

Filarial worms



Somatic Nematodes

Introduction

- ❑ Includes nematode worms which reside in lymphatic system & connective tissue
- ❑ Slender, thread like measuring 2 to 10 cm
- ❑ Worms has got simple lipless mouth, cylindrical esophagus without a bulb & simple intestine
- ❑ Copulatory spicules are unequal
- ❑ Females are viviparous – produce larva –
Microfilaria – present in blood or skin

Genus	Species	Habitat of Adult worm	Microfilaria
Wuchereria	W.bancrofti	Lymphatic system	Blood (S)
Brugia	B.malayi	-do-	Blood (S)
Loa	L.loa	Connective tissue	Blood (S)
Acanthocheil lonema	A.perstans	-do-	Blood (U)
Onchocerca	O.volvulus	-do-	Skin
Mansonella	M.ozzardi	Mesentry	Blood (U)

Wuchereria bancrofti



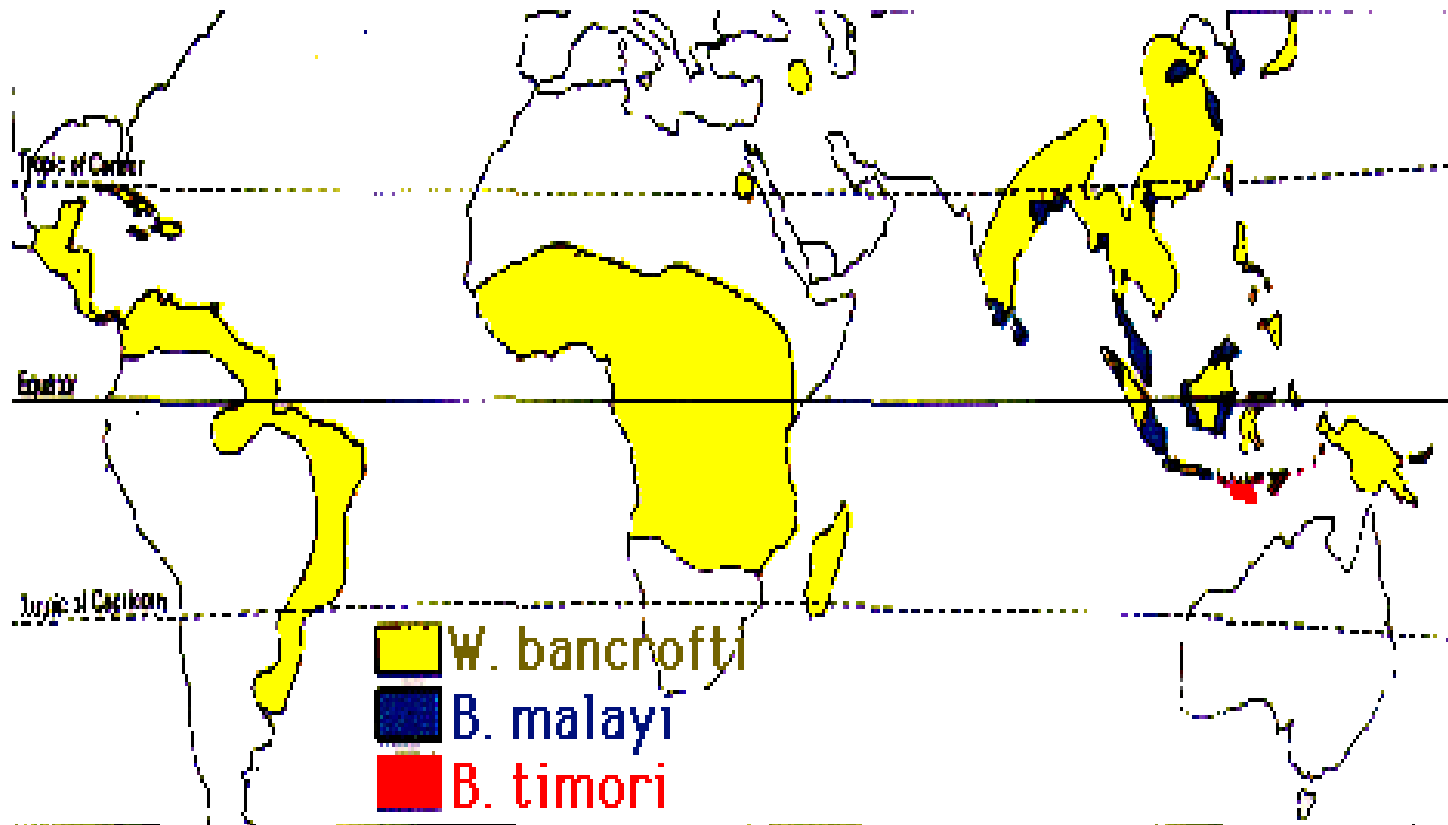
Common name : Bancroft's filaria

History

- Wucherer – 1866 – found larval forms in chylous urine
- Bancroft – 1876 – found adult female

Geographical distribution

- Confined to tropical & subtropical area
- India, West Indies, Southern china, Japan, North-eastern Australia, Central & Western Africa & South America
- In India, diseases is mainly seen in Southern & eastern region

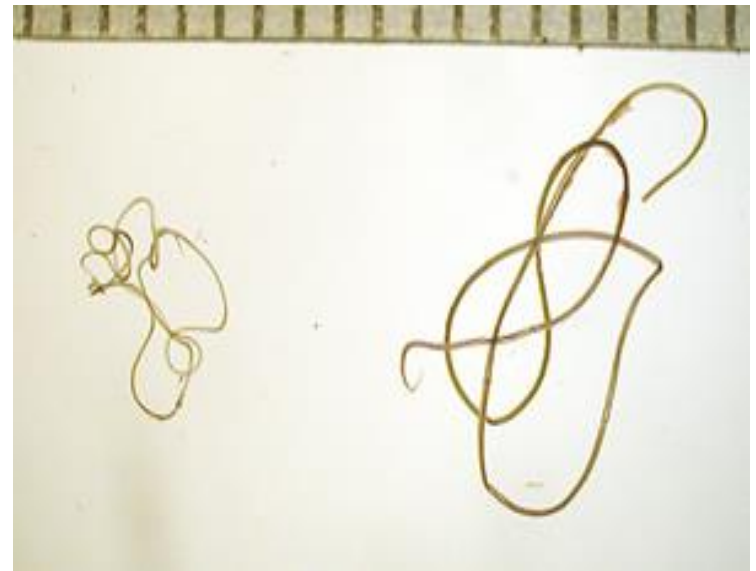


Habitat

- Adult worms – lymphatic vessels & lymph nodes
- Microfilaria – larval forms are seen in blood vessels

Morphology

- Adult worms :
 - Long, hair like, transparent
 - Filiform in shape, both ends are tapering
- Male :
 - 2.5 to 4 cm × 0.1 mm
 - Tail ends is coiled ventrally, contains 2 spicules of unequal length
- Female :
 - 8-10 cm × 0.2-0.3 mm
 - Tail – narrow & abruptly pointed



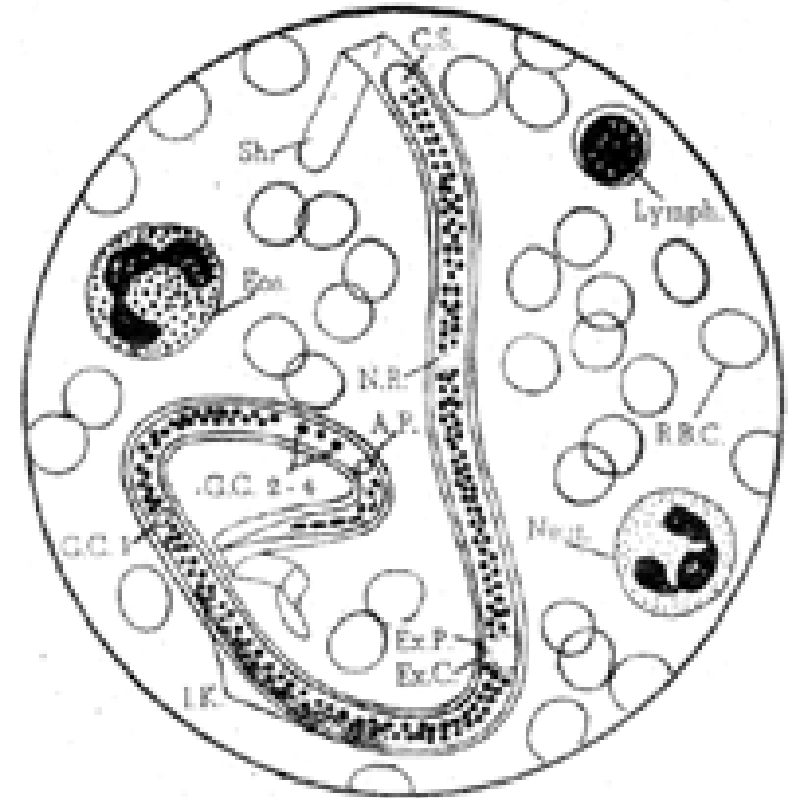
Microfilariae

- Present in blood, can move both with & against blood stream
- When unstained - colorless & transparent body with blunt head & pointed tail
- Measure $300\ \mu\text{L} \times 6 - 7\ \mu\text{B}$



Microfilariae

- Hyaline sheath
 - Longer than body
- Cuticula
- Somatic cells or nuclei – granules in body, extends from head to tail
- Breaking of granules at some places
 - Nerve ring
 - Anterior V-spot
 - Posterior V-spot
- A few G cells –
 - G 2,3,4 – in front of Posterior V-spot
 - G 1 – midway
 - **Innenkorper of Fulleborn – Central body of Manson**

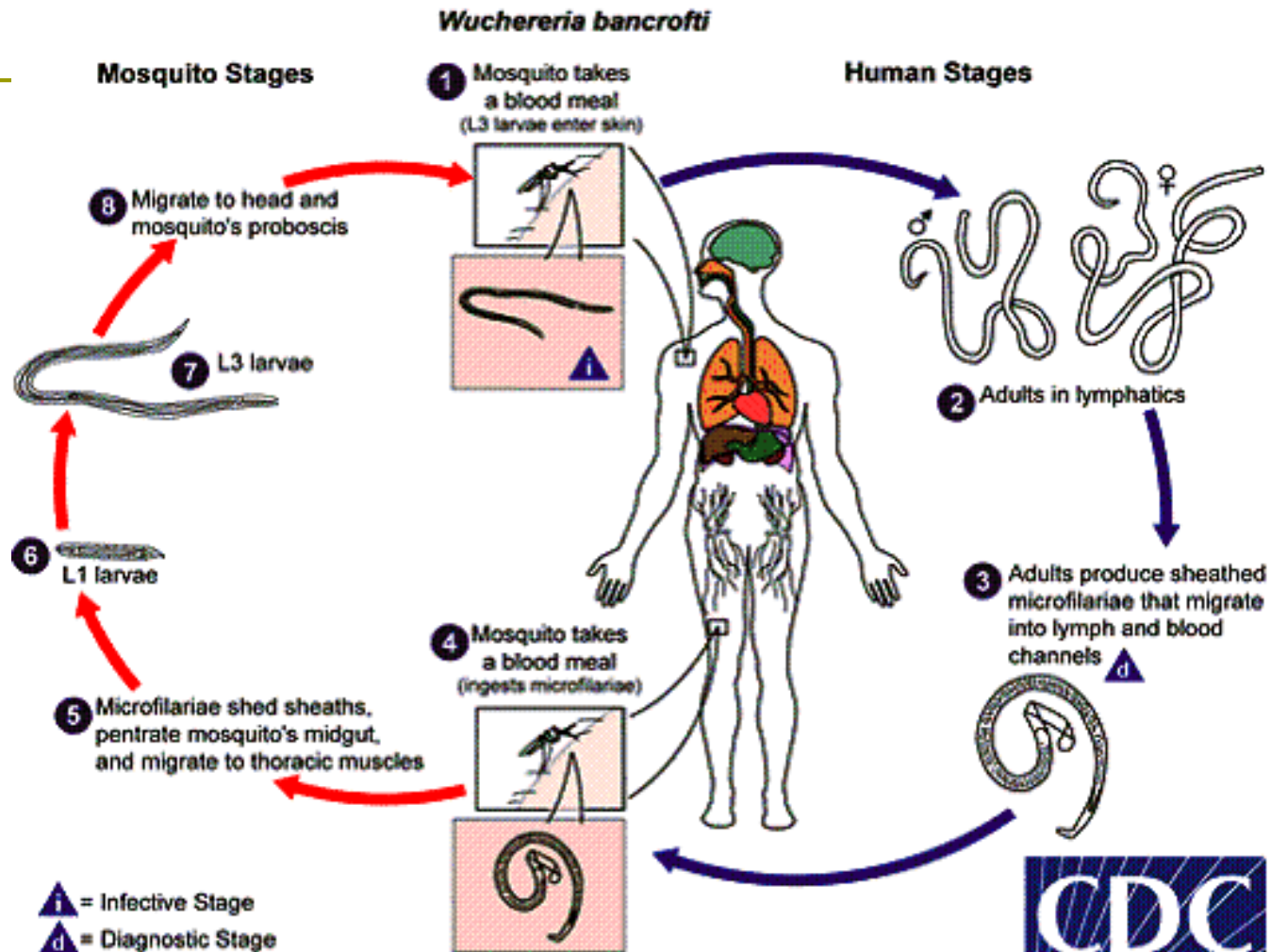




Life cycle

- 2 hosts –
- Definite host – man
- Intermediate host – mosquito
 - Genus Culex, Aedes and Anopheles

Life cycle



Development in mosquito

Mosquito during its blood meal takes up sheathed microfilariae

↓
Cast off their sheath, penetrate gut wall

↓
Migrate to thoracic muscles

↓
L1 – thick short sausage shaped with short spiky tail – 125 to
250 μ \times 10 –17 μ

↓
L2 – 225 to 300 μ \times 15 –30 μ

↓
L3 – infective form –1500 - 2000 μ \times 18 –23 μ

↓
Mosquito becomes infective by 14 days

Development inside man

- Infective 3rd stage larva are inoculated on skin while mosquito bites a human

↓

- Due to warmth of skin larvae enter body through puncture wound or penetrate skin

↓

- Reach lymphatic vessels, settle down & begins to grow into adult worms

↓

- 6 to 18 months – become sexually mature

↓

- Female liberates larvae – through thoracic duct to right lymphatic duct to venous circulation - enters systemic circulation

Pathogenicity & clinical features

- ❑ Infection – wuchereriosis or filariasis
- ❑ Disease – confined to lymphatic system
- ❑ Mode of infection – inoculation through bite of infected female mosquito (Anopheles, Aedes or Culex)
- ❑ Infective form – third stage larva
- ❑ Portal of entry – skin
- ❑ Site of localization – lymphatic vessels
- ❑ Biological incubation period – one year

Pathogenesis

- Effects are produced due to
 - Adult worm – dead or living
 - Living microfilariae – does not produce any symptoms
- Metabolites of larvae in blood in highly reactive individuals –
 - Allergic manifestations – urticaria, fugitive swelling & lymphoedema
- Injurious influence excited by adult worm in host is due to –
 - Inflammatory reaction of lymphatic system – **lymphangitis**

Causes of lymphangitis

□ Mechanical :

- Mechanical irritation due to movement of adult worm

□ Allergic :

- Liberation of metabolites by growing larvae or secretion of toxic fluids at time of parturition by adult female
- Absorption of toxic products liberated from dead worm

Recurrent attacks of
lymphangitis leads to



Lymphatic obstruction

Causes of lymphatic obstruction

- ❑ Mechanical blocking by dead worm
- ❑ Obliterative endolymphangitis
 - Endothelial proliferation and inflammatory thickening of wall of lymphatics
- ❑ Excessive fibrosis of lymphatic vessels due to recurrent attack

Lymphatic obstruction

leads to

**Lymphvarix
Elephantiasis**

Lymphvarix - Ballooning or enlargement of lymphatic vessels

□ Rupture of lymphangiovarix

■ Lymphorrhagia

- Lymph scrotum
- Lymphocele
- Lymphuria

■ Chylorrhagia

- Chylocele, chyluria, chylous diarrhea, chylous ascites & chylothorax

Elephantiasis

Enlargement of affected part – tumor like solidity
End result of wuchererial infection

Lymphatic obstruction leads to exudation of lymph fluid



Rich in protein content



Stimulates connective tissue to excessive growth



Hypertrophy and hyperplasia



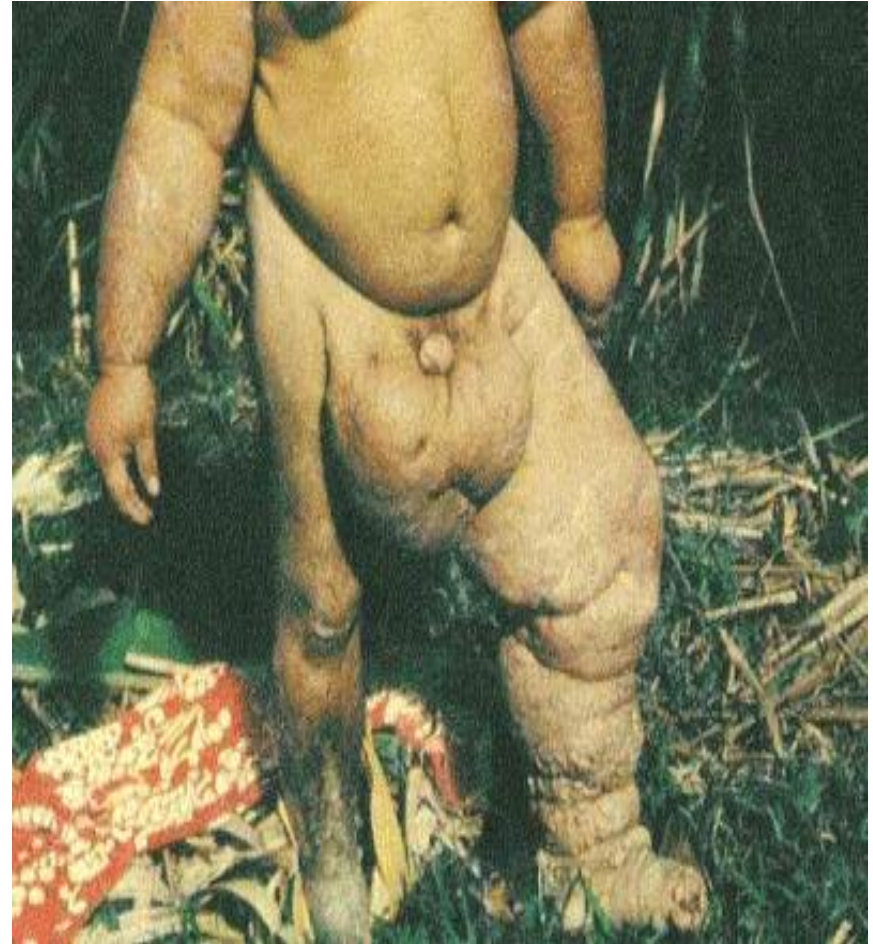
Elephantiasis

Pathology in elephantiasis

- ❑ Surface of skin – rough, fissured & papillomatous
- ❑ Hair- rough & sparse
- ❑ On section –
 - Skin - thickened, dense & fibrous
 - Subcutaneous tissue – edematous
 - Bones & muscles - unaffected



Severe form – involving scrotum & upper limb



Chyluria

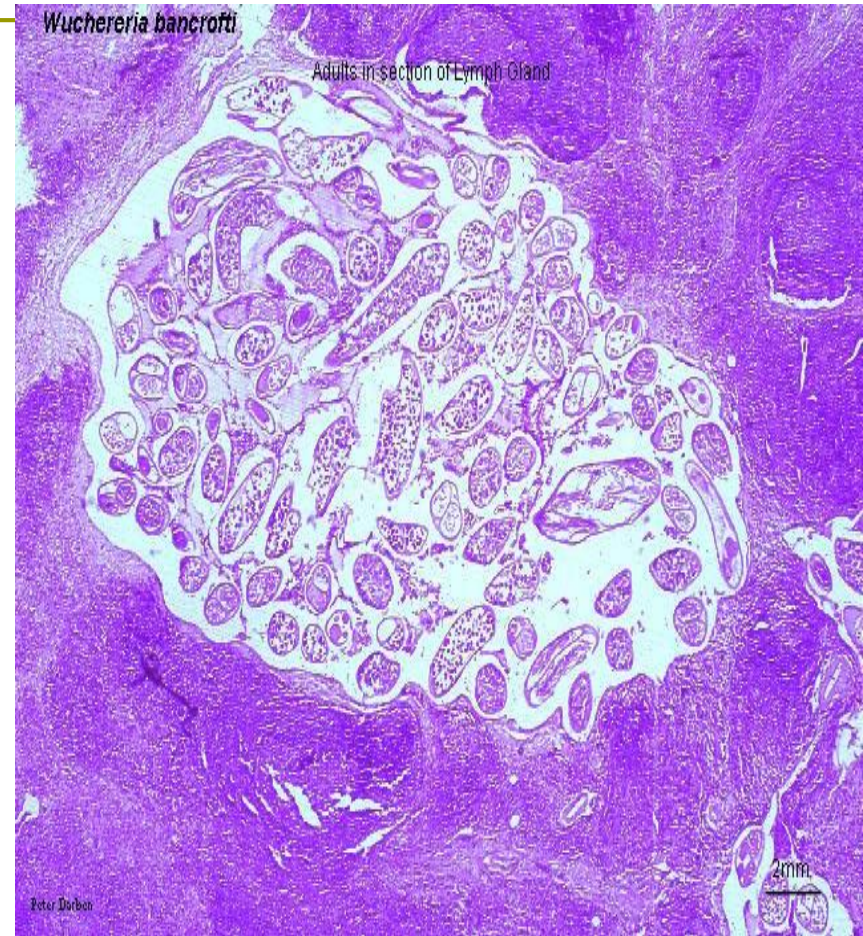
- Escape of chyle through urine due to rupture of varicose chyle vessels
- Urine – milky white in color
 - Fat particles
 - Albumin
 - Fibrinogen
 - Microfilariae

Occult filariasis

- ❑ Hypersensitivity reaction to microfilarial antigens
- ❑ Massive eosinophilia, lymph node enlargement, hepatosplenomegaly & pulmonary symptoms
- ❑ Adult worm produce microfilariae but destroyed in tissues
- ❑ In affected organs eosinophil granulomas develop in which eosinophils aggregate around microfilariae

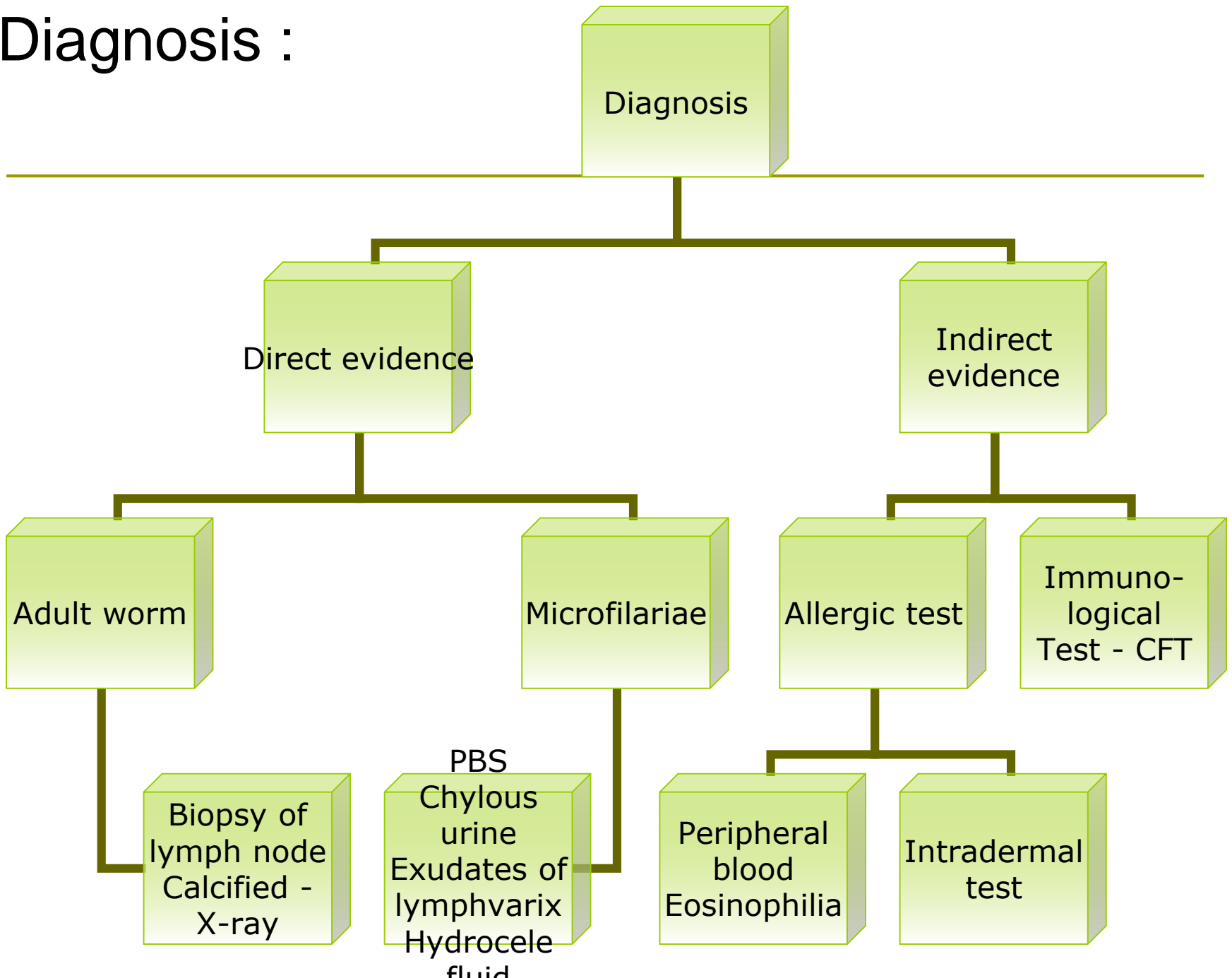
Tropical pulmonary eosinophilia (TPE)

- Malaise, fever, wt. loss & respi. symptoms like cough, dyspnoea & asthmatic wheezing
- Eosinophil count $> 3000/\mu\text{l}$
- Responds to treatment with microfilaricidal drug (diethylcarbamazine)
- Microfilariae not in blood but seen in lung biopsies



	Classical filariasis	Occult filariasis
Cause	Developing worms & adults	Microfilariae
Basic lesions	Acute inflammation-epitheloid granuloma	Eosinophilic granuloma
Organs	Lymphatic system	Lymphatic system, lung, liver & spleen
Microfilaria	Present in blood	In tissues
Therapeutic response	No response	responds
Serological test	CFT less sensitive	Highly sensitive

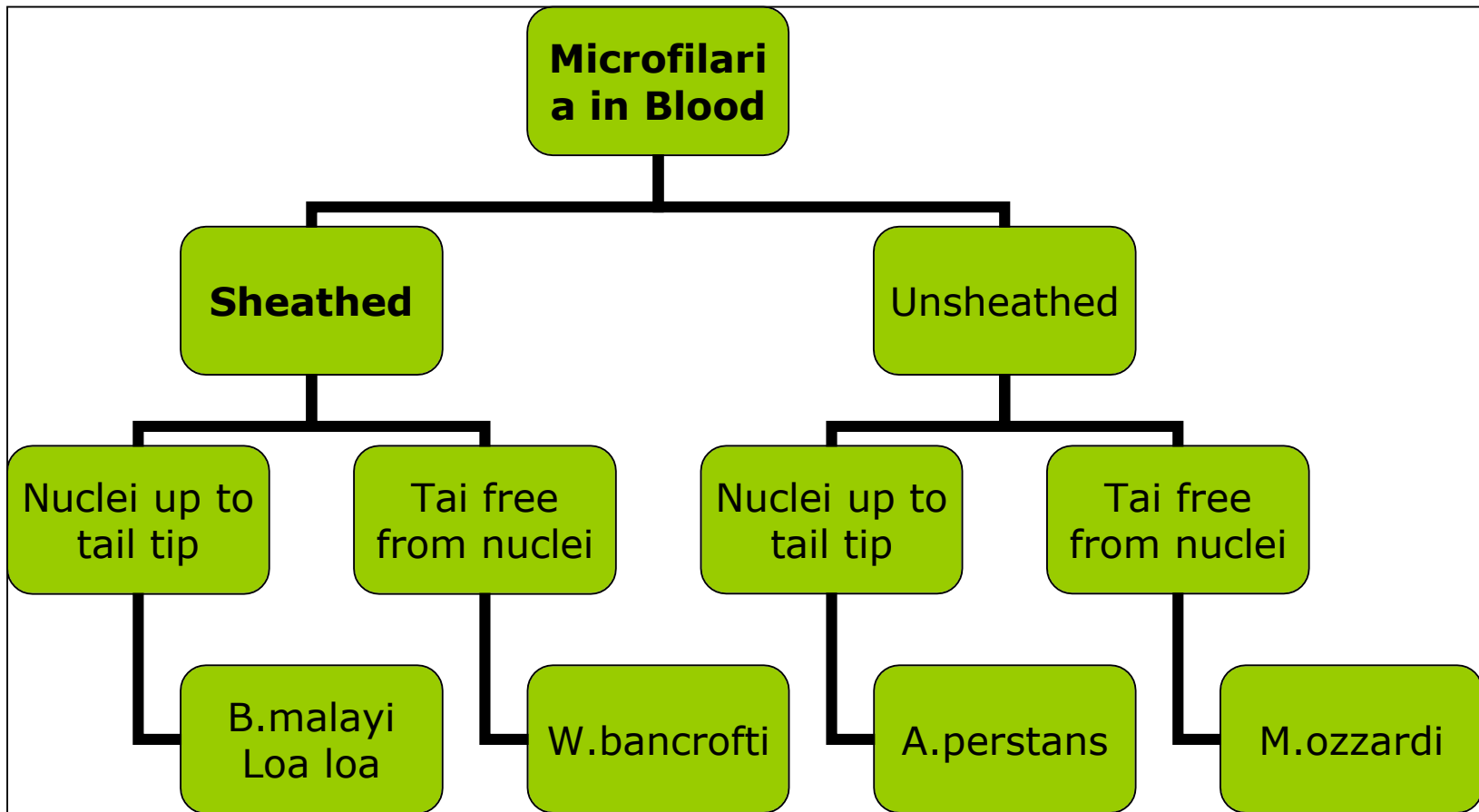
Diagnosis :



Brugia malayi

- Resembles *W.bancrofti* in all aspects except differences in morphology of Microfilariae
- *Mf.malayi* differs from *Mf.bancrofti* in :
 - Smaller in size
 - Surface is not smooth, has got secondary kinks
 - Cephalic space – broad
 - Nuclei are present up to tail tip

Differentiation of species by Microfilaria



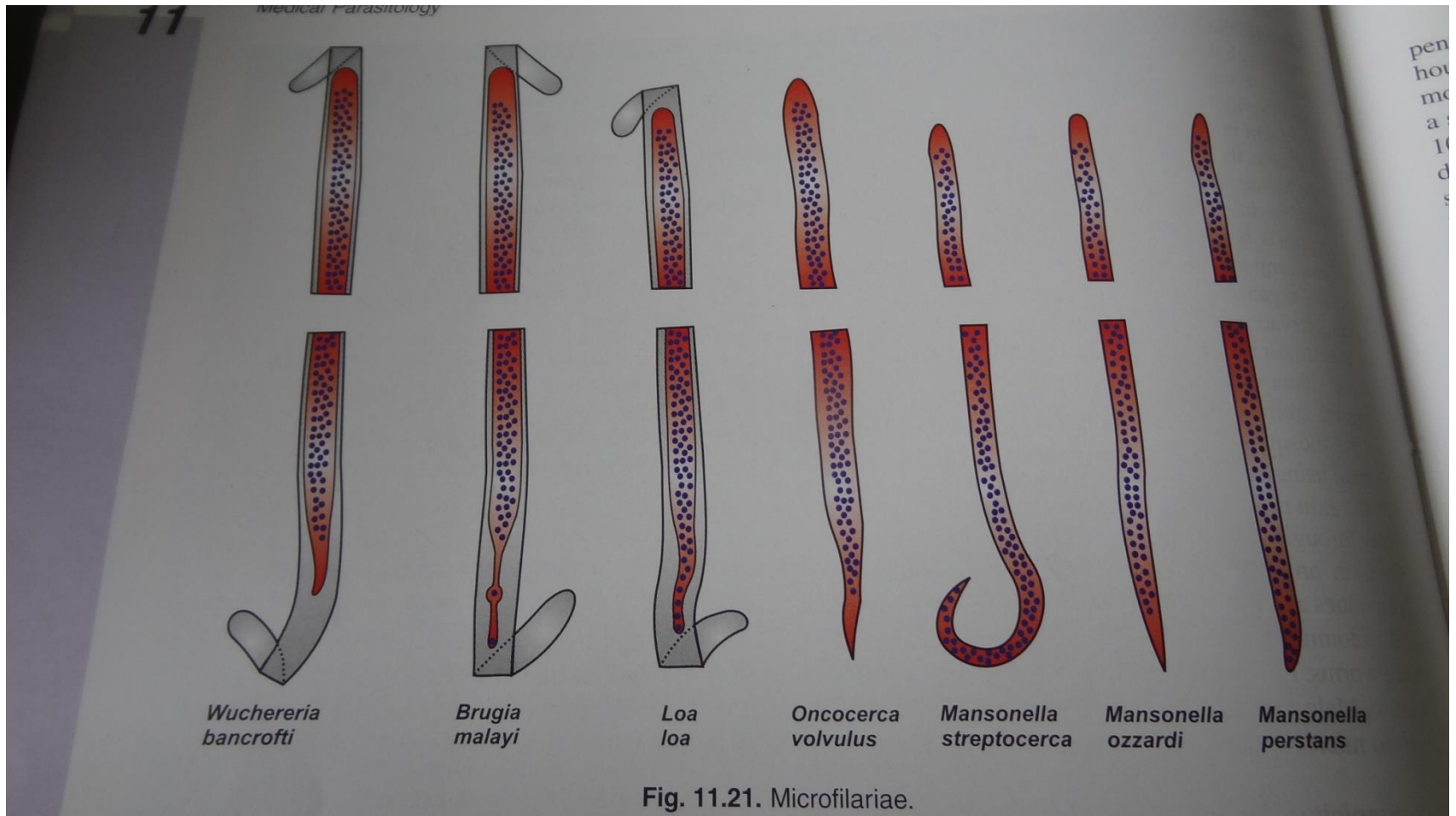


Fig. 11.21. Microfilariae.

Dracunculus medinensis

Common name : Guinea worm,
Dragon worm, Serpent worm,
Medina worm

Habitat

- ▣ Subcutaneous tissue especially of legs, arms & back

Morphology

□ Adult male :

- Smaller than female, 1.5 – 2 cm L × 0.4 mm B

□ Adult female :

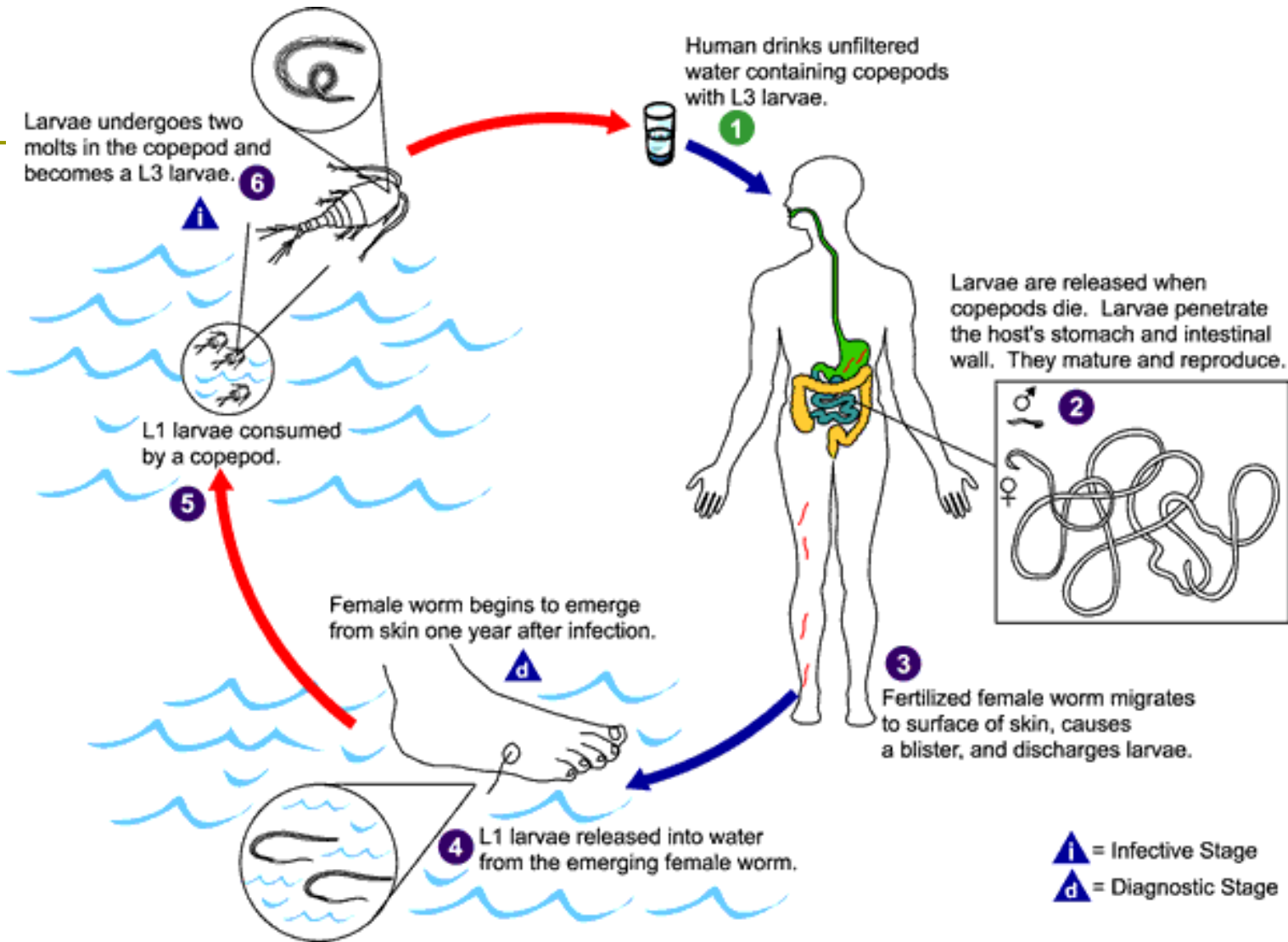
- 6 cm to 1 meter L × 1.5 -1.7 mm B
- Posterior end tapering, bent like a hook
- Cylindrical, smooth & milky white in color
- Viviparous

Larvae

- Coiled bodies with rounded heads & long slender tapering tail
- $700\ \mu \times 17\text{-}20\ \mu$
- Released by adult female when in contact with water
- Enters cyclops for further development

Life cycle

- 2 hosts
- Definite host : Man
- Intermediate host : Cyclops



Larvae undergoes two molts in the copepod and becomes a L3 larvae. **6**

L1 larvae consumed by a copepod. **5**

Human drinks unfiltered water containing copepods with L3 larvae. **1**

Larvae are released when copepods die. Larvae penetrate the host's stomach and intestinal wall. They mature and reproduce. **2**

Female worm begins to emerge from skin one year after infection. **d**

Fertilized female worm migrates to surface of skin, causes a blister, and discharges larvae. **3**

L1 larvae released into water from the emerging female worm. **4**

i = Infective Stage
d = Diagnostic Stage

Cyclops



Life cycle : Development in cyclops

- ❑ Embryos released by adult female are ingested by Cyclops
- ❑ Each Cyclops can ingest 15 -20 larvae
- ❑ Within 1-3 hours – penetrate gut wall
- ❑ Enters body cavity – undergo metamorphosis
- ❑ In about 2 weeks development completes

Development in man

- ❑ Mode of infection : ingestion
- ❑ Source of infection : contaminated water
- ❑ Ingestion of water contaminated with infected cyclops
- ❑ Cyclops are digested by gastric juice, larvae are liberated
- ❑ Penetrate gut wall – enters retroperitoneal connective tissue – reside there & grows to sexual maturity
- ❑ Fertilized female migrate and select those part of skin which comes in frequent contact with water
- ❑ Contact with water stimulates gravid female to discharge larvae in water

Pathogenicity

- Blister formation
- Secondary infection of ulcer

Blister formation



Laboratory diagnosis

- Detection of adult worm
- Detection of embryo
- Intradermal test
- Blood examination : eosinophilia