



Anisakis spp.



**Presented by:
Dr. Asma**

INTRODUCTION

- ❖ *Anisakis* is a genus of parasitic nematodes that have life cycles involving fish and marine mammals.
- ❖ They are infective to humans and cause anisakiasis.
- ❖ People who produce immunoglobulin E in response to this parasite may subsequently have an allergic reaction, including anaphylaxis, after eating fish infected with *Anisakis* species.



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Epidemiology

- ❖ Larval anisakids are common parasites marine and anadromous fish (e.g. salmon), found in squid and cuttlefish.
- ❖ In contrast, they are absent from fish in waters of low salinity, due to the physiological requirements of krill, which are involved in the completion of the worm's lifecycle.
- ❖ Anisakids are also uncommon in areas where cetaceans are rare, such as the southern North Sea.



Life cycle

- * *Anisakis* species have complex life cycles which pass through a number of hosts through the course of their lives.
- * Eggs hatch in seawater, and larvae are eaten by crustaceans, usually euphausiids.
- * The infected crustaceans are subsequently eaten by fish or squid, and the nematodes burrow into the wall of the gut and encyst in a protective coat, usually on the outside of the visceral organs, but occasionally in the muscle or beneath the skin.
- * The lifecycle is completed when an infected fish is eaten by a marine mammal.

Morphology



* *Anisakis* share the common features of all nematodes: the vermiform body plan, round in cross section, and a lack of segmentation.

* The body cavity is reduced to a narrow pseudocoel.

* The mouth is located anteriorly and surrounded by projections used in feeding and sensation, with the anus slightly offset from the posterior.

* The squamous epithelium secretes a layered cuticle to protect the body from digestive acid.

Life cycle

- ❖ The nematode excysts in the intestine, feeds, grows, mates, and releases eggs into the seawater in the host's feces.
- ❖ As the gut of a marine mammal is functionally very similar to that of a human, *Anisakis* species are able to infect humans who eat raw or undercooked fish.
- ❖ Each final host species was discovered to have its own biochemically and genetically identifiable "sibling species" of *Anisakis*, which is reproductively isolated.

Anisakiasis

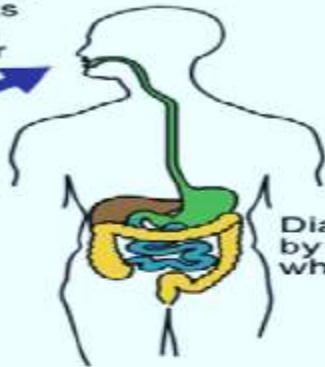
(*Anisakis simplex*, *Pseudoterranova decipiens*)

i = Infective Stage

d = Diagnostic Stage

Diagnosis of anisakiasis can be made by gastroscopic examination during which the 2 cm larvae can be removed. **d**

7 Humans become incidental hosts through eating infected raw or undercooked seafood.



6 When fish or squid containing L3 larvae are ingested by marine mammals, the larvae molt twice and develop into adult worms. Adult worms produce eggs that are shed by marine mammals.

1 Marine mammals excrete unembryonated eggs.

2a Eggs become embryonated in water and L2 larvae form in the eggs.

2b After the L2 larvae hatch from eggs, they become free-swimming.

5 Fish and squid maintain **i** L3 larvae that are infective to humans and marine mammals.

3 Free-swimming larvae are ingested by crustaceans and they mature into L3 larvae.

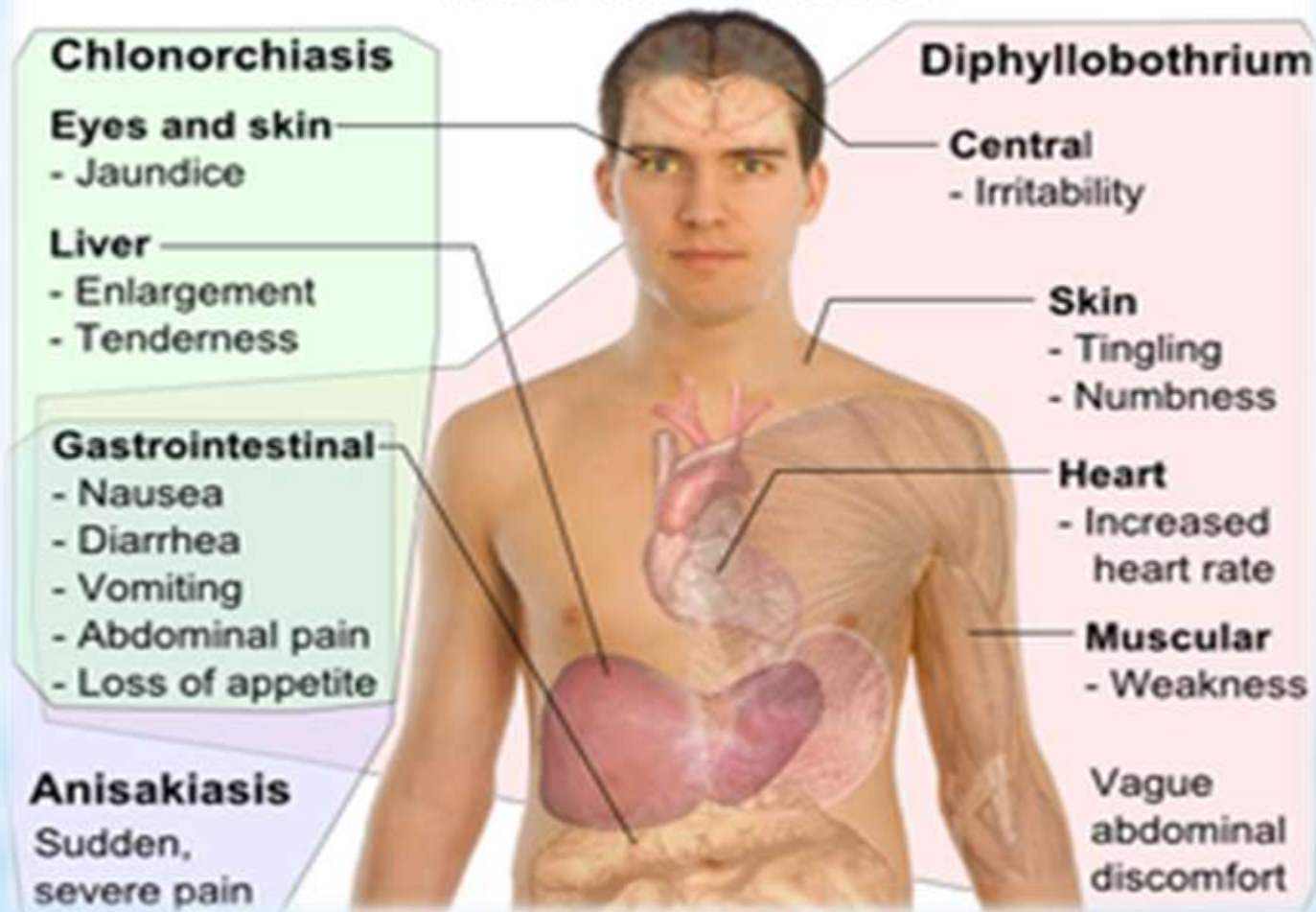
4 Infected crustaceans are eaten by fish and squid. Upon the host's death, larvae migrate to the muscle tissues, and through predation, the larvae are transferred from fish to fish.



SYMPTOMS

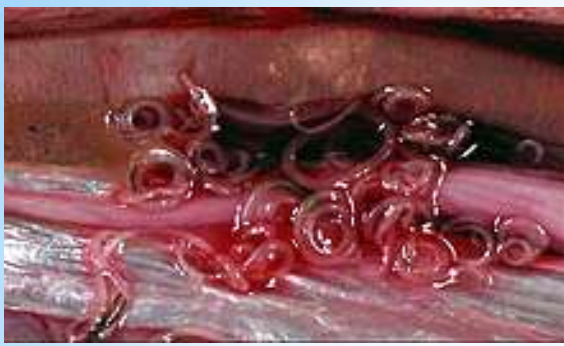
- ❖ **Within a few hours of ingestion, the parasitic worm tries to burrow through the intestinal wall, but since it cannot penetrate it, it gets stuck and dies.**
- ❖ **The presence of the parasite triggers an immune response; immune cells surround the worms, forming a ball-like structure that can block the digestive system, causing severe abdominal pain, malnutrition, nausea and vomiting.**
- ❖ **Allergic reactions with rash and itching, and infrequently, anaphylaxis, can also occur.**
- ❖ **If the larvae pass into the bowel or large intestine, a severe eosinophilic granulomatous response may also occur one to two weeks following infection, causing symptoms mimicking Crohn's disease.**

Symptoms of Raw fish infection

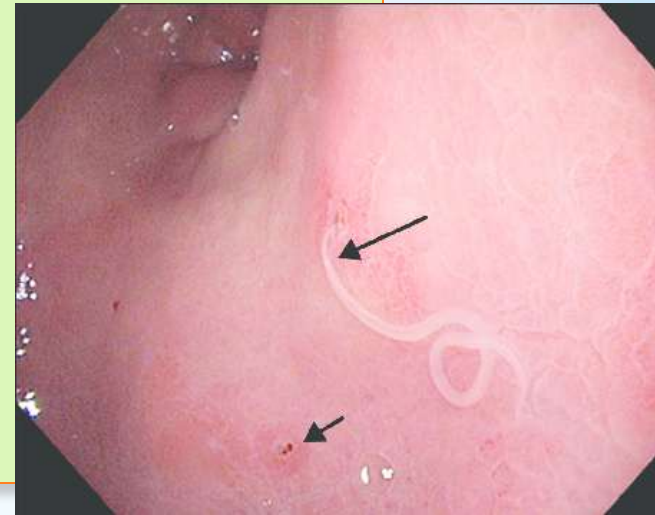


https://en.wikipedia.org/wiki/Anisakis#/media/File:Symptoms_of_Raw_fish_infection.png

Treatment



- * **Diagnosis can be made by gastroscopic examination, during which the 2-cm larvae are visually observed and removed, or by histopathologic examination of tissue removed at biopsy or during surgery.**
- * **Treatment with albendazole alone (avoiding surgery) has been reported to be successful.**
- * **Anisakiasis can be easily prevented by adequate cooking at temperatures greater than 60 °C or freezing.**



PREVENTION AND CONTROL

- * Do not eat raw or undercooked fish or squid.
- * The FDA recommends the following for seafood preparation or storage to kill parasites.
- * **Cooking (Seafood in General)**
 - * Cook seafood adequately (to an internal temperature of at least 145° F [\sim 63° C]).
- * **Freezing (Fish)**
 - * At -4°F (-20°C) or below for 7 days (total time), or
 - * At -31°F (-35°C) or below until solid, and storing at -31°F (-35°C) or below for 15 hours, or
 - * At -31°F (-35°C) or below until solid and storing at -4°F (-20°C) or below for 24 hours.



Distribution in Pakistan

- * Parasitism is a ubiquitous phenomenon in the marine environment and it is probable that all marine fishes are infected with parasites.
- * The fishes found along the coast of Pakistan were reported to be infected by various types of parasites among which trematode are most common.
- * A comprehensive list of helminth parasites from the fishes of Karachi coast and the organs affected is available.
- * The seasonal variation of parasitic infection is present in edible fishes landing at the Karachi Fish Harbour.

Wuchereria bancrofti

- ❖ *Wuchereria bancrofti* is a human parasitic worm that is the major cause of lymphatic filariasis.
- ❖ These filarial worms are spread by a variety of mosquito vector species.
- ❖ If left untreated, the infection can develop into a chronic disease called Lymphatic filariasis.
- ❖ They develop in adults that commonly reside in the lymphatics.
- ❖ An estimated 90% of LF cases are caused by *W. bancrofti* (*Bancroftian filariasis*).



Epidemiology

- * *W. bancrofti* was once widespread in tropical regions globally but control measures have reduced its geographic range.
- * It is currently endemic throughout Sub-Saharan Africa.
- * *Bancroftian filariasis* also occurs sporadically in South America, India, and Southeast Asia.



- * It also present in Philippines, Camarines Sur, Sorsogon Mindoro, Romblon, Bohol, Samar, Palawan, Mountain Province and all provinces of Mindanao.



Symptoms

- * The pathogenesis of *W. bancrofti* infection is dependent on the immune system and inflammatory responses of the host.
- * The asymptomatic phase usually consists of high microfilaria infection, and individuals show no symptoms of being infected.
- * In the inflammatory (acute) phase the individual exhibits fever, chills, skin infections, painful lymph nodes, and tender skin of the lymph edematous extremity.





Symptoms



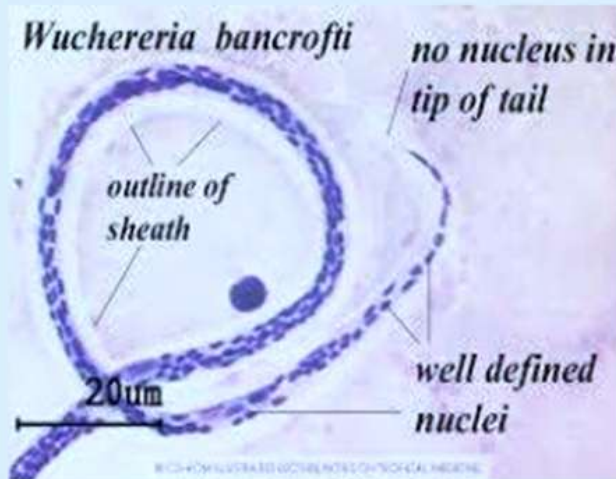
- * **These symptoms often lessen after 5–7 days.**
- * **Other symptoms that may occur include orchitis, an inflammation of the testes, which is accompanied by painful, immediate enlargement and epididymitis.**
- * **The obstructive (chronic) phase is marked by lymph varices, lymph scrotum, hydrocele, chyluria, and elephantiasis.**
- * **A key feature of this phase is scar formation from affected tissue areas.**
- * **Other features include thickening of the skin and elephantiasis.**

Morphology



- * As a dioecious worm, *W. bancrofti* exhibits sexual dimorphism.
- * The adult worm is long, cylindrical, slender, and smooth with rounded ends.
- * It is white in colour and almost transparent.
- * The body is quite delicate, making removing it from tissues difficult.
- * It has a short cephalic or head region connected to the main body by a short neck, which appears as a constriction.
- * Dark spots are dispersed nuclei throughout the body cavity, with no nuclei at the tail tip.
- * Males and females can be differentiated by size and structure of their tail tips.

Microfilaria - is a miniature adult that retains the egg membrane as a sheath.



<https://www.slideshare.net/HazelMarieBarcela/wuchereria-bancrofti-57456676>



Life cycle

- ❖ *W. bancrofti* carries out its lifecycle in two hosts.
- ❖ Humans serve as the definitive host and mosquitos as the intermediate host.
- ❖ The adult parasites reside in the lymphatics of the human host.
- ❖ The first-stage larvae, known as microfilariae, are present in the circulation.
- ❖ They migrate between the deep and the peripheral, circulation exhibiting unique diurnal periodicity.
- ❖ The microfilariae are transferred into a vector, which are most commonly mosquito species of the genera *Culex*, *Anopheles*, and *Aedes*.



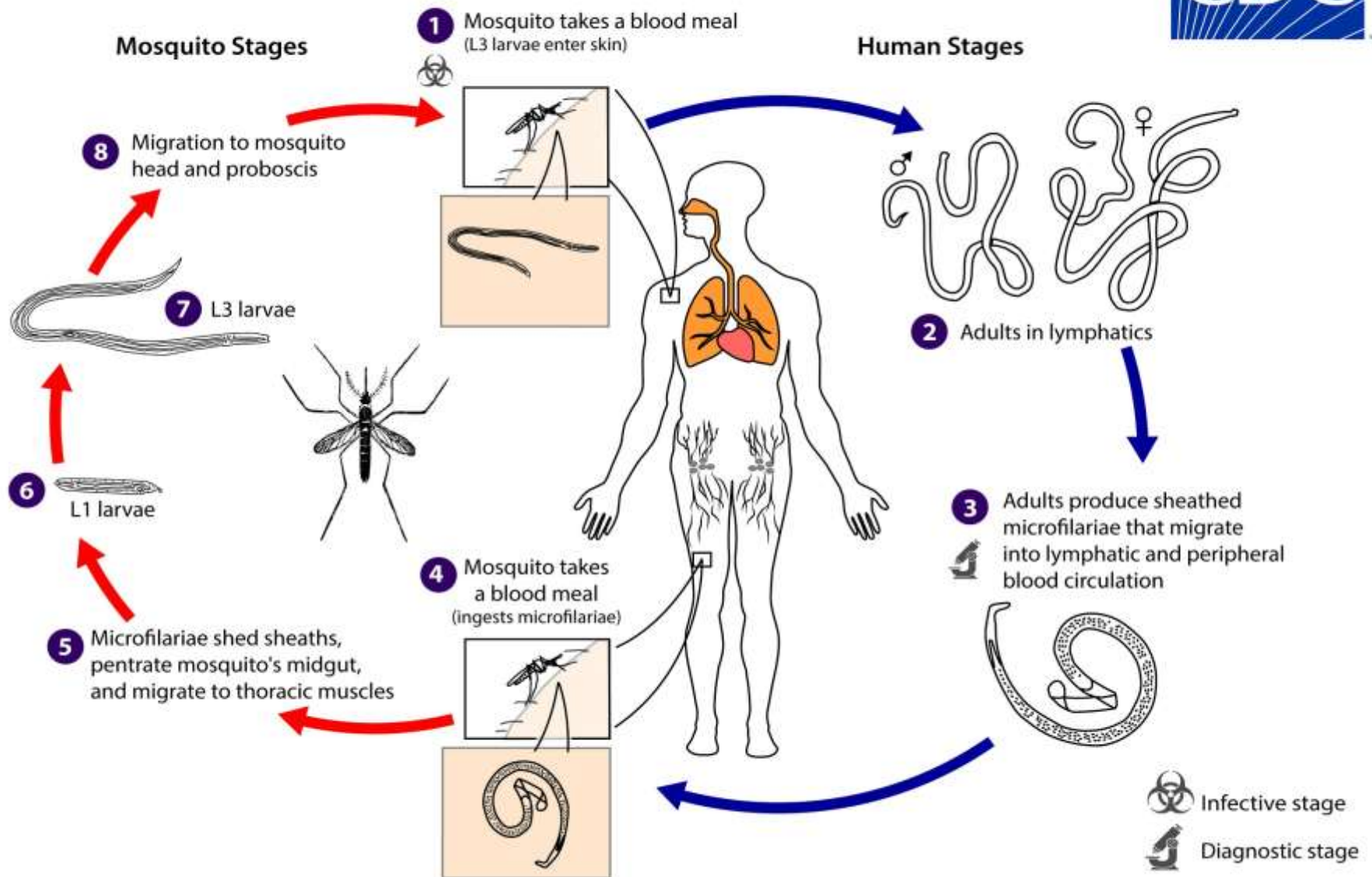
Life cycle

- ❖ Inside the mosquito, the microfilariae mature into motile larvae called juveniles; these migrate to the labium after a period around 10 days.
- ❖ When the infected mosquito has its next blood meal, *W. bancrofti* larvae are deposited from the mouthparts onto the skin of the prospective host and migrate through micro cuts in the dermis.
- ❖ The larvae move through the lymphatic system to regional lymph nodes, predominantly in the legs and genital area.



Life cycle

- * **The larvae develop into adult worms over the course of a year, and reach sexual maturity in the afferent lymphatic vessels.**
- ❖ **After mating, the adult female worm can produce thousands of microfilariae that migrate into the bloodstream.**
- ❖ **A mosquito vector can bite the infected human host, ingest the microfilariae, and thus repeat the lifecycle.**
- ❖ **The organism notably does not multiply within its intermediate host, the mosquito.**



Diagnosis

- * Direct methods (visualization of larval stage or microfilaria and adult worm)**
Microfilaria can be seen on peripheral blood or other body fluids (eg. urine, hydrocoele, or lymph fluid).
- * Examination of stained peripheral blood smear which is also useful in species identification based on morphologic features of organism, especially the tail end.**
- * Thick or concentrated blood smears, concentration smears are useful in patients with low parasitemia.**
- * blood sample is taken during the period in the day when the juveniles are in the peripheral circulation.**
- * Indirect Methods include Peripheral blood eosinophilia**
- * Elevated serum IgE concentration**
- * Presence of antifilarial serum antibody**
- * Intradermal complement fixation tests**



Treatment

- ❖ **The severe symptoms caused by the parasite can be avoided by cleansing the skin, surgery, or the use of anthelmintic drugs, such as diethylcarbamazine, or albendazole.**
- ❖ **The drug of choice is diethylcarbamazine, which can eliminate the microfilariae from the blood and also kill the adult worms with a dose of 6 mg/kg/day for 12 days, semi-annually or annually.**
- ❖ **Mass chemotherapy should cover the entire endemic area at the same time.**



Prevention and control

- ❖ Prevention focuses on protecting against mosquito bites in endemic regions.
- ❖ Insect repellents and mosquito nets are useful to protect against mosquito bites.
- ❖ Public education efforts must also be made within the endemic areas to successfully lower the prevalence of *W. bancrofti* infections.
- ❖ The WHO is coordinating an effort to eradicate filariasis.
- ❖ The mainstay of this program is the mass use of ant filarial drugs on a regular basis for at least five years.

Thank you