

(AEDES)FILARIASIS

Prof.Nuzhat Jahan

Department Of Zoology
Karim City College

WHAT IS Filariasis

- Filariasis (or philariasis) is a parasitic disease caused by an infection with roundworms of the Filarioidea type. These are spread by blood-feeding black flies and mosquitoes. This disease belongs to the group of diseases called helminthiasis.
- Eight known filarial nematodes use humans as their definitive hosts.

Epidemiology- International

- 120 million in 80 countries
- 1 billion at risk
- 90% - Wucheraria Bancrofti
- Remainder – Brugia Malayi

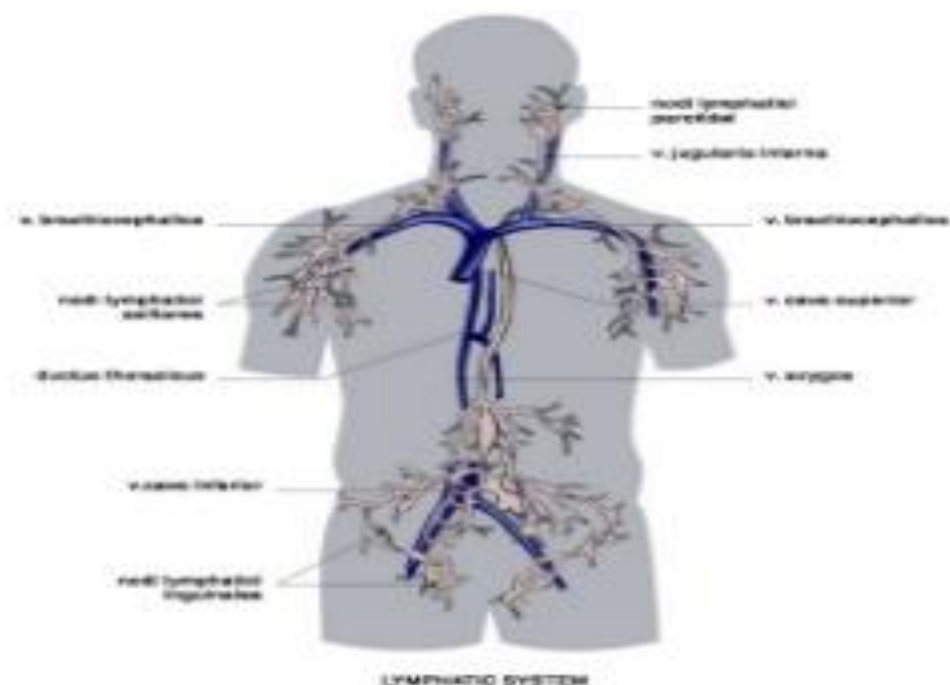


**Approximate geographic distribution of lymphatic filariasis
(Parasites and Parasitological Resources)**

Parasites



- White, slender roundworms
- Three types: *Wuchereria bancrofti*, *Brugia malayi*, *Brugia timori*
- Live for 5-7 years, produce millions of offspring
- Block the lymphatic system
 - Network of channels and lymph nodes that help maintain fluid levels in the body
 - Blockage leads to edema (collection of fluid in tissues)



Mosquitos are Vectors and spread the Infection

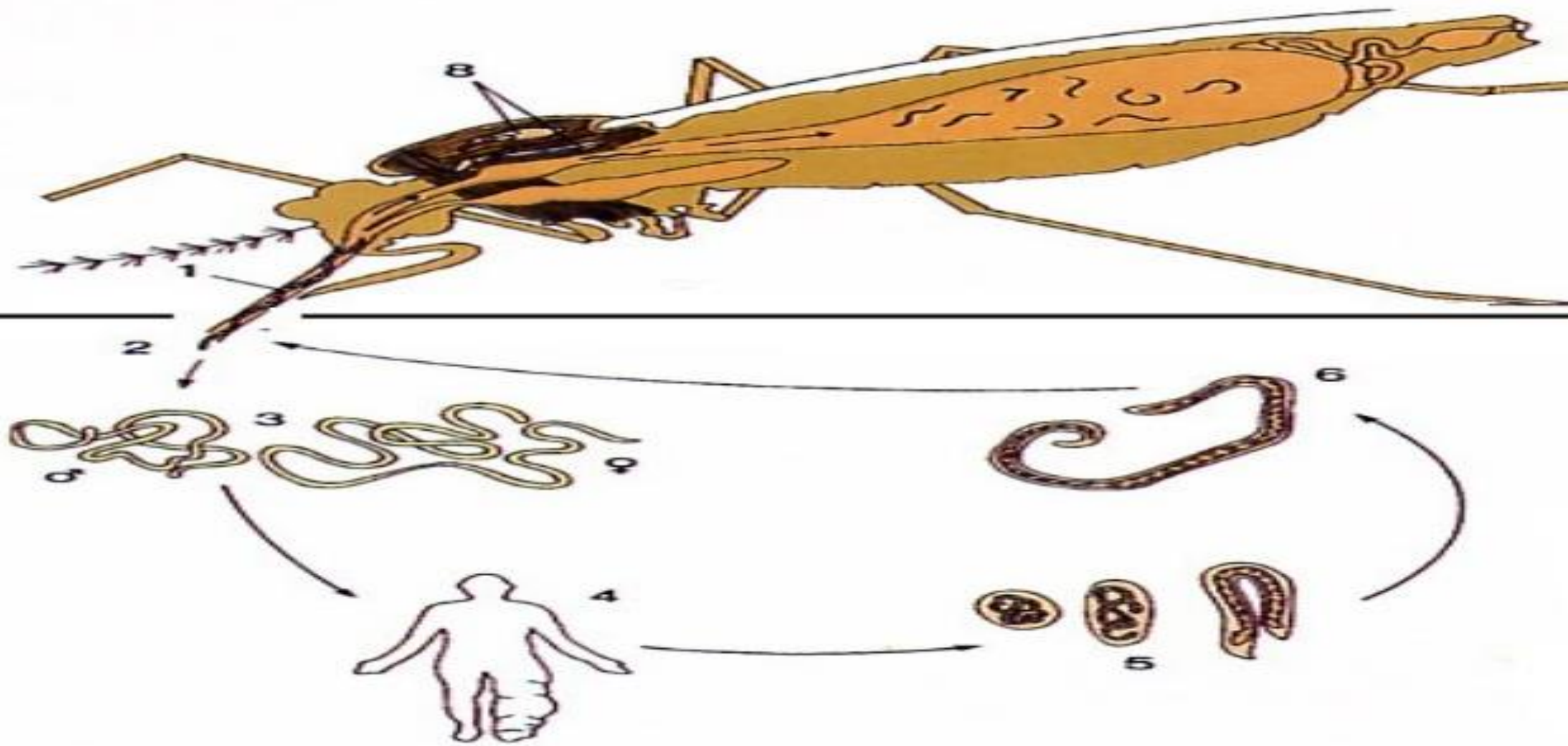
- A mosquito is the intermediate host and carrier. The most common vectors/carriers are:
- in Africa: *Anopheles species*
- in the Americas: *Culex quinquefasciatus*
- in the Pacific and in Asia: *Mansonia* and *Aedes species*.

Millions are Infected with filariasis

- One hundred and twenty million people in at least 80 nations of the world have lymphatic filariasis. One billion people are at risk of getting infected. Ninety percent of these infections are caused by *Wuchereria bancrofti*, and most of the remainder by *Brugia malayi*. For *W. bancrofti*, humans are the exclusive host, and even though certain strains of *B. malayi* can also infect some felines and monkeys.

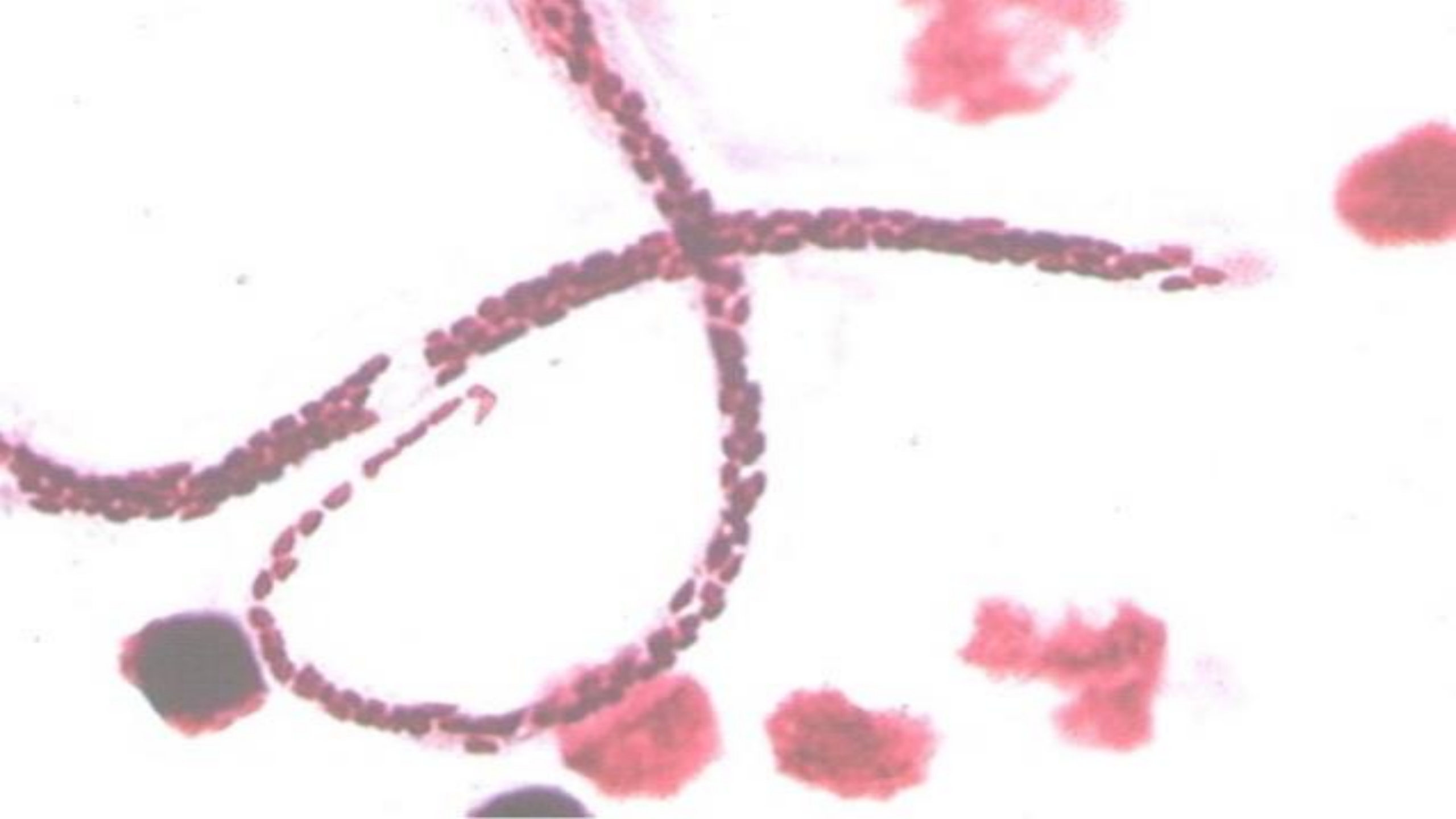
Wucheraria bancrofti

- Primary causative agent of lymphatic filariasis
- Overt bancroftian filariasis : 115 million cases worldwide (45.5 million India, 40 million sub-Saharan Africa)
- Widespread throughout the subtropics and tropics (for e.g. Central Africa, India, Thailand, Malaysia, Phillipines, Pacific Islands, Haiti, coastal Brazil)



Lymphatic Filariasis Endemic Countries and Territories



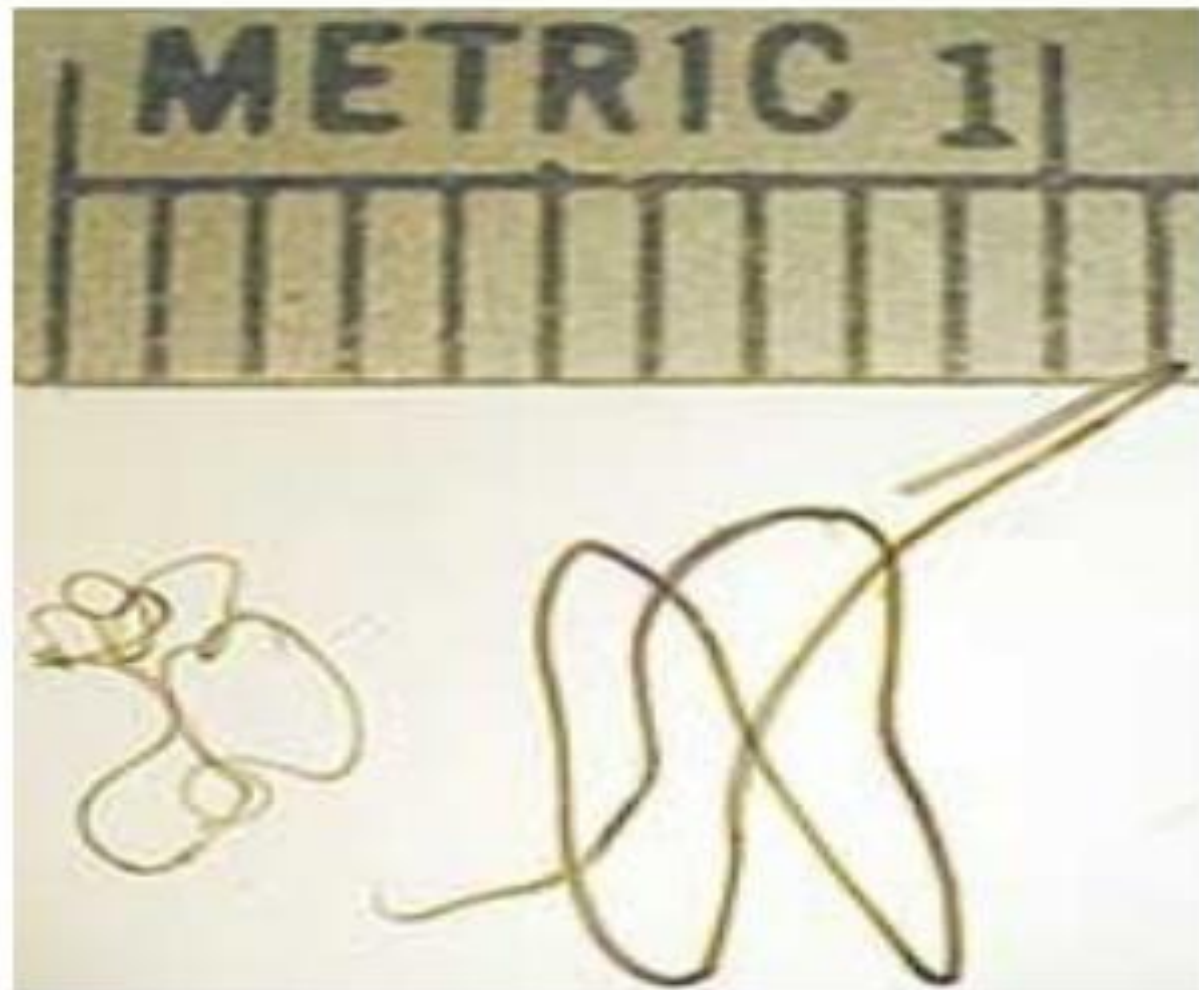




Microfilaria of *Mansonella ozzardi*.
Apparently, it died out of Campeche, Mexico.
Stain: methylene blue.

Characters of the Adult Parasites

- An Adult female *Wuchereria bancrofti* is about 80–100 mm long and 0.24–0.30 mm in diameter, whereas a male is about 40 mm long and 0.1 mm in diameter.



How the Larva Appear

- A microfilaria is about 240–300 μm (micrometers) long and 7.5–10 μm thick. It is sheathed and has nocturnal periodicity, except the South Pacific microfilaria which does not have marked periodicity. It has a gently curved body, and a tail that is tapered to a point.

How the Larva Appear

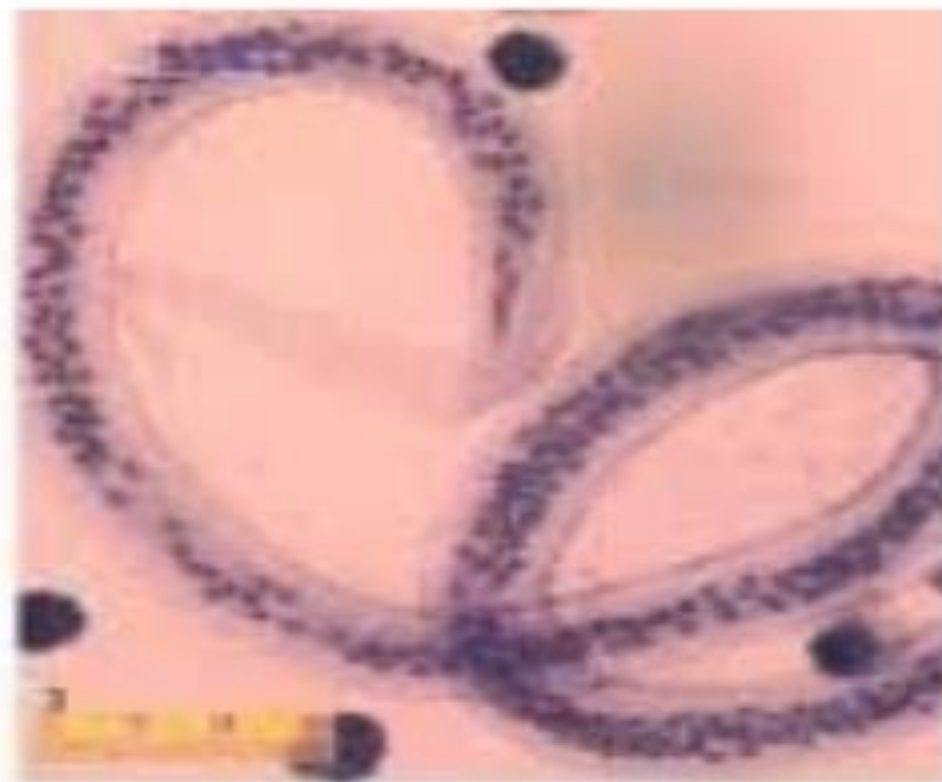
- The nuclear column (the cells that constitute its body) is loosely packed. The cells can be seen individually under a microscope and do not extend to the tip of the tail.



Filarial Larvae



Larvae of *Brugia malayi*



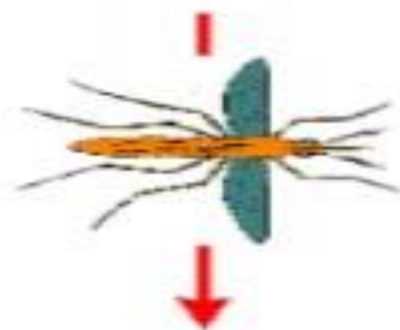
Larvae of *Wuchereria bancrofti*

THE LIFE CYCLES OF *WUCHERERIA BANCROFTI* AND *BRUGIA MALAYI* (LYMPHATIC FILARIASIS OR ELEPHANTIASIS)

The juveniles migrate to the lymph nodes, grow to sexual maturity.



The females produce microfilariae which end up in the blood stream.



The vector, a mosquito, ingests microfilariae when it takes a blood meal.



The microfilariae develop into infective juveniles in the mosquito.



The mosquito injects infective juveniles when it feeds.



Impact of Filariasis

- with the disease can suffer from lymphedema and elephantiasis and in men, swelling of the scrotum, called hydrocele. Lymphatic filariasis is a leading cause of permanent disability worldwide. Communities frequently shun and reject women and men disfigured by the disease. Affected people frequently are unable to work because of their disability, and this harms their families and their communities.

Life Cycle:

- Infective larvae are transmitted by infected biting mosquitoes during a blood meal. The larvae migrate to lymphatic vessels and lymph nodes, where they develop into microfilariae-producing adults.

Life Cycle:

- The adults dwell in lymphatic vessels and lymph nodes where they can live for several years. The female worms produce microfilariae which circulate in the blood

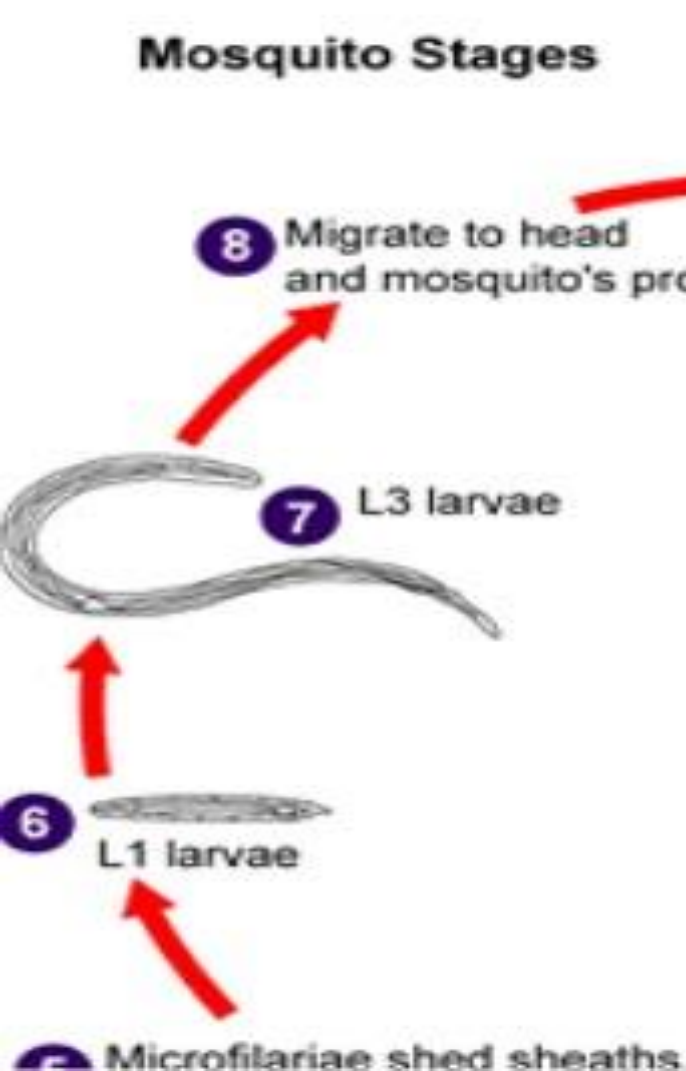
Microfilariae

- The microfilariae infect biting mosquitoes. Inside the mosquito, the microfilariae develop in 1 to 2 weeks into infective filariform (third-stage) larvae. During a subsequent blood meal by the mosquito, the larvae infect the human host. They migrate to the lymphatic vessels and lymph nodes of the human host, where they develop into adults.

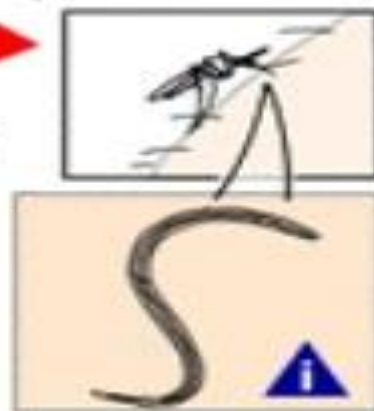
Life cycle of *Brugia* that also applies to *Wuchereria* by CDC

Brugia malayi

Mosquito Stages

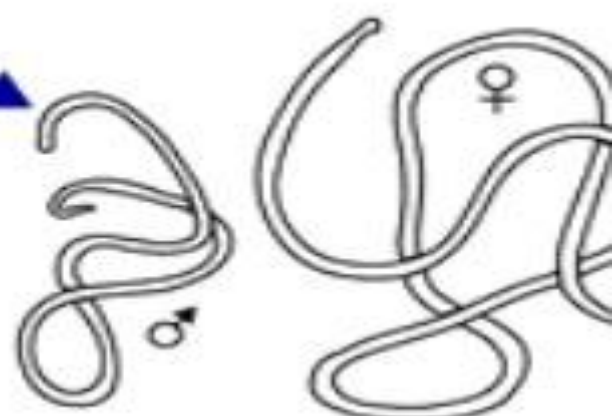


- 1 Mosquito takes a blood meal (L3 larvae enter skin)



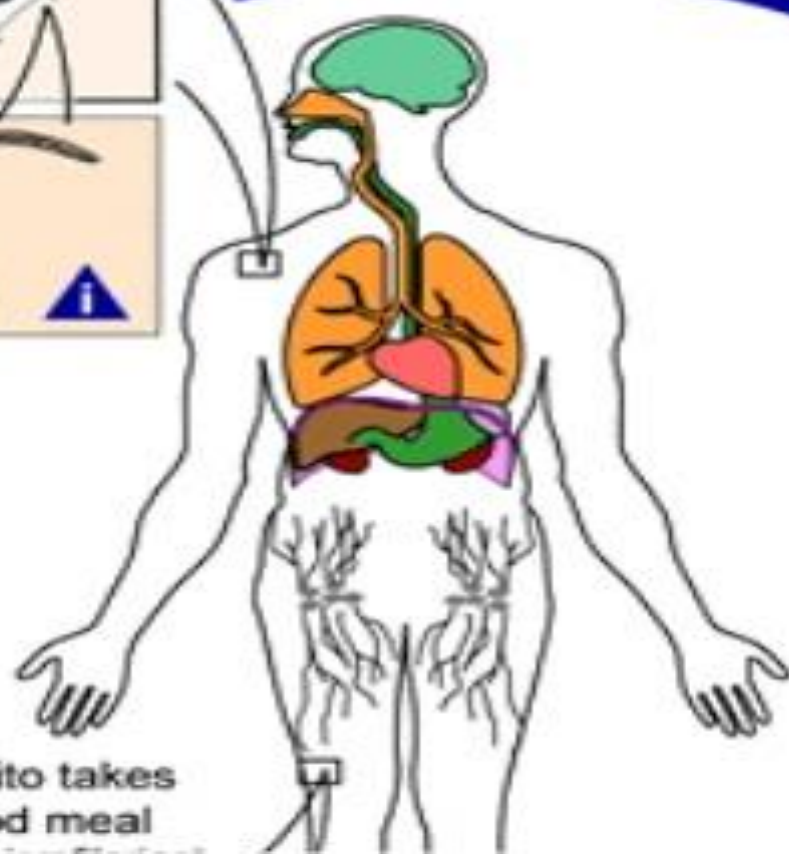
- 4 Mosquito takes a blood meal (Microfilariae enter mosquito)

Human Stages



- 2 Adults in lymphatics

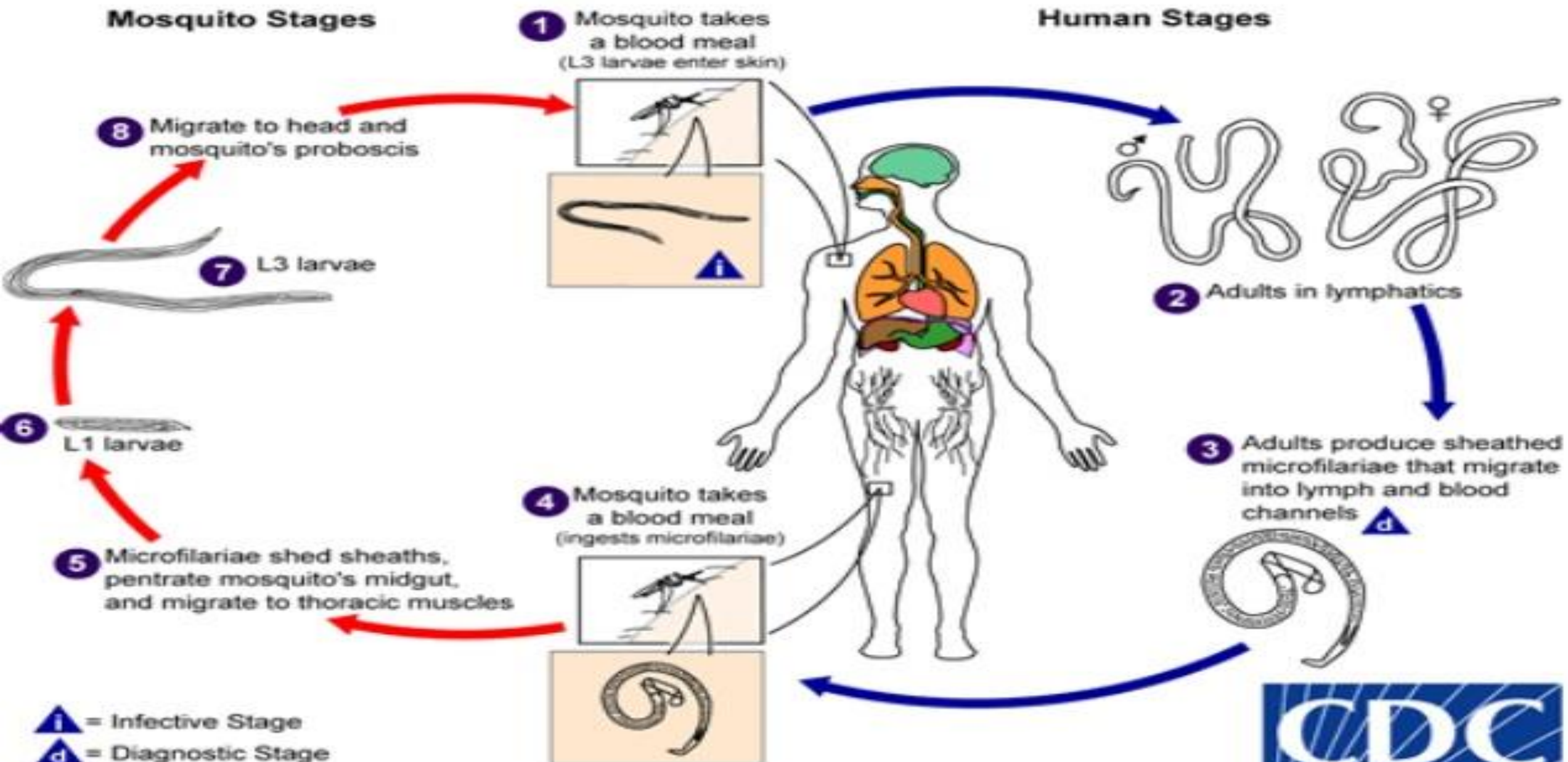
- 3 Adults produce sheathed microfilariae that reach the blood stream



Wuchereria bancrofti

Mosquito Stages

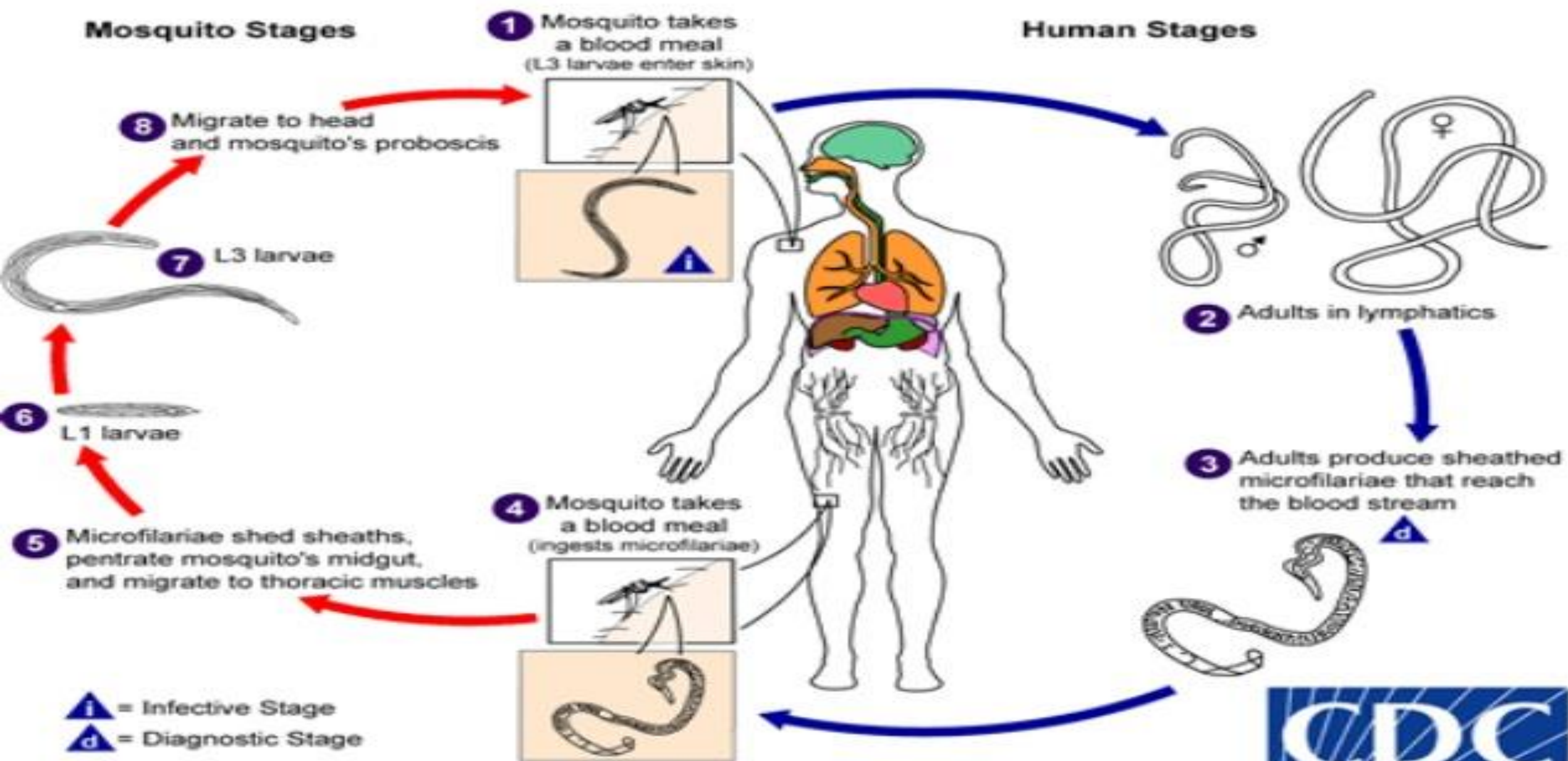
Human Stages



Brugia malayi

Mosquito Stages

Human Stages



Multiplication and Life Cycle

- Adult female worms produce microfilariae. Feeding vector mosquitoes ingest microfilariae from the bloodstream. In the mosquito the microfilariae mature to infective larvae, which migrate to the mosquito's mouth-parts, enter a new host via the vector's puncture wound, migrate to the lymphatics, mature, and mate.

Why Clinical Manifestations

- Disease manifestations are due to lymphatic dysfunction resulting from the presence of living and dead worms, lymph thrombi, inflammation, and immune reactions to worms and worm products.

Pathogenesis and Pathology

- Complex interplay of the pathogenic potential of the parasite, the immune response of the host, and external ('complicating') bacterial and fungal infections.
- Most recognizable – Genital damage (Hydroceles) and Lymphoedema/elephantiasis

Clinical features.

There are chronic, acute and asymptomatic presentations of lymphatic filarial disease, as well as some syndromes associated with these infections. Among chronic manifestations, *hydrele*, even though found only with *W. bancrofti* infections not in *Brugia* infections is the most common clinical manifestation of lymphatic filariasis.

Disease Manifestations

- Although the parasite damages the lymph system, most infected people have no symptoms and will never develop clinical symptoms. These people do not know they have lymphatic filariasis unless tested. A small percentage of persons will develop lymphedema.

Disease Manifestations

- This is caused by fluid collection because of improper functioning of the lymph system resulting in swelling. This mostly affects the legs, but can also occur in the arms, breasts, and genitalia. Most people develop these symptoms years after being infected.

What is elephantiasis characterized by?

- Thickening and hardening of the skin
- Correct.
- + B) Increased body size due to masses of worms all over the body, especially in the nose
- + C) Eosinophilia, heart failure and breathing difficulty

What causes elephantiasis?

- A) Decrease of blood flow due to worms inside blood vessels
- + B) Blockage of lymph fluid due to worms inside lymph vessels
- + C) Masses of microfilaria in skin tissue

Tropical pulmonary eosinophilia (TPE)

- Distinct syndrome in some individuals
- Paroxysmal cough and wheezing
- Weight loss, low grade fever, pronounced blood eosinophilia
- Total serum IgE and antifilarial Ab titres raised
- Responds well to treatment but in its absence progressive pulmonary damage

Symptoms

- Fever
- Kidney damage
- Skin abnormalities due to bacterial infection.
- Elephantiasis
 - Swelling of limbs and genitalia
 - Male: Enlargement of scrotum, penis retracted under skin, spermatic cords thickened
 - Female: Long tumorous mass covered by thickened ulcerated skin develops on the vulva



Social Impact of Disease



- Sexual Disability
- Communities frequently shun those disfigured.
- Inability to work
- Women with visible signs may never marry or spouses and families will reject them.

Clinical features.

There are chronic, acute and asymptomatic presentations of lymphatic filarial disease, as well as some syndromes associated with these infections. Among chronic manifestations, *hydrele*, even though found only with *W. bancrofti* infections not in *Brugia* infections is the most common clinical manifestation of lymphatic filariasis.



Pathogenesis

- Men can develop hydrocele or swelling of the scrotum due to infection with one of the parasites that causes LF specifically *W. bancrofti*.
- Filarial infection can also cause tropical pulmonary eosinophilia syndrome, although this syndrome is typically found in persons living with the disease in Asia. Symptoms of tropical pulmonary eosinophilia syndrome include cough, shortness of breath, and wheezing. The eosinophilia is often accompanied by high levels of IgE (Immunoglobulin E) and antifilarial antibodies.

- Histologically - dilatation and proliferation of lymphatic endothelium & abnormal lymphatic function
- 'non-inflammatory pathway'
- 'inflammatory pathway' - adenitis and retrograde lymphangitis
- bacterial and fungal superinfections

Clinical Features

- ***Chronic manifestations:*** Hydrocoele (most common), elephantiasis, Chyluria
- ***Acute manifestations:*** Acute inflammatory episodes 'DLA'(dermatolymphangioadenitis) , 'filarial fever' , tropical pulmonary eosinophilia, acute inflammatory reaction
- ***Asymptomatic Presentations***
- ***Other Syndromes:*** arthritis (typically monoarticular), endomyocardial fibrosis, tenosynovitis, thrombophlebitis, glomerulonephritis, lateral popliteal nerve palsy, and others.

While lymphedema can develop in the absence of overt inflammatory reactions and in the early stages be associated with microfilaremia, the development of elephantiasis (either of the limbs or the genitals) is most often associated with a history of recurrent inflammation. The early pitting edema gives rise to a stronger edema with the hardening of the tissues.

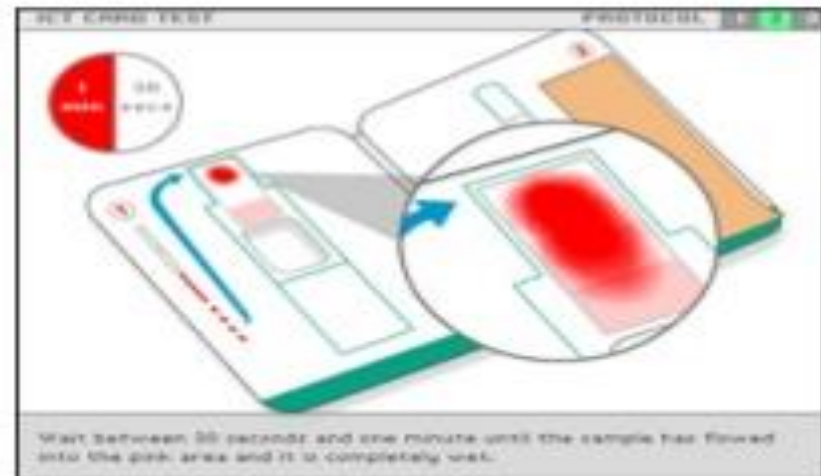


Diagnosis.

Until very recently, diagnosing lymphatic filariasis had been extremely difficult, since parasites had to be detected microscopically in the blood, and in most parts of the world, the parasites have a nocturnal periodicity that restricts their appearance in the blood to only the hours around midnight.

Diagnosis

- Until recently, very difficult to diagnose
 - Nocturnal periodicity: The worms can only be detected in the blood of those infected around the hour of midnight.
- New specific card test: Detects parasites using only finger prick blood tests any time of day.
- Ultrasound can identify rapidly moving adult worms.



Diagnosis

- Until recently, diagnosis depended on the direct demonstration of the parasite
- *Antigen detection*: Circulating filarial antigen (CFA) - 'gold standard' for diagnosing *Wuchereria bancrofti* infections.
- Clinical Diagnosis



Serology

- Serologic techniques provide an alternative to microscopic detection of microfilariae for the diagnosis of lymphatic filariasis. Patients with active filarial infection typically have elevated levels of ant filarial IgG4 in the blood and these can be detected using routine assays.

Treatment.

Communities where filariasis is endemic.

The primary goal of treating the affected community is to eliminate microfilariae from the blood of infected individuals so that transmission of the infection by the mosquito can be interrupted.

Management

- ***Treating the infection:*** DEC (6 mg/kg per day) for 12 days in bancroftian filariasis and for 6 days in brugian filariasis, repeated at 1-6 monthly intervals if necessary
- Ivermectin
- Albendazole
- Side effects : headaches, fever, myalgia, lymphadenopathy and occasionally rash, itching

Treatment and Management of Elephantiasis

- Prevention
 - Mosquito nets, insect repellents
- Voodoo healing techniques
- Elevate and exercise affected body part
- Skin treatment
 - Wash area twice daily
 - Antibacterial cream
- CDP (Complex decongestive physiotherapy)
 - Lymph drainage, massage, compressive bandages



Management and Treatment of Lymphatic Filariasis

- Currently Used:
 - Antifilarial drugs (DEC and ivermectin) are useful against larval offspring
- Testing:
 - Doxycycline
 - Tested on a Tanzanian village.
 - Found to almost completely eliminate adult worms 14 months after treatment.
 - Sustained loss of larval offspring for 8-14 months after treatment.
 - Albendazole and DEC
 - Given together once a year
 - Found to be 99% effective in removing microfilariae from blood for full year after treatment



Prevention

- By decreasing contact between humans and vectors or by decreasing the amount of infection the vector can acquire
- **Population:** through reducing the numbers of mosquito vectors
- 2-drug treatment regimens (selecting among albendazole and either ivermectin or diethylcarbamazine [DEC])

How to prevent the Filarial infection

- *Individuals:* personal repellents, bednets or insecticide-impregnated materials.
- Prophylactic regimen of DEC (6 mg/kg per day x 2 days each month)

How can I prevent infection?

- How can I prevent infection?
- Avoiding mosquito bites is the best form of prevention. The mosquitoes that carry the microscopic worms usually bite between the hours of dusk and dawn. If you live in or travel to an area with lymphatic filariasis:
 - Sleep under a mosquito net.
 - Wear long sleeves and trousers.
 - Use mosquito repellent on exposed skin between dusk and dawn.

Treating the individual.

- Both albendazole and DEC have been shown to be effective in killing the adult-stage filarial parasites. It is clear that this antiparasite treatment can result in improvement of patients' elephantiasis and hydrocele (especially in the early stages of disease)

WHO's Strategy to Eliminate Lymphatic Filariasis

- The strategy of the World Health Organization (WHO) of the Global Programme to Eliminate Lymphatic Filariasis has 2 aims: a) to stop the spread of infection (interrupt transmission), and secondly b) to alleviate the suffering of affected individuals.

Mass Treatments for Prevention

- To interrupt transmission, districts in which lymphatic filariasis is endemic must be identified, and then community-wide ("mass treatment") programs implemented to treat the entire at risk population. In most countries, the program will be based on once-yearly administration of single doses of 2 drugs given together: albendazole plus either diethylcarbamazine (DEC) or ivermectin, the latter in areas where either onchocerciasis, loiasis or another may also be endemic.

Community Treatments

- To alleviate the suffering caused by the disease, it will be necessary to implement community education programmes to raise awareness in affected patients. This would promote the benefits of intensive local hygiene and the possible improvement, both in the damage that has already occurred, and in preventing the debilitating and painful, acute episodes of inflammation.

International communities help for elimination of Disease

- The pledge in 1998 by GlaxoSmithKline to collaborate with the WHO in its elimination efforts included the donation of numerous resources, but especially albendazole free of charge, for as long as necessary. This donation, coupled with the recent decision by Merck to expand its wellknown Mectizan[®] (iverme

Economic and Social Impact.

- In recent years, lymphatic filariasis has steadily increased because of the expansion of slum areas and poverty, especially in Africa and the Indian subcontinent. More breeding sites are provided for vectors, some at urban-civic interfaces. As many filariasis patients are physically incapacitated, it is also a disease that prevents patients from having a normal working life.