

# PUBLIC HEALTH REFERENCE SHEET

## Filariasis, Loiasis, and Onchocerciasis



<b>Name</b>	Filariasis ( <i>Wuchereria bancrofti</i> , <i>Brugia malayi</i> , <i>Brugia timori</i> ) Loiasis ( <i>Loa loa</i> ) Onchocerciasis ( <i>Onchocerca volvulus</i> )
<b>Reservoir &amp; Transmission</b>	Filariasis: Human reservoir; transmission through mosquito bite Loiasis: Human reservoir; transmission through <i>Chrysops</i> deer fly bite Onchocerciasis: Human reservoir, transmission through <i>Simulium</i> female blackfly bite
<b>Incubation Period</b>	Filariasis: 3–6 months in <i>B. malayi</i> ; 6–12 months in <i>W. bancrofti</i> Loiasis: 4 months–several years Onchocerciasis: 6 months–1 year
<b>Common Symptoms</b>	Filariasis: recurrent fevers, lymphadenitis, retrograde lymphangitis, elephantiasis, or tropical pulmonary eosinophilia syndrome Loiasis: transient swelling and generalized pruritus, often with eosinophilia. May also result in eye worm causing eye congestion, itching, pain, and light sensitivity Onchocerciasis: Small nodules beneath the skin, severe pruritus, pigmentation changes, and corneal opacities potentially leading to blindness in severe infections
<b>Gold Standard Diagnostic Test</b>	Microscopic identification
<b>Risk Groups</b>	Universal susceptibility to infection is probable. Repeated infections may occur in endemic regions.
<b>Geographic Significance</b>	Tropical and subtropical areas of Asia, Africa, Western Pacific, parts of South America, and the Caribbean

### **Filariasis**

Filariasis, also called lymphatic filariasis (LF), is a parasitic disease caused by microscopic, thread-like worms. The adult worms only live in the human lymph system. There are three different filarial species that can cause filariasis in humans. Most of the infections worldwide are caused by *Wuchereria bancrofti*. In Asia, the disease can also be caused by *Brugia malayi* and *Brugia timori*.

### **What is the occurrence of filariasis?**

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. It has not been reported to occur from worms in the United States.

### **How is filariasis transmitted?**

The disease spreads from person-to-person by mosquito bites. A wide range of mosquitoes can transmit the parasite, depending on the geographic area. In Africa, the most common vector is *Anopheles*. In the Americas, *Culex quinquefasciatus* is most common. In the Pacific and in Asia, *Aedes* and *Mansonia* can transmit the infection. When a mosquito bites a person who has LF, microscopic worms, microfilariae, circulating in the person's blood enter and infect the mosquito. The microfilariae pass from the mosquito through the human skin and travel to the lymph vessels. In the lymph vessels, the larval worms grow into adult worms, which is a process that takes 6 months or more. An adult worm lives for about 5–7 years. The adult worm mates and releases millions of microfilariae into the blood. People with microfilariae in their blood can serve

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as a source of infection to others. LF occurs after repeated mosquito bites over several months to years.

### Who is at risk for filariasis?

People living for a long time in tropical or sub-tropical areas where the disease is common are at the greatest risk for infection. Short-term tourists have a very low risk.

### What are the signs and symptoms of filariasis?

Most infected people are asymptomatic and will never develop clinical symptoms, even though the parasite damages the lymph system. If present, systemic symptoms, such as headache or fever, are generally mild. Chronic manifestations of lymphedema and/or hydrocele will develop in approximately 30% of LF-infected persons. Lymphedema mostly affects the legs, but can also occur in the arms, breasts, and genitalia. Most people develop these symptoms years after infection has cleared.

### What are potential complications of filariasis?

Elephantiasis, a hardening and thickening of the skin, indicates an advanced stage of lymphedema from recurrent secondary bacterial infections in the skin and lymph system. In postpubertal males, adult *Wuchereria bancrofti* organisms may cause funiculitis, epididymitis, or orchitis.

Filarial hydrocele, swelling of the scrotum, is thought to be the consequence of lymphatic damage caused by adult worms.

Chyluria, which results from rupture of dilated lymphatics into the renal pelvis, can occur as a manifestation of bancroftian filariasis.

Tropical pulmonary eosinophilia syndrome includes symptoms of include cough, fever, marked eosinophilia, high serum immunoglobulin E concentrations, and positive antifilarial antibodies. These are typically reported in long-term residents, men 20–40 years old, from Asia.

### How is filariasis diagnosed?

Microscopic examination for identification of microfilariae is the standard method for diagnosing active infection. This is not always feasible because in most parts of the world microfilariae are nocturnally periodic, which means that they only circulate in the blood at night. For this reason, the blood collection has to be done at night to coincide with the appearance of the microfilariae. Serologic enzyme immunoassay tests, including antifilarial IgG1 and IgG4, provide an alternative to microscopic detection of microfilariae for the diagnosis of LF. Since lymphedema may develop many years after infection, lab tests are often negative with these patients.

Tissue specimens: allow visualization of adult worms or microfilariae.

Ultrasonography: allows visualization of adult worms.

### How is filariasis the treated?

Because LF is rare in the United States, Diethylcarbamazine citrate (DEC) is no longer approved by the Food and Drug Administration (FDA). Physicians can obtain the medication from CDC after confirmed positive lab results.

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The main goal of treatment of an infected person is to kill the adult worm. DEC, which is both microfilaricidal and active against the adult worm, is the drug of choice for LF. The late phase of chronic disease is not affected by chemotherapy. Ivermectin is effective against the microfilariae of *W. bancrofti* but has no effect on the adult parasite. The adult worm is responsible for the pathology of lymphedema and hydrocele. Some studies have shown doxycycline (200mg/day for 4–6 weeks) to treat adult worm.

### **How can filariasis be prevented?**

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 LF:

- Sleep under a mosquito net.
- Wear long sleeves and trousers.
- Use mosquito repellent on exposed skin between dusk and dawn.

### **Loiasis**

Loiasis, also called African eye worm, is an infection caused by the parasitic worm *Loa loa*.

### **What is the occurrence of loiasis?**

Deerflies in certain rain forests of West and Central Africa usually bite during the day and are more common during the rainy season.

### **How is loiasis transmitted?**

Deerflies, also known as mango flies or mangrove flies, of the genus *Chrysops* become infected when they bite an infected person. These deerflies bite during the day. If a deerfly eats infected blood from an infected human, the larvae (non-adult parasites) will infect cells in its abdomen. After 7–12 days, the larvae develop the ability to infect humans. Then, the larvae move to the mouth parts of the fly. When the deerfly breaks a human's skin to eat blood, the larvae enter the wound and begin moving through the person's body. It takes about 5 months for larvae to become adult worms inside the human body. Larvae can become adults only inside the human body. The adult worms live between layers of connective tissue (e.g., ligaments, tendons) under the skin and between the thin layers of tissue that cover muscles (fascia). Fertilized females can make thousands of microfilariae a day. The microfilaria moves into the lymph vessels of the human body, then into the lungs, where they spend most of their time. These microfilariae enter the blood, usually around midday. It takes 5 or more months for microfilariae to be found in the blood after someone is infected with *Loa loa*. The microfilariae can live up to 1 year in the human body. The microfilariae will die if not consumed in a blood meal by a deerfly. Adult worms may live up to 17 years in the human body and can continue to make new microfilariae for much of this time. Travelers are more likely to become infected with the parasite if they are in areas where they are bitten by deerflies for many months, though occasionally they get infected even if they are in the area for less than 30 days.

### **What are the signs and symptoms of loiasis?**

Most people do not develop any symptoms, and symptoms usually do not show up for many months after infection. People who get infected while visiting areas with loiasis but do not come from areas where loiasis is found (travelers) are more likely to have symptoms. The most common manifestations of the disease are Calabar swellings and eye worm. Calabar swellings are localized, non-tender swellings 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

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movement of the adult worm across the surface of the eye. Eye worm can cause eye congestion, itching, pain, and light sensitivity. Eye worm lasts less than 1 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. High numbers of blood cells called eosinophils are sometimes found on blood counts.

### How is loiasis diagnosed?

Loiasis is diagnosed with the identification of the adult worm in the eye, or microscopic identification of the adult worm after it is removed from under the skin or eye; identification of the microfilariae on a blood smear made from blood taken from the patient between 10AM and 2PM; or identification of antibodies against *L. loa* on specialized blood test, which is not widely available in the United States. A positive antibody blood test in someone with no symptoms means only that the person was infected sometime in their life. It does not mean that the person still has living parasites in their body.

### How is loiasis treated?

Consult an infectious disease or tropical medicine expert. Surgical removal of adult worms moving under the skin or across the eye can relieve anxiety but does not cure loiasis. Diethylcarbamazine (DEC) can be used to kill the microfilariae and adult worms. Albendazole is believed to kill adult worms and is sometimes used in patients who are not cured with multiple DEC treatments. Sometimes treatment with medications is not recommended.

### How can loiasis be prevented?

- Avoid areas with deerflies—muddy, shaded areas along rivers or around wood fires.
- Use insect repellants that contain DEET, treat clothes with permethrin, and wearing long pants and long-sleeved shirts during the day when deerflies bite.
- The flies do not typically enter homes, but may be attracted to homes that are well lit.
- Consult a tropical medicine expert to determine if DEC—300mg taken once a week—is available to reduce risk of infection.

### Onchocerciasis (River Blindness)

Onchocerciasis is a neglected tropical disease caused by the parasitic worm *Onchocerca volvulus*. It is also called River Blindness because the fly that transmits infection breeds in rapidly flowing streams and the infection can cause blindness.

### What is the occurrence of onchocerciasis?

*Onchocerca* infections are found in tropical climates. Onchocerciasis is locally transmitted in 31 countries in sub-Saharan Africa. The parasite is also found in limited areas in Yemen in the Middle East. Only a small, single transmission zone remains in South America, crossing the border between the Bolivarian Republic of Venezuela and Brazil.

### How is onchocerciasis transmitted?

Onchocerciasis is spread through repeated bites of infected blackflies of the genus *Simulium*.

### Who is at risk for onchocerciasis?

People most at risk are those who live or work near streams or rivers where there are *Simulium* blackflies, such as rural agricultural areas in sub-Saharan Africa. Many bites are needed before

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becoming infected; long-term travelers (more than 3 months) to at-risk areas include missionaries, Peace Corps volunteers, and field researchers.

### What are the sign and symptoms of onchocerciasis?

This disease can cause skin disease, including intense itching, rashes, or nodules under the skin, in addition to visual impairment or blindness.

### How is onchocerciasis diagnosed?

Onchocerciasis is diagnosed with the microscopic identification of microfilariae from blood, urine, or skin or the identification of the adult worm after it is removed from under the skin or eye.

### How is onchocerciasis treated?

Treatment is to prevent long-term skin damage and blindness. Ivermectin, given every 6 months for the lifespan of the adult worms (i.e., 10–15 years) or for as long as the infected person has evidence of skin or eye infection. Ivermectin kills the parasitic larvae and prevents them from causing damage, but it does not kill the adult worms. A promising treatment is using doxycycline that kills the adult worms by killing the Wolbachia bacteria on which the adult worms depend on to survive.

### How can onchocerciasis be prevented?

There are no vaccines or medications available to prevent becoming infected with *O. volvulus*. Personal protection measures against biting insects include using insecticides that contain N,N-Diethyl-meta-toluamide (DEET) on exposed skin, wearing long sleeve shirts and pants during the day when blackflies bite, and wearing permethrin treated clothing.

### What are some public health considerations?

- Specify the etiologic/causative agent.
- Document relevant travel and deployment history occurring within the incubation period.

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