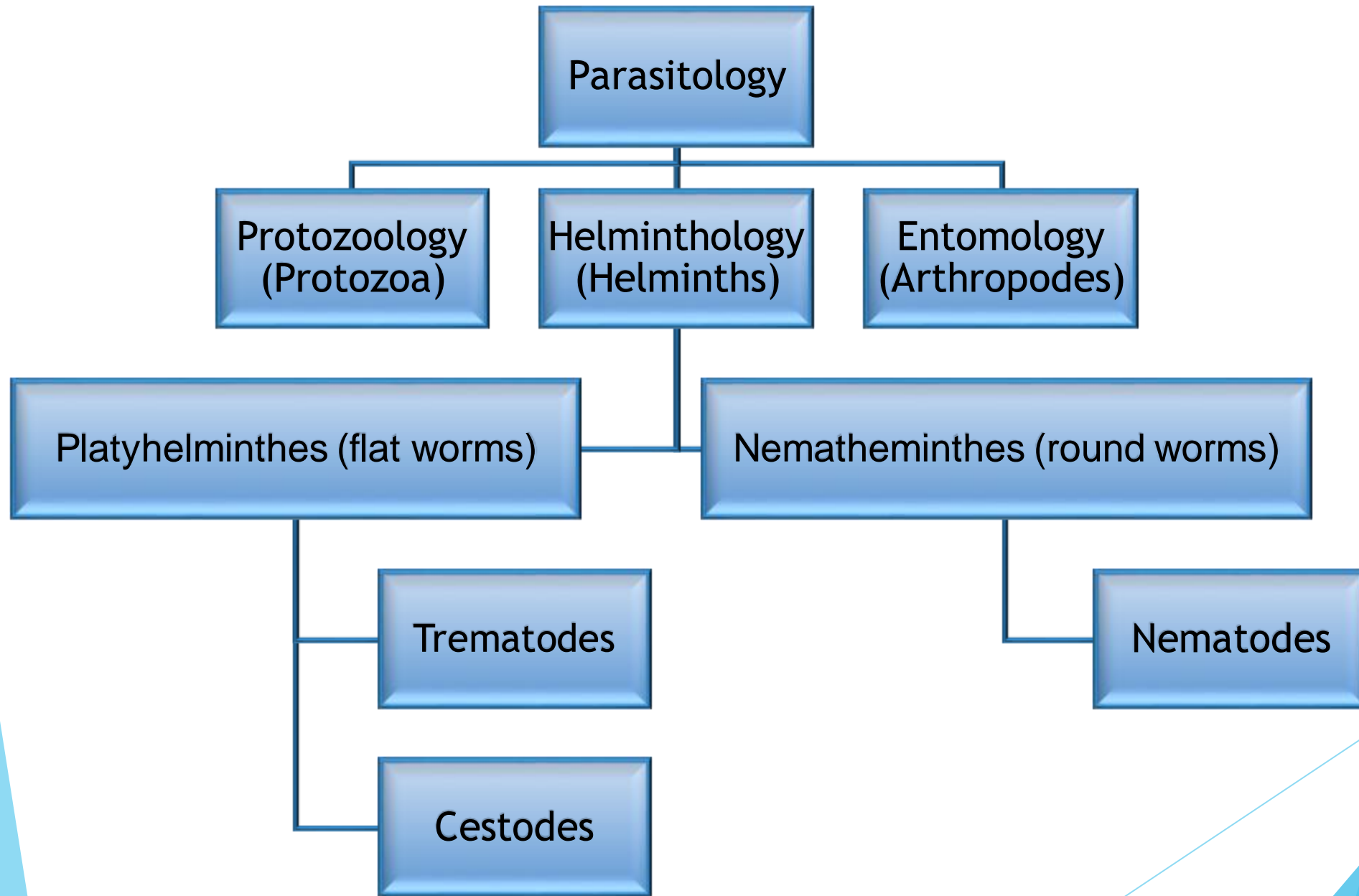
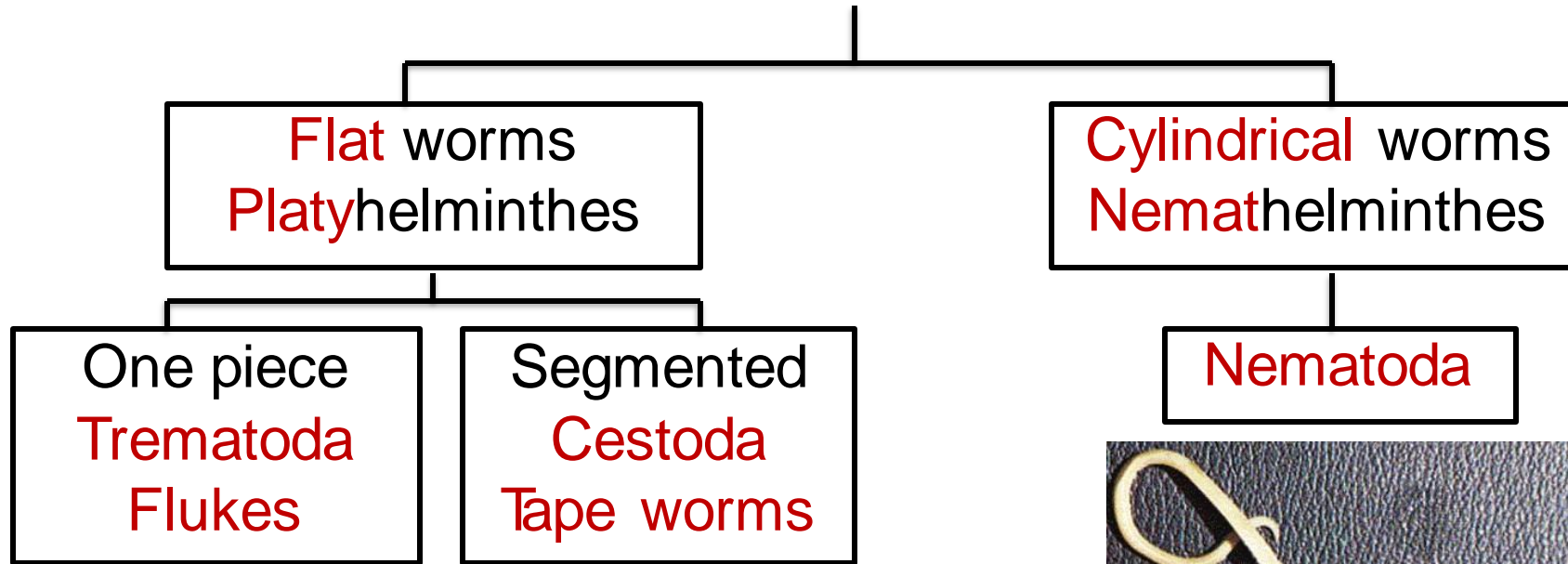


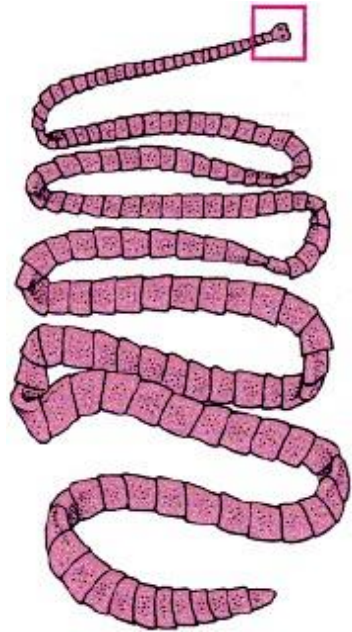
□ Course Introduction



Helminths (worms)



in different
areas



intestine & Tissue



Intestinal, Blood & tissue

❑ Points to be studied in any helminth

Geographical Distribution

Definitive host (Final host)

Habitat (adult parasite)

Intermediate host

Infective Stage & mode of infection

Pathogenesis & Clinical picture

Diagnostic stage & Methods of diagnosis

Treatment

Prevention and Control

Phylum: NEMATHELMINTHES

Class : NEMATODA "Round worms"

■ Intestinal Nematodes

- *Enterobius vermicularis*
- *Trichuris trichiura*
- *Ascaris lumbricoides*
- *Ancylostoma duodenale*
- *Necator americanus*
- *Strongyloides stercoralis*
- *Capillaria philippinensis*

■ TISSUE Nematodes

- *Trichinella spiralis*
- *Wuchereria bancrofti*
- *Brugia malayi*
- *Onchocerca volvulus*
- *Loa loa*
- *Dracunculus medinensis*
- *Toxocara spp.*
- *Ancylostoma caninum*



Adaptation of Nematodes (within habitat):

Intestinal nematodes maintain their position by one of the followings:

- 1- Oral attachment to the mucosa by buccal capsule e.g. Hook worm
- 2- Partial embedded by it attenuated end e.g. *Trichuris*
- 3- Deeply embedded in the mucosa e.g. *Strongyloides*.
- 4- Free in the lumen or loosely attached by lips e.g. *Ascaris*

Nematodes get their nutrition either by:

- 1- Sucking blood e.g. hook worm.
- 2- Ingestion of lysed tissue by embedded worm e.g. *Trichuris*, *Strongyloides*.
- 3- Feeding of intestinal contents e.g. *Ascaris*, *Enterobius*.
- 4- ingestion of body fluids e.g. *Filaria*.



Pathogenicity

Pathological effect of nematodes upon the host depends upon:

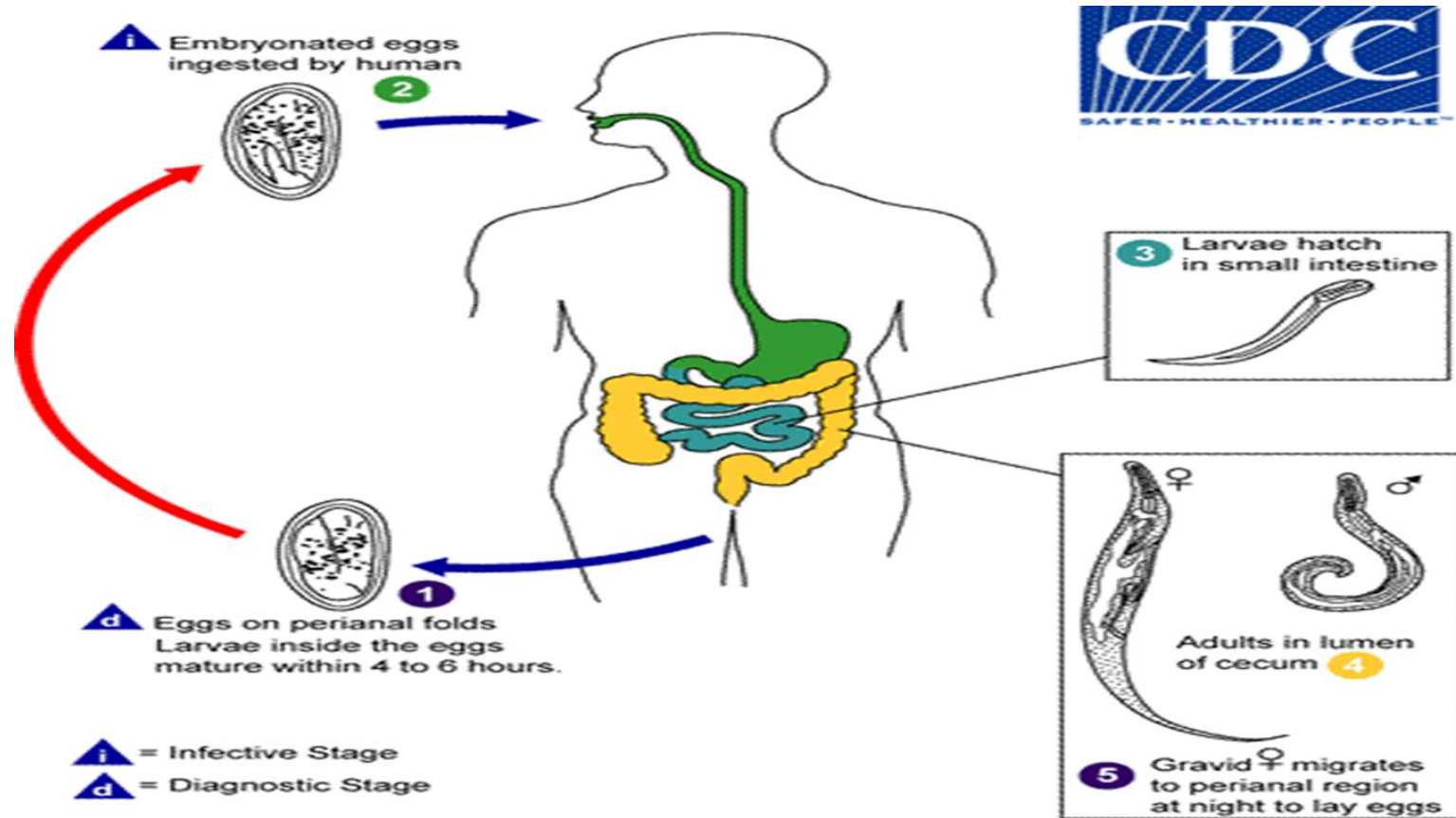
- 1- Intensity of infection.
- 2- Site and surface area affected.
- 3- Immunological and nutritional status of the host.
- 4- Duration of infection.

Pathogenicity may develop as one or more of the followings:

- **Local reaction**: varied from local mechanical irritation – local mechanical trauma leading to mucosal damage.
- **Secretory products** leading to stimulation of inflammatory cells
- Immune response either to adult or larvae leading to:
 - 1- Immediate hypersensitivity (allergic reaction) in the form of skin irritation, bronchial asthma as with migrating larvae.
 - 2- Delayed type hypersensitivity leading to tissue damage as in case of skin lesion following Onchocercosis.

Intestinal nematodes

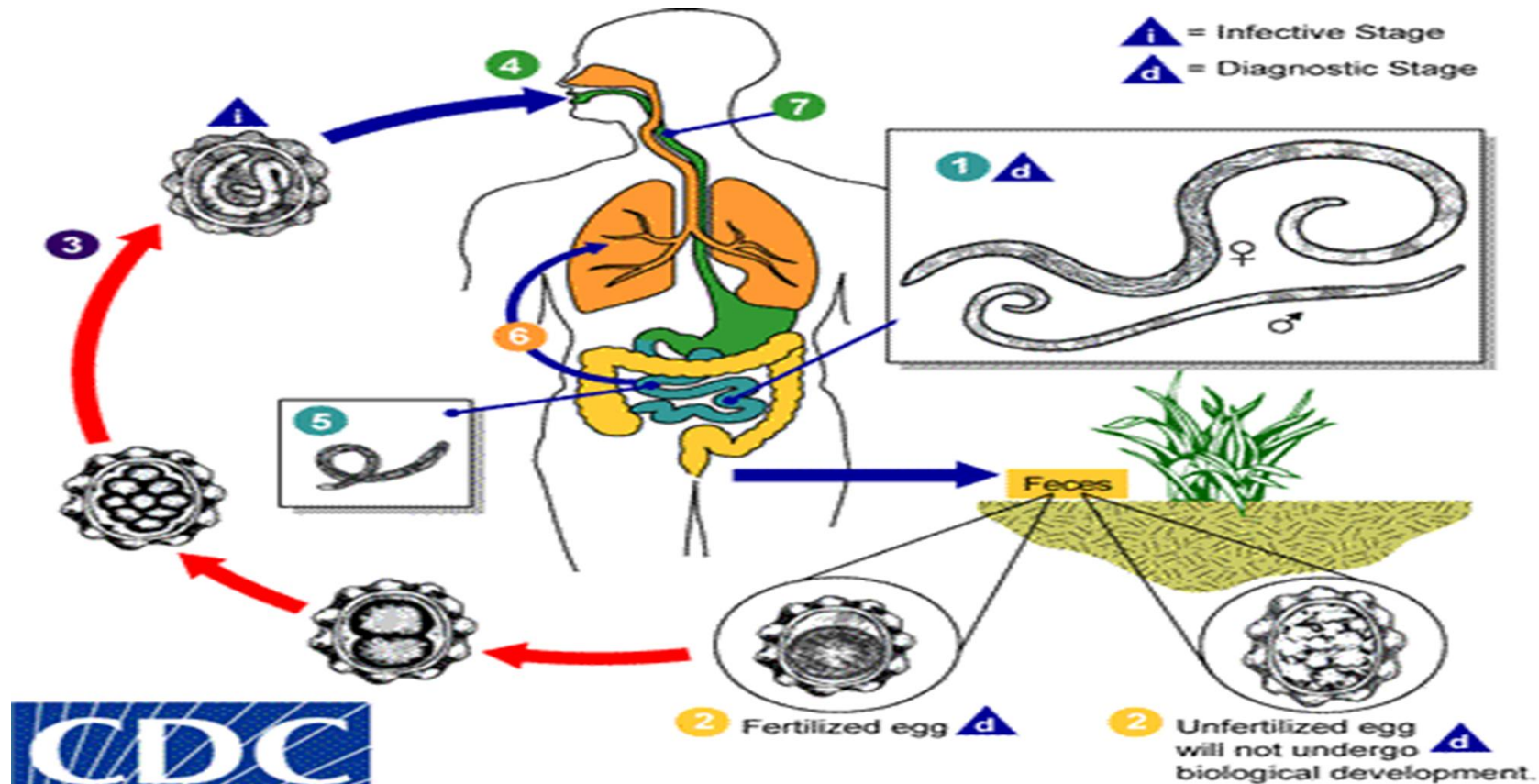
Enterobius vermicularis



Intestinal nematodes

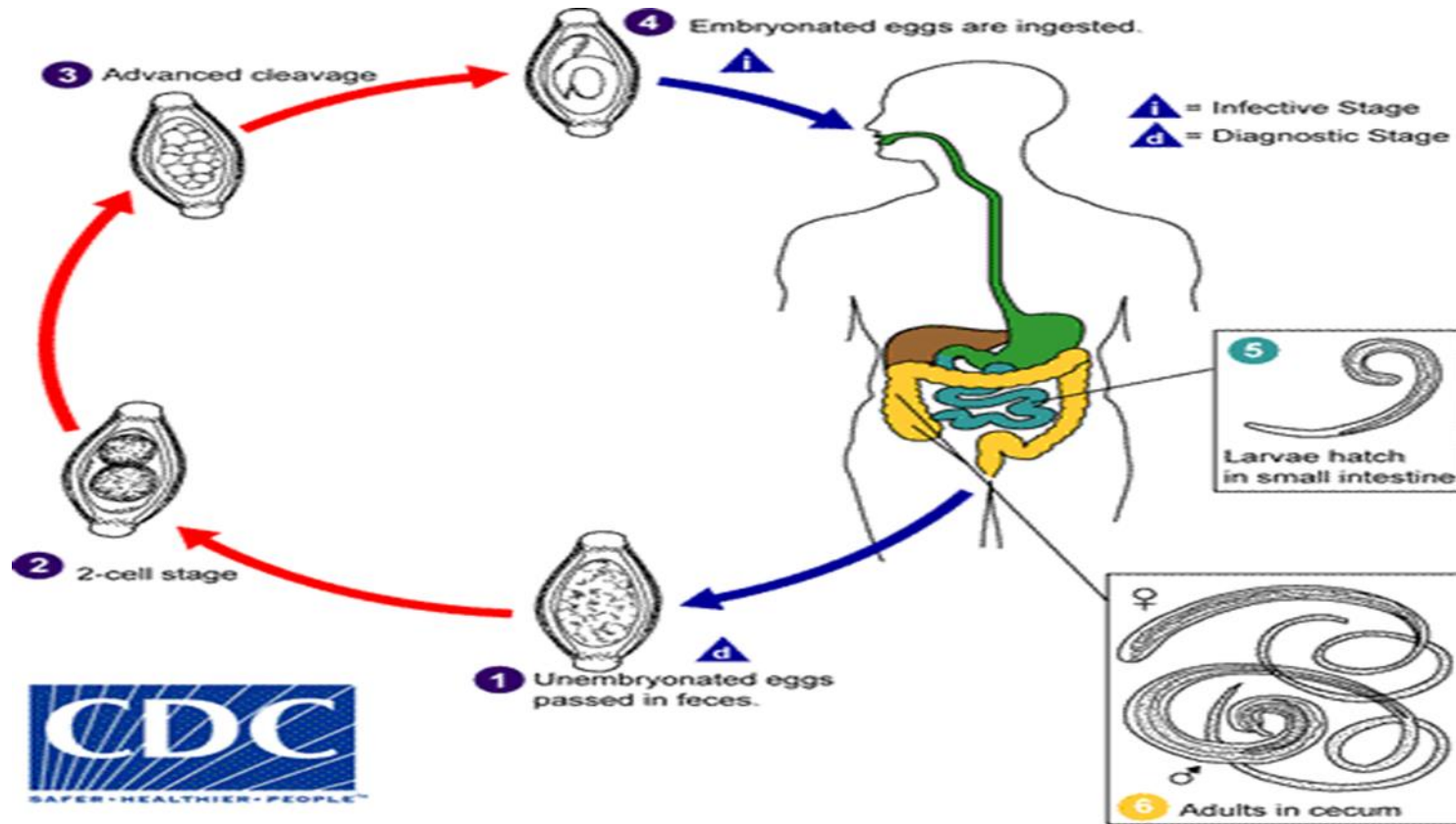
Ascaris lumbricoides

Giant Worm



Intestinal nematodes

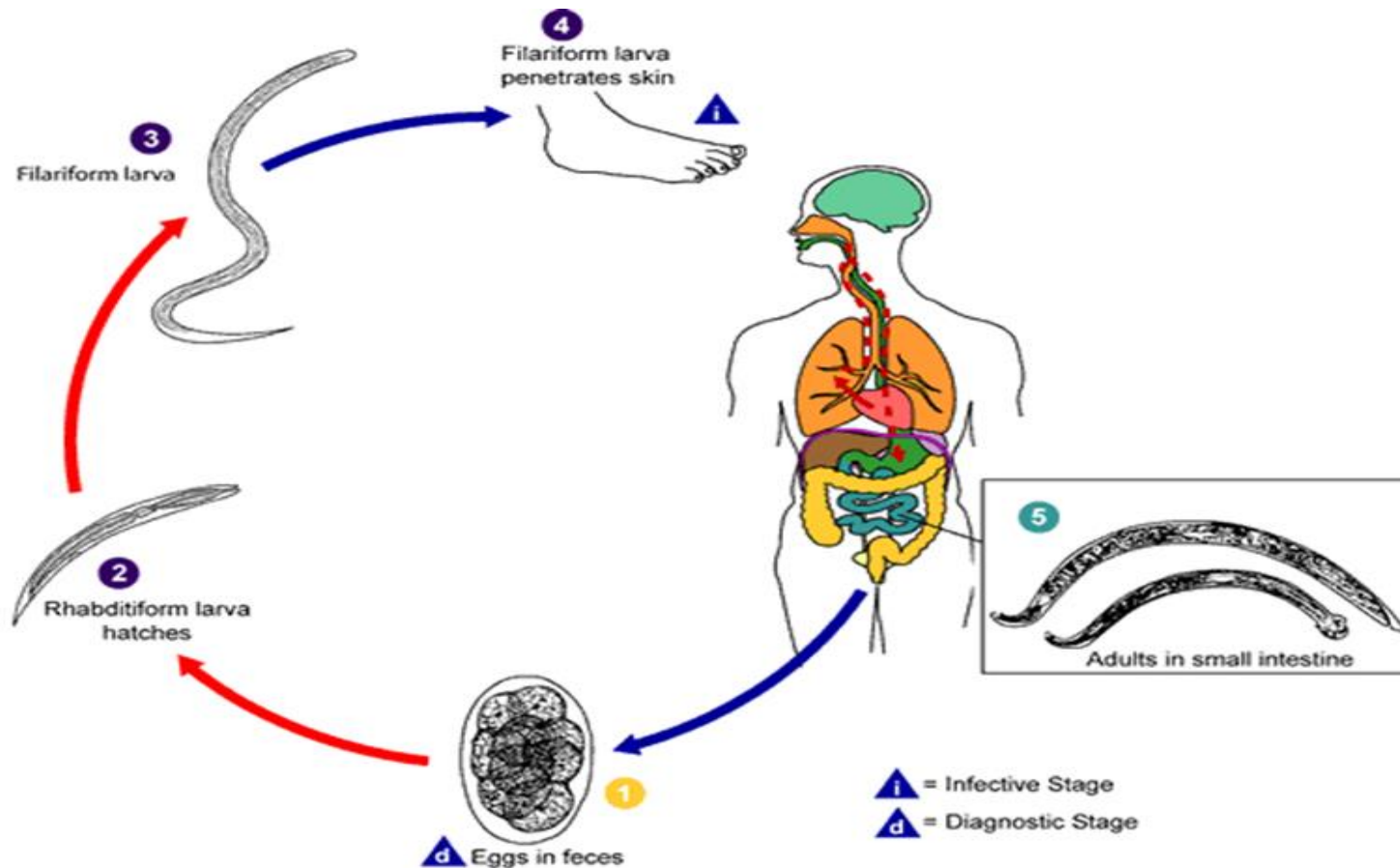
Trichuris trichiura Whip Worm



Intestinal nematodes

Ancylostoma duodenale

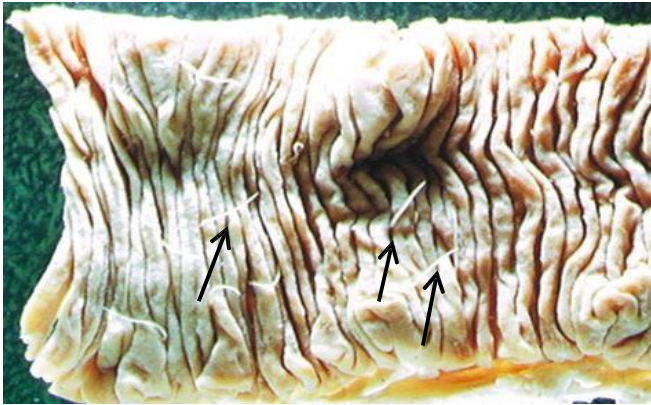
Hook Worm



Ancylostoma duodenale → Ancylostomiasis

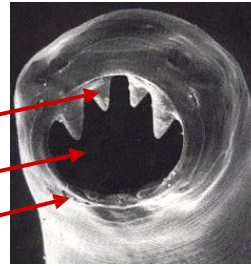
Definitive host: **Man only**

Habitat: **small intestine (jejunum)**



Adult worms attached to intestinal mucosa by their buccal capsule

4 Teeth
2 lancets
2 Plates

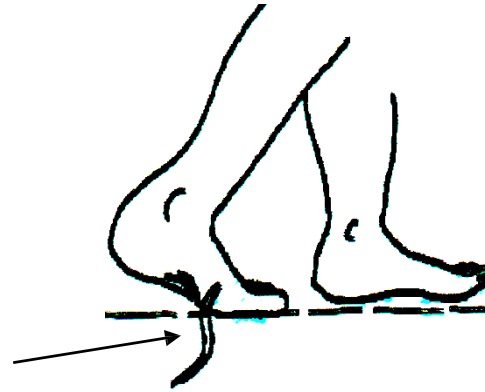
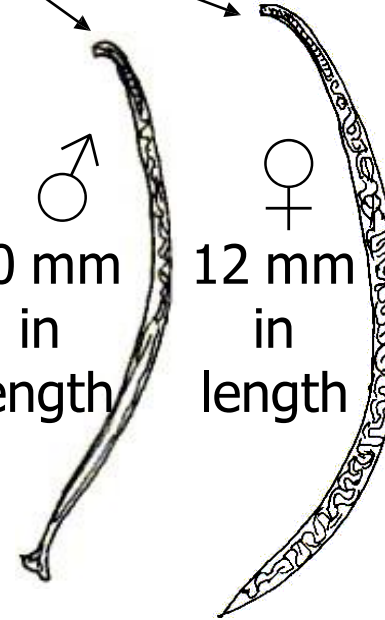


Mouth opening
(Buccal capsule)

Mouth opening

♂
10 mm
in
length

♀
12 mm
in
length



Diagnostic stage:

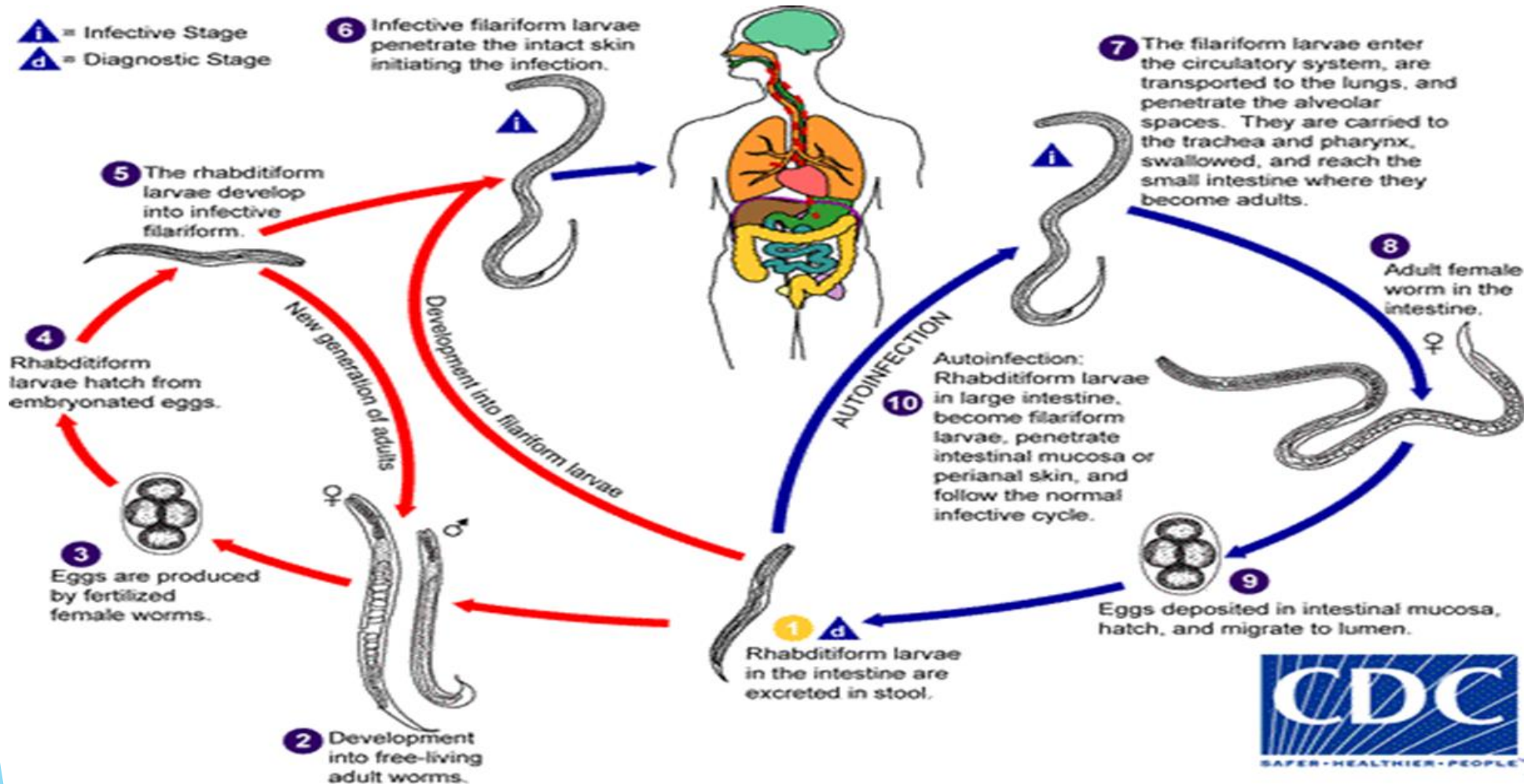
Infective stage:

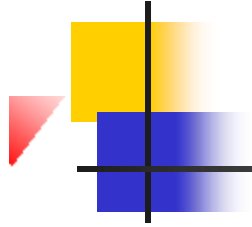
Mode of infection:

Intestinal nematodes

Strongyloides stercoralis

Dwarf-thread Worm





Tissue Nematodes

Trichinella spiralis → Trichinosis

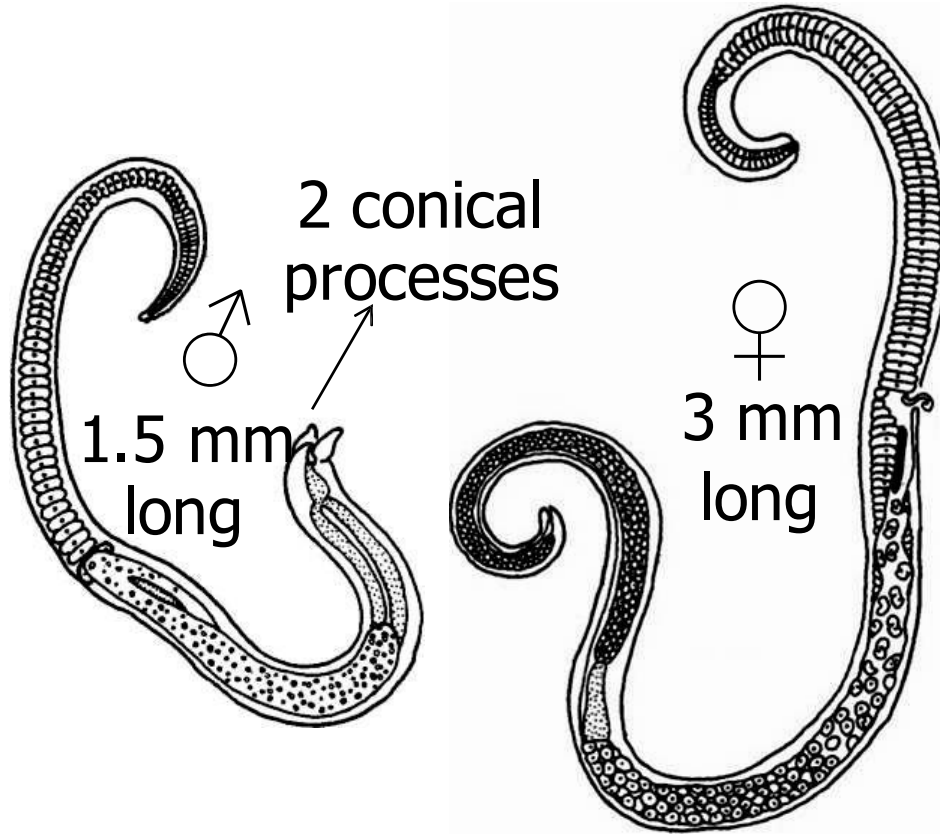
Trichinella: little hair
spiralis: like the spiral

Geographical distribution:

Final host:

Habitat:

Intermediate host:

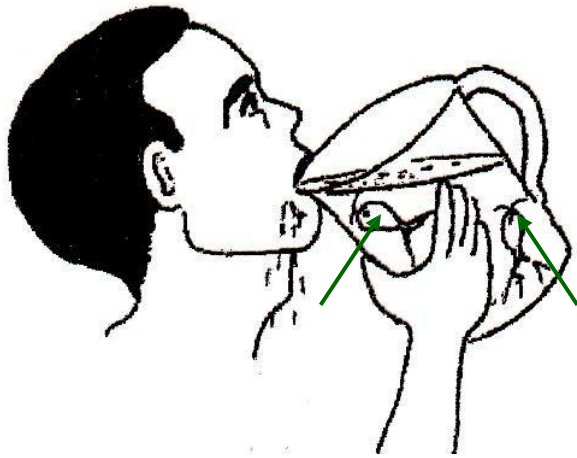


Life Cycle of *Dracunculus medinensis*

Dracontiasis

Dragon worm,
Guinea worm,
Medina worm

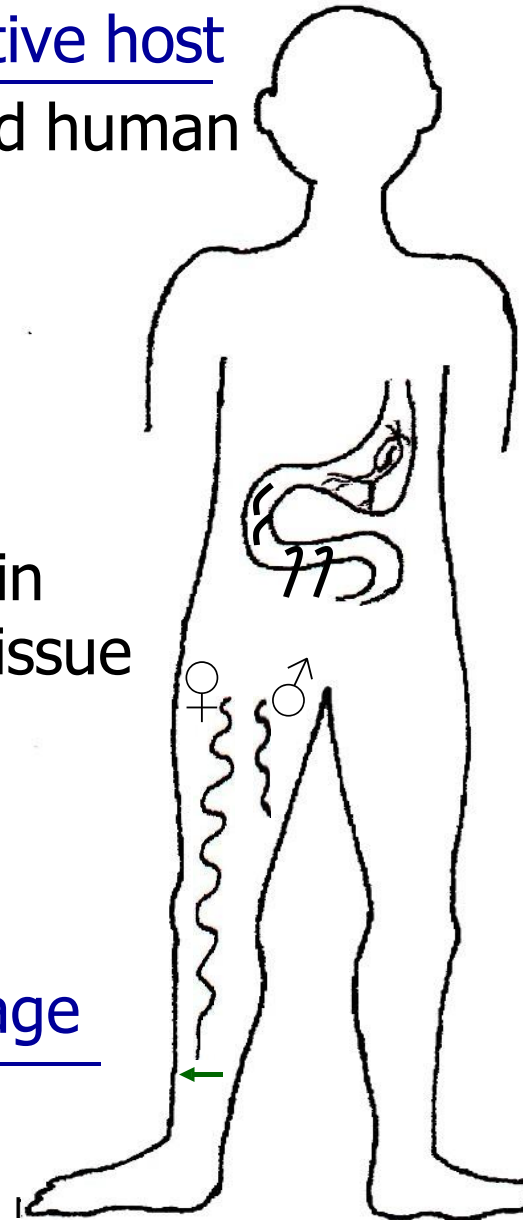
Mode of infection



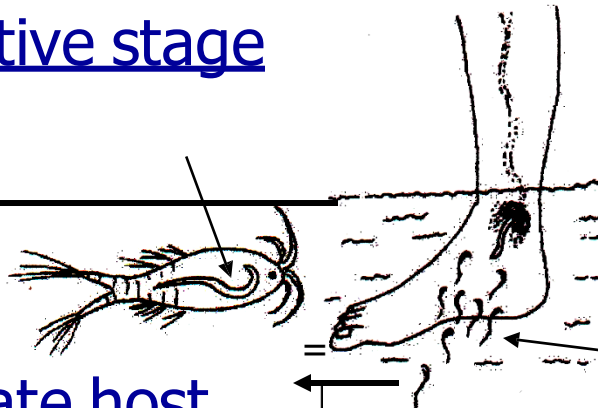
Definitive host
Infected human

Habitat

Adults exist in
subcutaneous tissue



Infective stage

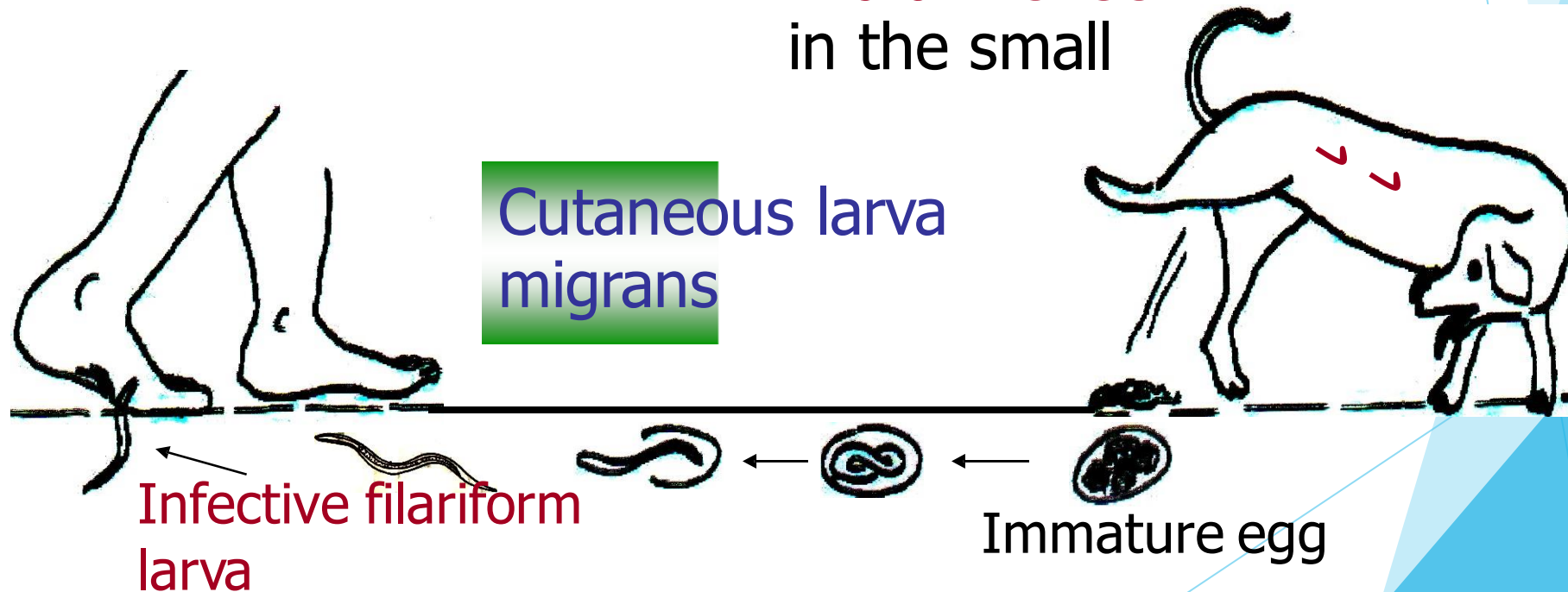


Diagnostic stage

Intermediate host

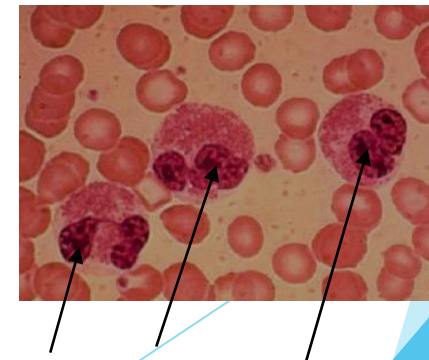
What happens when infective filariform larva of *A.caninum* or *A.braziliense* penetrate human skin?

Infected dog harboring *A.caninum* or *A.braziliense* intestine in the small



Diagnosis of Cutaneous Larva Migrans

- Advancing serpiginous tunnels.
- History of skin contact to soil.
- Larva is ahead of its track.
- High eosinophilia.



Other causes of Cutaneous Larva Migrans

- Strongyloides filariform larva (larva currens).



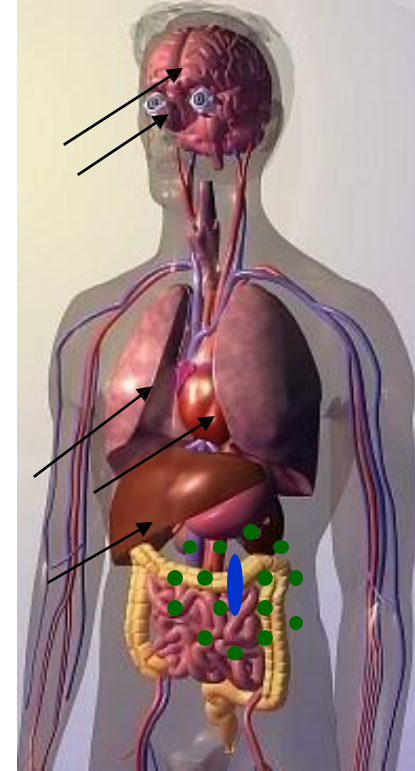
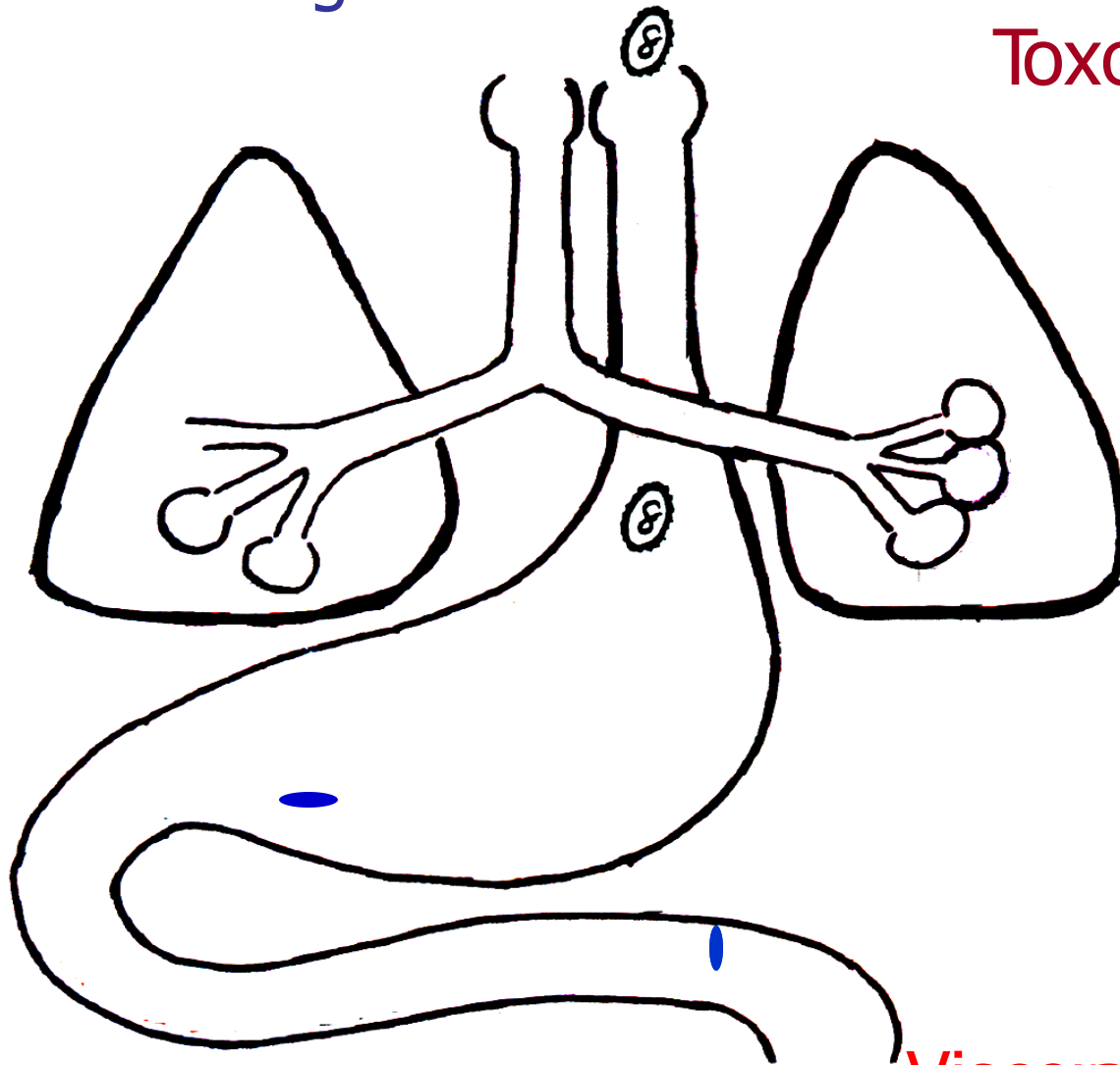
Larva migrates in skin of buttocks

What happens
when Man ingests

Embryonated

Toxocara canis
egg?

Toxocara cati egg?



Visceral larva migrans

Larva migrans

Migration of larvae of nematodes in **unsuitable** hosts.
larvae **cannot complete** their normal development
into adults.

Cutaneous larva
migrans



Invasion of human
skin by filariform
larvae of **A.caninum**
& **A.braziliense**

Visceral larva
migrans



Invasion of human
viscera by larvae of
Toxocara canis &
Toxocara cati



Filariae

Wuchereria bancrofti

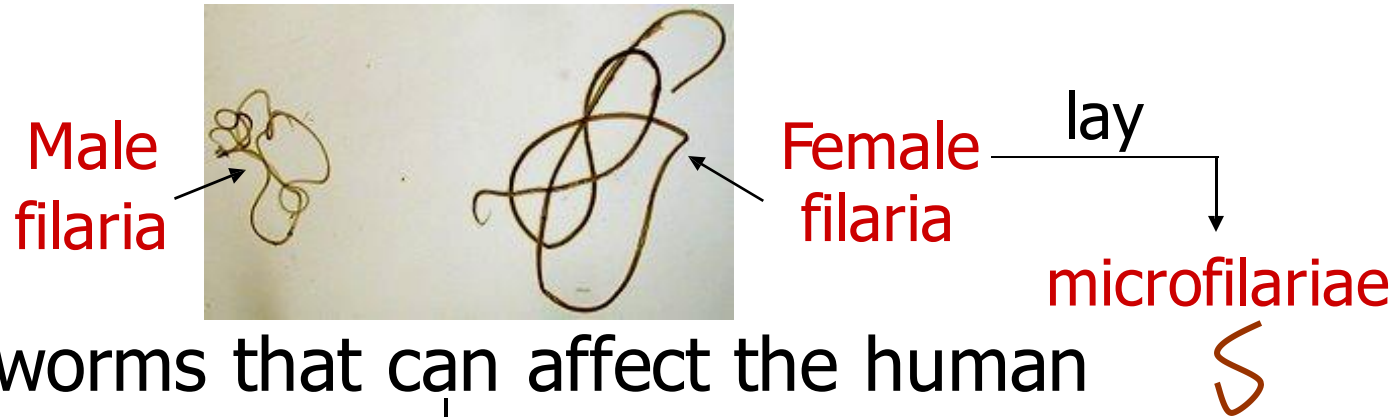
Onchocerca volvulus

Loa loa



Filaria (thread-like)

Are thread-like cylindrical worms



Filaria worms that can affect the human

Lymphatic system

Wuchereria bancrofti
Brugia malayi
Brugia timori

Subcutaneous tissue

Loa loa
Onchocerca volvulus

Serous cavity

Mansonella perstans
Mansonella ozzardi

Filaria are transmitted to man through the bite of vector

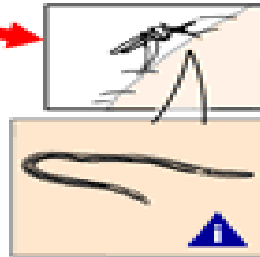
Wuchereria bancrofti

Mosquito Stages

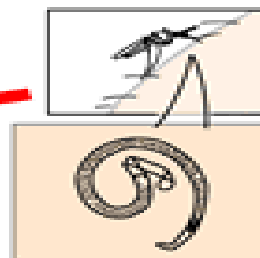
- 8 Migrate to head and mosquito's proboscis
- 7 L3 larvae
- 6 L1 larvae
- 5 Microfilariae shed sheaths, penetrate mosquito's midgut, and migrate to thoracic muscles

i = Infective Stage
d = Diagnostic Stage

- 1 Mosquito takes a blood meal (L3 larvae enter skin)



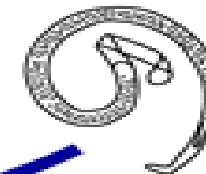
- 4 Mosquito takes a blood meal (ingests microfilariae)



Human Stages

- 2 Adults in lymphatics

- 3 Adults produce sheathed microfilariae that migrate into lymph and blood channels



Comparison between

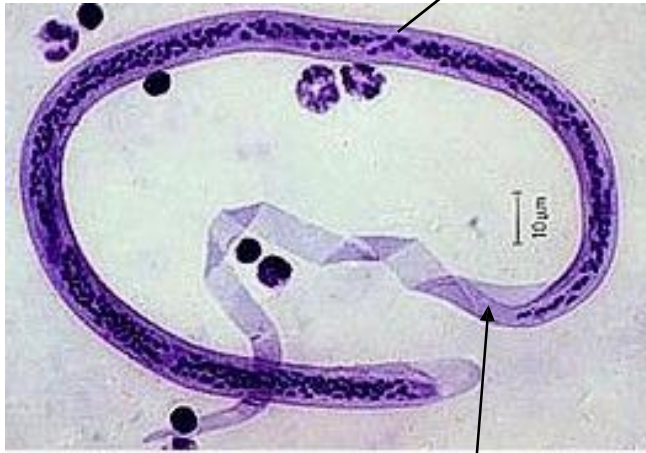
Wuchereria bancrofti

Exists in Egypt

Adult exists in Man only

Microfilaria

Graceful curve



Periodicity

Tail free of nuclei

Absolutely nocturnal

Vectors

♀ *Culex, Aedes, Anopheles*

Brugia malayi

Exists in Far East

Some strains exist in monkeys & cats

Kinky curve



2 Distinct nuclei at tail

Less absolute

♀ *Aedes, Anopheles, Mansonia*

Wuchereria bancrofti

Pathogenesis & Clinical Picture

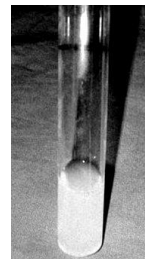
Severer disease

Usually affects genitalia & lower limbs



Genital organs are involved
Allergic manifestations are not common

Chyluria occurs



Brugia malayi

Pathogenesis & Clinical Picture

Milder disease

Usually affects legs below knees & arms below elbows

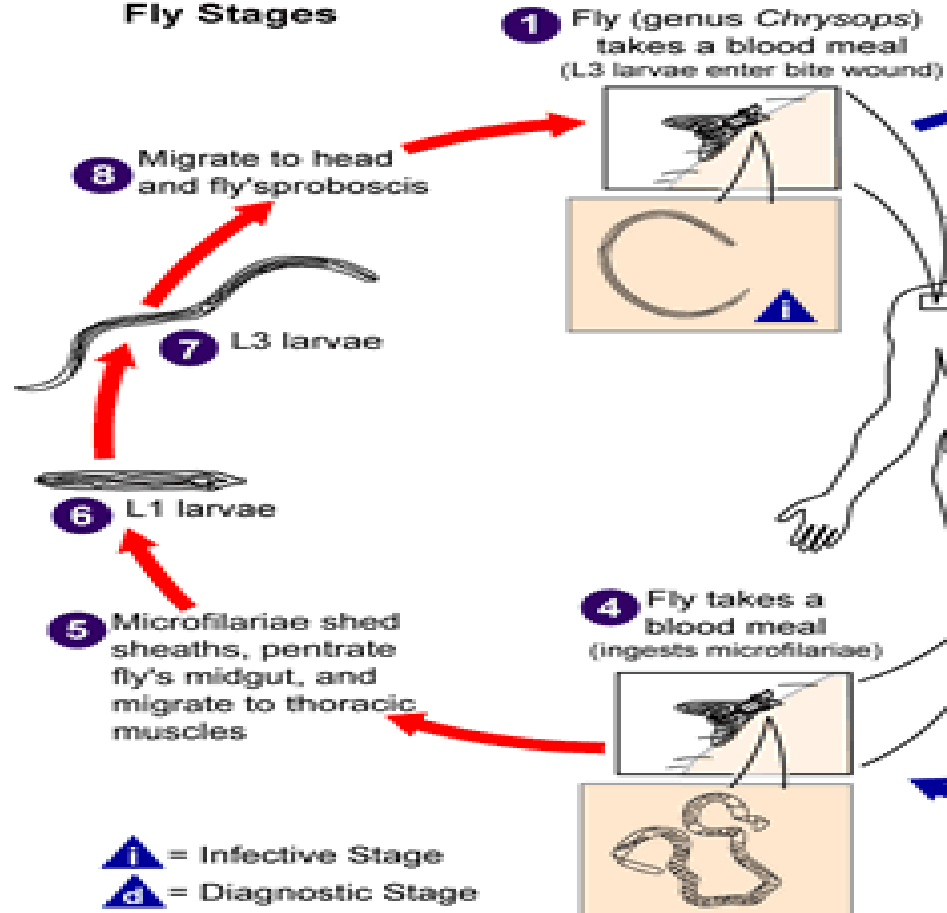


Genital involvement is rare
Allergic manifestations are common

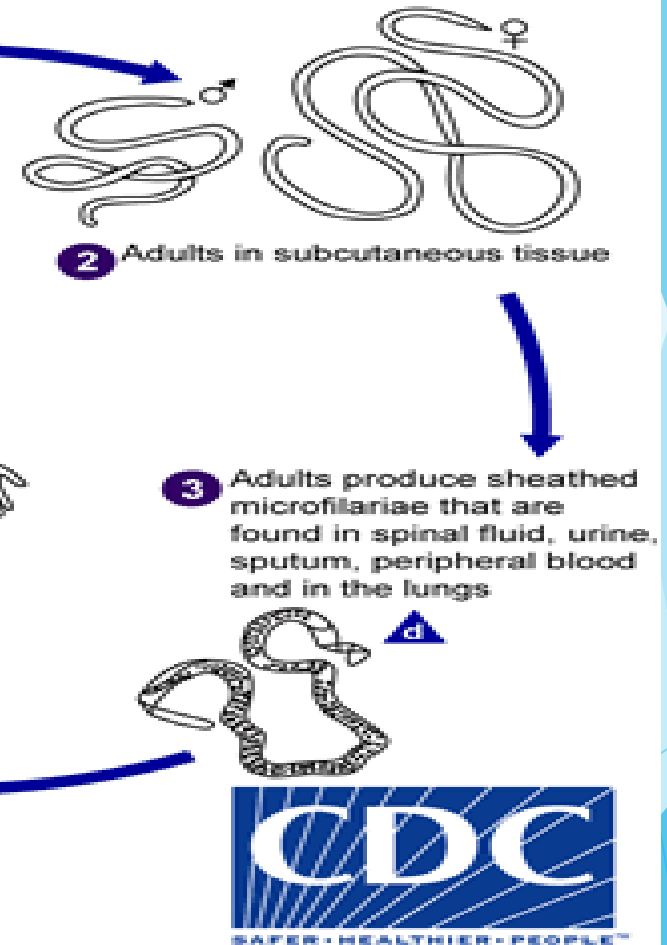
Chyluria is rare

Loa loa

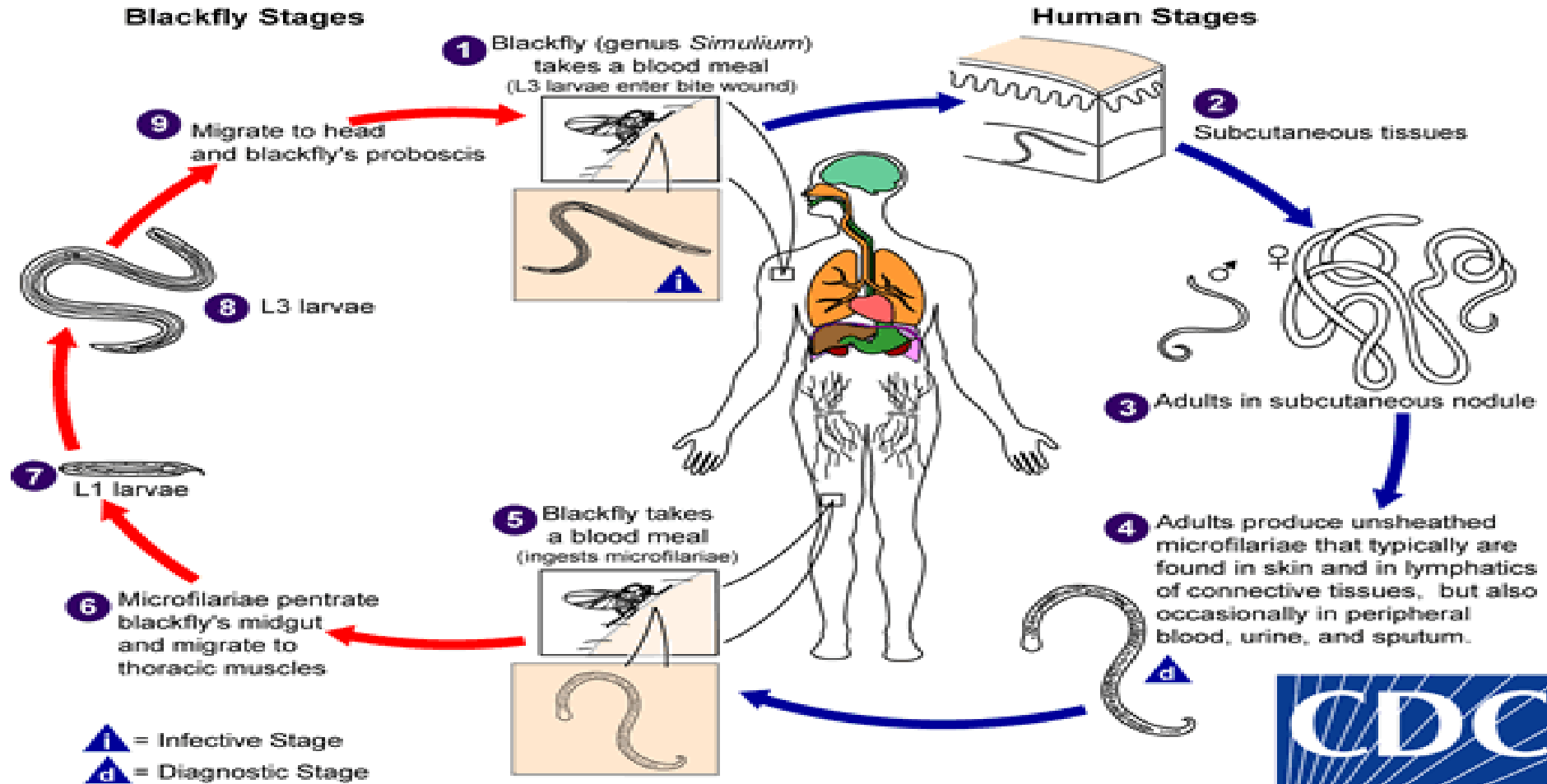
Fly Stages



Human Stages



Onchocerca volvulus



Comparison between

Loa loa

Transmitted
by *Chrysops*



Adult migrates under the
conjunctiva (called eye worm)

Vision is not affected

**When they reach the
human eye**

Onchocerca Volvulus Transmitted
by *Simulium*



Adults are coiled
forming a
subcutaneous
nodule

Microfilaria attack eye globe

Cause River blindness

Comparison between microfilariae

Arthropod vector:

