Wuchereia bancrofti

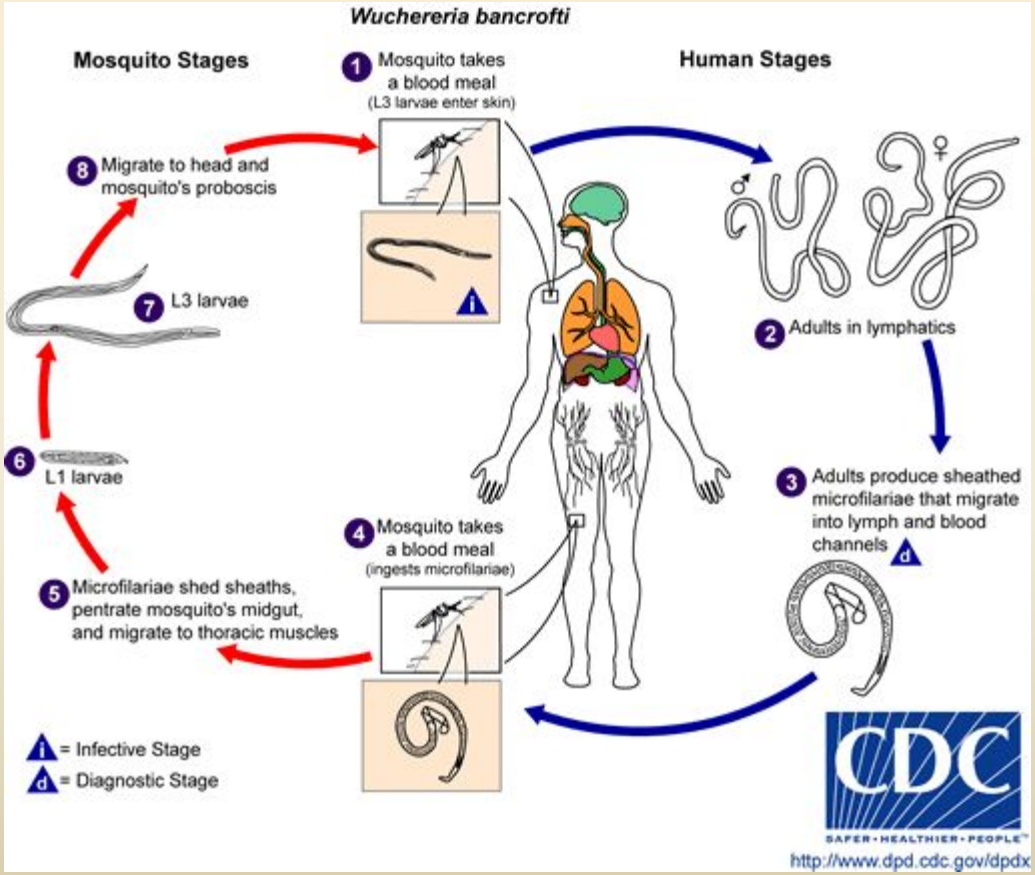
Brugia malayi

Epidemiology

Lymphatic filariasis (elephantiasis) is a parasitic disease caused by microscopic, thread-like worms. The adult worms only live in the human lymph system. Most of the infections worldwide are caused by *Wuchereria bancrofti*. The infection spreads from person to person by mosquito bites. The adult worm lives in the human lymph vessels, mates, and produces millions of microscopic worms, also known as microfilariae. Lymphatic filariasis affects over 120 million people in 80 countries throughout the tropics and sub-tropics of Asia, Africa, the Western Pacific, and parts of the .Caribbean and South America

Disease State

Although the parasite damages the lymph system, most infected people have no symptoms and will never develop clinical symptoms. A small percentage of persons will develop lymphedema. . 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. Men can develop **hydrocele** or swelling of the scrotum due to infection with one of the parasites that causes LF specifically *W. bancrofti*.


Wuchereria bancrofti
Mosquito Stages
Human Stages
1 Mosquito takes a blood meal
(L3 larvae enter skin)
2 Adults in lymphatics
3 Adults produce sheathed microfilariae that migrate into lymph and blood channels
4 Mosquito takes a blood meal
(ingests microfilariae)
5 Microfilariae shed sheaths, pentrate mosquito's midgut, and migrate to thoracic muscles
6 L1 larvae
7 L3 larvae
8 Migrate to head and mosquito's proboscis
i = Infective Stage
d = Diagnostic Stage
CDC
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Clinical Presentation

- Although the parasite damages the lymph system, most infected people have no symptoms and will never develop clinical symptoms.
- A small percentage of persons will develop lymphedema. This is caused by fluid collection because of improper functioning of the lymph system resulting in swelling.
- The swelling decreased and come across of the lymph system lead to hardening and thickening of the skin (elephantiasis).

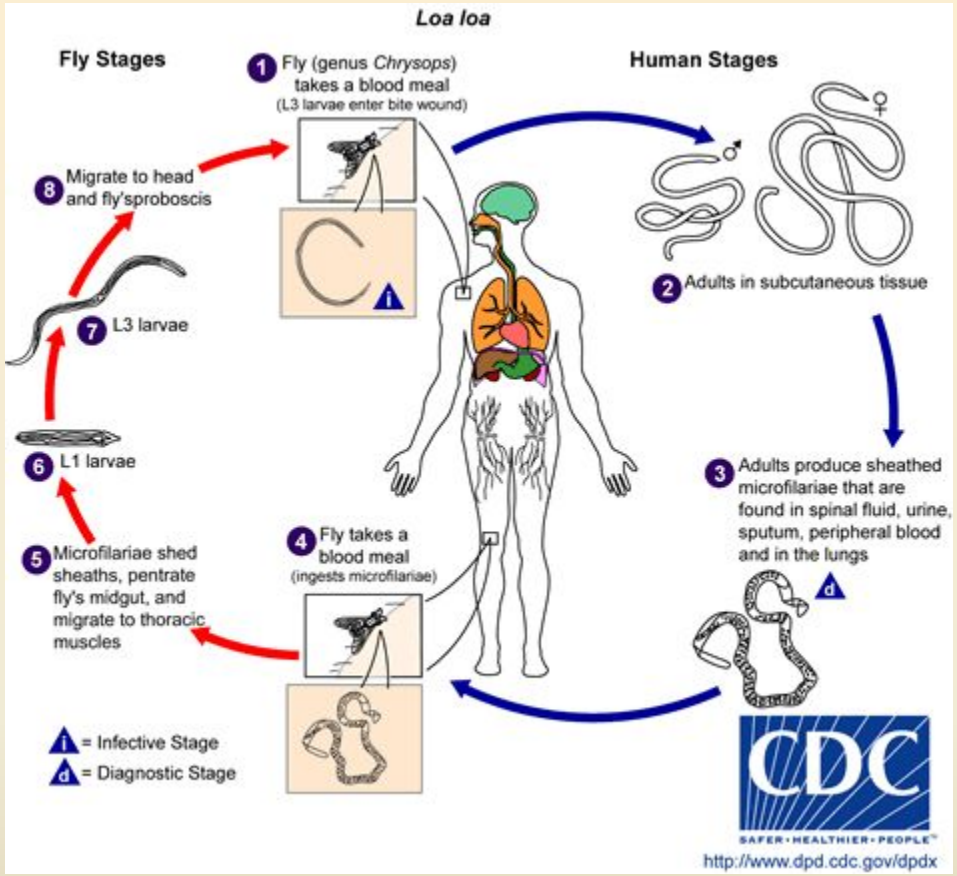
Diagnosis

- The standard method for diagnosing active infection is the identification of microfilariae in a blood smear by microscopic examination. Blood collection should be done at night to coincide with the appearance of the microfilariae, and a thick smear should be made and stained with Giemsa or hematoxylin and eosin.
- Serologic techniques provide an alternative to microscopic detection of microfilariae for the diagnosis of lymphatic filariasis.

- **Management**
- Both albendazole and Diethylcarbamazine DEC have been shown to be effective in killing the adult-stage filarial parasites, but ideal treatment regimens still need to be defined.
- Diethylcarbamazine (DEC) is the drug of choice in the United States. The drug kills the microfilaria and some of the adult worms

- ***Loa loa***
- Epidemiology: *Loa Loa* is contracted only in the rainforest and swamp forest areas of West Africa. 12 to 13 million people may be affected with *Loa Loa* filariasis at any given time.
- **Disease State:** Known as *Loa Loa* filariaisis, loiasis, African eyeworm, or tropical swelling, *Loa Loa* filariasis is caused by the nematode worm *Loa Loa*. The worm migrates through the subcutaneous tissue of humans and other primates, occasionally moving into the subconjunctiva. The worms can sometimes be seen through the skin and can usually be seen easily when they migrate to the eye.

- **Life cycle:**
- **-** Humans are the primary reservoir for *Loa Loa*.
- - *Loa Loa* is transmitted via the Deer Fly or Mango Fly (*Chysops* spp). The fly will bite a human and during the blood meal will transmit the third stage larvae into the wound.
- - The larvae will then mature and penetrate into the subcutaneous tissue.
- -The adults then produce microfilariae that migrate throughout the host and can be found even **in spinal fluid, urine, and sputum.**
- **-** Another fly will then have a blood meal from the host and acquire some of the microfilariae. These microfilariae will then unsheathe and mature to third stage larvae within the body of the fly. The fly will then have another blood meal on a soon-to-be host.


Loa loa
Fly Stages
Human Stages
1 Fly (genus Chrysops) takes a blood meal
(L3 larvae enter bite wound)
2 Adults in subcutaneous tissue
3 Adults produce sheathed microfilariae that are found in spinal fluid, urine, sputum, peripheral blood and in the lungs
4 Fly takes a blood meal
(ingests microfilariae)
5 Microfilariae shed sheaths, pentrate fly's midgut, and migrate to thoracic muscles
6 L1 larvae
7 L3 larvae
8 Migrate to head and fly'sproboscis
i = Infective Stage
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Clinical Presentation:

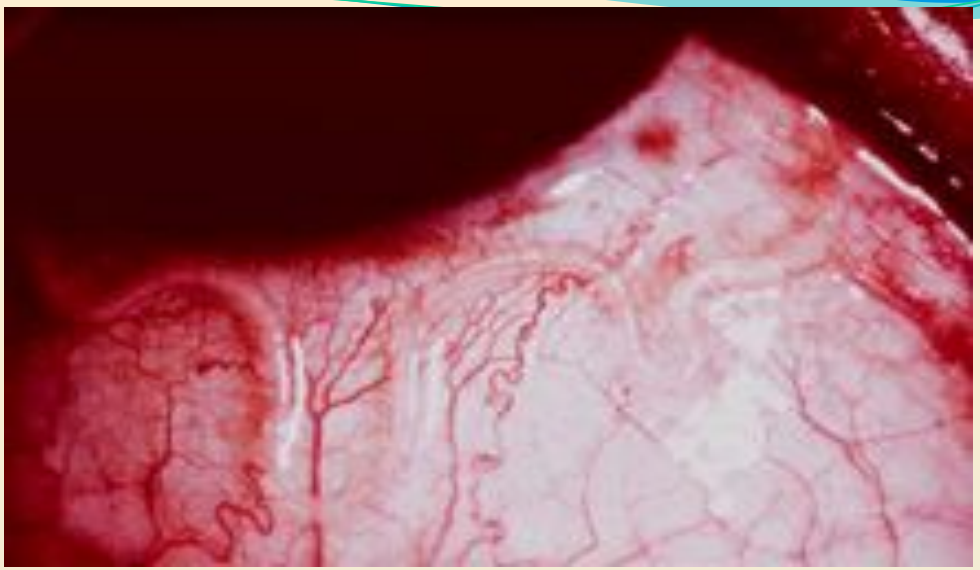
-*Loa Loa* filariasis is not usually painful, unless the worm is moving about the eye or the bridge of the nose. The patient's vision is normally not affected.

- Angioedema can occur and present on patient's skin as Calabar swellings. These Calabar swellings can cause utricaria and pruritus and usually last for 1 to 3 days.

- Lymphedema caused by lymphatic dysfunction can occur in some patients.

-Migration of the worms to the subconjunctiva may occur frequently, but it often does not take more than 15 minutes for the worm to migrate over the eye. .

- **Diagnosis:**
- **-** Blood samples are gathered from the suspected host and analyzed for the presence of microfilariae. If the presence of microfilariae is confirmed, the diagnosis is rather definitive. -- However, due to the waxing and waning concentrations of microfilariae within the host, an immunoassay may be necessary to detect host antigen. Detection of the *Loa Loa* worm moving about the eye is also cause for treatment of *Loa Loa*.
- **Management:** Diethylcarbamazine 6 mg/kg/d PO in 3 doses x 12d is the treatment of choice for *Loa Loa* infection. Albendazole 400 mg PO bid x 10d is an alternative, and is also used in more severe cases with a high microfilarial load in which rapid microfilarial death may lead to encephalopathy and other complications.



Crysops (Loa loa vector)

- ***Onchocerca volvulus***
- *Onchocerca volvulus* is a filarial worm that is transmitted to humans by blackflies (*Simulium*). Mature worms live in the subcutaneous tissues and produce microfilariae that migrate through the skin and connective tissues.
- **Clinical Manifestations**
- -Changes in skin pigmentation are often the first obvious signs of *Onchocerca* infection. Later stages of dermatitis present as atrophy and loss of skin elasticity.
- -Although lymph nodes may become involved in onchocerciasis, involvement is not as prominent as with the lymphatic filariae. The subcutaneous nodules that harbor adult *Onchocerca* are usually firm and non-tender. They vary in size and location but usually are easily recognized when they occur in geographic areas where the disease is endemic. However, in some geographic regions, nodules may be in deeper tissue, and thus not easily palpable.

- The most serious clinical manifestation of onchocerciasis is blindness, caused by microfilariae that wander into the eye. In endemic areas, corneal opacities resulting from the reaction to dying microfilariae often suggest onchocercal infection. Alternatively, active living microfilariae may be seen when the eye is examined with a slit lamp.

- **Life Cycle**
- The life cycle of *Onchocerca*. The microfilariae produced by adult female worms in subcutaneous nodules migrate into the skin and connective tissue; they do not generally enter the circulatory system. Microfilariae are ingested by vector blackflies, develop to the infective stage in the muscles of the flies, and then migrate to the mouth parts. When the infected flies feed on a new host, the larvae leave the mouth parts and enter the wound produced by the biting fly. Developing male and female worms congregate in subcutaneous tissue where they usually induce formation of a nodule.

Pathogenesis

Adult worms in the subcutaneous tissues cause varying degrees of inflammation and may induce subcutaneous nodules. Nodules appear 3 to 4 months after infection, but microfilariae are not generally detectable until I .year after infection

Adult worms may be surrounded by an inflammatory response that progresses to granuloma formation and fibrosis or calcification, depending .on the condition of the worm and age of the nodule

Microfilariae appear to move upward, and in chronic heavy infections may be seen in the eye. Ocular damage is thought to be due both to the trauma caused by living microfilariae and to a hypersensitivity reaction to dead ones. A major problem in the management of onchocerciasis patients is the acute inflammatory response to dying microfilariae in the eye during treatment. Antigen-antibody complexes probably play a role in the

.development of eye lesions resulting from microfilariae

- **Dracunculus Medinensis**
- *Dracunculus medinensis*, the guinea worm, is not a true filarial worm, but is often grouped with the filariae. It is one of the oldest known parasitic diseases of man. Some authors suggest that the ancient technique of removing the adult female worm, which may be more than 1 meter long, by winding it on a stick, may be the origin of the medical emblem, the caduceus.
- Dracunculiasis is still quite common in parts of Africa and Asia. Humans acquire the infection when they **swallow infected copepods** (genus *Cyclops*) in drinking water. Often, the first sign of infection is the formation of a blister when the adult female worm migrates to the subcutaneous tissue. On contact with water, the blister breaks and the worm ruptures and discharges larvae into the water. The larvae are ingested by *Cyclops*, in which they develop to the infective stage.
- The ultimate location of the adult worm determines the pathology, since lesions develop in response to the worms. Frequent sites of inflammation and abscess include knee and ankle joints, as well as the subcutaneous tissues of the extremities.