Wuchereria bancrofti
Lymphatic Filariasis
Elephantiasis

Lymphatic filariasis is a parasitic disease,The adult worms only live in the human lymph system. The lymph system maintains the body's fluid balance and fights infections.

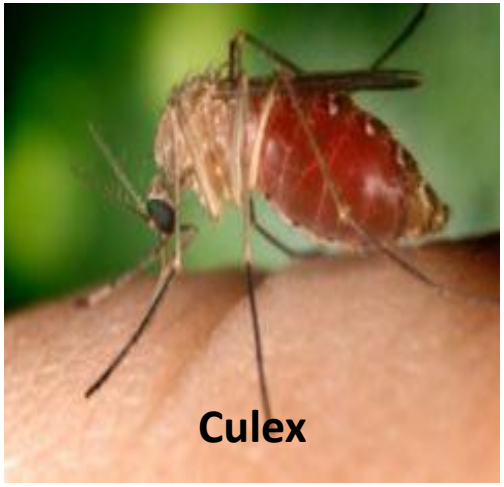
Lymphatic filariasis affects over 120 million people in 73 countries throughout the tropics and sub-tropics of Asia, Africa, the Western Pacific, and parts of the Caribbean and South America.

Wuchereria bancrofti

- Spread by several species of night - feeding mosquitoes

- Humans are the definitive host for the worms that cause lymphatic filariasis,There are no known reservoirs for *W.bancrofti*
- Intermidiate host , *W.bancrofti* is transmitted by Culex, Aedes, and Anopheles species


Anopheles


Culex

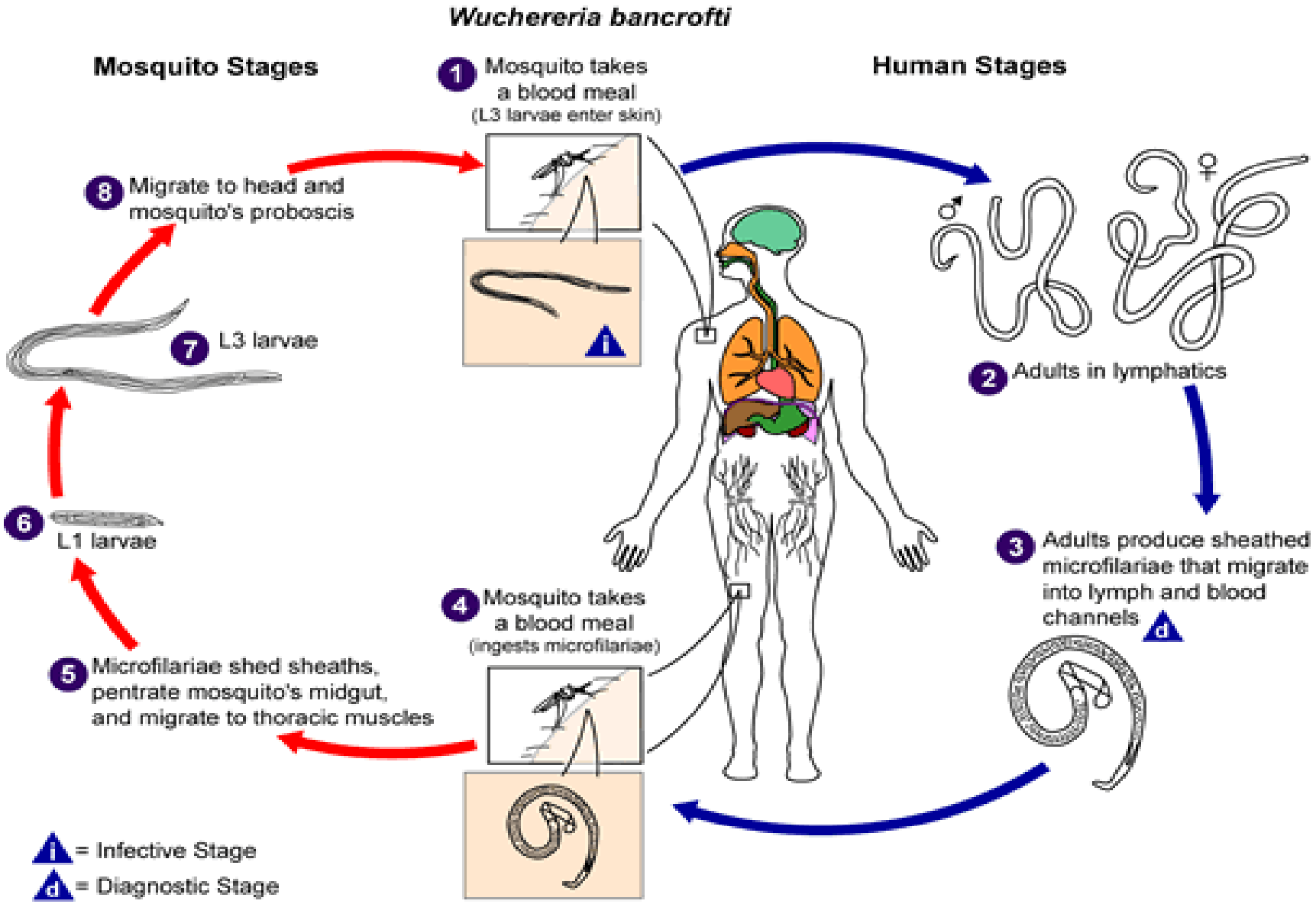

Aedes

Morphology

- *W.bancrofti* is a sexually dimorphic species.
- The adult male worm is long and slender, between four and five centimeters in length, a tenth of a centimeter in diameter, and has a curved tail.
- The female is six to ten centimeters long, and three times larger in diameter than the male.
- Microfilariae are sheathed, and approximately 245 to 300 µm in length.

Life Cycle

Different species of the following genera of mosquitoes are vectors of *W. bancrofti* filariasis depending on geographical distribution. Among them are: *Culex Anopheles and Aedes*. During a blood meal, an infected mosquito introduces third-stage filarial larvae onto the skin of the human host, where they penetrate into the bite wound . They develop in adults that commonly reside in the lymphatics . Adults produce microfilariae ,which are sheathed and migrate into lymph and blood channels moving actively through lymph and blood . A mosquito ingests the microfilariae during a blood meal . After ingestion, the microfilariae lose their sheaths and some of them work their way through the wall of the proventriculus and cardiac portion of the mosquito's midgut and reach the thoracic muscles . There the microfilariae develop into first-stage larvae and subsequently into third-stage infective larvae . The third-stage infective larvae migrate through the hemocoel to the mosquito's prosbocis and can infect another human when the mosquito takes a blood meal .


Wuchereria bancrofti
Mosquito Stages
Human Stages
1 Mosquito takes a blood meal
(L3 larvae enter skin)
i
2 Adults in lymphatics
♂
♀
3 Adults produce sheathed microfilariae that migrate into lymph and blood channels
d
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

Clinical Signs

The parasite damages the lymph system. A small percentage of persons will develop lymphedema. This is caused by improper functioning of the lymph system that results in fluid collection and swelling. This mostly affects the legs, but can also occur in the arms, breasts, and genitalia. Most people develop these clinical manifestations years after being infected.

The swelling and the decreased function of the lymph system make it difficult for the body to fight germs and infections. Affected persons will have more bacterial infections in the skin and lymph system. This causes hardening and thickening of the skin, which is called elephantiasis. Many of these bacterial infections can be prevented with appropriate skin hygiene.

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. This syndrome is typically found in infected persons in Asia. Clinical manifestations 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.

Diagnosis

The standard method for diagnosing active infection is the identification of microfilariae in a blood smear by microscopic examination. The microfilariae that cause lymphatic filariasis circulate in the blood at night. 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. For increased sensitivity, concentration techniques can be used.

Serologic techniques provide an alternative to microscopic detection of microfilariae for the diagnosis of lymphatic filariasis.

Treatment

Diethylcarbamazine (DEC) is the drug of choice in the United States. The drug kills the microfilaria and some of the adult worms. DEC has been used world-wide for more than 50 years. the physicians the choice between 1 or 12-day treatment of DEC (6 mg/kg/day). DEC is generally well tolerated. Side effects are in general limited and depend on the number of microfilariae in the blood. The most common side effects are dizziness, nausea, fever, headache, or pain in muscles or joints.
The drug ivermectin kills only the microfilariae, but not the adult worm; the adult worm is responsible for the pathology of lymphedema and hydrocele.
Some studies have shown adult worm killing with treatment with doxycycline (200mg/day for 4–6 weeks).

Loa loa

Loiasis is caused by the nematodes (roundworm) *Loa loa* that can inhabit the lymphatics and subcutaneous tissues of humans.

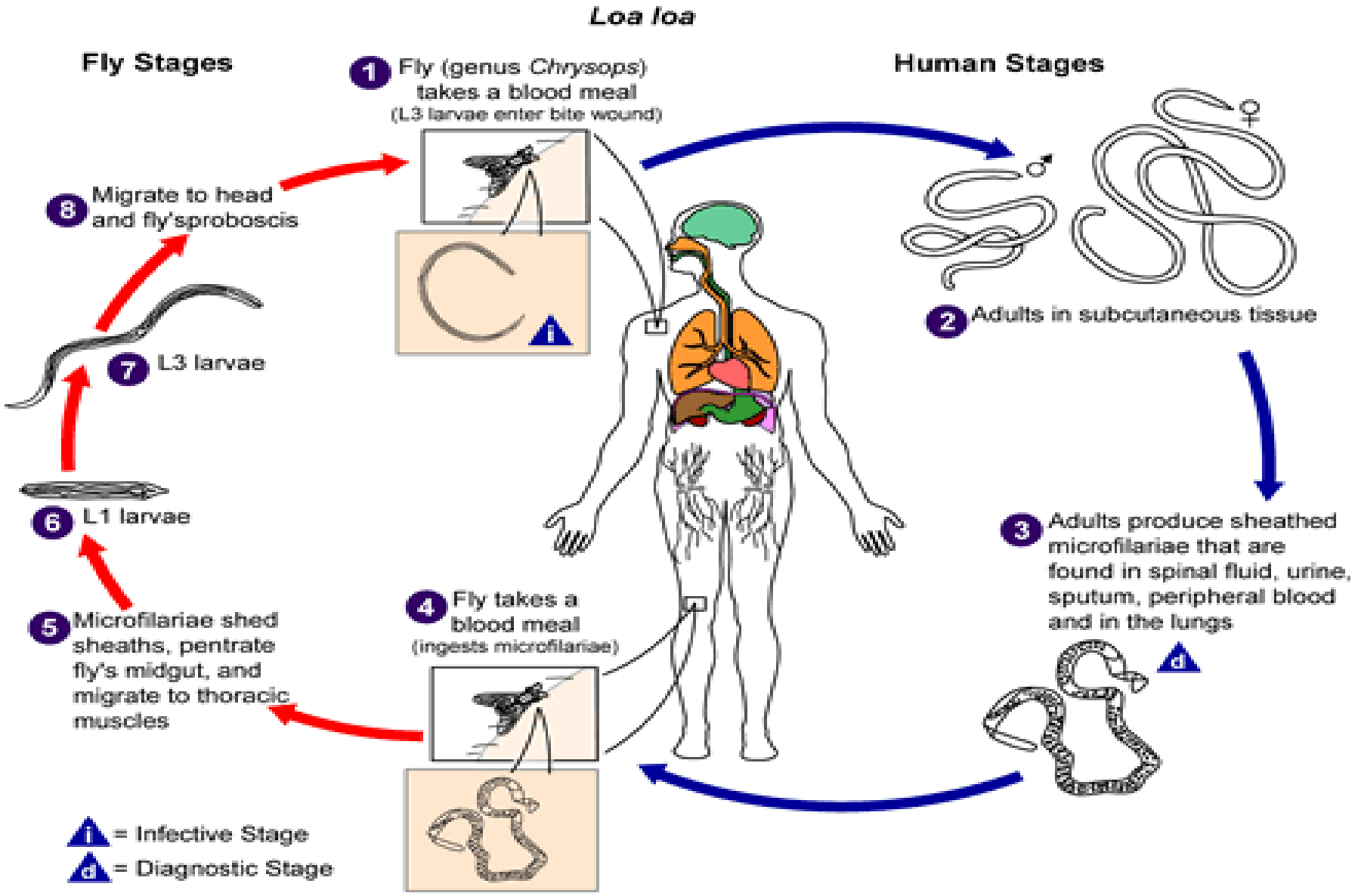
Geographical Distribution

Loa loa parasites are found in West and Central Africa. Ten countries have areas where there are high rates of infection (i.e., where more than 40% of the people who live in that area report that they have had eye worm in the past). An estimated 14.4 million people live in these areas of high rates of infection.

You get infected by being bitten by an infected deerfly of the genus*Chrysops*. Deerflies become infected when they eat blood from an infected person. Travelers are more likely to become infected if they are in areas where they are bitten by deerflies for many months.

Life Cycle

The vector for *Loa loa* filariasis are flies from two species of the genus *Chrysops*,During a blood meal, an infected fly (genus *Chrysops*, day-biting flies) introduces third-stage filarial larvae onto the skin of the human host, where they penetrate into the bite wound . The larvae develop into adults that commonly reside in subcutaneous tissue . The female worms measure 40 to 70 mm in length and 0.5 mm in diameter, while the males measure 30 to 34 mm in length and 0.35 to 0.43 mm in diameter. Adults produce microfilariae measuring 250 to 300 µm by 6 to 8 µm, which are sheathed and have diurnal periodicity. Microfilariae have been recovered from spinal fluids, urine, and sputum. During the day they are found in peripheral blood, but during the noncirculation phase, they are found in the lungs . The fly ingests microfilariae during a blood meal . After ingestion, the microfilariae lose their sheaths and migrate from the fly's midgut through the hemocoel to the thoracic muscles of the arthropod . There the microfilariae develop into first-stage larvae and subsequently into third-stage infective larvae . The third-stage infective larvae migrate to the fly's proboscis and can infect another human when the fly takes a blood meal.


Loa loa
Fly Stages
Human Stages
1 Fly (genus Chrysops) takes a blood meal
(L3 larvae enter bite wound)
i
2 Adults in subcutaneous tissue
3 Adults produce sheathed microfilariae that are found in spinal fluid, urine, sputum, peripheral blood and in the lungs
d
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
d = Diagnostic Stage

Clinical Signs

Most people with loiasis do not have any symptoms. People who get infected while visiting areas with loiasis . The most common manifestations of the disease are Calabar swellings and eye worm. Calabar swellings are localized, usually found on the arms and legs and near joints. Itching can occur around the area of swelling or can occur all over the body. Eye worm is the visible movement of the adult worm across the surface of the eye. Eye worm can cause eye congestion, itching, pain, and light sensitivity. Although eye worm can be scary, it lasts less than one week (often just hours) and usually causes very little damage to the eye. People with loiasis can have itching all over the body (even when they do not have Calabar swellings), hives, muscle pains, joint pains, and tiredness. Sometimes adult worms can be seen moving under the skin. Other rare manifestations include painful swellings of lymph glands, scrotal swellings, inflammation of parts of the lungs, fluid collections around the lung, and scarring of heart muscle.

Diagnosis

In people who have been bitten by the flies that carry *Loa loa* in areas where *Loa loa* is known to exist, the diagnosis can be made in the following ways:

Identification of the adult worm by a microbiologist or pathologist after its removal from under the skin or eye

Identification of an adult worm in the eye by a health care provider

Identification of the microfilariae on a blood smear made from blood taken from the patient between 10AM and 2PM

Identification of antibodies against *L. loa* on specialized blood test

Diagnosis of loiasis can be difficult, especially in light infections where there are very few microfilariae in the blood.

Treatment

Surgical removal of adult worms moving under the skin or across the eye can be done to relieve anxiety, loiasis is not cured by surgery alone. There are two medications that can be used to treat the infection and manage the symptoms.

The treatment of choice is diethylcarbamazine (DEC), which kills the microfilariae and adult worms. Albendazole is sometimes used in patients who are not cured with multiple DEC treatments. It is thought to kill adult worms. Certain people with heavy infections are at risk of brain inflammation when treated with DEC. This can cause coma or sometimes death. People with heavy infections need to be treated by experienced specialists.