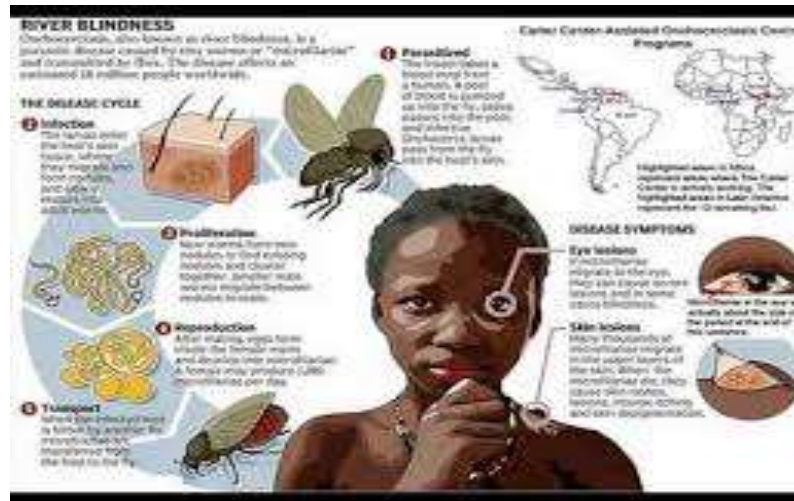


ONCHOCERCA VOLVULUS

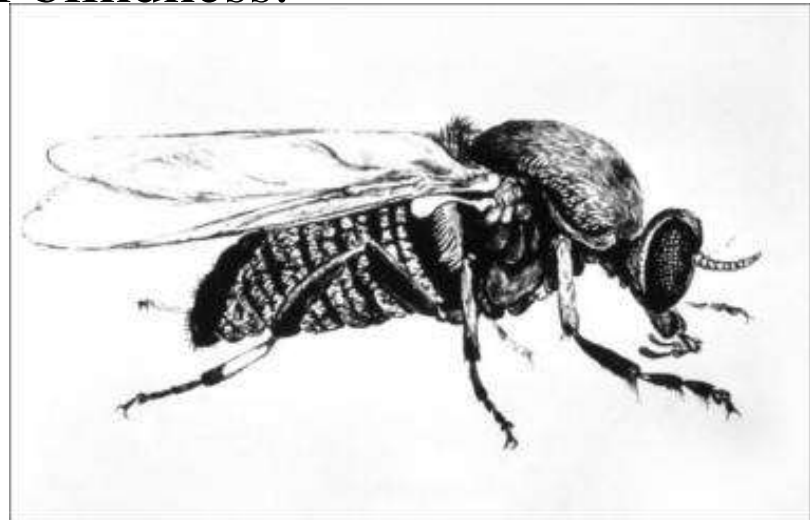


Presented by: Dr. Asma



INTRODUCTION

- *Onchocerca volvulus* is a nematode that causes onchocerciasis (river blindness), and is the second-leading cause of blindness worldwide after trachoma.
- It is one of the 20 neglected tropical diseases listed by the World Health Organization, with elimination from certain countries expected by 2020.
- Humans acquire onchocerciasis through the bite of *Simulium* blackflies. Because the fly develops and breeds in flowing water, onchocerciasis is commonly found along rivers and is sometimes referred to as river blindness.

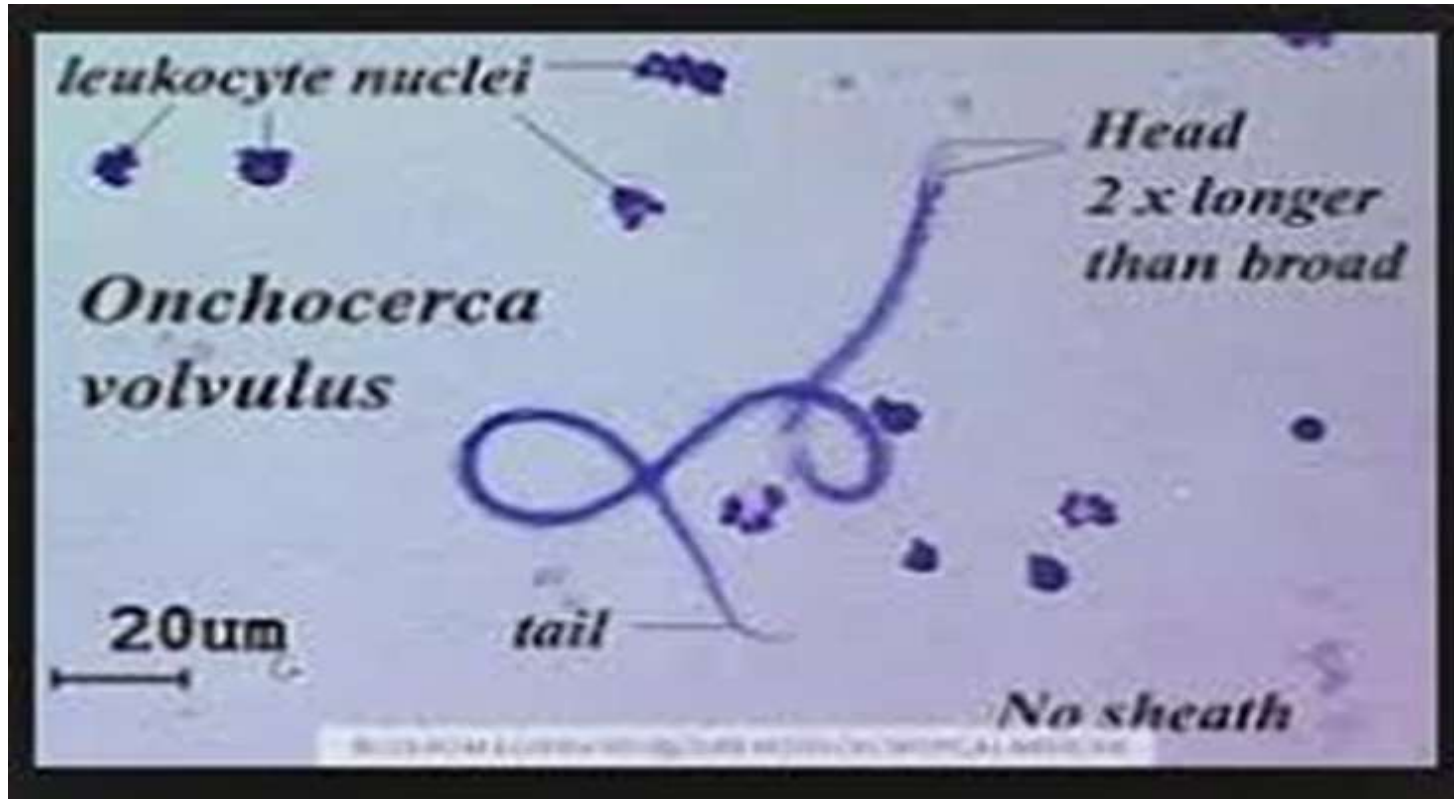


MORPHOLOGY

- It is a dioecious species, containing distinct males and females, which form nodules under the skin in humans. Mature female worms permanently reside in these fibrous nodules, while male worms are free to move around the subcutaneous tissue. The males are smaller than females, with male worms measuring 23 mm in length compared to 230–700 mm in female.
- The release of oocytes (eggs) in female worms does not depend upon the presence of a male worm, although they may attract male worms using unidentified pheromones.
- The first larval stage, microfilariae, are 300 μm in length and unsheathed, meaning when they mature into microfilariae, they exit from the envelope of the egg



MORPHOLOGY




LIFE CYCLE

The average adult worm lifespan is 15 years, and mature females can produce between 500 and 1,500 microfilariae per day. The normal microfilarial lifespan is 1.0 to 1.5 years.

1. Blackfly stages

- The microfilariae of *O. volvulus* are found in the dermis layer of skin in the host.
- When a female *Simulium* blackfly takes a blood meal from an infected host, the microfilariae are also ingested.
- Then it penetrates the gut and migrate to the thoracic flight muscles, where they enter the first juvenile phase, J1.
- After maturing into J2, they migrate to the proboscis, where they are found in the saliva.
- J2 stage juveniles then mature into infectious stage three juveniles, J3, in the saliva. The lifecycle in the blackfly takes between one and three weeks

2. Human stages

- When the female blackfly takes a blood meal, J3 juveniles pass into the human bloodstream.
 - From here, the juveniles migrate to the subcutaneous tissue, where they form nodules and mature into adult worms over a period of 6–12 months.
 - After maturation, the smaller adult males migrate from nodules to subcutaneous tissue, where they mate with the larger adult females.
 - The eggs mature internally to form stage-one microfilariae, which are released from the female's body one at a time and remain in the subcutaneous tissue.
 - The microfilariae are taken up by a female blackfly when she takes a blood meal, thus completing the life cycle of *O. volvulus*
- 

Blackfly (genus *Simulium*) takes a blood meal and L3 Larvae enter bite wound.

Infective Stage

HUMAN STAGE

Migrate to blackfly's head and proboscis

L3 Larvae

Human Subcutaneous tissue



Adults in subcutaneous nodules

L1 Larvae

Microfilariae penetrate blackfly's midgut and migrate to thoracic muscles

Blackfly (genus *Simulium*) takes a blood meal and ingests microfilariae.

Adults produce unsheathed microfilariae that typically are found in skin and lymphatics of connective tissues, but also occasionally in peripheral blood, urine and sputum.

Diagnostic Stage

BLACKFLY STAGE

RIVER BLINDNESS

Onchocerciasis, also known as river blindness, is a parasitic disease caused by tiny worms or "microfilariae" and transmitted by flies. The disease affects an estimated 18 million people worldwide.

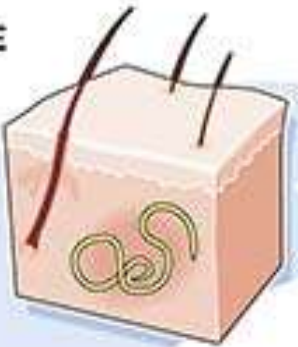
World distribution



THE DISEASE CYCLE

1 Infection

The larvae enter the host's skin tissue, where they migrate and form nodules, and slowly mature into adult worms



2 Black Fly

The infected insect takes a blood meal from a human. A pool of blood is pumped up into the fly, saliva passes into the pool, and infective *Onchocerca* larvae pass from the fly into the host's skin.



3 Proliferation

New worms form new nodules or find existing nodules and cluster together. Smaller male worms migrate between nodules to mate.



4 Reproduction

After mating, eggs form inside the female worm and develop into microfilariae. A female may produce 1,000 microfilariae per day.



5 Transport

When the infected host is bitten by another fly, microfilariae are transferred from the host to the fly.



DISEASE SYMPTOMS

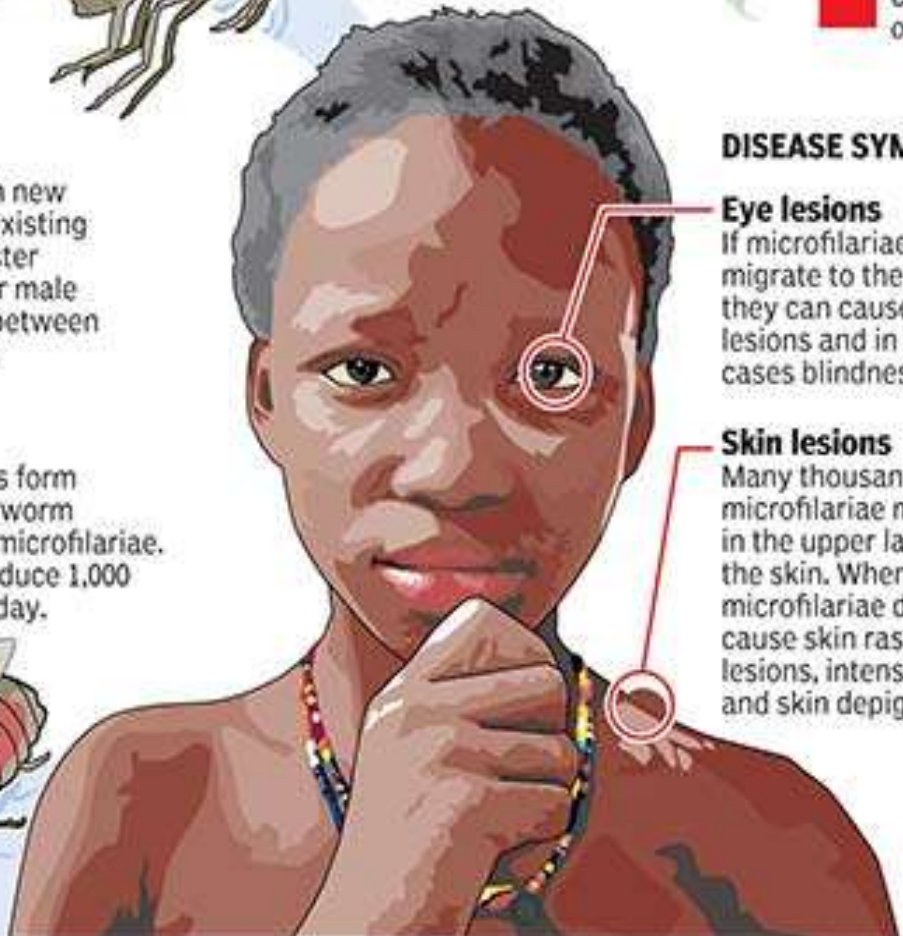
Eye lesions

If microfilariae migrate to the eye, they can cause severe lesions and in some cases blindness.



Skin lesions

Many thousands of microfilariae migrate in the upper layers of the skin. When the microfilariae die, they cause skin rashes, lesions, intense itching and skin depigmentation.



Sources: World Health Organization, Centers for Disease Control.

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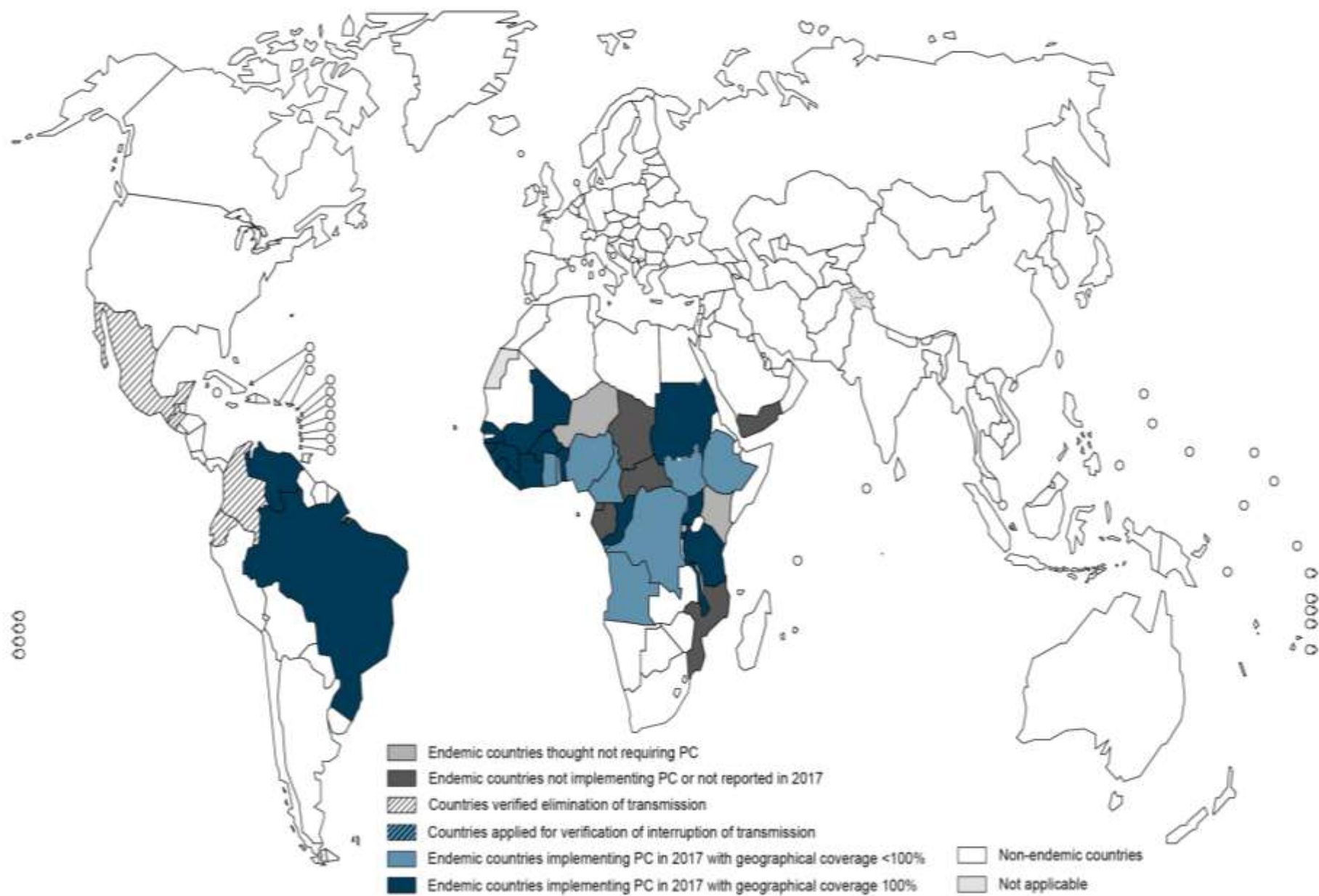
EPIDEMIOLOGY

An estimated 187 million people are at risk of *O. volvulus* infection, with 17–25 million people infected and 0.8 million showing some impairment of vision. *O. volvulus* has not directly caused a single death, but has cost 1.1 million disability adjusted life years, which measure the number of years of healthy life lost due to a specific disease and show the burden of a disease

About 99% of cases of onchocerciasis are found in 31 countries in sub-Saharan Africa, although areas of limited transmission occur in Brazil, Venezuela, and Yemen. The disease is thought to have been imported into Latin America through the slave trade.



Distribution of onchocerciasis



SIGNS AND SYMPTOMS

- Acute papular onchodermatitis – scattered pruritic papules
- Chronic papular onchodermatitis – larger papules, resulting in hyperpigmentation
- Lichenified onchodermatitis – hyperpigmented papules and plaques, with edema, lymphadenopathy, pruritus and common secondary bacterial infections
- Skin atrophy – loss of elasticity, the skin resembles tissue paper, 'lizard skin' appearance
- Depigmentation – 'leopard skin' appearance, usually on anterior lower leg
- Glaucoma effect – eyes malfunction, begin to see shadows or nothing



1-3 Ocular changes 4- Blindness 5-6 Skin bumps



TREATMENT

- The Onchocerciasis Control Programme in West Africa (OCP) achieved vector control by weekly aerial spraying of insecticides over fast-flowing rivers and streams – the breeding sites of the blackflies.



- Spraying continued for more than 14 years to break the life-cycle of the parasite, and was combined with treatment of eligible populations with ivermectin.



PREVENTION

The best prevention efforts include personal protection measures against biting insects. This includes wearing insect repellent such as N,N-Diethyl-meta-toluamide (DEET) on exposed skin, wearing long sleeves and long pants during the day when blackflies bite, and wearing permethrin- treated clothing.

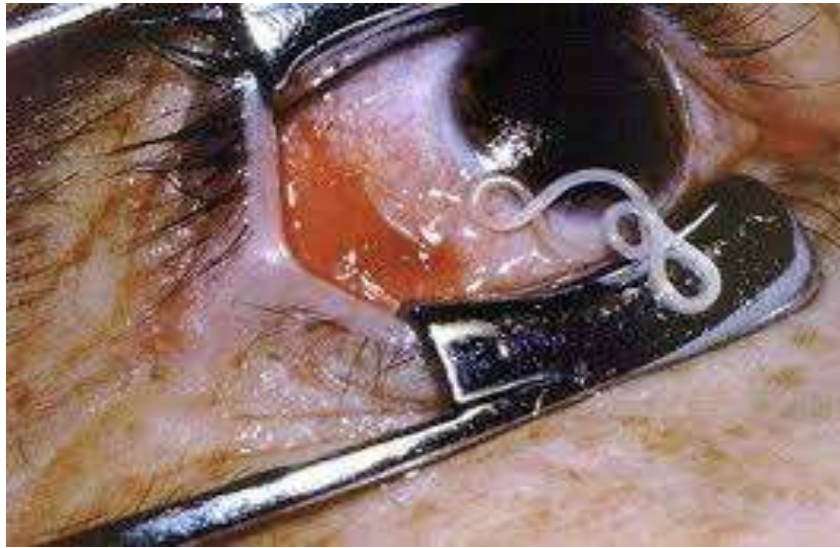
LABORATORY DIAGNOSIS

The gold standard test for the diagnosis of onchocerciasis remains the skin snip biopsy. The biopsy is performed using a sclerocorneal biopsy punch or by elevating a small cone of skin (3 mm in diameter) with a needle and shaving it off with a scalpel. If a patient has skin nodules caused by *Onchocerca* infection, Slit lamp eye exam can be used to visualize microfilariae, or the lesions they cause, in individuals with eye disease.






LOA LOA



Presented by: Dr. Asma



INTRODUCTION

- *Loa loa* is the filarial nematode (roundworm) species that causes *Loa loa* filariasis.
 - *Loa loa* actually means "worm worm", but is commonly known as the "eye worm", as it localizes to the conjunctiva of the eye.
 - *Loa loa* is commonly found in Africa.
 - *Loa loa* is one of three parasitic filarial nematodes that cause subcutaneous filariasis in humans.
 - The young larvae, or microfilariae, develop in horseflies of the genus *Chrysops* (deer flies, yellow flies), which infect humans by biting them. After bites from these infected flies, the microfilariae are unique in that they travel in the peripheral blood during the day and migrate into the lungs at night.
- 

MORPHOLOGY

- *L. loa* worms have a simple body consisting of a head that lacks lips, a body, and a blunt tail. The outer body of the worm is composed of a cuticle with **3 main layers** made up of collagen and other compounds which aid in protecting the nematodes while they are inside the digestive system of their host. Male adults range from **20 to 34 mm long** and **350 to 430 μm wide**. Female adults range from **20 to 70 mm long** and can be about **425 μm wide**. They vary in color.



LIFE CYCLE

The human is the definitive host, in which the parasitic worms attain sexual maturity, mate, and produce microfilariae. The flies serve as intermediate hosts in which the microfilariae undergo part of their morphological development, and then are borne to the next definitive host.

Two species of *Chrysops* deerflies, *C. silacea* and *C. dimidiata*, are the main vectors for this filariasis.

- A fly bearing third-stage filarial larvae in its proboscis infects the human host through the bite wound.
- After entering the human host, the larvae mature into adults, commonly in subcutaneous tissue.

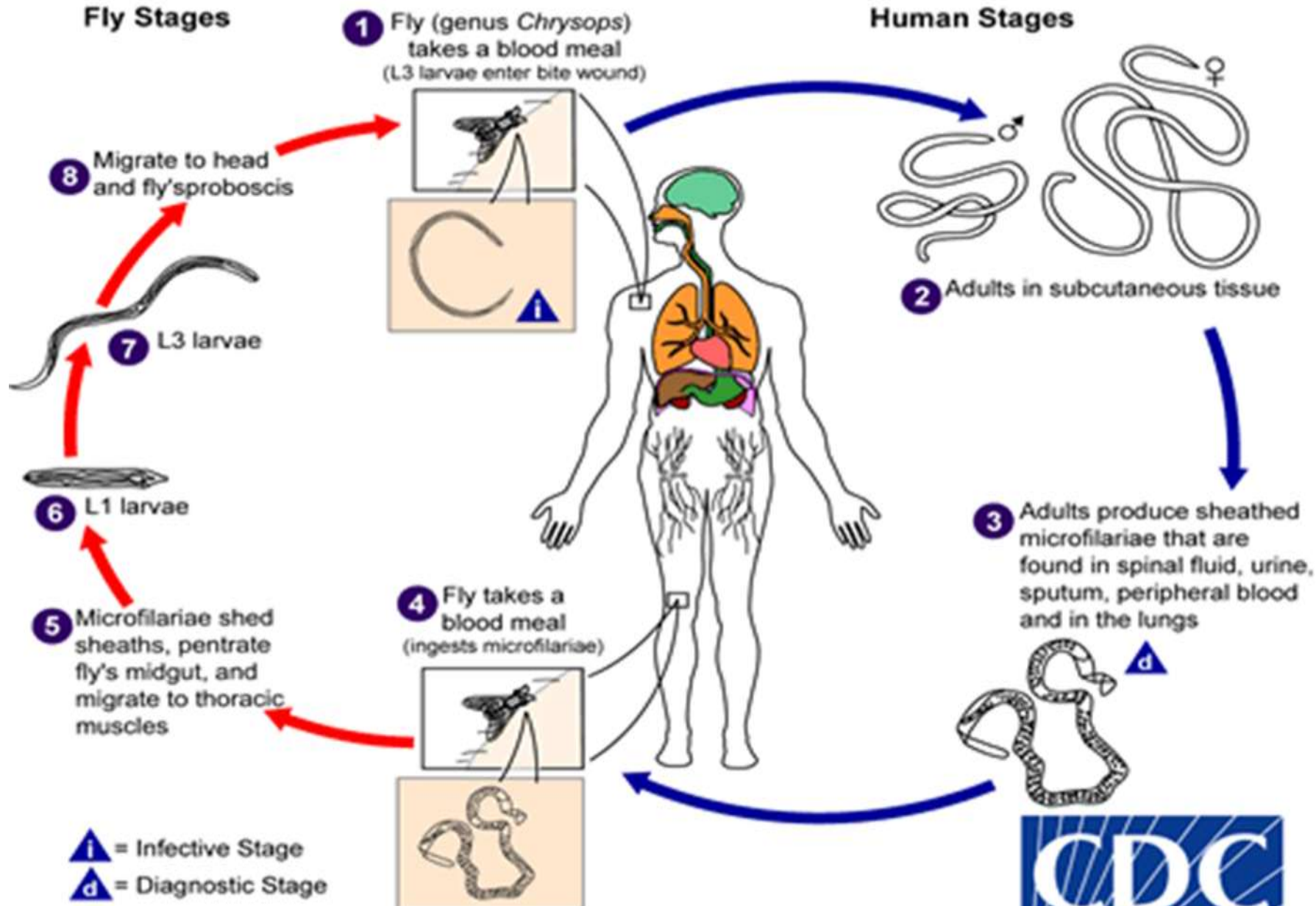
- The adult female produces large numbers of microfilariae, about 250 to 300 μm in length and 6-8 μm in width.
- Microfilariae tend to reside within spinal fluids, urine, and sputum; by day, they also circulate in the bloodstream.
- The vector fly ingests microfilariae while feeding on the host's blood.
- Once inside the vector, the microfilaria sheds its sheaths and escapes through the walls of the midgut into the fly's haemocoel.
- It then migrates through the haemolymph into the wing muscles in the fly's thorax.
- In the thoracic muscles, the microfilaria develops successively into a first-stage larva, second-stage larva, and finally into the infectious third-stage larva.
- The third-stage larva migrates to the fly's proboscis.
- Once the larva is established in the proboscis and the fly takes its next human blood meal, the cycle of infection continues.



Loa loa

Fly Stages

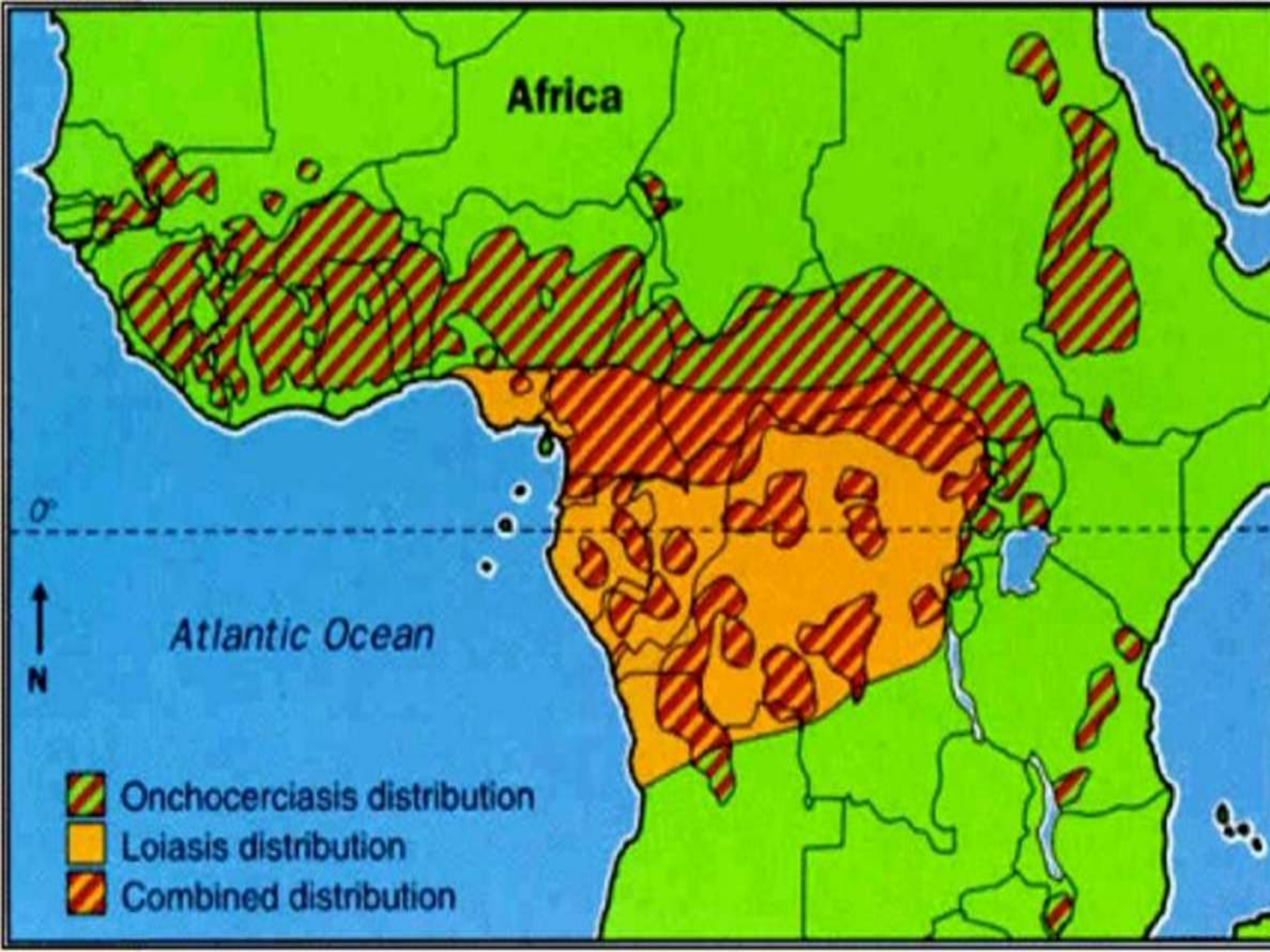
Human Stages



EPIDEMIOLOGY

Epidemiological studies have been emphasized in the western part of Africa. In this area, the disease is considered endemic. A study conducted by the Research Foundation in Tropical Diseases and Environment in 2002 had a sample of 1458 persons, spanning 16 different villages, and found *Loa loa* presence in these villages ranging from 2.22 to 19.23% of the population.





SIGNS AND SYMPTOMS

- The most visual sign of an adult worm infections is when the worm crosses the sclera of the eye, which causes significant pain to the host and is usually associated with inflammation and less likely, blindness.
- Eye worms typically cause little eye damage and last a few hours to a week.
- Other tissues in which this worm can be found includes: the penis, testes, nipples, bridge of the nose, kidneys, and heart.
- The worms in these locations are not always externally visible.



TREATMENT

Adult worms found in the eye can be surgically removed with forceps after being paralyzed with a topical anesthesia. The worm is not paralyzed completely, so if it is not extracted quickly, it can vanish upon attempting extraction.

Ivermectin has become the most common antiparasitic agent used worldwide, but can lead to residual microfilarial load when given in the management of loiasis.



PREVENTION

- Currently, no control programs or vaccines for loiasis are available. However, diethylcarbamazine treatment is suggested to reduce risk of infection.
- Avoiding areas where the vectors, deer and mango flies, are found also reduces risk. This includes swamps, bogs, and shaded areas near rivers or near wood fires.
- Fly bites can be reduced by using insect repellents such as DEET and wearing long sleeves and pants during the daytime.
- Permethrin treatment on clothes is an additional repellent that could be used. Also, using malaria nets can reduce the number of fly bites acquired.



LABORATORY DIAGNOSIS

Loa loa filariasis is diagnosed by examining a sample of blood under a microscope. While examining the blood sample, a medical professional will look for the larvae of the *Loa loa* worm in the blood. This disease can also be diagnosed by simply seeing the worm crawling across one or both of the eyes.





Thank
you

