Lymphatic Filariasis

Dr. Hala Mahmoud Altarawneh

Bachelor degree in Medicine and Surgery - Mutah university

MSC Medical Microbiology – University of Manchester

PhD Medical Microbiology - University of Manchester

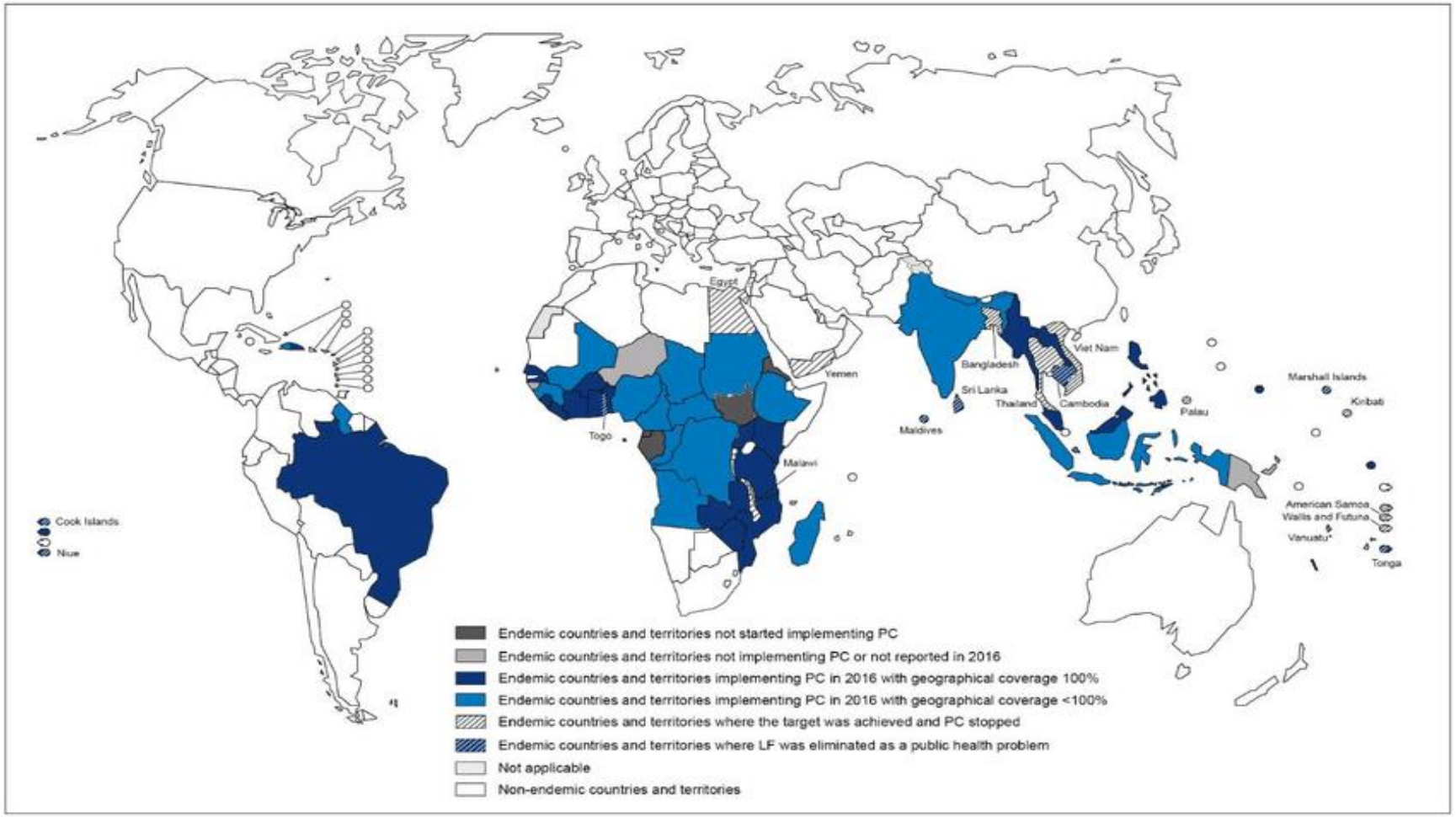
Outlines

- Lymphatic filariasis:
  - Etiology and life cycle
  - Clinical features
  - Diagnosis, treatment, and prevention

Introduction

- Lymphatic filariasis, also known as elephantiasis, is a chronic mosquito-borne infection targeting the lymphatics, caused by filarial nematodes.
- **Epidemiology:** 120 million patients infected worldwide as of 2019
- **Geographic distribution:**
  - Tropical and subtropical climates (West & Central Africa, South America)
  - Lymphatic filariasis has a 10:1 predilection for men over women.

Introduction



Distribution of lymphatic filariasis in endemic countries. (2016). (World Health Organization, 2020)

Etiology- Filarial nematodes

- Nematodes (roundworms) are long, thin, unsegmented, tube-like worms. Adult worms form separate sexes, with the males usually being smaller than the females.
- **Causative species:**
  - *Wuchereria bancrofti* (responsible for most cases of lymphatic filariasis worldwide)
  - *Brugia malayi*

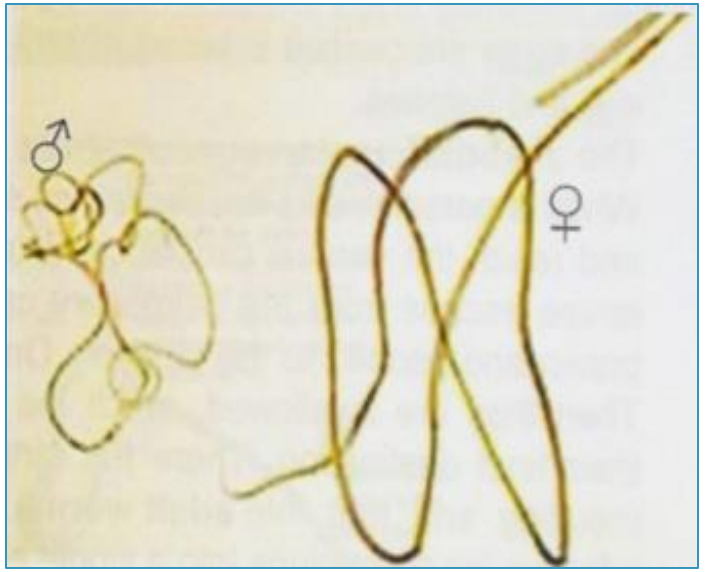
Etiology- Filarial nematodes- Stages of Life

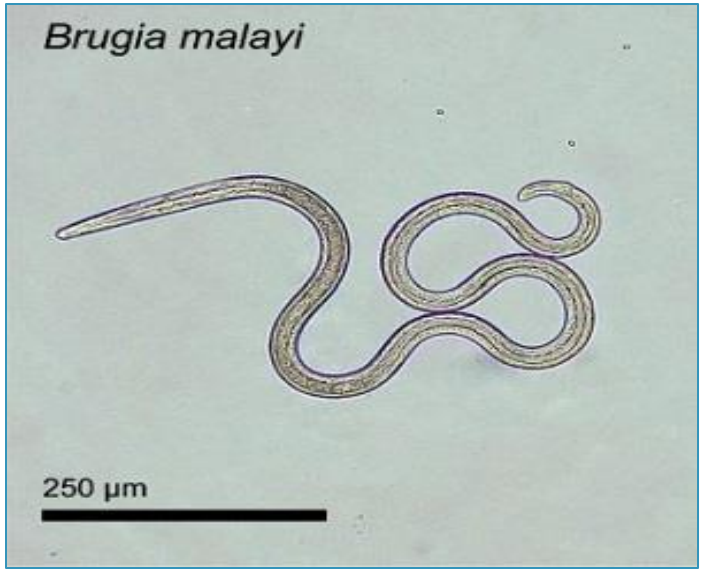
- **Microfilariae:**
  - Produced by adult nematodes
  - Found in the peripheral blood of the human host
  - Microfilariae have nocturnal periodicity (10 p.m. to 2 a.m.).

- **Larvae:**
  - Microfilariae that lose their sheaths
  - Microfilariae mature into larvae inside the mosquito: L1 (1st stage) larvae to L3 (3rd stage) larvae
  - Maturity reached in 6–9 months

Etiology- Nematodes Stages of Life

- **Adults:**
  - Mature from L3 larvae in the regional lymphatics
  - Wuchereria worms:
    - Adult female: 80–100 mm in length
    - Adult male: about 40 mm
  - Brugia worms:
    - Adult female: 43–55 mm in length
    - Adult male: 13–23 mm in length

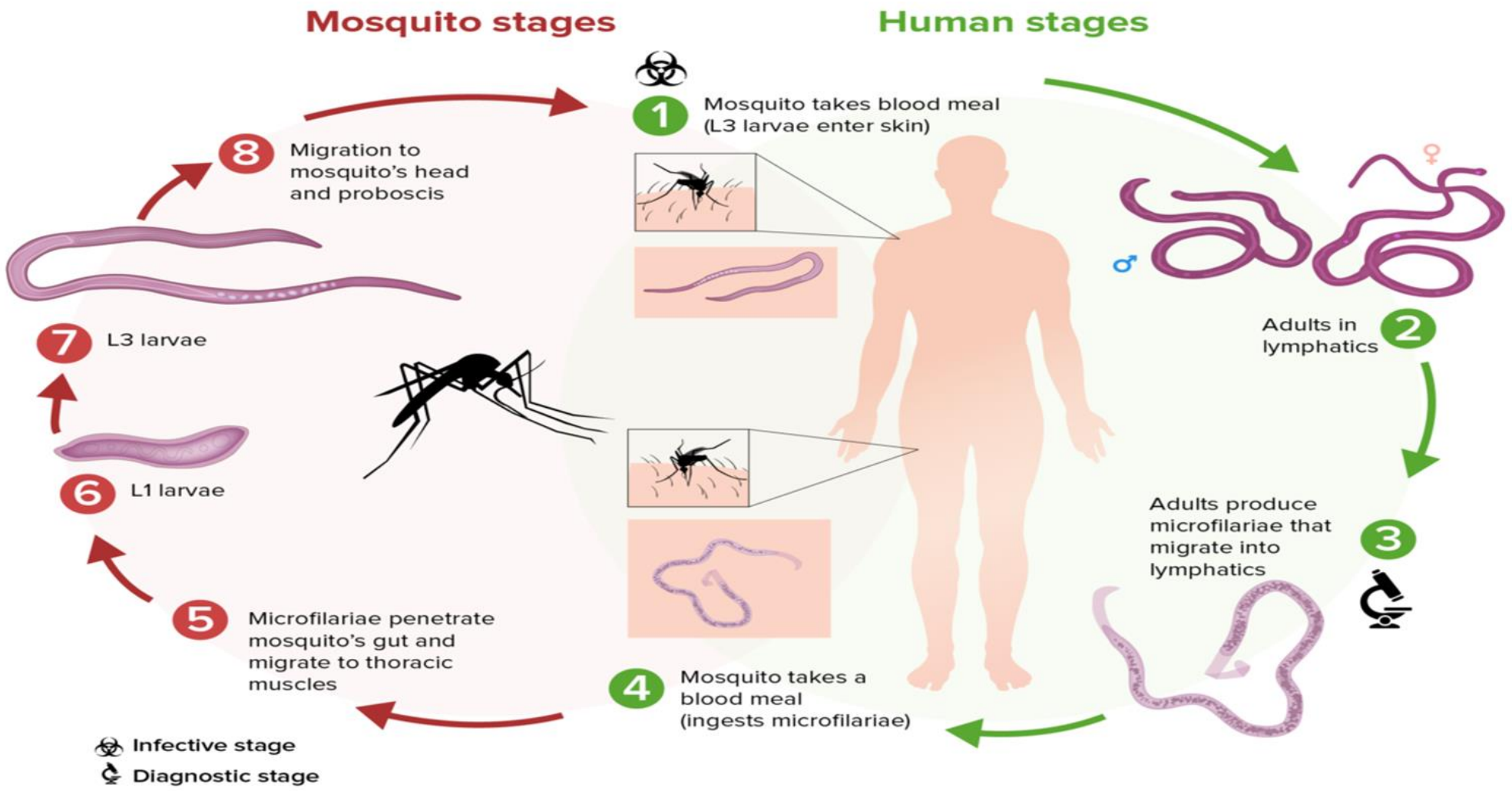




Etiology- *W. bancrofti* Life Cycle

1. An infected mosquito introduces L3 larvae into the skin of the human host.
2. L3 larvae migrate to the lymph nodes and regional lymphatics and mature into adults, which have a predilection for inguinal lymph nodes.
3. Adult worms undergo sexual reproduction, with females birthing microfilariae that migrate actively through lymph and blood.
4. A mosquito ingests the microfilariae during a blood meal → Within the mosquito, the microfilariae develop into L1 larvae.
5. L1 larvae subsequently develop into L2 then L3 infective larvae

Etiology- W. bancrofti Life Cycle



Mode of Infection

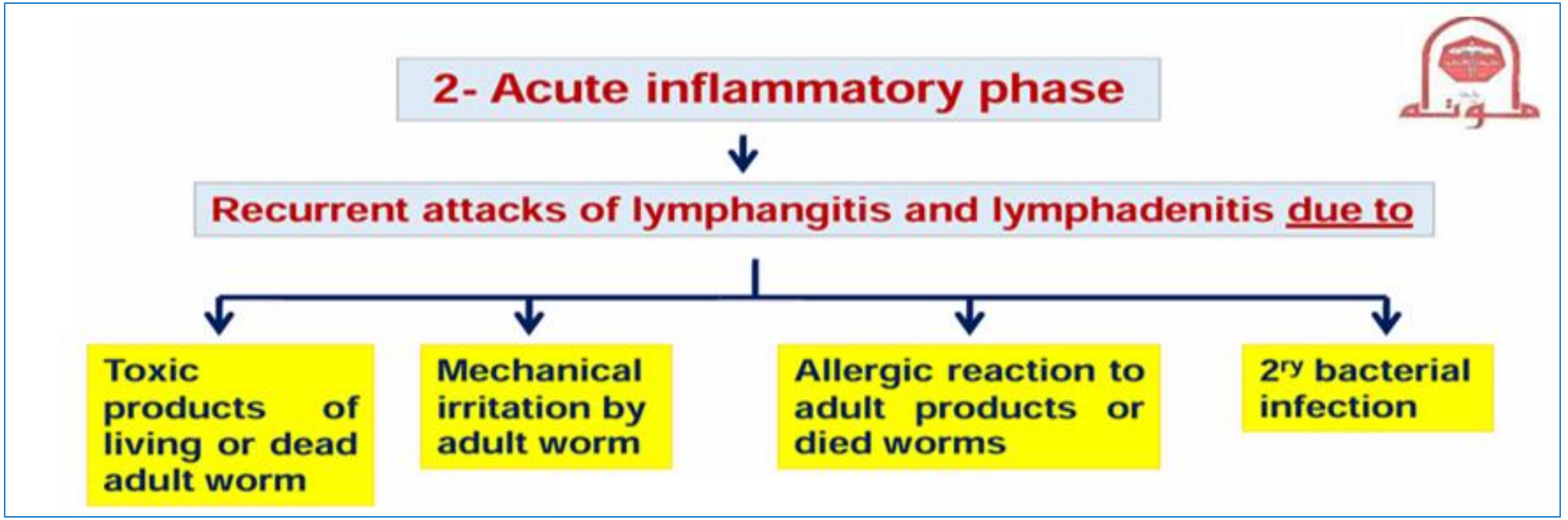
- Mode of transmission: female mosquito bite.
- *W. bancrofti* is transmitted by many different mosquito species, depending on geographical distribution. Among them are:
  - *Aedes* spp.
  - *Anopheles* spp.
  - *Culex* spp.
  - *Mansonia* spp.

Disease process

- Pathological lesions occur in the lymphatic system, due to the presence of adult worms (living or dead), but not due to microfilariae.
- Symptoms may take 9 months up to 1 year to manifest after the initial infection.
- Children or individuals in endemic areas often remain **asymptomatic** (subclinical infection), while others show **acute** and/or **chronic** signs and symptoms.

Disease process- Acute phase

- Acute infection: Filarial antigens trigger increased cytokines and immunoglobulins (IgE and IgG4).



Disease process- Acute phase Clinical Features

A. Filarial fever: Typically, low-grade fever (self-limiting). May have myalgias, +/– Lymphadenopathy.

B. Acute adenolymphangitis (ADL):

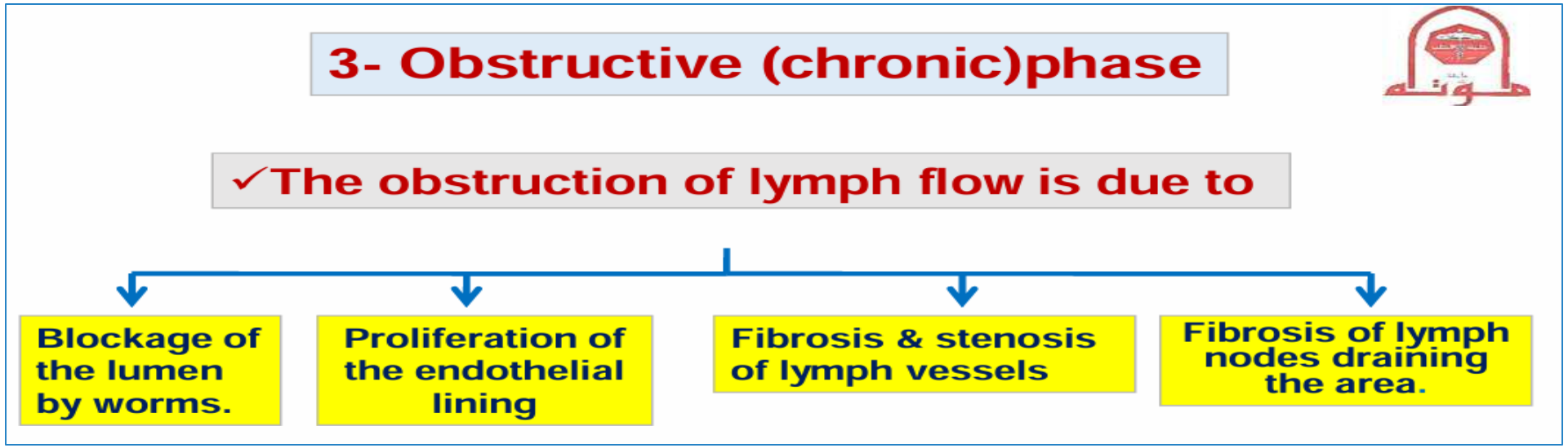
- Fever and lymphadenopathy
- Lymphangitis (inflammation spread distally to the lymph node), with lymphatic vessels in the leg(s) becoming warm, enlarged, red, and tender
- Commonly seen in inguinal lymph nodes but can also affect the genitalia (epididymitis in males)
- Lasts a few days then resolves, but **recurs periodically**

Disease process- Acute phase Clinical Features

C. Tropical pulmonary eosinophilia (TPE): Immune reaction to **microfilariae trapped** in the lungs results in Restrictive lung disease, which can progress to interstitial pulmonary fibrosis

Disease process- Chronic phase

- Chronic and repeated infections lead to: Granuloma formation, and fibrosis of lymphatic vessels and the surrounding connective tissue → Resulting in:
  - Contractile dysfunction and lymphatic occlusion, causing lymphedema
  - Susceptibility of the human host to bacterial and fungal infections, which further contribute to tissue damage



Chronic phase Clinical Features

A.Lymphedema:

- Chronic swelling of the limb from chronic inflammation of the lymphatic vessels
- Graded based on the extent and progression of the symptoms: From Grade 0: subclinical to Grade III: nonpitting oedema with skin thickening, hyperkeratosis and overgrowths, **non-reversible → Elephantiasis**

Disease process- Clinical Features

Stage	Description	Clinical Features	Reversible?
Stage 0	**Latent/Subclinical**	Transport capacity is reduced. No visible or palpable swelling. **Patient may feel heaviness.**	N/A
Stage 1	**Early/Mild**	Pitting edema is present. Swelling increases during the day but **reduces with elevation**.	**Yes** (Reversible)
Stage 2	**Moderate**	Pitting becomes more difficult. Fibrosis (tissue thickening) begins. **Does not resolve with elevation.**	**No** (Spontaneous reversal no longer occurs)
Stage 3	**Severe**	Lymphostatic elephantiasis. **Tissue is hard (fibrotic). Pitting is absent**. Skin changes, warts, and infection are common.	**No** (Severe)

Disease process- Clinical Features

Lymphedema:

Disease process- Chronic phase Clinical Features

B. **Chronic Hydrocele:** the accumulation of fluid in the scrotal sac. It can impact their fertility, and mobility.

C. **Renal involvement:** Chyluria (milky urine):

- Normally, lymphatic vessels have no communication with the urinary tract.
- In filariasis, fluid with intestinal lymph leak into the urine intermittently:
    - The result is urine that looks like milk.
    - Chyluria leads to chronic protein and fat loss, which can cause significant nutritional deficiencies over time.

Diagnosis

A. Peripheral blood smear: blood smear obtained at night (with Giemsa stain): detection of microfilariae

B. Circulating filarial antigen (*W. bancrofti*): detects antigens of adult filarial worms. May be positive even in those without microfilariae

C. Anti-filarial antibody tests: elevated levels of anti-filarial IgG4 in the blood. Used mostly for travellers (who are not from endemic areas)

D. Imaging (Ultrasonography): Reveals adult worms moving in lymphatic vessels.

The "**filarial dance sign**"

an irregular worm movement pattern—may be detected on Doppler

Treatment

A. Filariasis without co-infection:

- Diethylcarbamazine (DEC): 1st-line therapy, Single dose
- Doxycycline in addition to DEC → For nonpregnant adults and children > 8 years of age

B. Surgical treatment:

- Skin debulking and lymphovenous anastomosis for drainage improvement
- Surgical excision of hydrocele

Which stage of the Lymphatic Filariasis parasite primarily causes damage to the lymphatic system?

A. Egg
B. Larvae
C. Adult worm
D. Microfilariae

Correct Answer: C. Adult worm

What is the primary vector for the transmission of Lymphatic Filariasis?

A. Tick
B. Mosquitoes
C. Fleas
D. Flies

Correct Answer: B

Thank you