PROPHYLAXIS (Prevention)

- Proper cooking of pork and other meat likely to be infected.
- The most effective methods is to stop the practice of feeding pigs with raw garbage.
- Extermination of rats from pig farms- the spread of infection.
- Smoking, salting, or drying the meat doesnot destroy the infective stage. Prolonged freezing decontaminates the meat.

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TREATMENT

- **Mild cases**
  - Supportive treatment like bedrest, analgesics and antipyretics.
- **Moderate cases**
  - Albendazole (400 mg BID for 8 days) or
  - Mebendazole (200-400 mg TID for 3 days, then 400 mg TID for 8 days)
- **Severe Cases**
  - Add glucocorticoids like prednisolone to albendazole or mebendazole.

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THANK YOU
FOR YOUR
ATTENTION