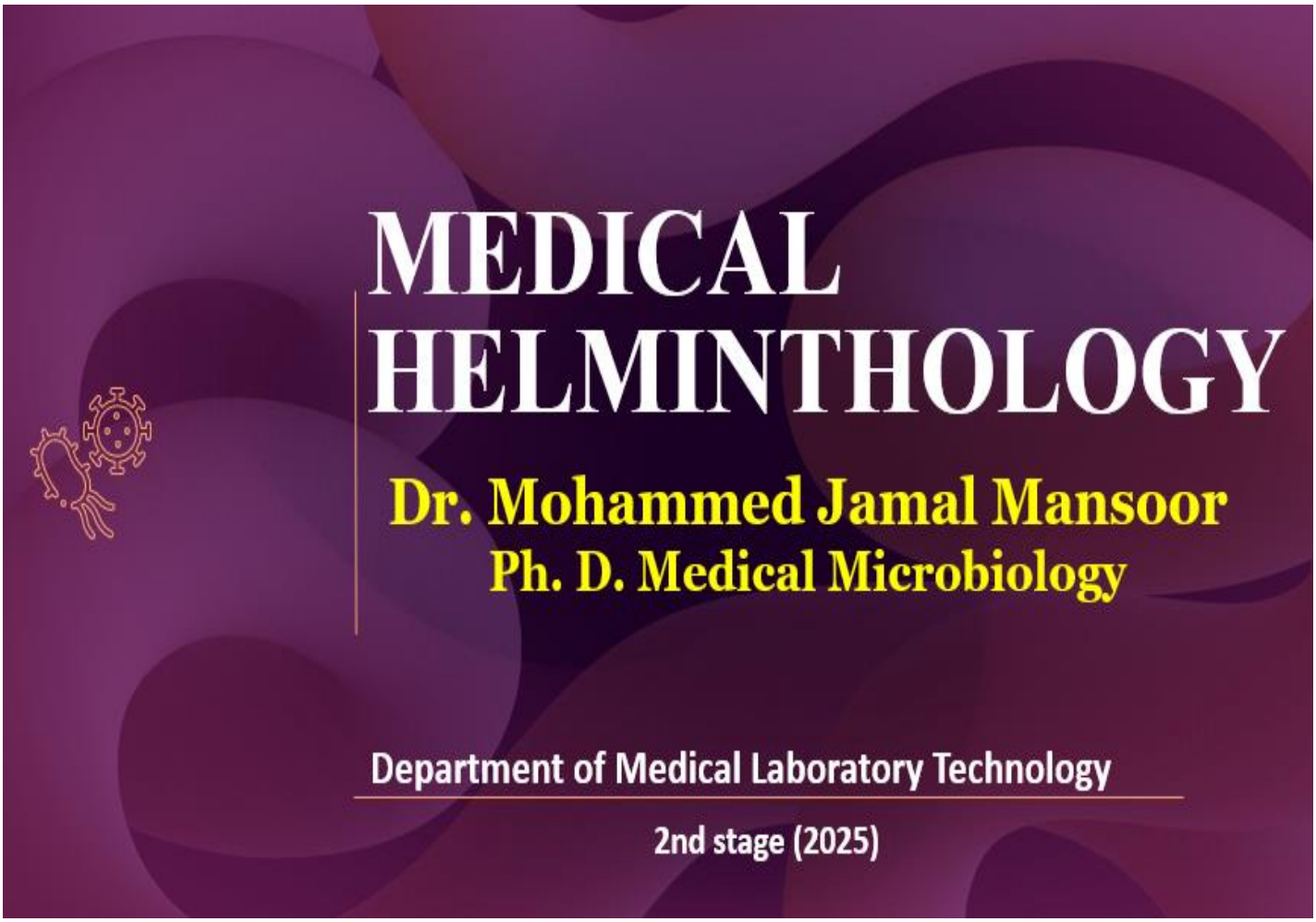

MEDICAL
HELMINTHOLOGY
Dr. Mohammed Jamal Mansoor
Ph. D. Medical Microbiology
Department of Medical Laboratory Technology
2nd stage (2025)

Lec.9 *Trichinella Spiralis*

Common name: Trichina worm

Trichinella spiralis, tissue nematode, is the causative agent of **trichinosis**.

*The name ***Trichinella*** is derived from the minute size of the adult. (Greek *trichos*—hair; *ella* sux for diminutive; *spiralis* refers to the spirally coiled appearance of larvae in muscles).

*** It was first observed in 1821 in the muscles of a patient at autopsy by James Paget.**

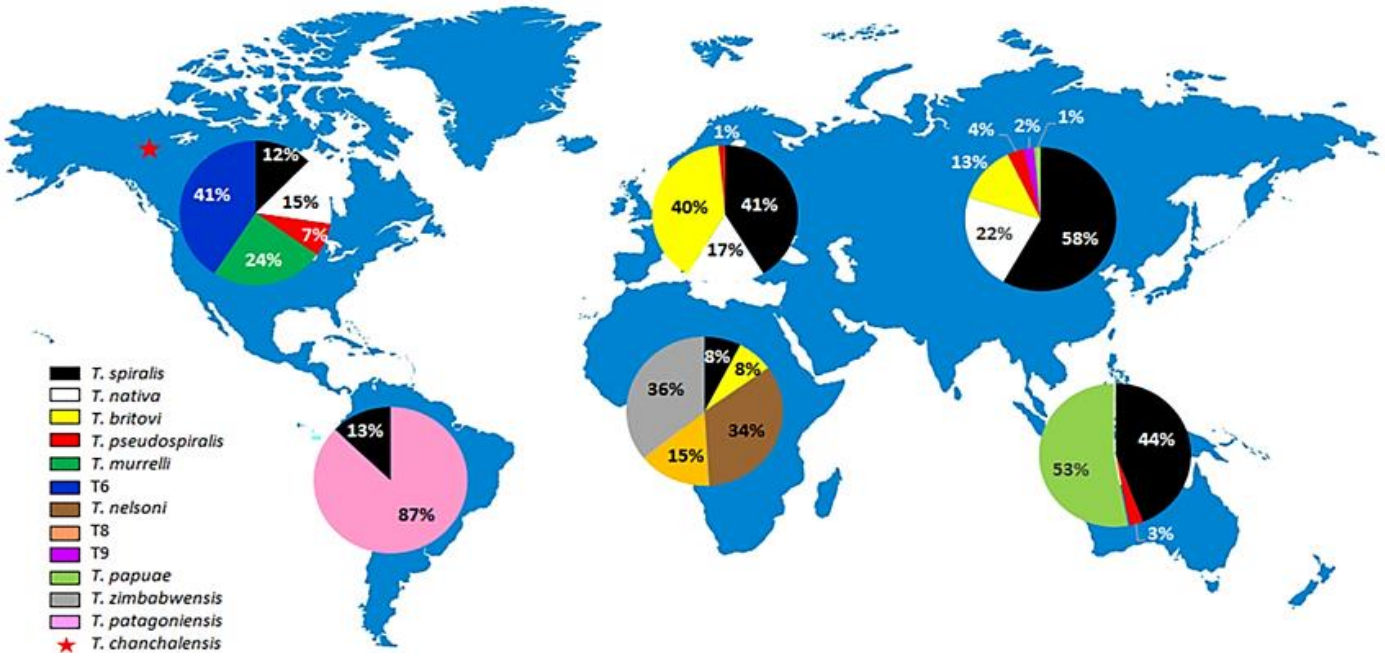
*** Owen, in 1835, described the encysted larval form in muscles and named it Trichina spiralis.**

***Virchow discovered its life cycle in 1859.**

*The major source of human infection was shown to be the **consumption of inadequately cooked pork**.

***Trichinosis** is recognized as an important public health problem in **Europe** and **America**, but is much **less** common in the tropics and oriental countries.

*Human trichinosis had not been recorded in India till 1996, when thirst case was reported from Punjab.



Habitat

Adult worms live **deeply buried** in the **mucosa of small intestine (duodenum or jejunum)** of **pig**, **bear**, **rat**, **or man**. The encysted larvae are present in the **striated muscles** of these hosts. There are no free-living stages.

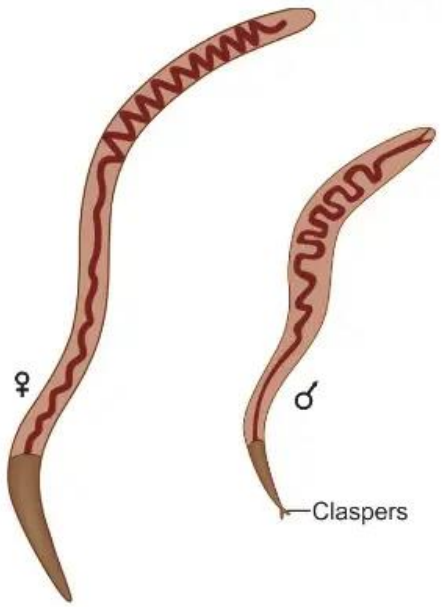
Morphology

Adult Worm

The adult ***T. spiralis***, a small **white** worm just visible to the **naked eye**, is one of **the smallest nematodes** infecting humans.

*The **male** measures about **1.5 mm by 0.04 mm** and the female about **3 mm by 0.06 mm (twice the length of male).**

*The **anterior half** of the body is **thin** and **pointed**, well adapted for **burrowing** into the mucosal epithelium.



The **posterior end** of the male has a pair of pear-shaped **clasping papillae** (termed as claspers), one on each side of the **cloaca** that it uses to hold the female worm during mating.

*The female worm is **viviparous** and discharge larva instead of eggs.

*The **life span** of the **adult worm is very short**. The male worm **dies** soon after fertilizing the female and the female dies after **4 weeks to 4 months (16 weeks)**, the time required for discharging the larvae.

Larvae

The larva becomes **encysted in the striated muscles** and at the **time** of **encystment** measures 1 mm in length by 36 μm in diameter.

*The larva in the **cyst** is **coiled** and hence, the name ***spiralis***.

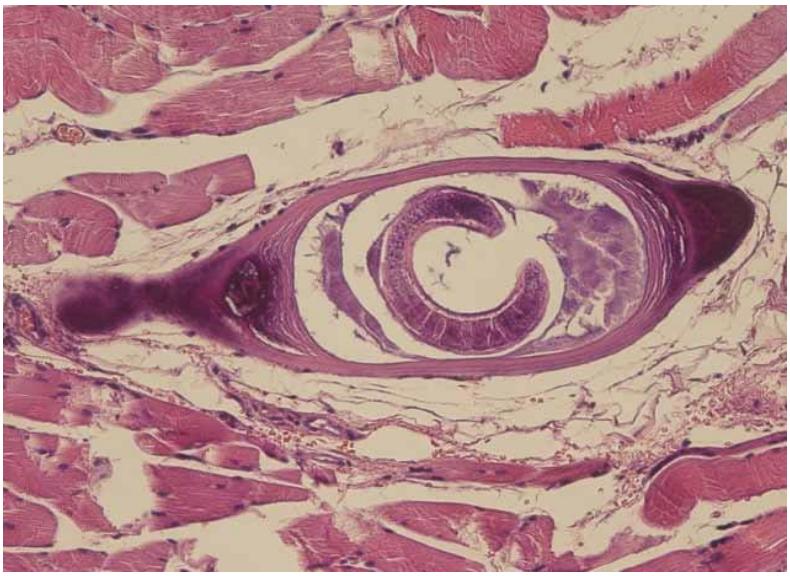
Life Cycle

Trichinella is a parasite that has a **direct life cycle**, which means it completes all stages of development in one host. But only a **single cycle** occurs in one host and for continuation of the cycle and maintenance of the species, it is necessary for the infection to be transmitted to another host of the same species or of different species.

*Optimum host: **Pig.**
*Alternate host**: Man**.
*Infection can pass from—**Pig-to-pig** (facilitated by the custom of feeding pigs with untreated household garbage, which may contain bits of pork with infective cysts), **rat to-rat**, and **pig-to-rat**.

*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 the muscles of pigs and other animals.**



*Mode of infection:

Man acquires infection mainly by **eating raw or undercooked pork** or **inadequately processed sausages** or other **meat products containing the viable larvae**.

*When such meat is eaten without adequate cooking, the **cysts are digested by the gastric juice and viable larvae are released (excystation)** in the **stomach, duodenum**, and **jejunum**.

***The larvae immediately penetrate the mucosal epithelium**.

*They molt **4 times** and **rapidly develop into adults**, **either male or female**, by the **second** day of infection. **Within 5 days, they become sexually mature**.

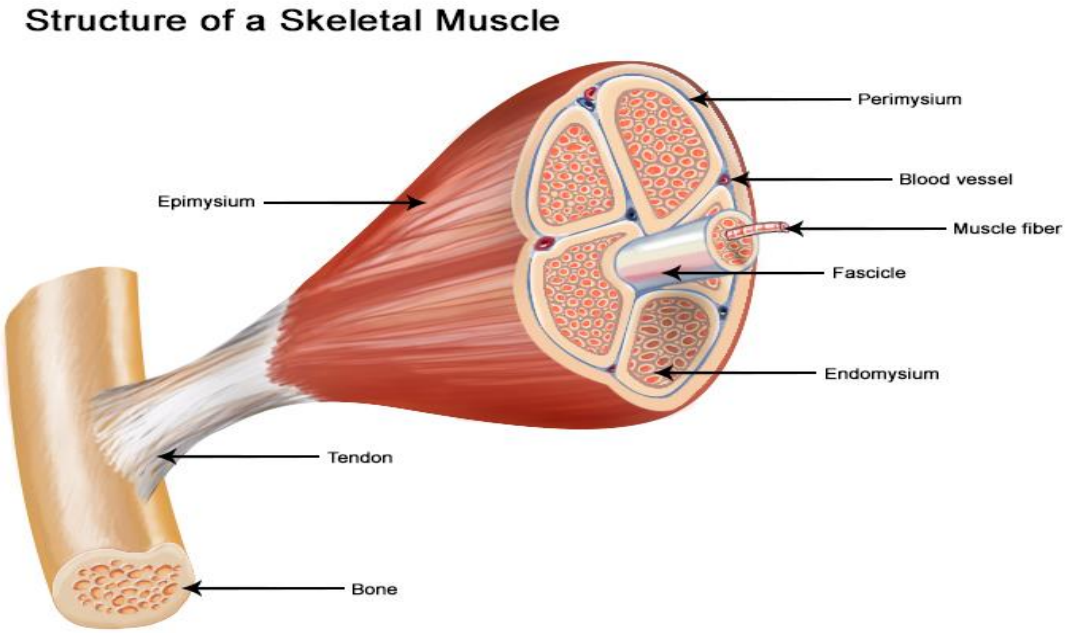
*The male dies after **fertilizing the female**. **The fertilized females start releasing motile larvae by the sixth day of infection.**

*Larvae continue to be discharged during the remaining part of the lifespan of the female worm, which ranges from **4 weeks to 4 months**.

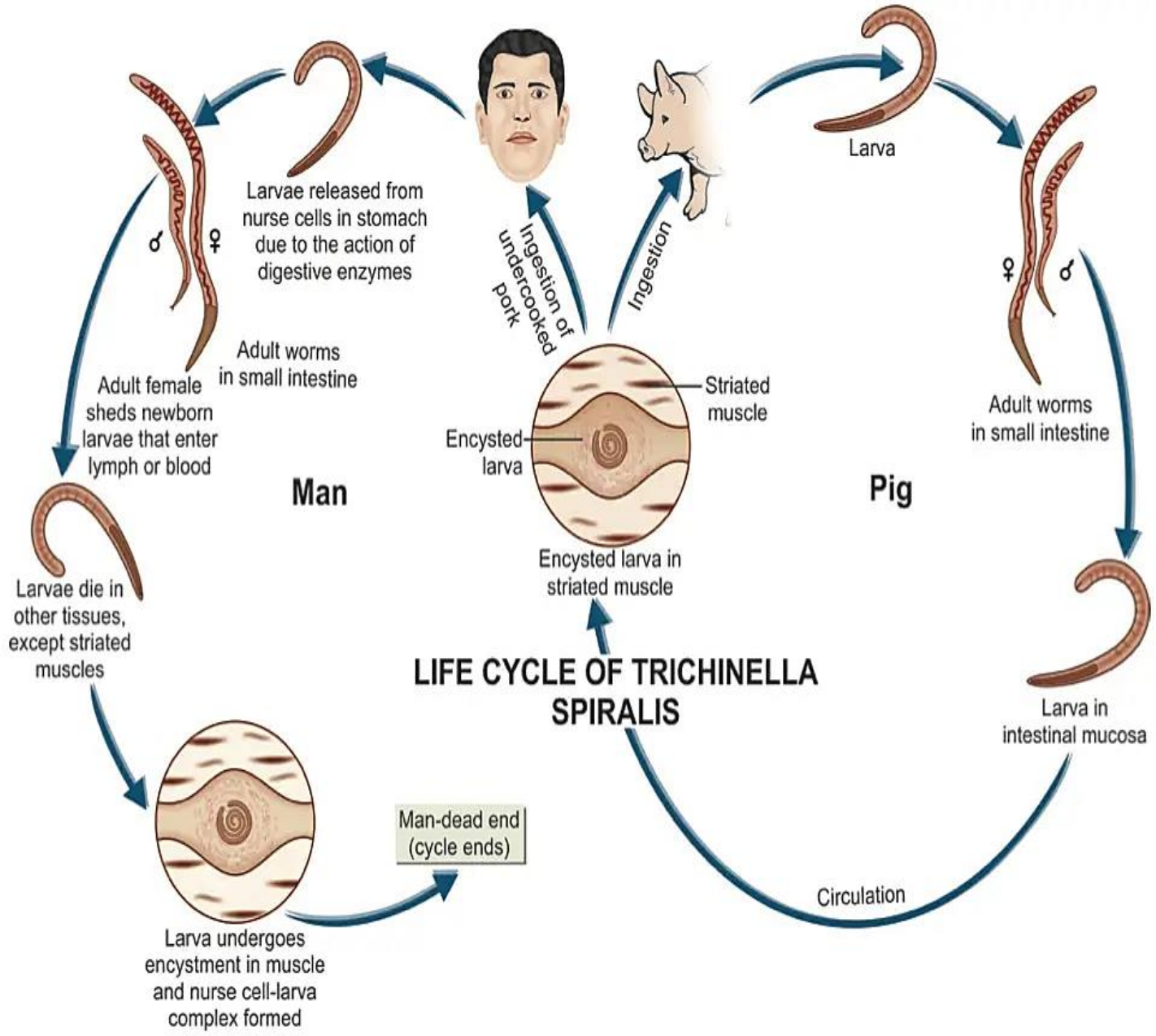
*Each female gives birth to approximately **1,000 larvae.**

*These larvae **enter the intestinal lymphatics** or **mesenteric venules** and are transported in **circulation** to different parts of the body. They get **deposited in the muscles**, **central nervous system,** and **other sites.**

The larva dies in most other situations, **except** the **skeletal muscles**, where it grows.



* **Deposition in the muscles** occurs mostly during the **second week** of infection.
* Larval development in muscles takes place during the **next 3 or 4 weeks**.
* Within **20 days** after **entering the muscle cells**, the **larvae become encysted**.
* A muscle cell carrying larva of *T. spiralis* is called as a **nurse cell**.
* **Encysted larva** can **survive** for **months to years**. **In man, the life cycle ends here**



Pathogenicity and Clinical Features

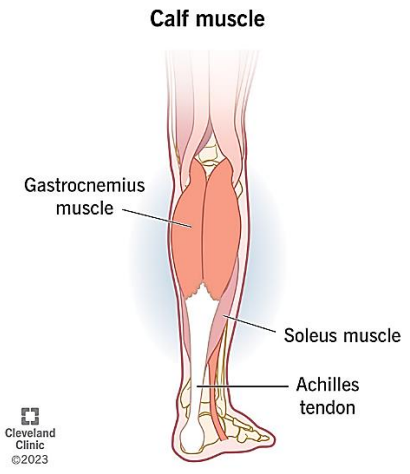
The disease caused by ***T. spiralis*** **is** called **trichinosis**.
*The manifestations vary from asymptomatic infection, which is very common, to an acute fatal illness, which is extremely rare.
***The pathology and clinical features** **vary** **according to the stage in the life cycle of the worm.**

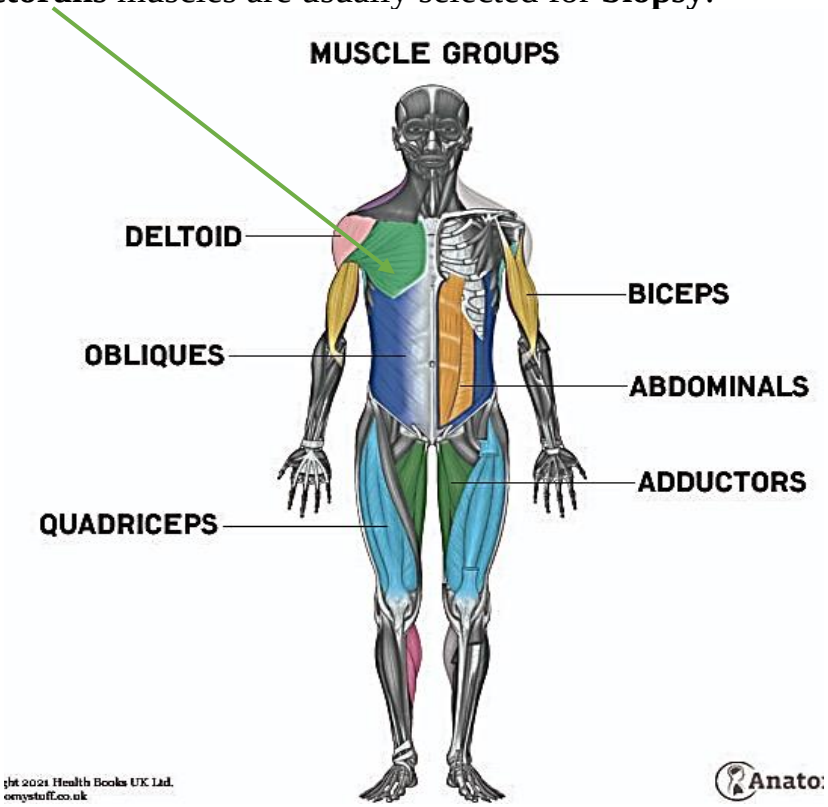
Laboratory Diagnosis

Diagnosis of trichinosis can be made by **direct** and **indirect** methods.

Direct Methods

1- **Detection of spiral larvae in muscle tissue by performing muscle biopsy**. **Deltoid**, **biceps**, **gastrocnemius**, or **pectoralis** muscles are usually selected for **biopsy**.





2- **Detection of adult worms and larvae in the stool during the diarrheic stage**

3- **Xenodiagnoses:** For xenodiagnoses, biopsy bits are fed to laboratory rats, which are killed a month or so, later. The larvae can be demonstrated more easily in the muscles of such infected rats.

Indirect Methods

History of consumption of raw or inadequately cooked or processed pork, about two weeks earlier along with a recent episode of **gastroenteritis**.

Treatment: Albendazole

Important Questions

Q: Pigs are reservoir for

- **A-** ***Taenia solium***
- **B-** ***Diphyllobothrium latum***
- **C-** ***Trichinella spiralis***
- **D-** ***Toxoplasma gondii***
- **E-** ***Schistosoma mansoni***

Q: *Trichinella spiralis*

- **A-** Nematode
- **B-** Pin worm
- **C-** Protozoa
- **D-** Trematode
- **E-** Cestode

Q: The diagnostic stage of *Trichinella spiralis* is

A- Embryonated egg
B- Filariform
C- Embryonated egg
D- Adult worm
E- Microfilaria

Q: Which of the following is not true about *Trichinella spiralis*

A- Infective stage encysted larvae in pork meat
B- fertilized female release larvae
C- fatal complications such as myocarditis and encephalitis
D- demonstration of adult in feces and larvae in blood
E- also called whip worm

Q: Best site for taking biopsy for diagnosis of trichinellosis is

A- Muscle
B- Diaphragm
C- Pectoralis major
D- Liver

Q: What is the common name of *Trichinella spiralis*?

ⓐ Hookworm
ⓒ Tapeworm
ⓑ Trichina worm
ⓓ Roundworm

Q: Who first observed *Trichinella spiralis* in the muscles of a patient during an autopsy?

ⓐ Virchow
ⓒ James Paget
ⓑ Owen
ⓓ St. Bartholomew

Q: What is the major source of human infection with *Trichinella spiralis*?

ⓐ Consumption of undercooked pork
ⓑ Contaminated water
ⓒ Mosquito bites
ⓓ Raw vegetables

Q: Where do adult *Trichinella spiralis* worms primarily reside in their hosts?

ⓐ Liver
ⓒ Lungs
ⓑ Small intestine
ⓓ Brain

Q: How do female *Trichinella spiralis* worms reproduce?

ⓐ They lay eggs
ⓒ They produce spores
ⓑ They give birth to live larvae
ⓓ They reproduce asexually

Q: What specialized structures does the posterior end of the male *Trichinella spiralis* worm have?

ⓐ Claspers
ⓒ Hooks
ⓑ Suckers
ⓓ Tentacles

Q: What is the approximate lifespan of the female *Trichinella spiralis* worm after fertilization?

ⓐ 1 week
ⓒ 1 year
ⓑ 4 months
ⓓ 2 weeks

Q: Which host is considered the optimum host for *Trichinella spiralis*?

ⓐ Rat
ⓒ human
ⓑ pig
ⓓ bird

Q: What happens to the Trichinella larvae after they are released in the stomach, duodenum, and jejunum?

ⓐ They remain in the digestive tract
ⓑ They penetrate the mucosal epithelium
ⓒ They become dormant
ⓓ They die due to gastric juices

Q: How many times do Trichinella spiralis larvae molt before developing into sexually mature adults?

ⓐ Once
ⓒ Three times
ⓑ Twice
ⓓ Four times

Q: How long does it take for *Trichinella spiralis* larvae to become sexually mature after infection?

ⓐ 1 day
ⓒ 5 days
ⓑ 3 days
ⓓ 7 days

Q: What is the specialized term for a muscle cell carrying a larva of *Trichinella spiralis*?

ⓐ Host cell
ⓒ Nurse cell
ⓑ Carrier cell
ⓓ Parasite cell

Q: What is the disease caused by *Trichinella spiralis* known as?

ⓐ Tapeworm infection
ⓒ Trichinosis
ⓑ Giardiasis
ⓓ Ascariasis