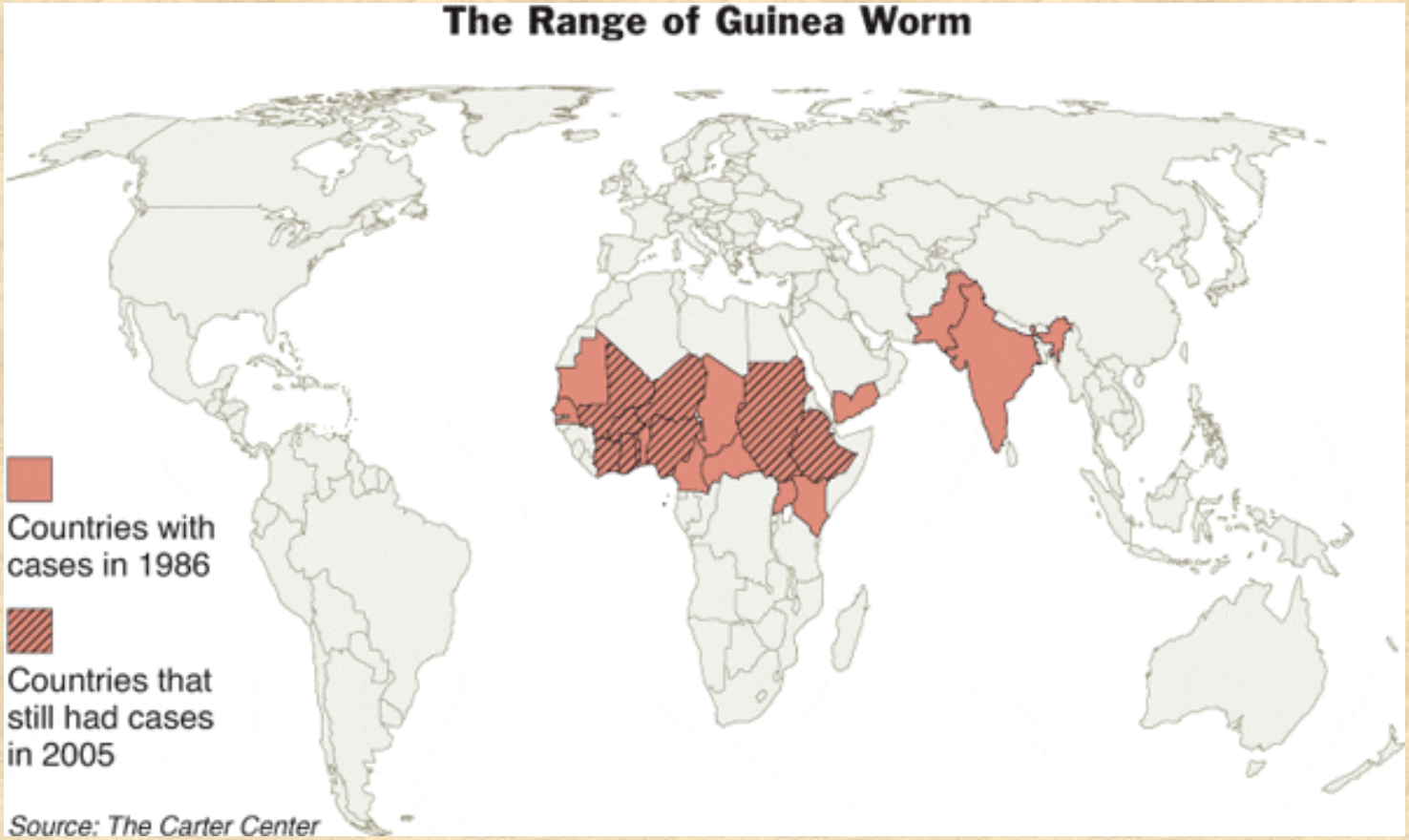
Lesson №22

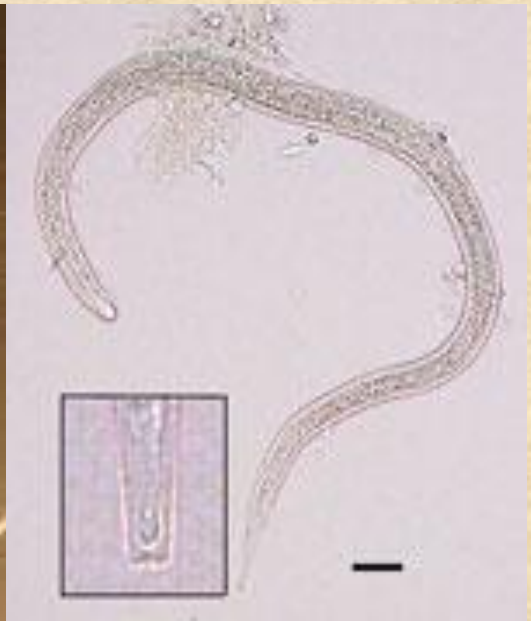
PHYLUM NEMATHELMINTHES, CLASS NEMATODA

Dracunculus medinensis (Guinea worm)

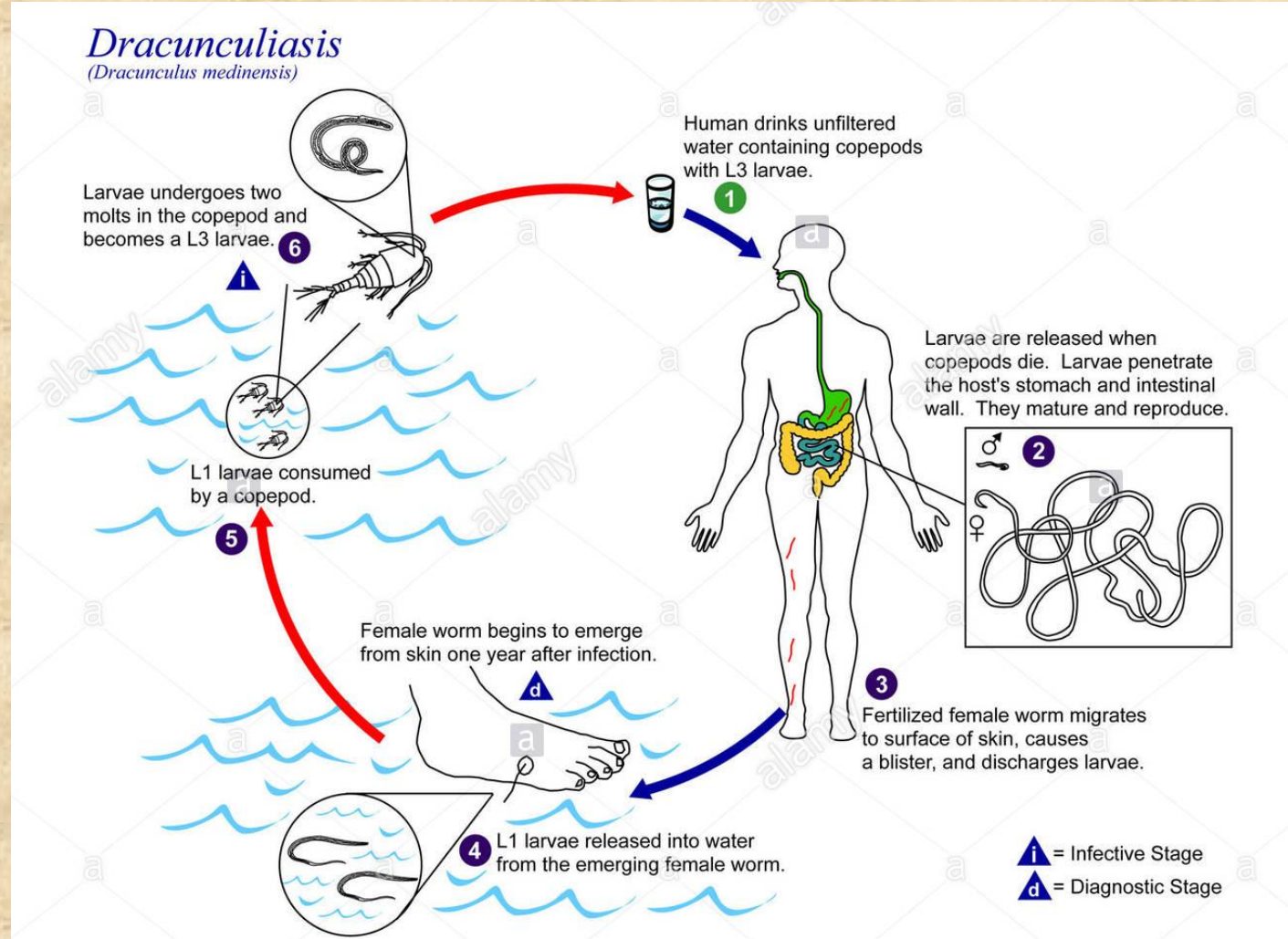
Dracunculus medinensis (Guinea worm) is a biohelminth, a pathogen of dracunculiasis. Foci of the disease are in Africa, the Near East, South- Western Asia and South America.



Morphological peculiarities: the length of a female is 30–150 cm, that a male is 12–29 cm. Guinea worm is viviparous. The reproductive system has no openings and larvae come out through ruptures of the uterus and cuticle on the anterior end of the body.

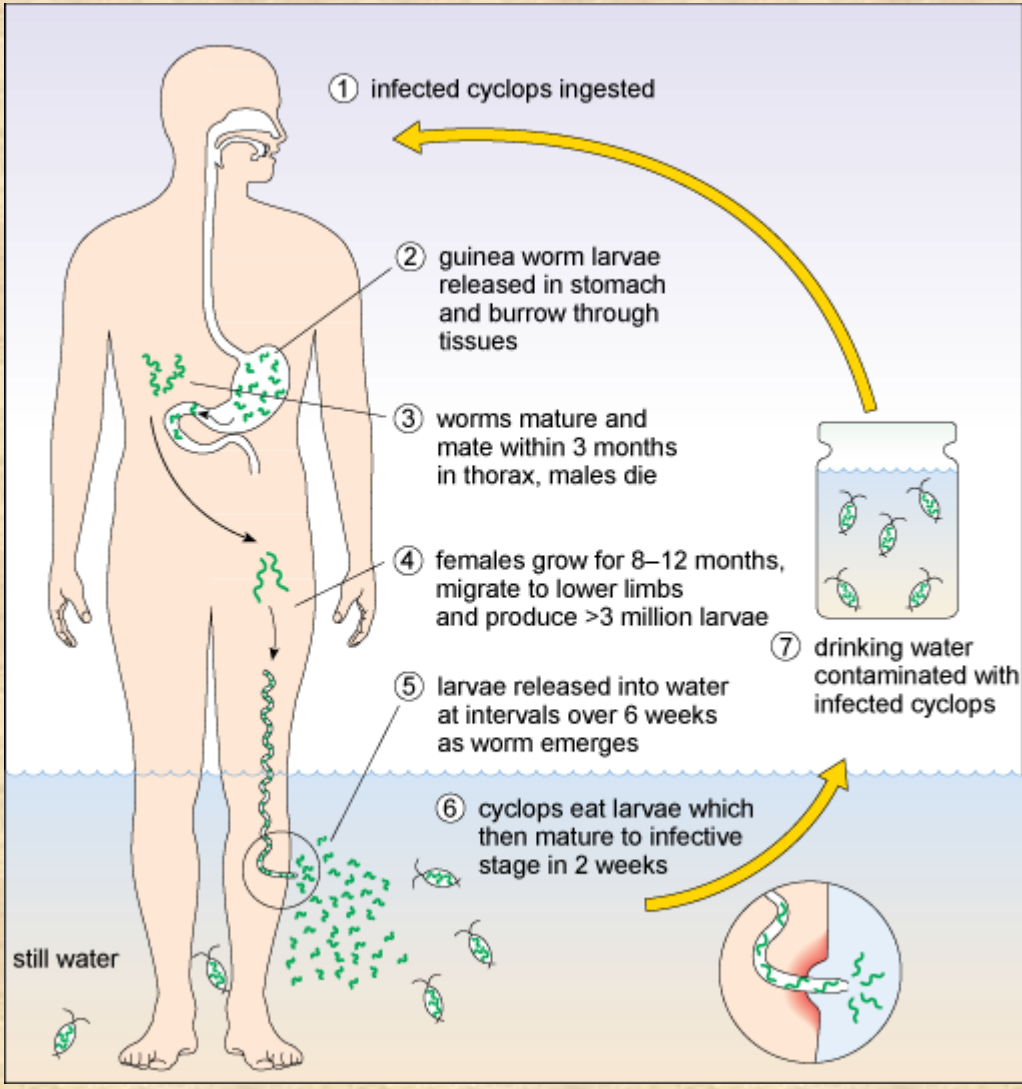


Life cycle. Principal host is human, sometimes dogs and monkeys. Intermediate hosts are small crawfishes (cyclops). A sexually mature female worm is located in subcutaneous adipose tissue of lower extremities. After fertilization larvae (microfilaria) develop in its body. The worm moves its anterior end closer to the skin surface and a vesicle (2–7 cm in diameter) filled with fluid forms there.



Then bursts and when water gets into the wound, a the parasite protrudes its anterior end and delivers up to 3 million larvae. After that it dies and is dissolved in tissues.

In the water larvae are swallowed by cyclops. The human gets infected while drinking water from reservoirs. In the intestine cyclops are digested, and microfilaria penetrate the intestinal wall. They get into the subcutaneous adipose tissue of lower extremities with blood and lymph. Sexual maturation occurs in 10–14 months after invasion.

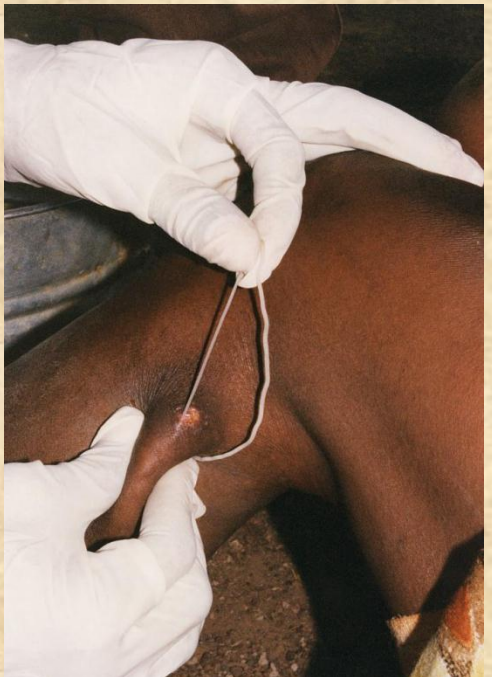


Pathogenic action:

1. *Mechanical* (intestinal walls, subcutaneous adipose tissue).

2. *Toxicoallergic (poisoning the organism by waste products and decay of dead parasites).*

Clinical manifestations: erythema, pains in the extremities, difficulty of movement, vesicles and ulcers at the site of helminth location. When vesicles burst – fever, diarrhea, urticaria and vomiting.



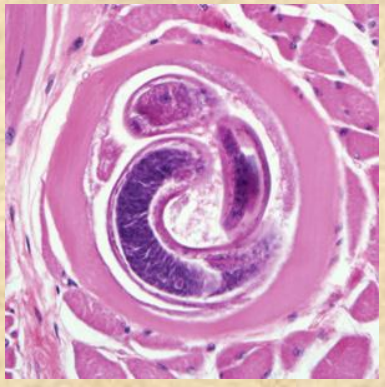
Laboratory diagnostics: is not required because the parasite is clearly seen as twisted subcutaneous band.

Personal prophylaxis boiling and filtration of water in foci of dracunculiasis. Measures of **social prophylaxis** are revealing and treating sick people, protection of water sources from contamination, health education.

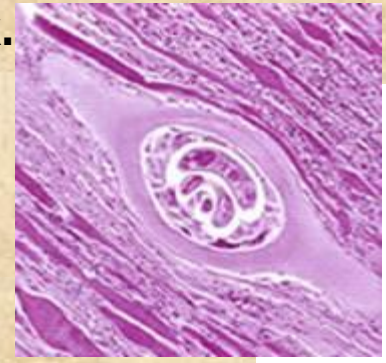
Trichinella spiralis

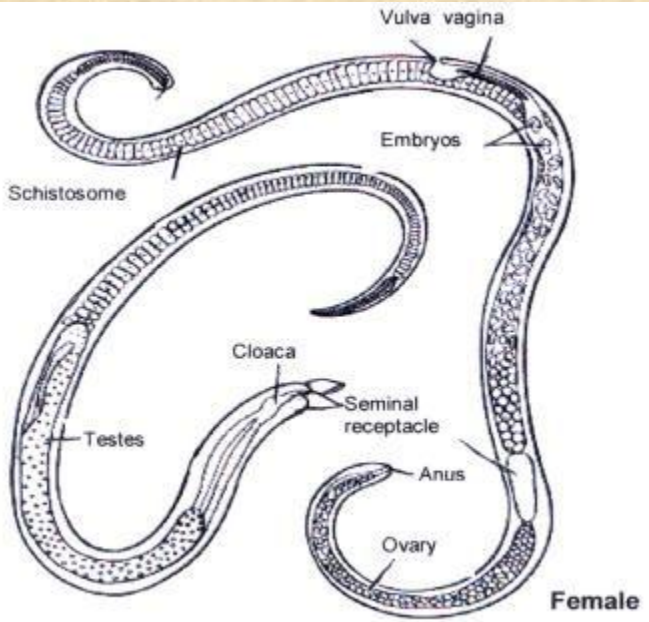
Trichinella spiralis is a biohelminth, a pathogen of trichinellosis.

Morphological peculiarities: females have sizes of 3–4 mm, males — 1.5–2.0 mm. Female reproductive tract is unpaired. Larvae are coiled like a spiral and encapsulated with connective tissue

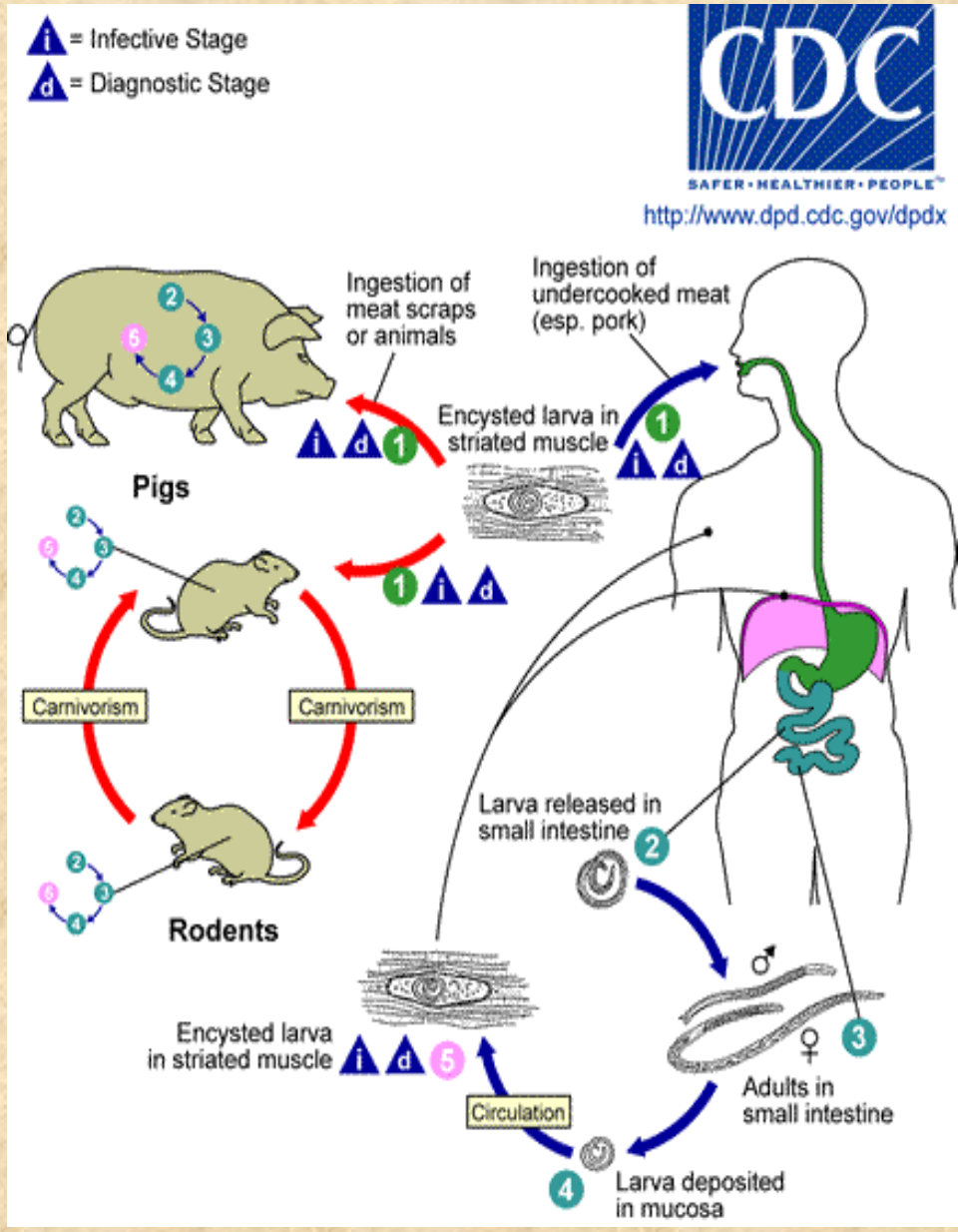


You must draw this picture in your drawing book.

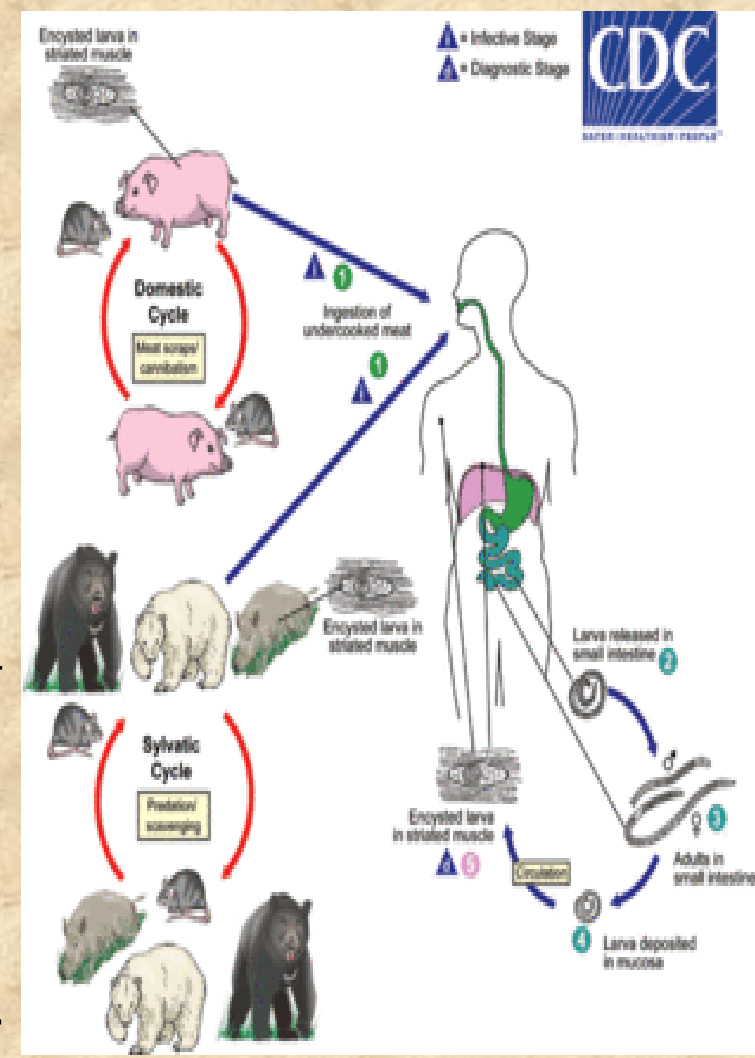




Life cycle. Trichinella parasitizes carnivorous and omnivorous animals (pigs, wild boars, cats, dogs, mice, rats, bears, etc.). One and the same organism is a principal host at first (sexually mature forms are in the intestine) and then an intermediate host (larvae are in muscles). Getting infected occurs while eating meat contaminated with larvae (pork, meat of wild boars, bears, etc.). In the small intestine capsules of larvae are digested, larvae transform in sexually mature worms.



After fertilization females implant into the mucous membrane of the small intestine and give birth to new larvae. The larvae are carried within the organism with blood flow of and lymph and settle in the skeletal muscles. The diaphragm, intercostal and mastication muscles are affected more frequently. Larvae get into muscles and coil into spirals. Each larva covers with a capsule which calcifies in a year. Larvae preserve their vitality in the capsule up to 20–25 years. To continue the life cycle and transform into sexually mature forms, larvae must get into the intestine of another host. The human is a biological end for the cycle.



Pathogenic action:

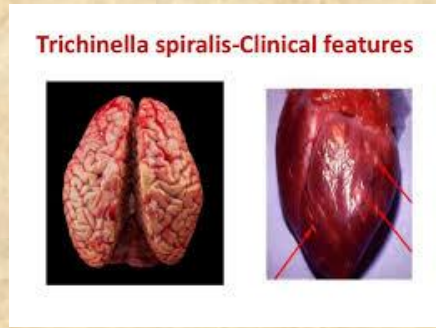
1. *Toxicoallergic* (poisoning of the organism by waste products of metabolism and decaying).

2. *Mechanical* (injury of intestinal walls and muscles).

3. Feeding at the expense of the host's organism and impairment of metabolic processes.

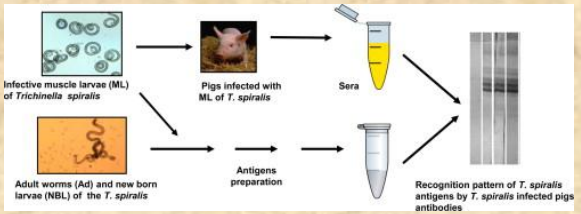
4. *Mutagenic*.

Clinical manifestations: ache in the abdomen, nausea, vomiting, diarrhea. Allergic rash and ache in muscles (ocular, masticatory muscles and muscles of calves, waist and shoulder girdle) appear, the temperature rises to 40–41 °C, edema of lids and face. Complications: myocarditis, pneumonia, meningoencephalitis, polyneuritis, thromboembolia, etc.



Diagnosis: clinical presentation of the disease (edema of the lids and the face, muscular pains), background (eating untested meat of pigs, wild boars). *Laboratory examinations*: clinical blood analysis (eosinophilia), imunoassay, microscopy of bioptates of gastrocnemius and deltoid muscles.

Personal prophylaxis: exclusion of untested meat from the diet (heat processing of meat does not kill larvae). **Social prophylaxis** consists in elimination of rodents (reservoirs of the patogen), veterinary checks of meat, zoohygienic keeping of pigs (not allowing them to eat rats), deratization and health education.



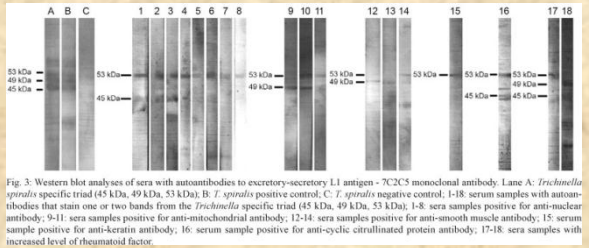


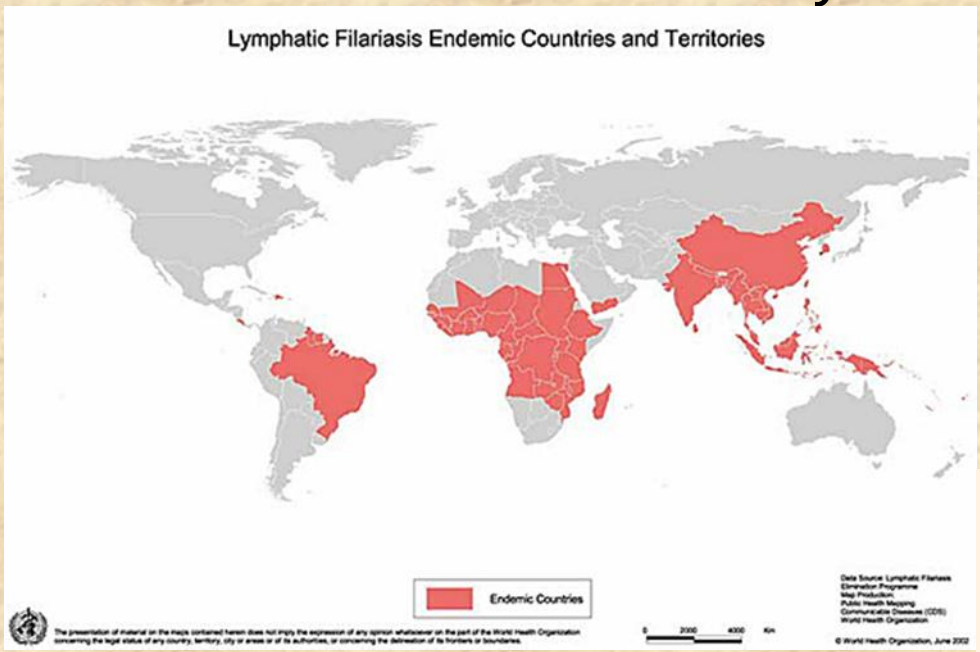
Fig. 3: Western blot analyses of sera with autoantibodies to excretory-secretory L1 antigen - 7C2C5 monoclonal antibody. Lane A: *Trichinella spiralis* specific triad (45 kDa, 49 kDa, 53 kDa); B: *T. spiralis* positive control; C: *T. spiralis* negative control; 1-18: serum samples with autoantibodies that stain one or two bands from the *Trichinella* specific triad (45 kDa, 49 kDa, 53 kDa); 1-8: sera samples positive for anti-nuclear antibody; 9-11: sera samples positive for anti-mitochondrial antibody; 12-14: sera samples positive for anti-smooth muscle antibody; 15: serum sample positive for anti-keratin antibody; 16: serum sample positive for anti-cyclic citrullinated protein antibody; 17-18: sera samples with increased level of rheumatoid factor.

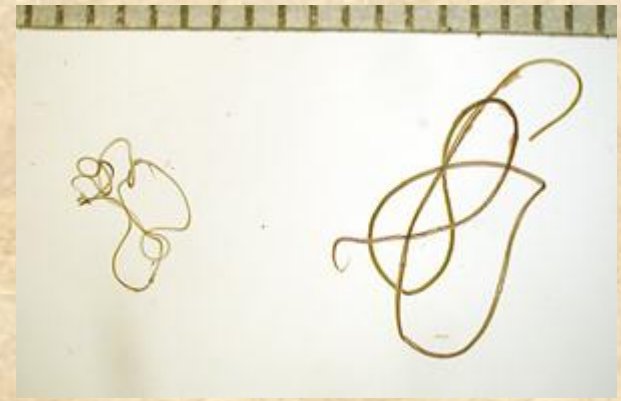
Filarioidea (filarial worms) are biohelminthes, pathopgens of filariasis, is widely spread in countries with a tropical and subtropical climate.

They have a filament-like shape, located in tissues and cavities of the human body while their larvae (microfilariae) are in the blood or tissues. Filarias are viviparous. *Principal hosts* are the human and other mammals. *Intermediate hosts and vectors* are blood-sucking dipteran insects.

Wuchereria bancrofti is a pathogen of wuchereriasis.

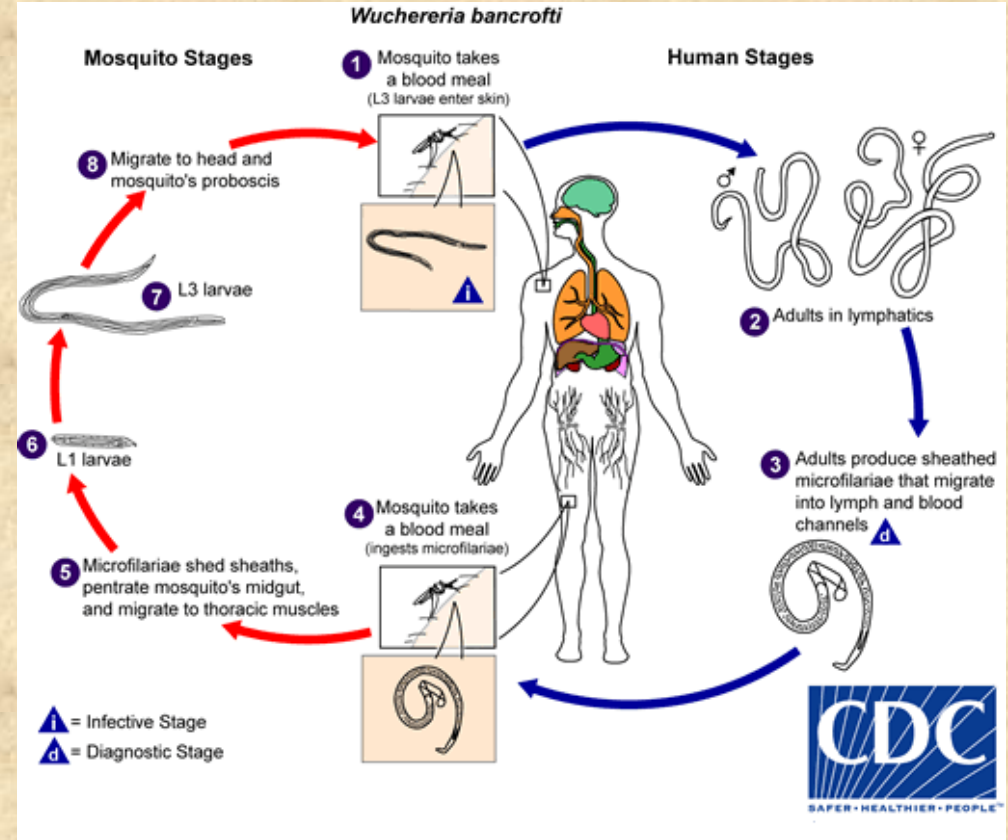
Morphological peculiarities: a female has a thread-like body of white color. The length is 8–10 cm and 4 cm for female and male relatively.





Life cycle: a principal host is human, intermediate hosts and vectors are mosquitoes of g. Culex, Anopheles, Aedes and Mansonia. Location of mature parasites is lymphatic vessels and nodes. Females deliver larvae that migrate into blood vessels (at day they are in deep vessels of internal organs, at night they migrate to peripheral vessels). A person bitten by a female mosquito becomes infected with microfilaria.

Microfilariae develop in the mosquito's body. When the person is bitten, microfilariae migrate into the lymphatic system and reach sexual maturity.



Pathogenic action:

1. *Mechanic*: obstruction of lymphatic vessels, impairment of the lymph efflux that leads to a sharp enlargement of the affected organ.

2. *Toxicoallergic action of the parasite's metabolite products*.

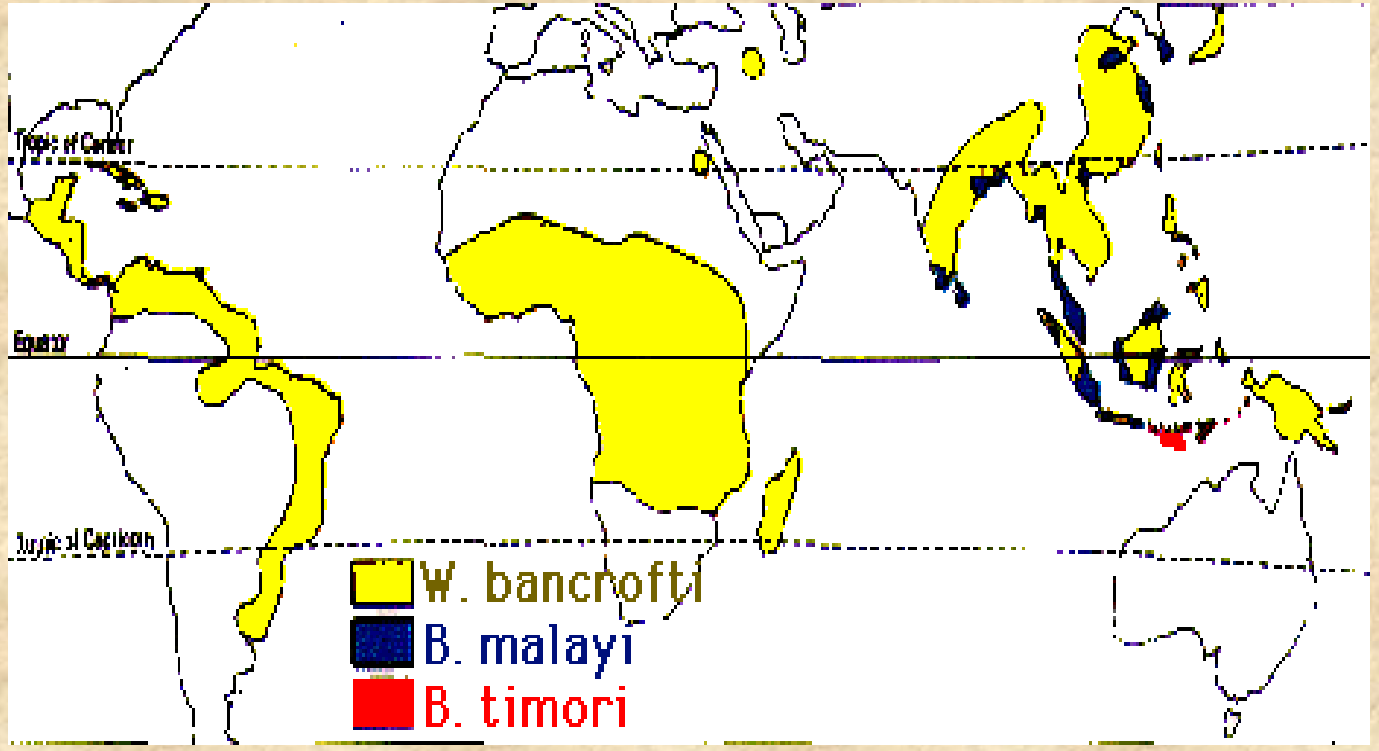
Clinical manifestations. At early stage of the disease: fever, conjunctivitis, enlargement of lymphatic nodes, attacks of bronchial asthma. The 2nd stage: inflammation of lymphatic nodes and vessels, microfilariae appear in the blood. The 3rd stage: lymph in the urine, testicle dropsy, diarrhea with lymph, elephanthiasis of legs, mammary glands, genitalia.

Diagnosis: finding microfilaria in blood.

Personal prophylaxis: protection from mosquito, chemoprophylaxis.

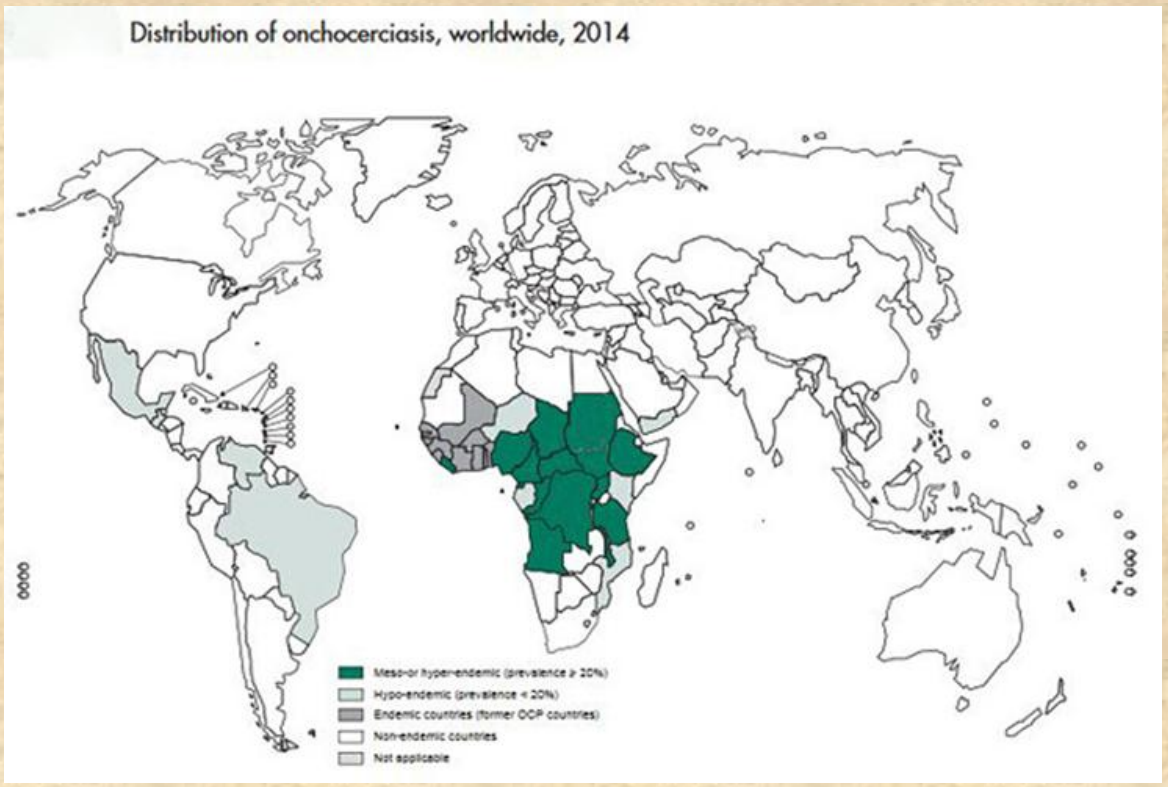
Social prophylaxis: revealing and treating sick people, elimination of vectors, personal and social health education.

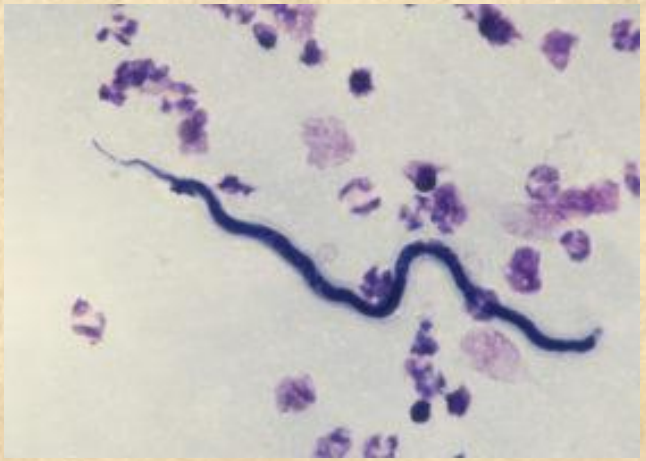
Brugia malayi a pathogen of *brugiasis*. The morphology is similar to that of W. bancrofti; life cycle is same. *Principal hosts* are human, monkeys, cats and dogs. *Intermediate hosts* and vectors are mosquitoes of g. Mansonia. The diease affects mainly extremities. Pathogenic action, clinical manifestations and diagnosis are the same as in wuchereriasis.

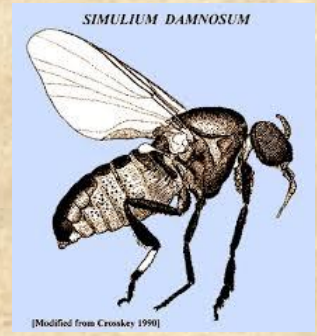


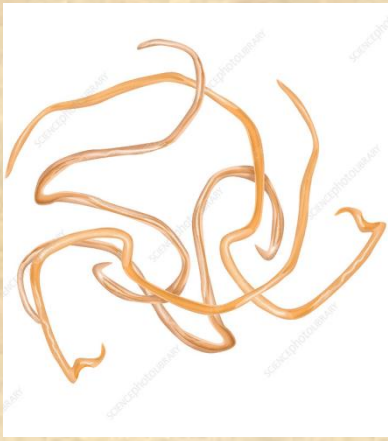
Onchocerca volvulus is a pathogen of *onchocerciasis*.

Morphological peculiarities: the principal host is human, an intermediate hosts and vectors are black flies of g. Simulium.



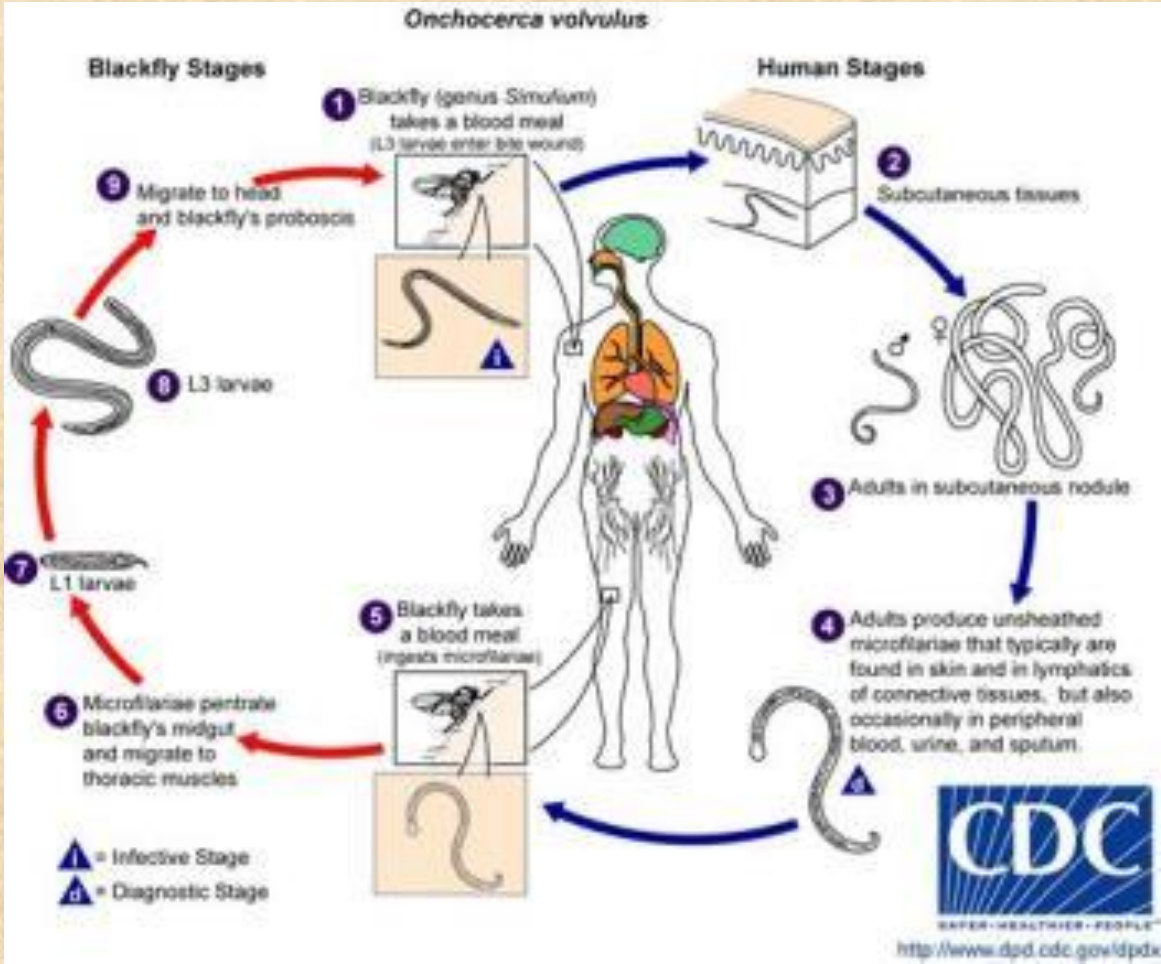






Sexually mature parasites are located in the superficial layers of the skin. After fertilization females deliver microfilariae that permeate into the skin, eyes and lymphatic nodes. If a sick person is bitten, larvae get into the stomach of the vector together with blood and become infectious.

When the vector bites a healthy person, larvae get into the skin, migrate into the subcutaneous adipose tissue, and reach sexual maturity.



Pathogenic action:

1. *Toxicoallergic* (poisoning by waste products).

2. *Mechanical* (injury of the skin, lymphatic vessels).

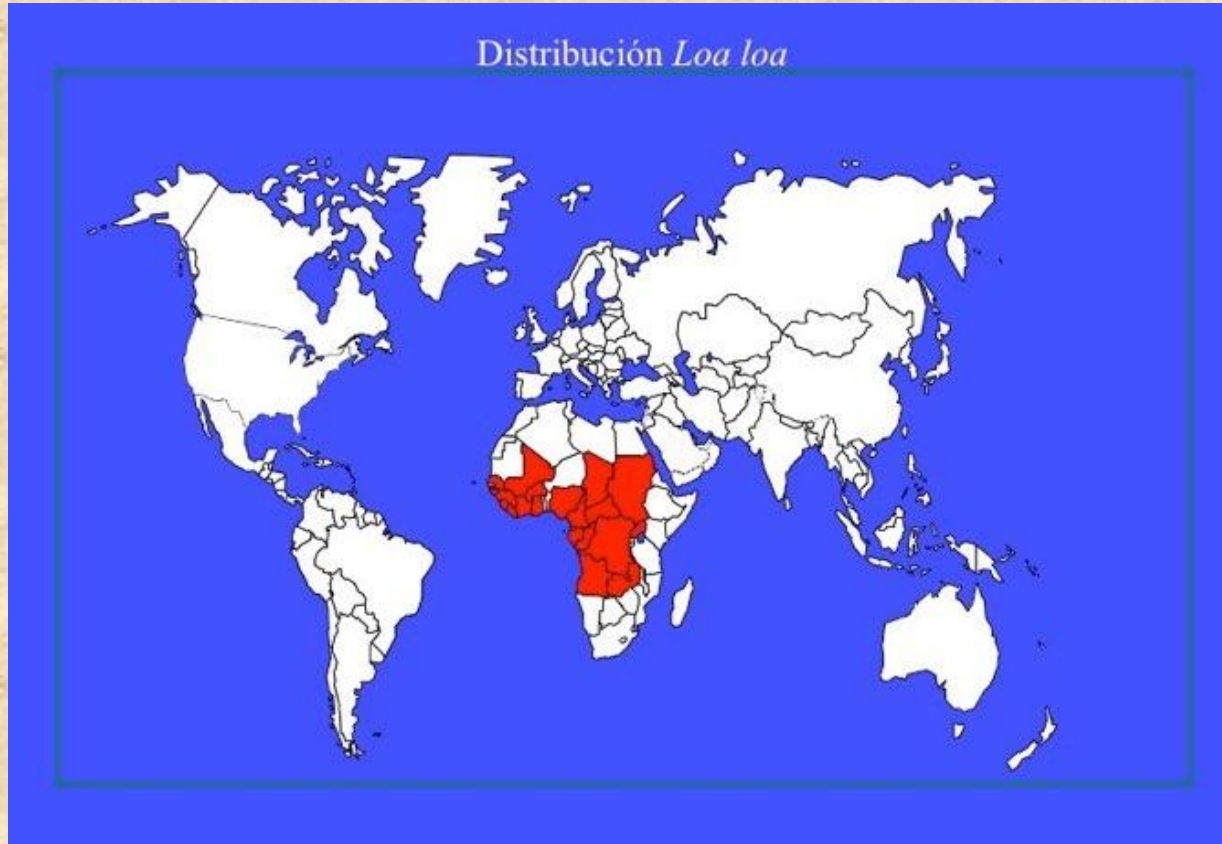
Clinical manifestations: onchocerciasis dermatitis (itching, skin eruptions, its thinning, loss of elasticity, formation of small wrinkles an «skin of an orange» or «skin of a crocodile», «skin of an elephant skin», elephantiasis of the face («lion's muzzle»). Complications are eye injuries, loss of vision.

Laboratory diagnostics: finding microfilariae in section of superficial layers of skin or mature worms in onchocercomes.

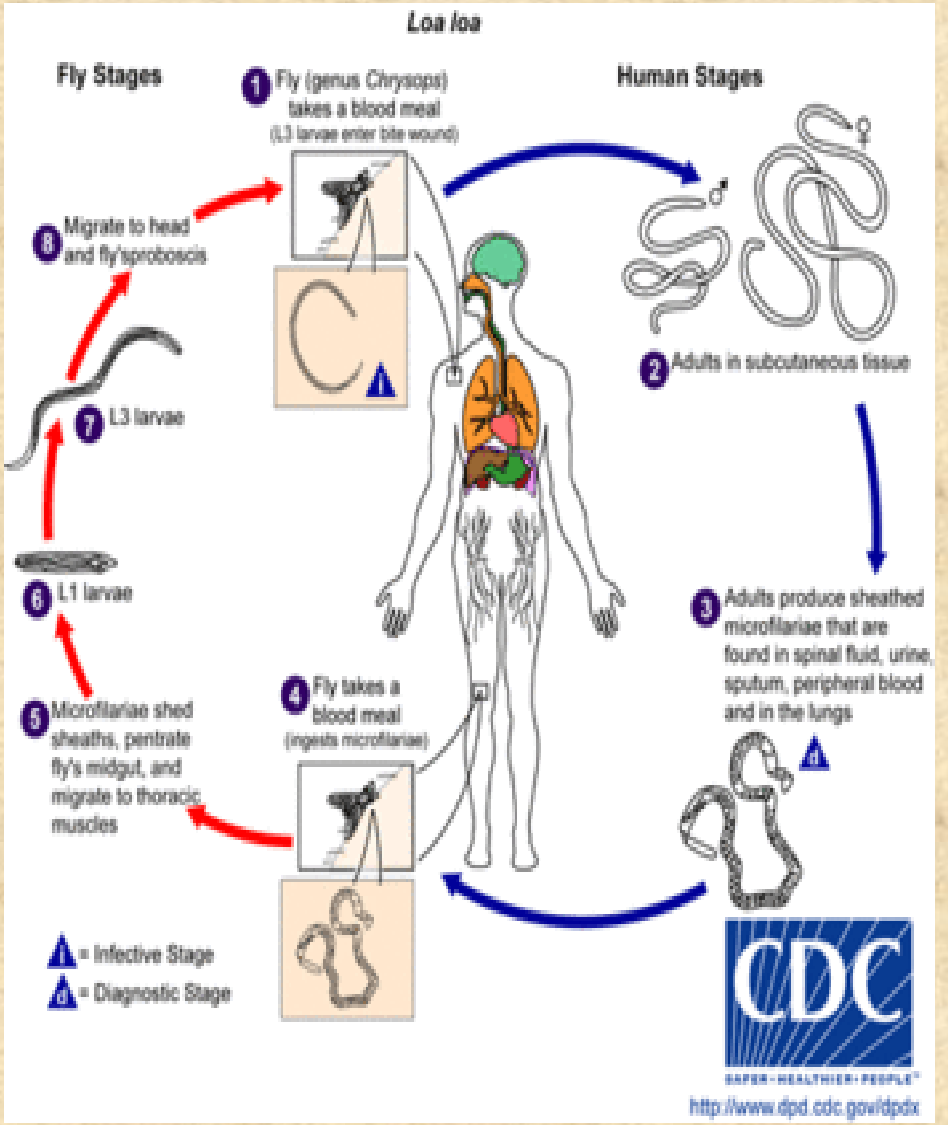
Personal prophylaxis: protection from bites of black flies.
Social prophylaxis: revealing and treating sick people, elimination of black flies, personal and social health education.

Loa loa is the pathogen of loaiasis.

Morphological peculiarities: a thread-like body has length up to 5 cm for females and to 3 cm for males.



Life cycle: principal hosts are human, monkeys, an intermediate hosts and vectors are horse flies. Location of mature parasites is subcutaneous adipose tissue, eye serous cavities while larvae are located in the cardiovascular system. Larvae (microfiilariae) are characterized by a daily periodicity of migrations in the human organism. When a horse fly bites a sick person microfilariae get to its organism become infectious. The human gets infected after a horse fly bite.

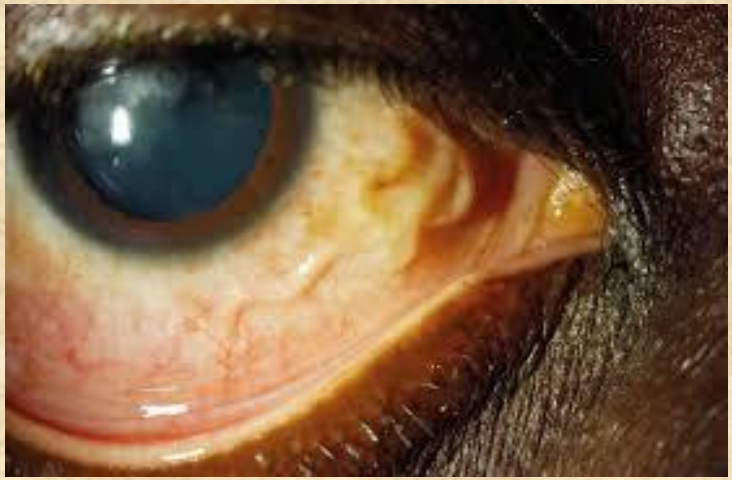


Pathogenic action:

1. *Toxicoallergic* (poisoning by waste products).

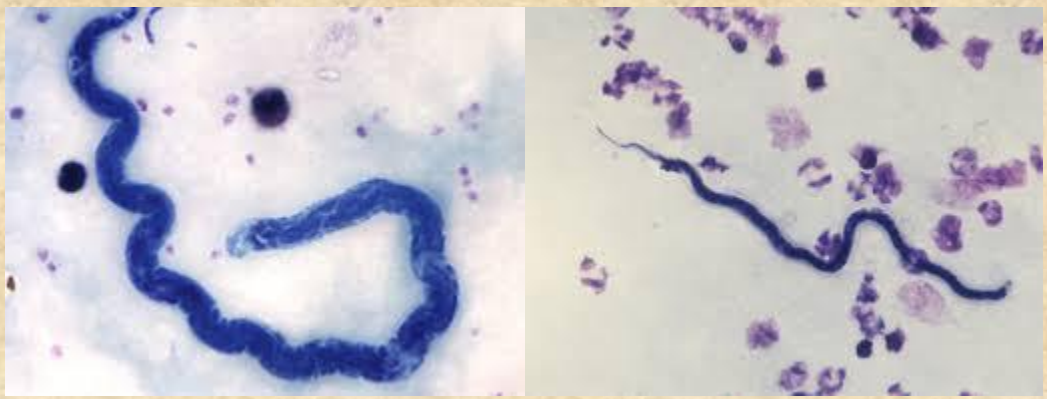
2. *Mechanical* (injury of tissues).

Clinical manifestations: pains in the extremities, paresthesia (impairment of sensitivity), edema. If eyes are affected — edema and hyperemia of lids, pains, decrement in visual acuity. As a result of a secondary infection, abscesses may develop in muscles and lymphatic nodes.



Laboratory diagnostics: finding microfilariae in blood smears and in a thick-blood film. Parasites are also seen beneath the conjunctiva.

Personal prophylaxis: protection from horse flies.
Social prophylaxis: revealing and treating sick people, elimination of vectors, personal and social health education.



Write down in your drawing book classification of **Dracunculus medinensis, Trichinella spiralis, Wuchereria bancrofti, Brugia malayi, Onchocerca volvulus, Loa loa.**

You must draw in your drawing book larva of **Trichinella spiralis.**