

FILARIASES

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OBJECTIVES :

1. Know the scientific names of the filarial worms that affect humans
2. Describe the lifecycle and morphology of the different stages of filarial worms
3. Discuss the epidemiology of filariases
4. Describe the pathology and pathogenesis of filariases
5. Discuss on clinical manifestations of filariases
6. Describe the laboratory diagnosis of filariases
7. Outline the management of filariases
8. Discuss on control and prevention of filariases

FILARIASES :

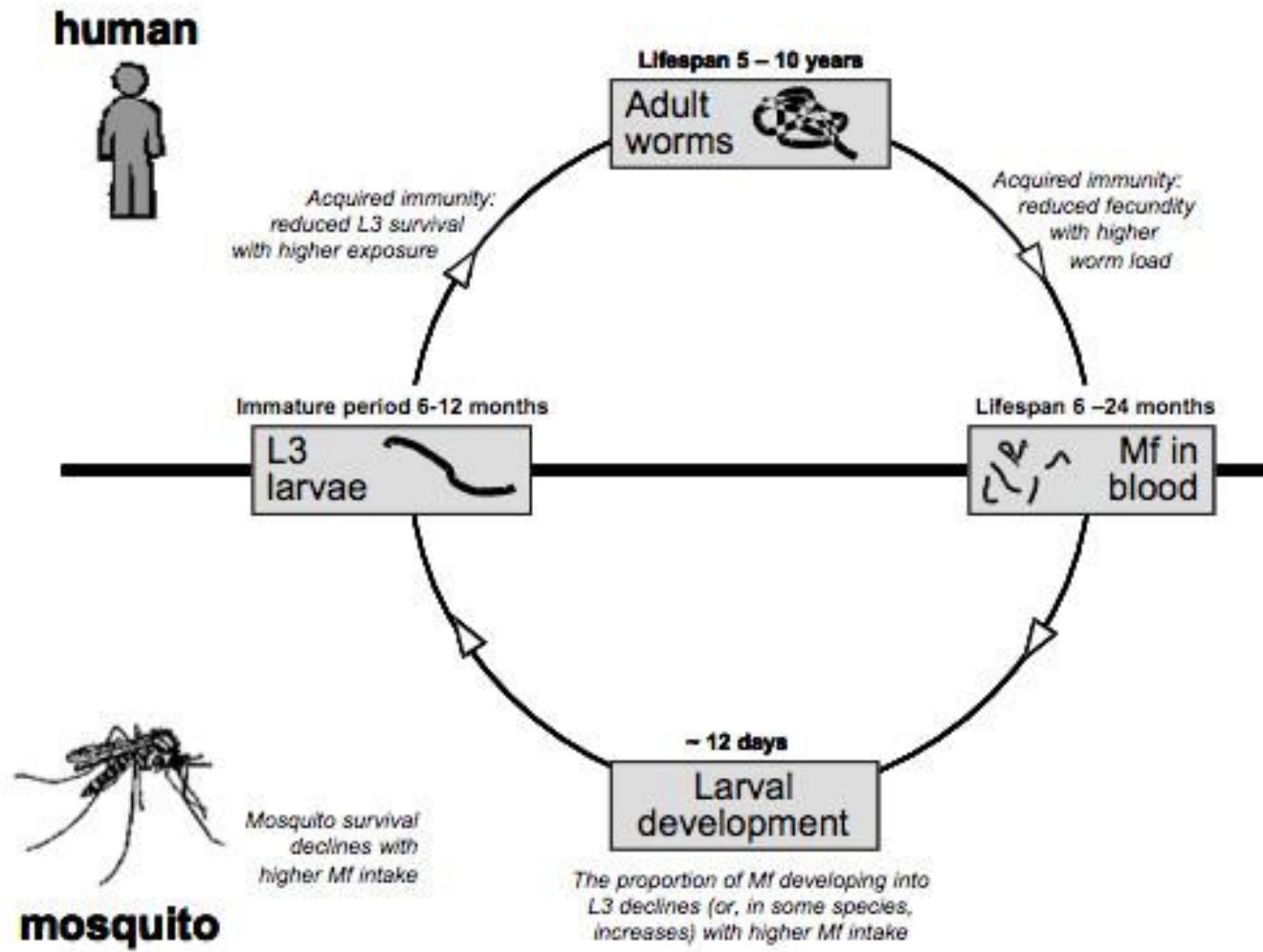
- Are a group of disease caused by tissue dwelling nematodes (round worms)
- They belongs to family Filariidae
- Affects humans and animals
- Is a vector born disease transmitted by mosquitoes
- Only 8 species cause natural infection in humans



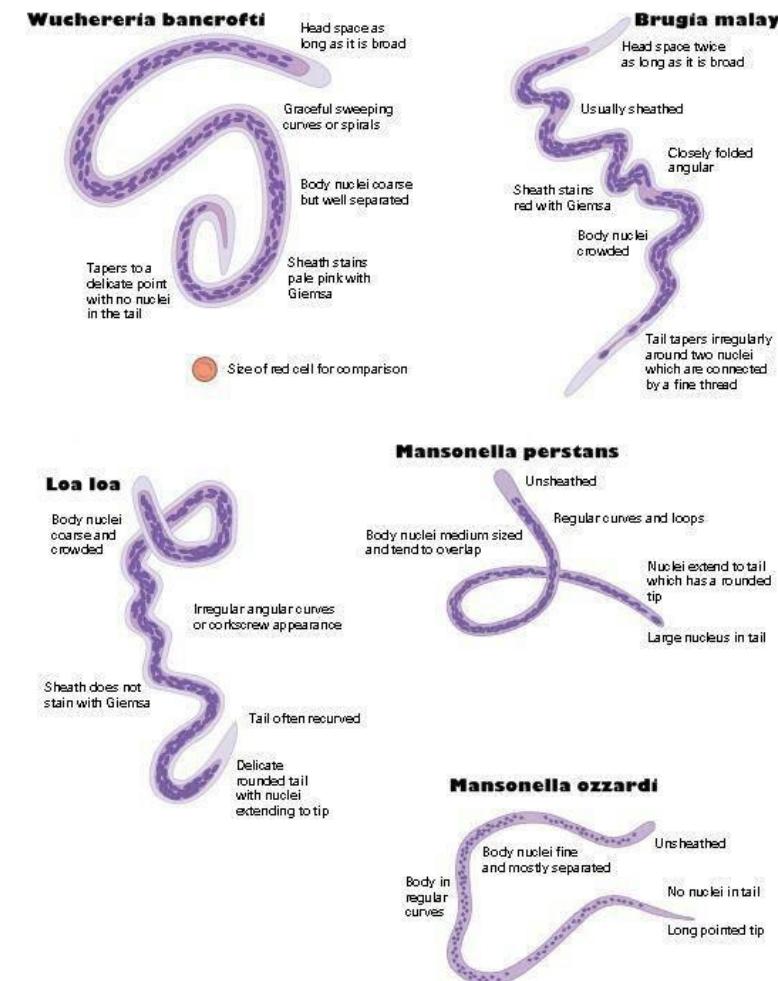
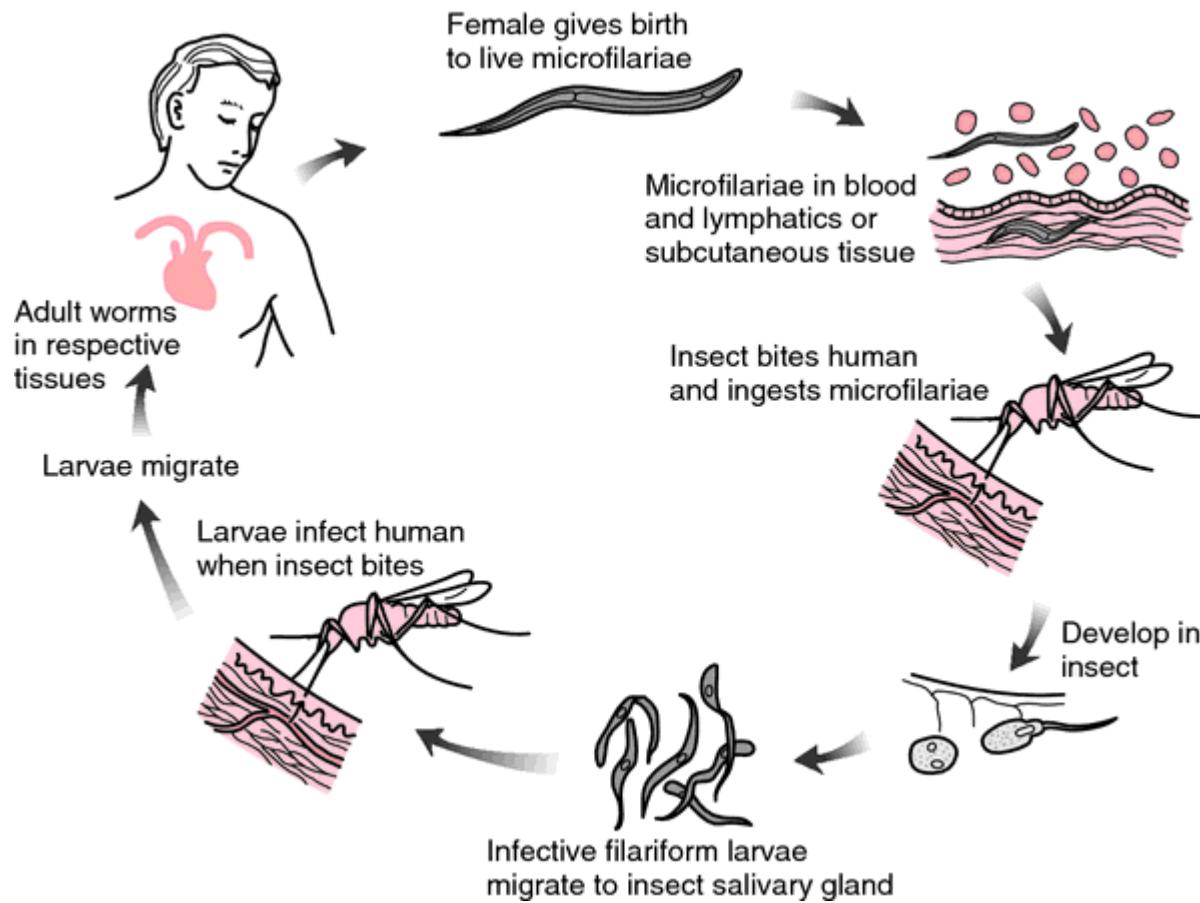
Infections with parasitic filarial worms cause disease known as;

FILARIASIS

GENERAL LIFE CYCLE OF FILARIAL WORMS:



- Adult female worms produce larvae known as “**microfilariae**” (mf)
- Mf live in the blood stream or skin depending on the species



- Depending on the site the adult worm occupy in the human (the definitive host), these are divided into three groups.
 1. Lymphatic filariasis – worms live in the lymphatic system
 2. Subcutaneous filariasis – worms in the subcutaneous layer of the skin
 3. Serous cavity filariasis – worms inhabiting the serous cavity/membranes

1. Lymphatic filariasis

Wuchereria bancrofti

Brugia malayi

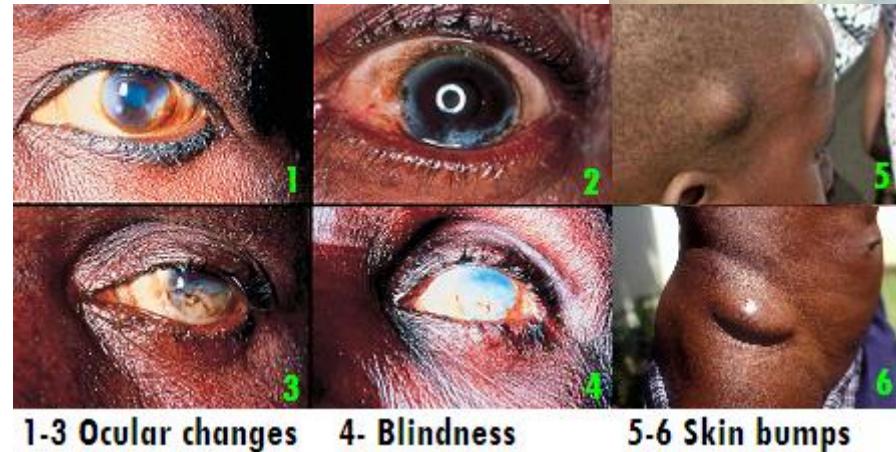
Brugia timori



2. Subcutaneous filariasis

Onchocerca volvulus

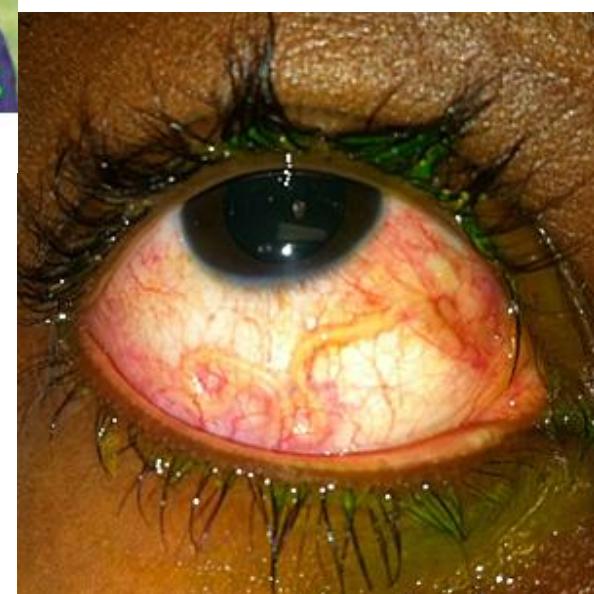
Loa loa



3. Serous cavity filariasis

Mansonella perstans

Mansonella ozzardi



MAJOR FILARIAL INFECTIONS OF HUMANS

species	Disease	Geographic distribution	Location of adult in humans	Location of microfilaria	vector	Lab. diagnosis
<i>Wuchereria bancrofti</i>	elephantiasis	Tropical and subtropical areas	Lymphatic vessels	Blood (nocturnal periodicity)	mosquitoes	Blood film
<i>Brugia malayi</i>	elephantiasis	Asia	Lymphatic vessels	Blood (nocturnal periodicity)	mosquitoes	Blood film
<i>Onchocerca volvulus</i>	Onchocerciasis (river blindness)	Africa, Central and South America, Yemen	Subcutaneous nodules	Skin, eyes, no periodicity	Simulium spp. (black fly)	Skin snip
<i>Loa loa</i>	loiasis	Central Africa	Moving in subcutaneous tissues	Blood (diurnal periodicity)	Chrysops spp. (deer fly)	Blood film

- Natural infection in animals due to the above species are rare & non existent or uncertain

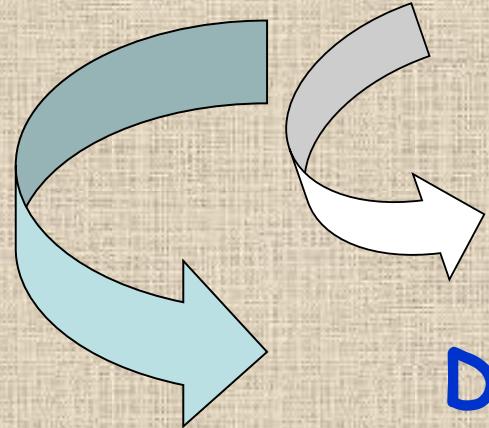
But for *B. malayi* – Animal reservoirs (+)

- Some non human filarial worms accidentally infect man

ZOONOTIC FILARIAL INFECTIONS

- Man gets infected accidentally
 - Accidental filarial infection

- Man gets infected



No microfilaraemia
Develops up to the adult.

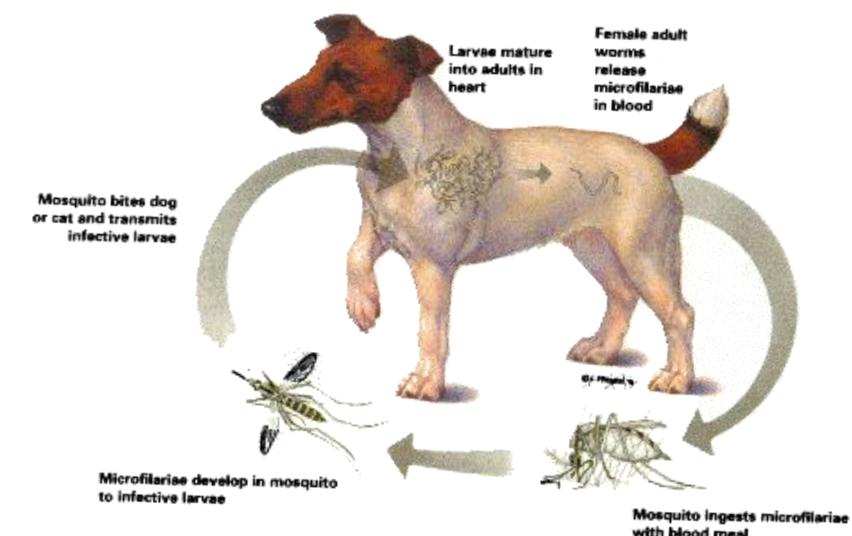
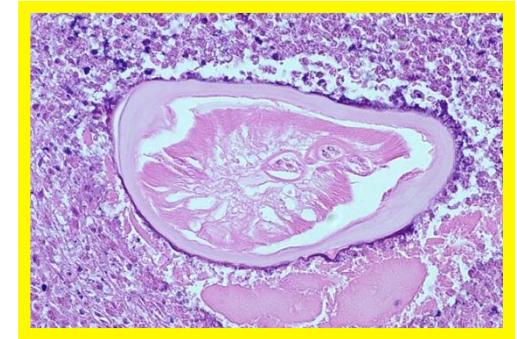
- Two main groups.

a) Sub genus:

Dirofilaria → *Dirofilaria immitis*

b) Sub genus:

Nochtiella → *Dirofilaria repens*

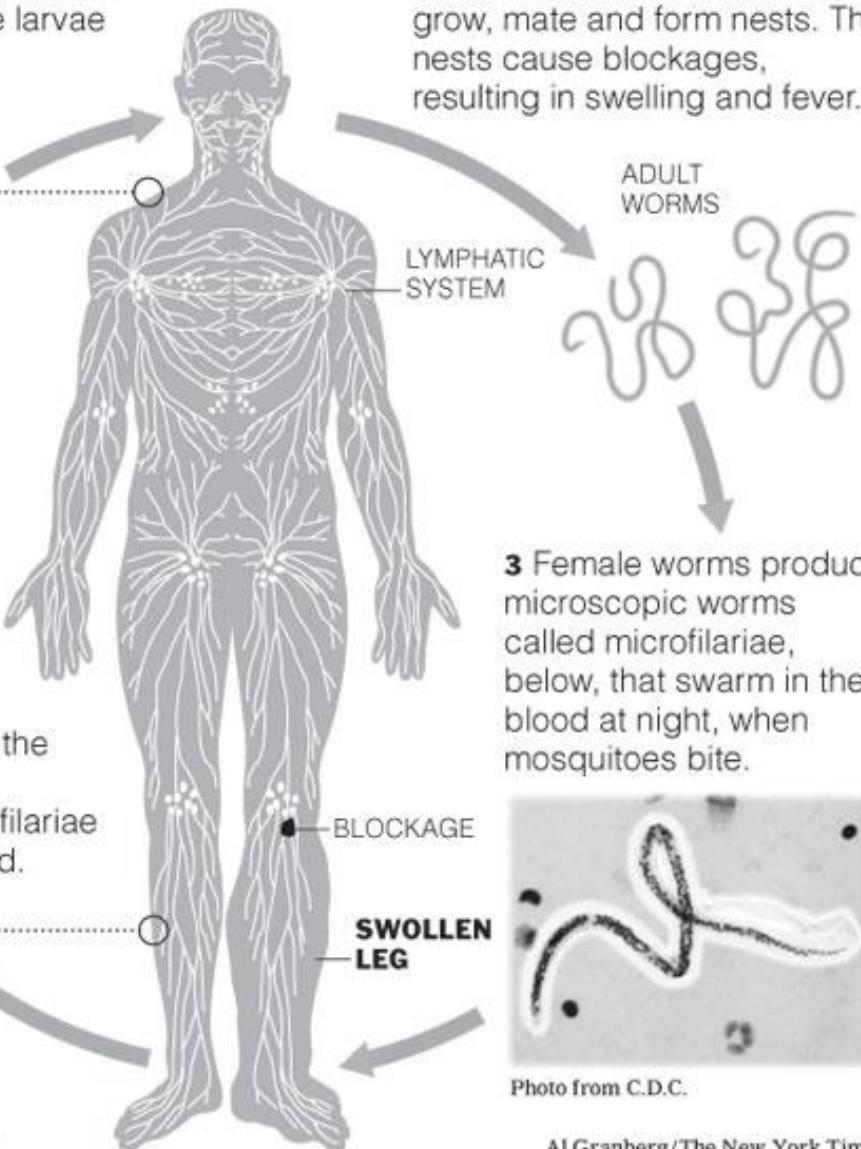


The Life Cycle of Lymphatic Filariasis

1 An infected mosquito deposits larvae on the skin while biting and the larvae enter the wound.



2 The larvae migrate to the lymphatic system, where they grow, mate and form nests. The nests cause blockages, resulting in swelling and fever.



5 Microfilariae develop into larvae over a period of a week.



4 A mosquito bites the infected person, ingesting the microfilariae along with the blood.



3 Female worms produce microscopic worms called microfilariae, below, that swarm in the blood at night, when mosquitoes bite.

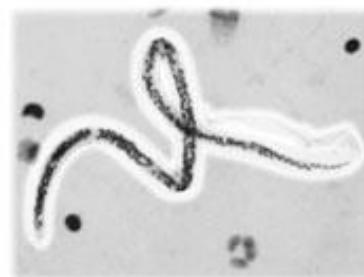


Photo from C.D.C.

Source: The Carter Center

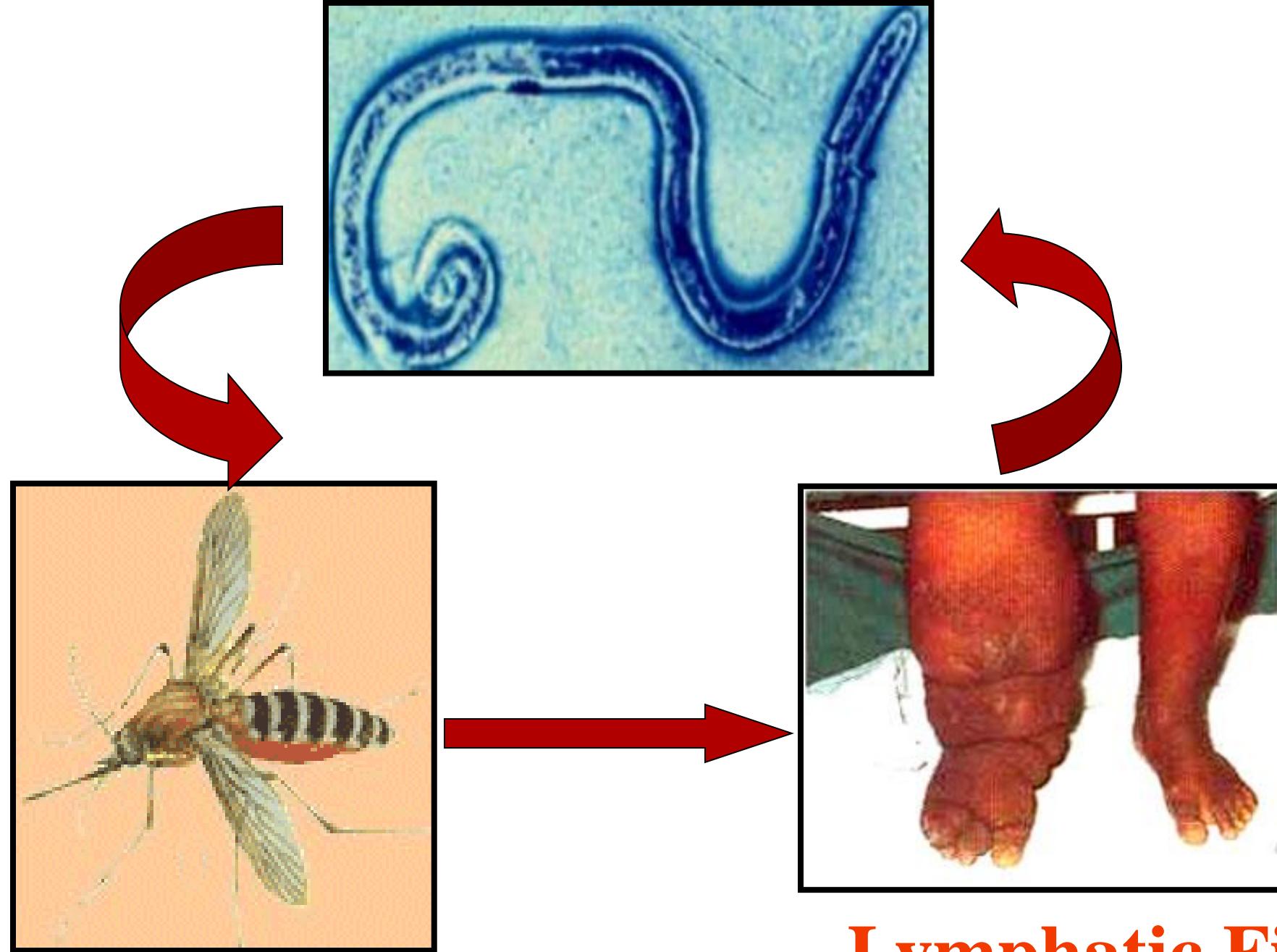
Al Granberg/The New York Times

In Sri Lanka dirofilariasis due to –

Dirofilaria repens
(ONLY)

Dirofilaria repens

- Natural parasite of subcutaneous tissues of the dogs.
- In Sri Lanka 30 – 60% dogs are infected.



Lymphatic Filariasis

- Lymphatic filariasis is a major public health problem in tropics
- Sri Lanka ?????
- Nearly 1.2 billion people are at risk of developing the disease all over the world
- Over 128 million have one of the various clinical condition



- Filarial worms that cause lymphatic filariasis are
 - Bancroftian filariasis - *Wuchereria bancrofti*
 - Brugian filariasis - *Brugia malayi*
Brugia timori
- In Sri Lanka lymphatic filariasis was mainly due to *Wuchereria bancrofti*
- Lymphatic filariasis due to *Brugia malayi* is also reported from the country
- *Wuchereria bancrofti* is responsible for 91% of cases of lymphatic filariasis all over the world

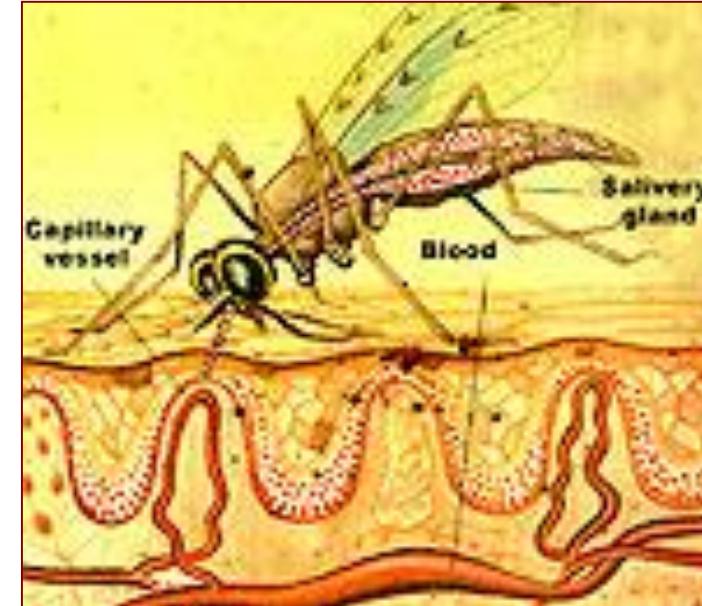
Wuchereria bancrofti

For *Wuchereria bancrofti*,

Mosquito → Intermediate host

Man → Definitive host

No free living forms



Habitat :

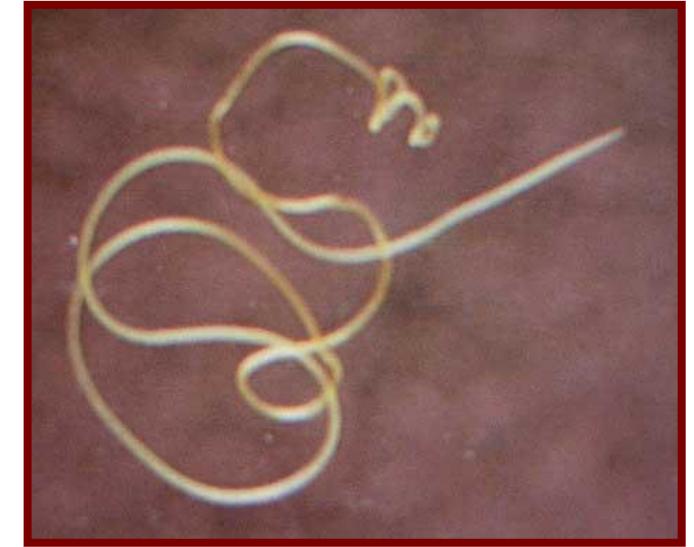
Lymphatic vessels

Sinuses of lymph nodes

- Commonly seen in the **Inguinal lymph nodes** and in the **lymphatic system of male and female genitalia**
- Less commonly seen in the axillary and epitrochlear lymph nodes

Morphology :

- White in colour
- Long thread like worms
- Females are distinctly larger than male worms



Females 8 -10 cm

Males 4 -5 cm

- Life span 10 years or more
- Are seen coiled inside the lymphatic

Microfilaria :

- are formed by the elongation of the embryos
- are released by gravid females to lymphatics
- are sheath microfilariae
 - elongated egg membrane remains as a protective sheath
- is acellular
- life span is 6 months to 1 year



Habitat of Mf :

- live in blood
- live mainly in the pulmonary circulation
- proportion of them escape into peripheral blood between 10.00 pm to 2.00 am
- can be detected in blood during the hours of their periodicity

Periodicity :

Number of detectable microfilariae in the blood fluctuate dramatically over a 24 hour period

or

Within humans microfilariae show a characteristic periodicity in the course of their 24hour cycle

**Microfilariae
density**

No of microfilariae
Unit volume of blood
(20, 60, 120 micro liters)



**Periodic form of Microfilariae are found in peripheral
blood only during few hours of the day**

Night → Nocturnally periodic
In most endemic areas

Day time → Diurnally periodic

Microfilariae are not seen in peripheral blood in other times
of the day

Eg. If Nocturnally periodic,

→ During the day **Microfilariae** are concentrated
in the microvasculature of deep tissues
predominantly in the lungs

Microfilariae are present in small numbers in peripheral blood throughout the day but show a marked increase during certain hours of the day

Night: **Nocturnally sub periodic**

Day time: **Diurnally sub periodic**

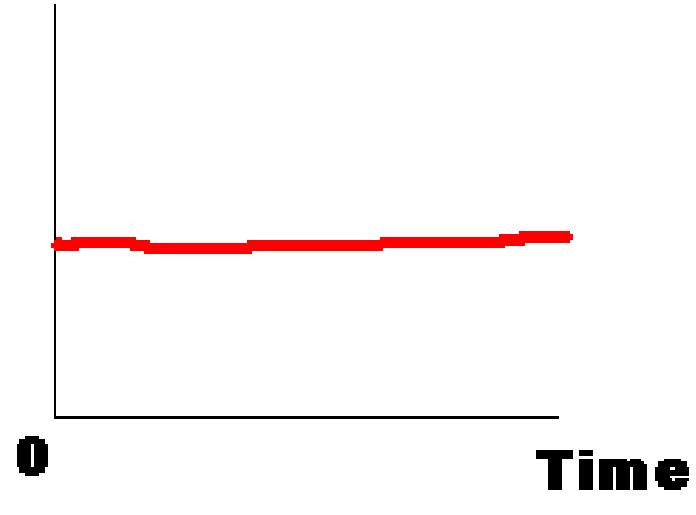
Non periodic:

- there is no change in the density of microfilariae

Periodicity is due to host factors;

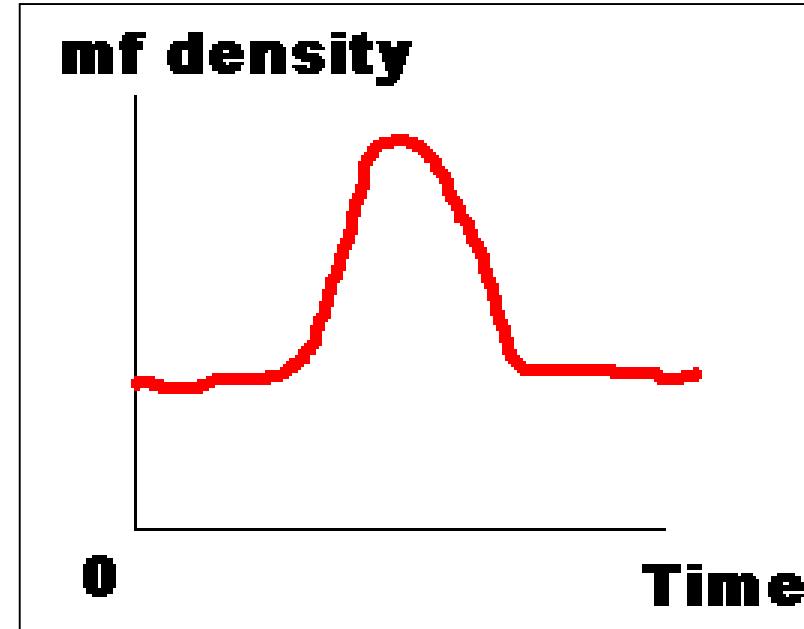
- Oxygen tension in the blood
- Body temperature

mf density

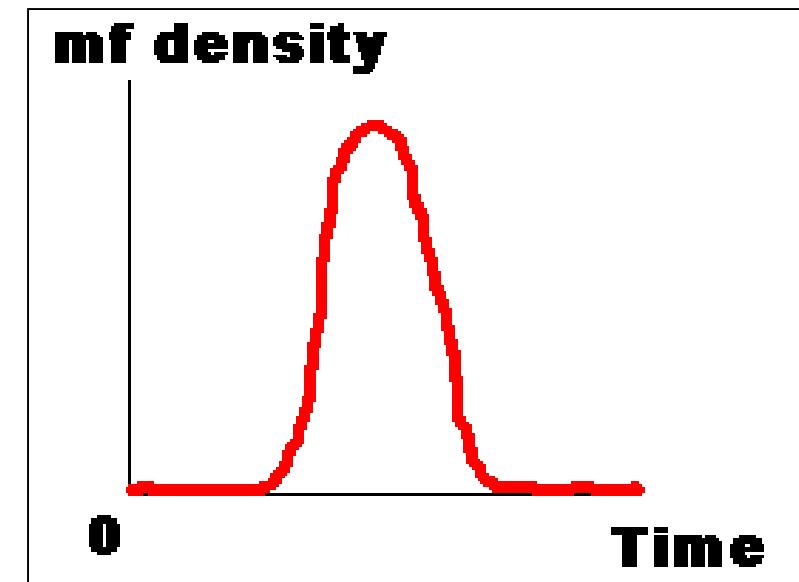


Periodicity :

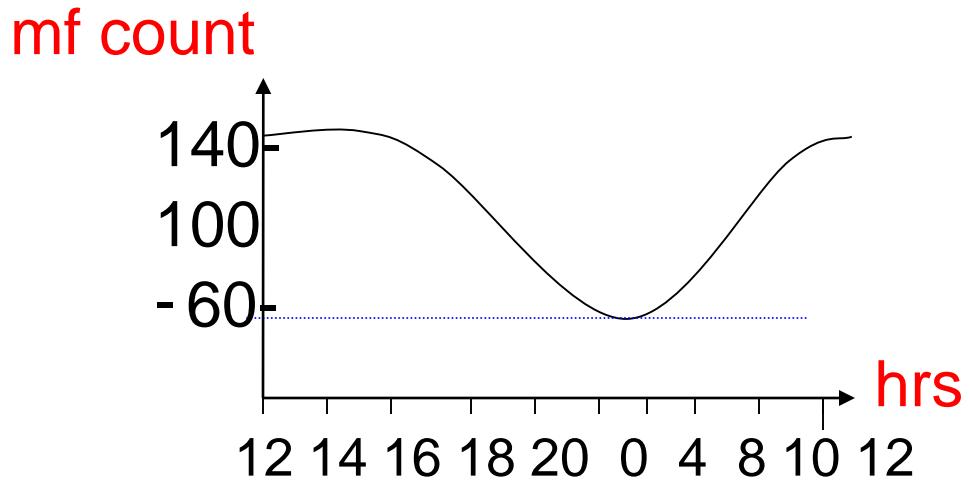
mf density



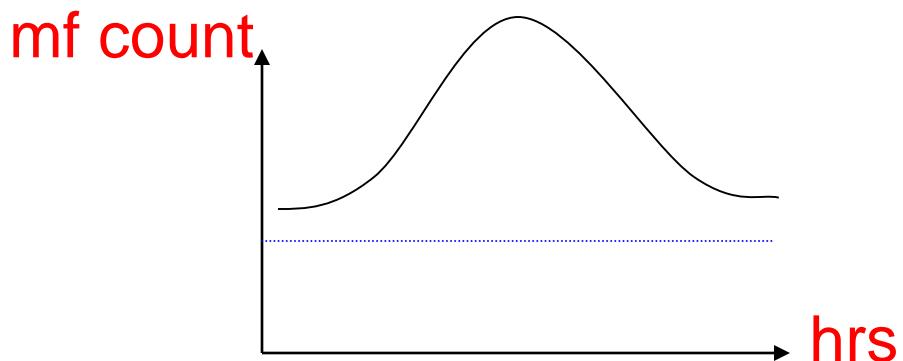
mf density



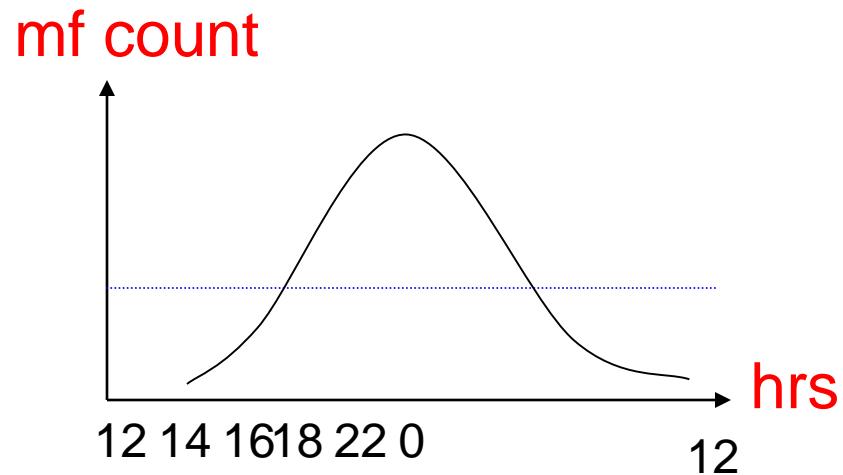
Periodicity curves of different filarial forms :



Diurnal subperiodic
- ***W.bancrofti***
- South Pacific

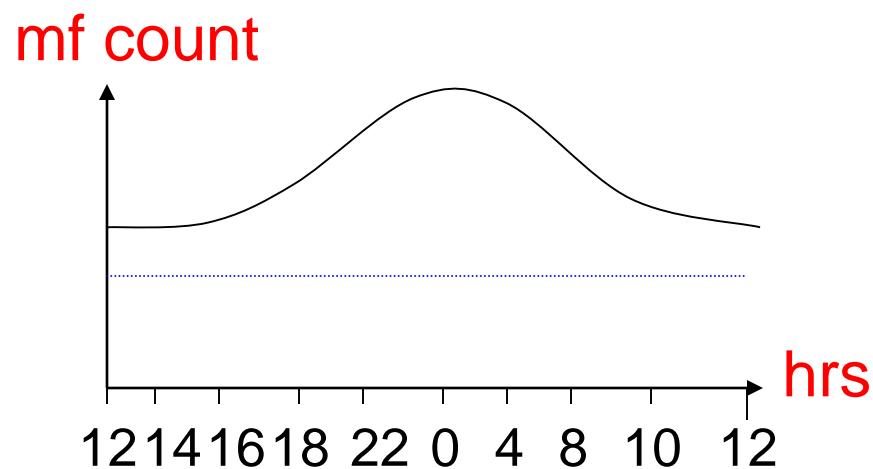


Nocturnally subperiodic
- ***W.bancrofti***
- West Thailand



Nocturnally periodic
W.bancrofti

Sri Lanka, Malaysia



Nocturnally subperiodic -
B.malayi in the
Philippines

Morphology of Mf :

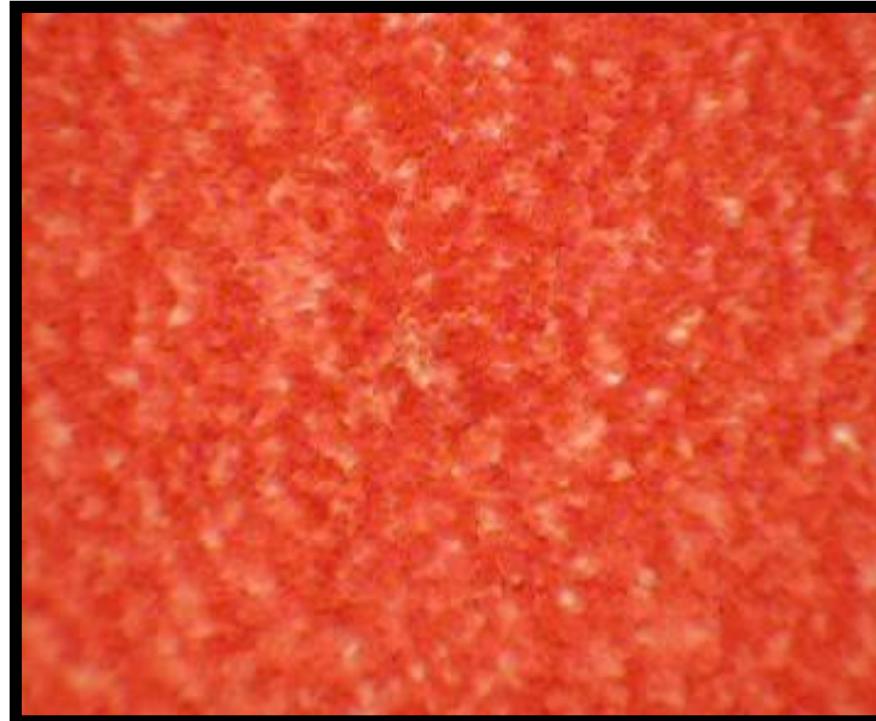
- Smoothly curved, thin and elongated
- Anterior end rounded
- Posterior end pointed
- Size 210x310 micrometers
- Sheath is longer than the Mf

- Whole body is filled with columns of nuclei
- But anterior and posterior ends are devoid of nuclei
- Nuclei are separated from each other
- At the tail end only a single row of nuclei

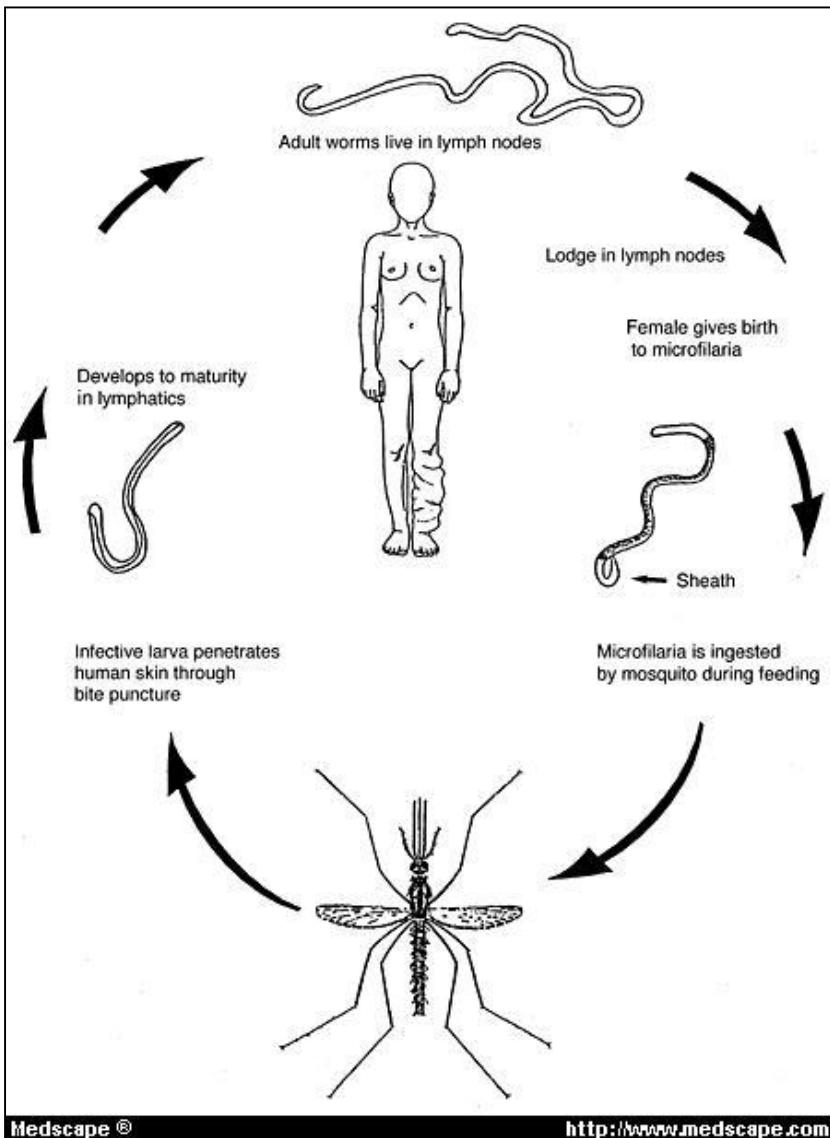


In a wet preparation they can be seen moving vigorously in a serpentine manner

They also move backwards and forwards within the sheath.



Life cycle of *Wuchereria bancrofti* :



Vector of Filariasis

- Over 70 different species and subspecies of mosquitoes have been identified as vectors

Culex quinquefasciatus,

- is the only vector for *W. b.* in Sri Lanka
- is a night biter
- found abundantly in urban areas

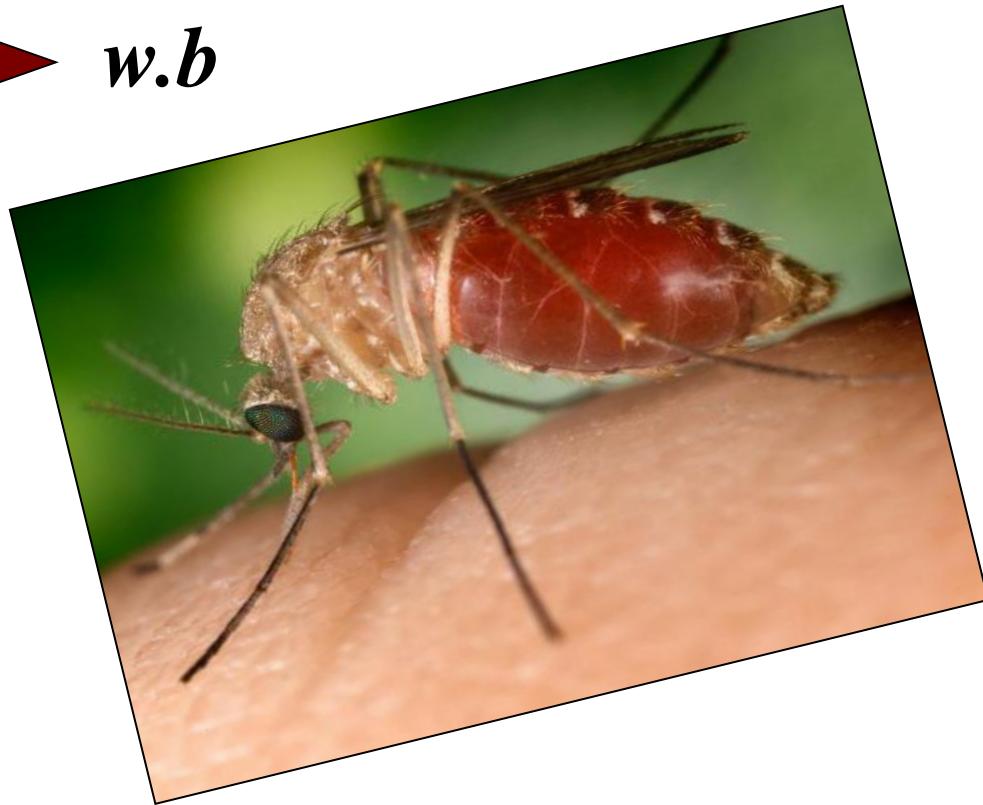
Other vectors:

Anopheles → *W.b / B.m / B.t*

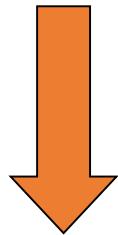
Aedes → *W.b / B.m*

Mansonia → *W.b / B.m*

Culex → *w.b*



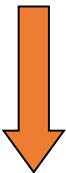
Microfilariae in peripheral circulation
(L1 stage)



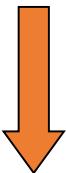
Are ingested with the blood meal of mosquitoes
(Mainly between **10 pm – 2 am**)

If not they will perish in 3-6 months (maximum 1 year)

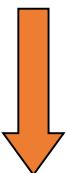
L1 lose their sheath within 15 – 30 minutes



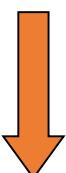
They penetrate the mid gut wall



Reach the thoracic muscles within 1-24 hrs



Become sausage shaped larvae (L2 stage)



Larvae grow larger and longer



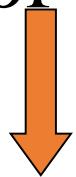
Become very active 3rd stage larvae
(They move within the haemocoel cavity)



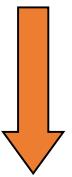
Migrate to the head and enter into the labium

**Now this mosquito is ready to infect
another healthy person**

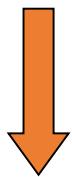
When mosquito is feeding, the larvae escape through the tips of labella



Enter man via the bite wound
(penetrate the host's dermis)



Larvae migrate to the lymphatics via peripheral blood vessels



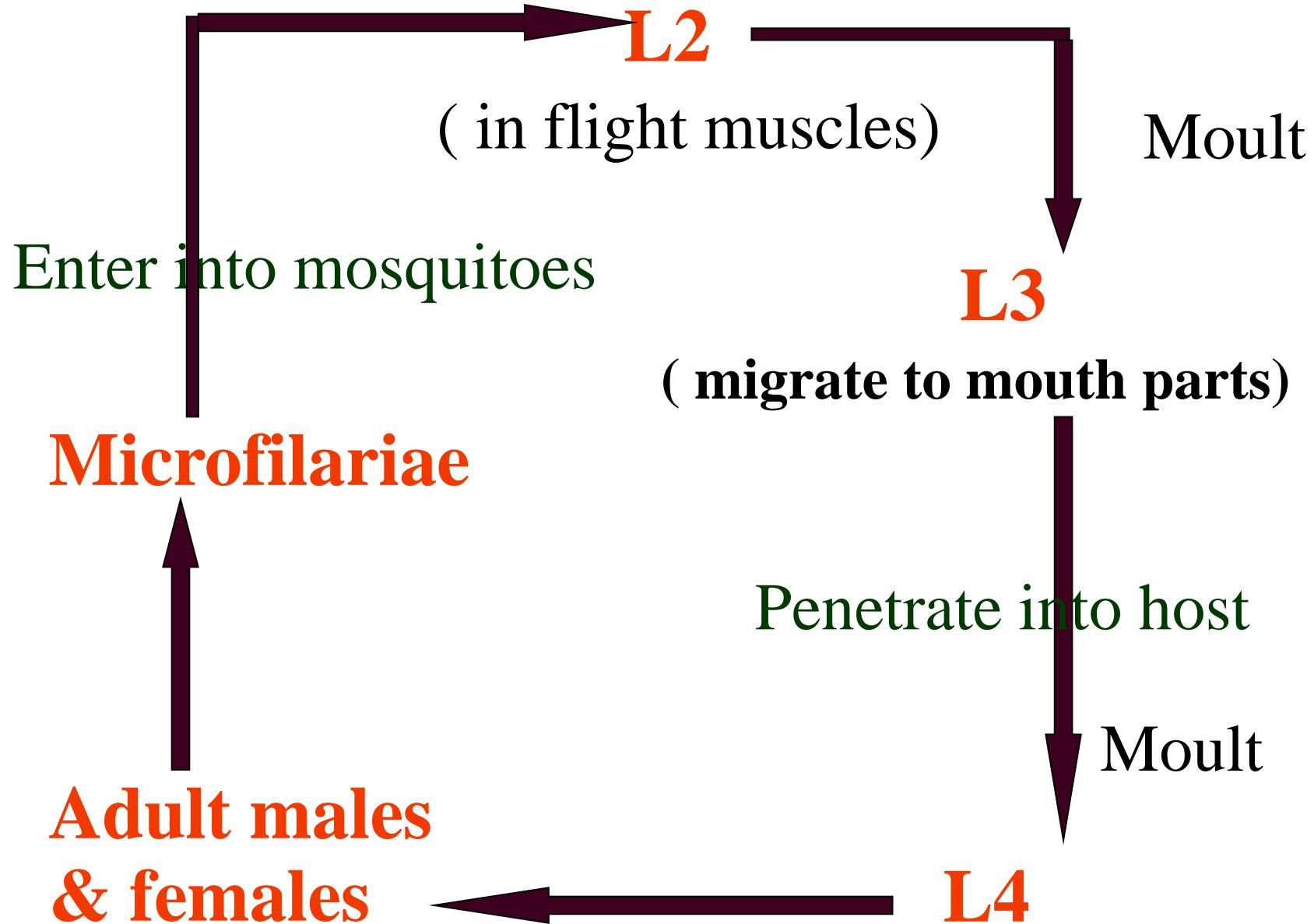
4th stage larvae



Mature adult worms

- It takes about 12 months for females to start producing eggs
- Adults reside in the lumen of dilated lymphatics

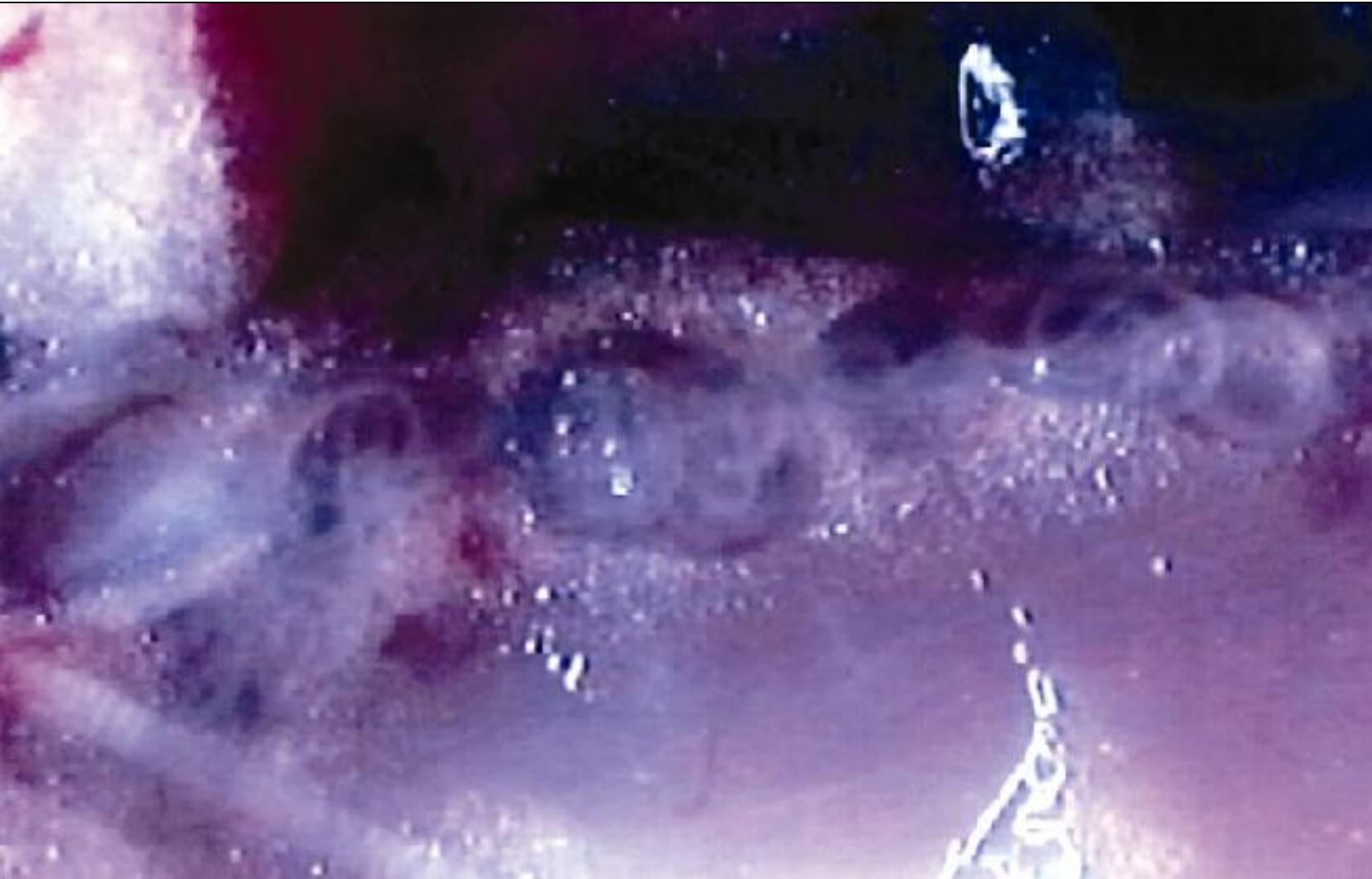




Pathogenesis of Elephantiasis

2 different mechanisms :

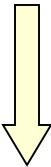
- i. Due to the presence of adult worms
- ii. Due to host immune reaction



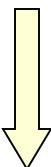
ADULT WORM WITHIN A LYMPHTICS

1. Pathology due to presence of adult worms

Presence of tangled masses of adult worms (live or dead) within the lymphatics



Leads to dilatation of the afferent lymphatics



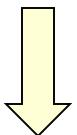
Leakage of lymph into the surrounding tissues



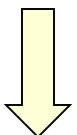
LYMPHOEDEMA

2. Pathology due to host immune response

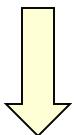
Inflammatory reaction around the parasite



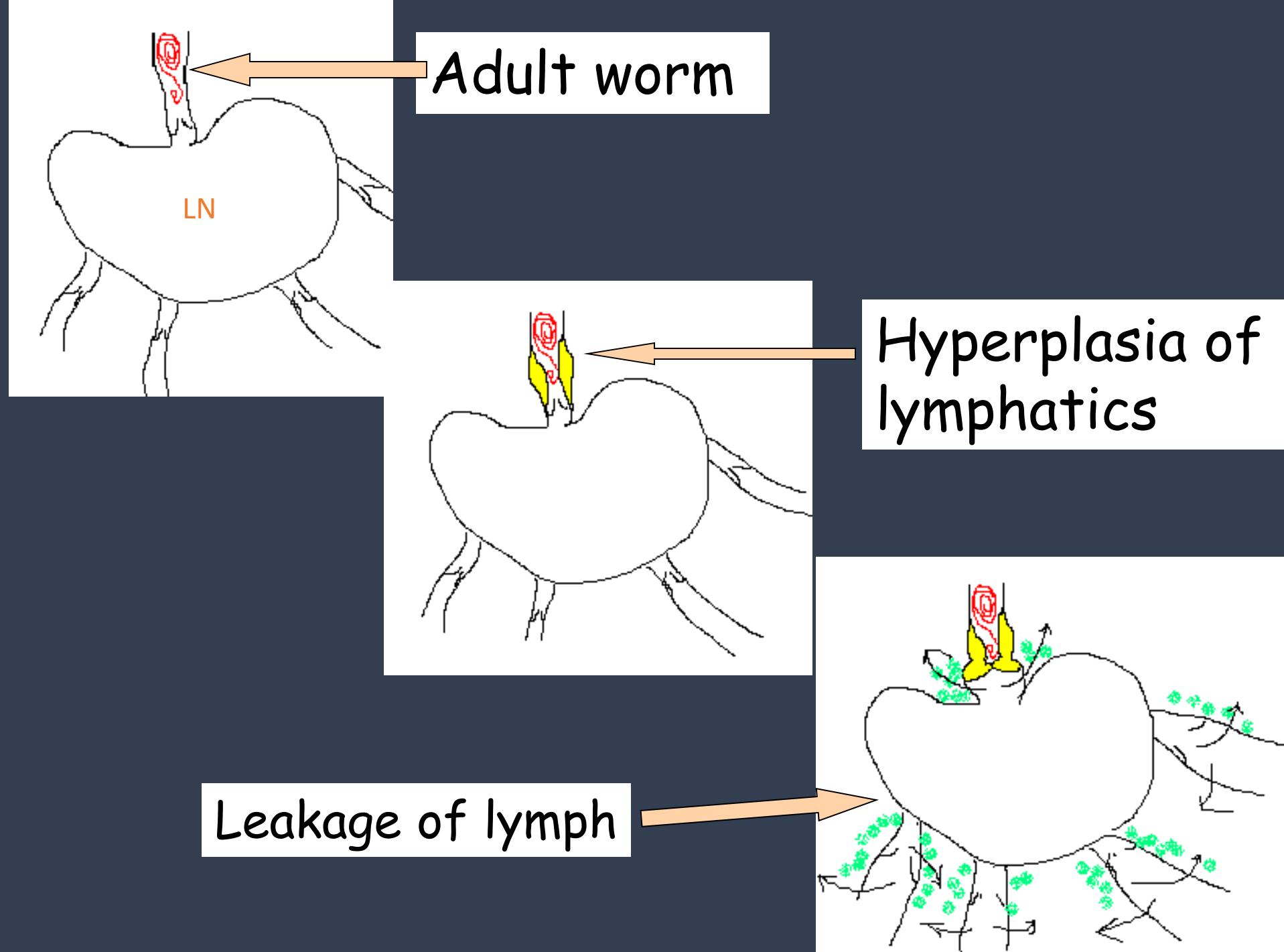
Granuloma formation



Obstruction of lymphatics



LYMPHOEDEMA



CLINICAL MANIFESTATIONS

Wide range of clinical manifestations

- Inguinal Lymphadenitis more common in Brugian than Bancroftian filariasis
- Lymphangitis also occur more frequently in Brugian filariasis
- Hydrocele and scrotal filariasis is not seen in Brugian filariasis

Signs & symptoms often differ from one endemic region to another

Hydrocoele more common in Tanzania

Both Hydrocoele & Elephantiasis
in equalent frequency in India

T.P.E. (tropical pulmonary
eosinophilia)..... India,
Brazil &
Malaysia

Chyluria Japan

Types of clinical manifestations :

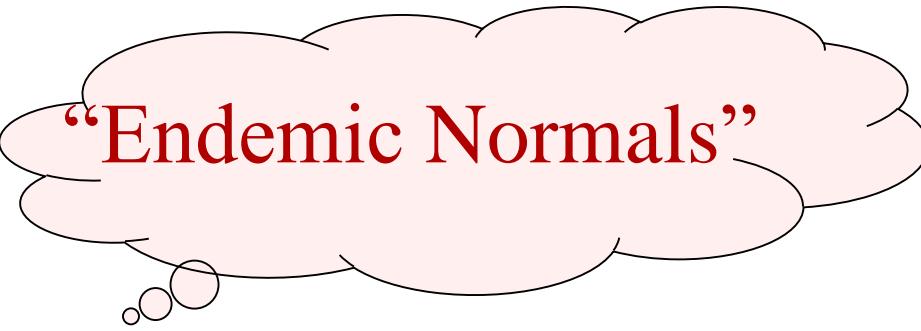
Asymptomatic amicrofilaraemia

Asymptomatic microfilaraemia

Acute manifestations

Chronic manifestations

1.) Asymptomatic amicrofilaraemia

- Is seen in all endemic areas
- People have
 - no clinical manifestations
 - no microfilariae in blood
- Are called as

“Endemic Normals”
- Newer diagnostic techniques detect parasite antigens from their blood

Asymptomatic



60 μ l finger prick blood test

(+)

Microfilaraemic



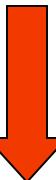
Amicrofilaraemic

(+)

Concentration techniques



Microfilaraemic



(-)

Amicrofilaraemic
Endemic normal

Asymptomatic Amicrofilaraemic

Endemic normal

Antigen tests

(-)

(+)

Asymptomatic

Amicrofilaraemic

Antigen negative

Asymptomatic

Amicrofilaraemic

Antigen positive

1. Asymptomatic amicrofilaraemic Antigen positive group

- may have sub clinical infection without microfilariae
- presence of filarial antigen in blood indicate current infection

Asymptomatic amicrofilaraemic Antigen negative group

- probably not been exposed sufficiently to become infected
- others may sufficiently exposed but do not have infection (Current diagnostic techniques may not sensitive enough to detect such infections)
- they may immune to infection partially or completely

2.) Asymptomatic microfilaraemic

- have microfilariae in blood but no clinical manifestations
- some may remain so for life
- others develop clinical disease either
 - a. after they have become amicrofilariamic spontaneously
or
 - b. while remaining microfilaraemic

3. Acute manifestations of lymphatic filariasis

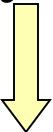
Clinical manifestations of acute filariasis :

- a. Filarial fever
- b. Lymphangitis and Lymphadenitis
- c. Funiculitis and Epididymitis
- d. Epididymoorchitis
- e. Filaria abscess

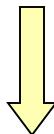
**Acute manifestations more common
in Brugian filariasis than in
Bancroftian filariasis**

ACUTE ATTACKS / Adenolymphangitis

Patients with lymphoedema

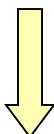


Have more bacteria and fungi on their skin

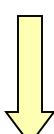


Develop entry lesions

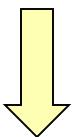
(following cuts, breaks or scratches in the skin)



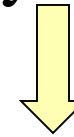
Large number of bacteria/ fungi enter via these lesions



Lymph nodes are not able to filter such large number of bacteria



Cause acute inflammatory reaction in the tissue



Acute attack (ADL attacks)



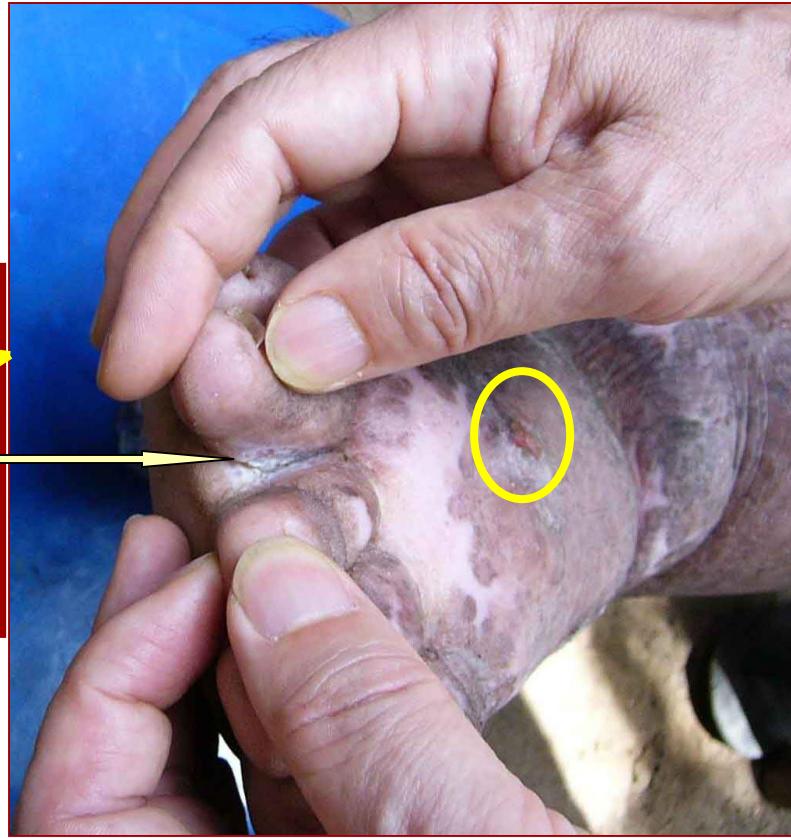
Result in further damage to the lymphatics



Rapid progression of the disease



“ Vicious Cycle”



→ In lymphatic filariasis, lymphoedema appears in only one part of the body

→ But bilateral disease can occur in the legs

If a patient has generalized swelling

→ Exclude other causes

a.) Filaria fever :

- Acute recurrent fever with chills and rigors
- Fever range from low to high grade (38- 40 centigrade)
- Sub side with sweating
- Associated with headache, malaise & loss of appetite
- May last for 3 to 5 days

b.) Lymphangitis and Lymphadenitis :

- Are characteristic of Bancroftian & Malayan filariasis
- Acute onset
- Involve single lymph node or group of lymph nodes
- Is associated with fever
- Is a retrograde lymphangitis

- Lymphatic trunks painful and cord like
- Visible as red streaks in skin of arms and legs
- Distal part of affected limb becomes swollen and oedematous
- Last for several days
- Fever + / -

Lymphangitis may occur in,

- Groin glands
- Testis
- Spermatic cords

“ Endemic Funiculitis”

Clinical features of Acute Attacks :





ADL with Bursting of Blister



ADL with Skin Peeling



c.) EPIDIDYMITIS :

- is an acute painful inflammation of the epididymis
- is usually associated with fever
- acute symptoms last for few days
- but recur at intervals
 - may lead to sterility

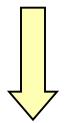
d.) EPIDIDYMO-ORCHITIS :

- orchitis is an acute painful condition involving the testis and epididymis
- Patients come with scrotal swelling and redness
- recurrent attacks lead sooner or later to hydrocele

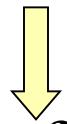
e.) FILARIAL ABSCESS :

- filarial abscesses develop within superficial lymphatics on the limbs or scrotum

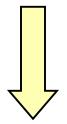
- first symptoms resemble of an attack of lymphangitis



pain and swelling increase with time



rupture of swelling



pus comes out

- pus may be sterile or contain bacteria
- fragments of dead adult worms may be seen within the pus





d.) CHRONIC MANIFESTATIONS OF FILARIASIS :

- Chronic stage of filariasis usually develop 10-15 years from the onset of the first acute attack
- Incidence and severity of chronic clinical manifestations tends to increase with age

Chronic Filariasis manifest as ,

- a.) Chronic lymphangitis
- b.) Thickened lymphatic trunk
- c.) Chronic lymphoedema & Elephantiasis
- d.) Lymph scrotm
- e.) Hydrocele
- f.) Chyluria

a.) Chronic Lymphangitis :

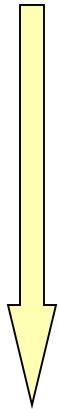
- Enlarged lymphatic glands with fibrotic changes
- Usually occur in groin glands
- Patients come with lumps in the groin
- Biopsy of node may reveal numerous coiled up adult worms

b.) THICKENED LYMPHATIC TRUNK :

- Occurs following repeated attacks of lymphangitis
- Can feel the remaining line of induration

c.) Chronic lymphoedema & Elephantiasis

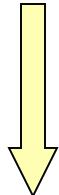
Lymphoedema (Initially pitting)



With recurrent episodes
of acute attacks

Oedema rapidly progresses with time

But subsides slowly

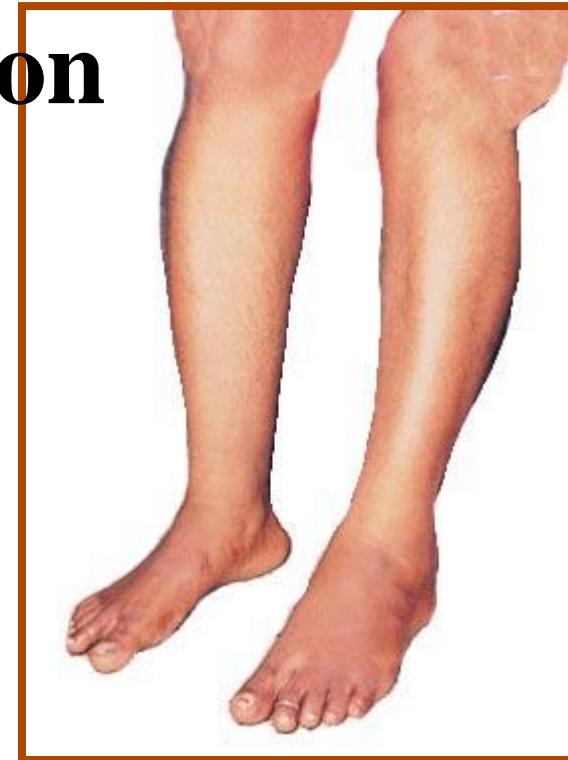


Permanent non pitting oedema

Classification for Lymphoedema

Grade I :

- Mostly pitting oedema
- Spontaneously reversible on elevation



Grade II :

- Mostly non pitting
- Not spontaneously reversible on elevation



Grade III :

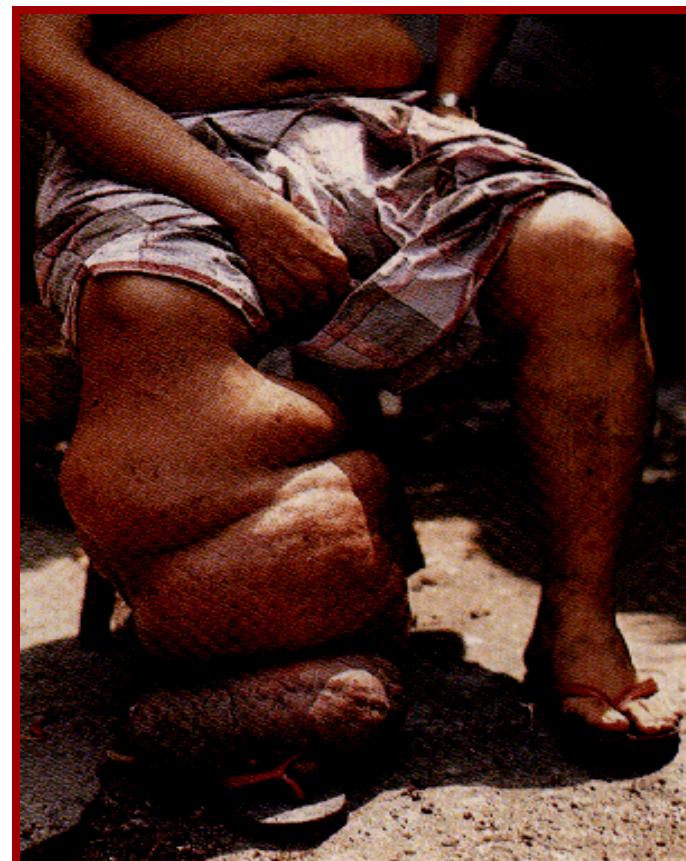
- Gross increase in volume
- Dermatosclerosis & papillomatous lesions



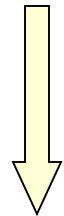


© VCRC

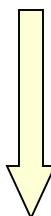
In most patients lymphoedema extends above the knee



In elephantitic stage



Usually no living adult worms



No detectable microfilariae in blood

d.) LYMPH SCROTUM :

- Thickened scrotal skin
- Lymphatic varicosities +
- serosanguineous discharge from skin lesions
- associated with Inguinal & Femoral adenopathy

e.) HYDROCELE :

- Is the commonest manifestation of bancroftian filariasis among males
- Occurs due to blockage of draining lymphatics
- Usually do not give any history of ADL attacks



d.) CHYLURIA :

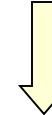
- Patient complains of passing milky white urine
- Occurs due to rupture of lymphatics into the urinary system
- give rise to complications like,
 - loss of fat
 - loss of protein

PATHOLOGY OF ELEPHANTIASIS :

a.) Allergic reaction to adult worms

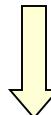


Recurrent obliterative endolymphangitis

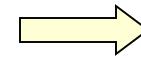


ELEPHANTIASIS

b.) Dead worm



Provokes granuloma reaction

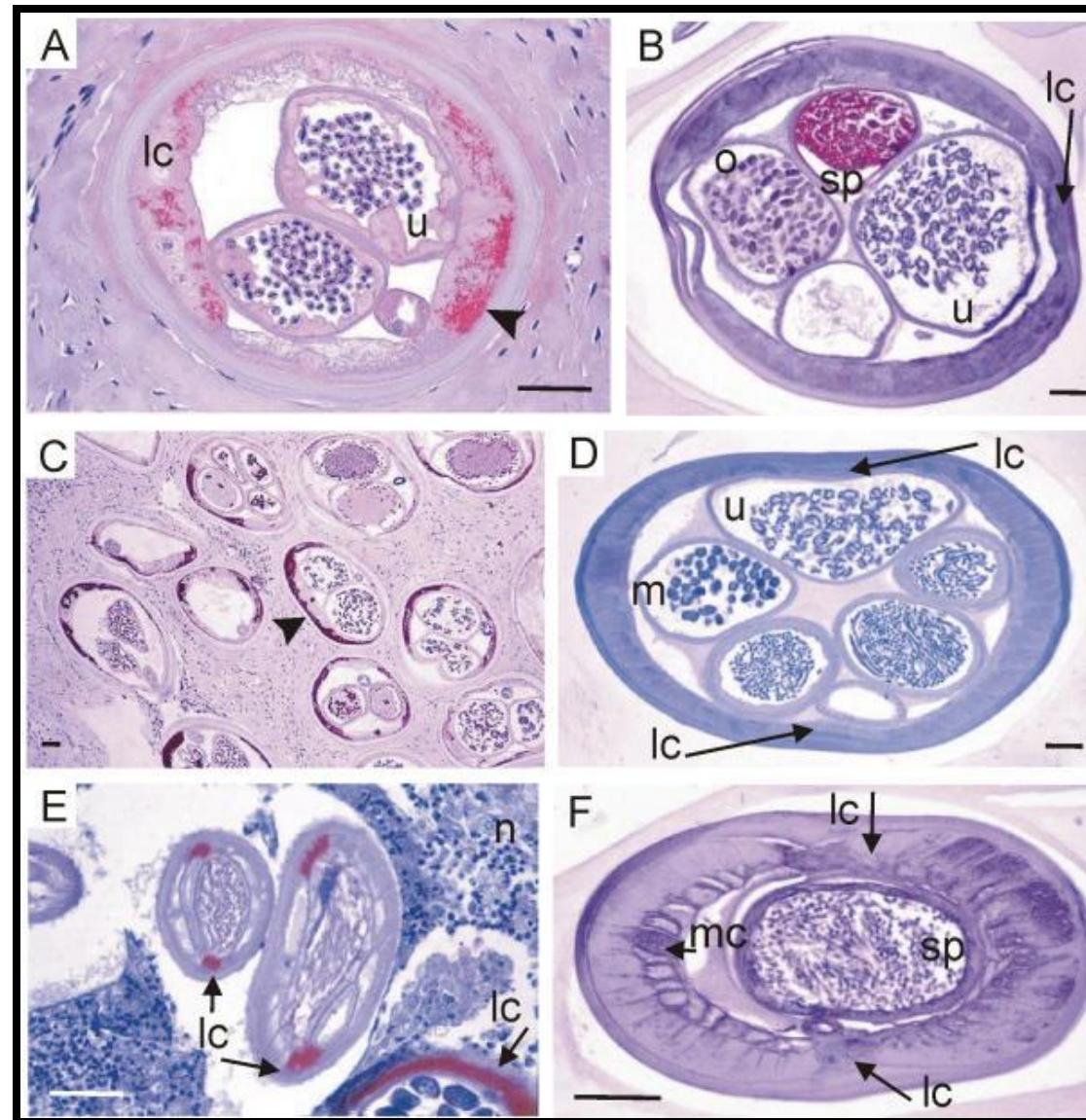


Fibrosis



ELEPHANTIASIS

Wolbachia



- *Wolbachia* is found within almost all the pathogenic filarial parasites
- Parasite can not live without *Wolbachia*
- Trans-ovarian transmission
- Sensitive to Tetracyclines

Anti Wolbachial antibiotics would be
the next generation treatment for
filariasis

Role of Wolbachia in pathogenesis of filariasis,

In vitro and vivo studies showed,

Wolbachia extract can induce almost all the immunological reactions that found in filariasis

Wolbachia free filarial nematodes failed to do so

OCCULT FILARIASIS

The term Occult Filariasis is commonly used to describe the filarial infections in which mf are not found in the peripheral blood although they may be seen in tissues

- Occult filariasis is believed to result from a hypersensitivity reaction to filarial antigens derived from microfilariae
- Only a very small proportion of individuals in a community where filariasis is endemic develop occult forms of the disease

Clinical manifestations of Occult filariasis are,

- a.) TROPICAL PULMONARY EOSINOPHILIA**

- b.) GLOMERULONEPHRITIS**

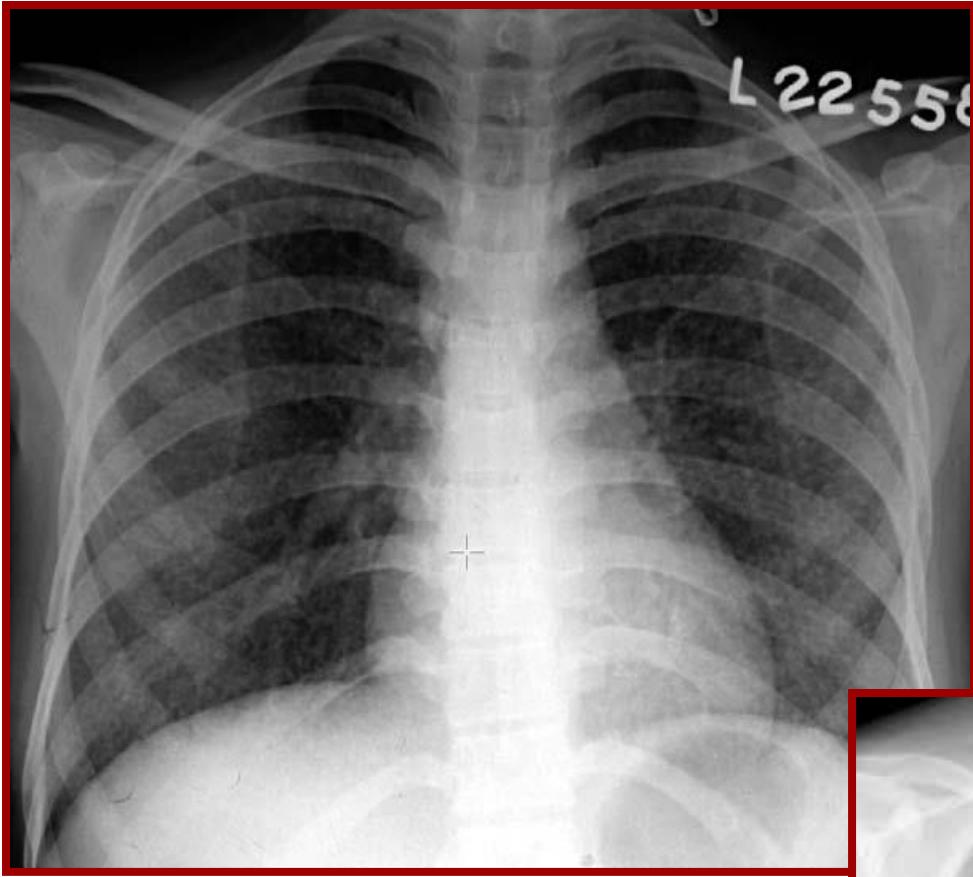
- c.) FILARIAL ARTHRITIS**

a.) TROPICAL PULMONARY EOSINOPHILIA :

Its main clinical manifestations are:

- Severe Cough and wheezing
(especially at night)
- Frequent weight loss and fatigue
- Minimal or no fever
- Restrictive or obstructive lung abnormalities

- Abnormal chest radiographs
 - show diffuse mottled pulmonary interstitial infiltrate
- Peripheral blood eosinophilia $> 3000 \text{ cell}/\mu\text{l}$
- Extreme elevation of immunoglobulin (IgE)
- Extreme elevation of anti-filarial antibodies
- Excellent response to DEC.



b.) FILARIAL ARTHRITIS

- Usually affects the knee joints
- Is fairly common in filarial endemic areas



FILARIASIS -2

DR. Gayana Gunaratna
MBBS (RUHUNA),
Dip. Med. Micro, MD Med. Micro (Colombo)
Department Parasitology

OBJECTIVES :

1. Know the scientific names of the filarial worms that affect humans
2. Describe the lifecycle and morphology of the different stages of filarial worms
3. Discuss the epidemiology of filariases
4. Describe the pathology and pathogenesis of filariases
5. Discuss on clinical manifestations of filariases
6. Describe the laboratory diagnosis of filariases
7. Outline the management of filariases
8. Discuss on control and prevention of filariases

LABORATORY DIAGNOSIS :

1. Direct methods for Mf

- i. Wet blood film examination
- ii. Thick night blood film examination

Concentration techniques;

- i. Knott's method
- ii. Membrane Filtration

DEC provocation Test

Detection of adult worms – Histology on biopsy specimens

2. Indirect methods; serological

- a) Detection of circulating filarial antigens (CFA)
- b) Detection of filarial antibodies

Direct methods :

Detection of mf in blood

1. Thick Blood film



Collect 20-60 µl- capillary blood at night (10p.m.-2a.m.)

Thick film made on a slide

Dry

Stain with Geimsa/ delafIELDS haematoxylin

Examine under microscope

Species identification



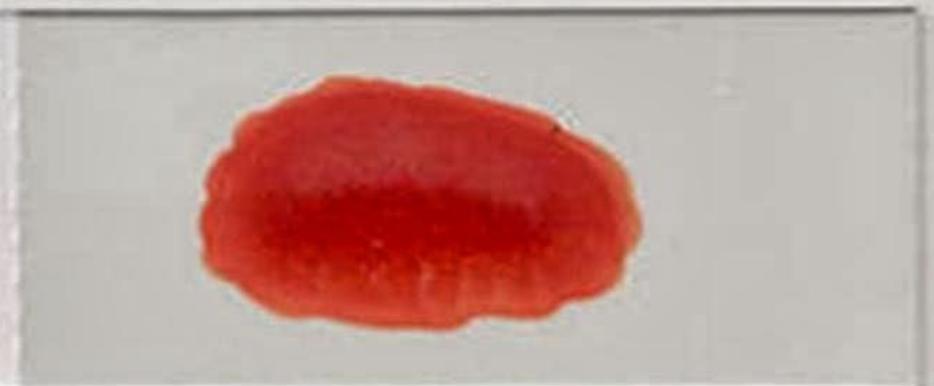
A

**THIN
SMEAR**

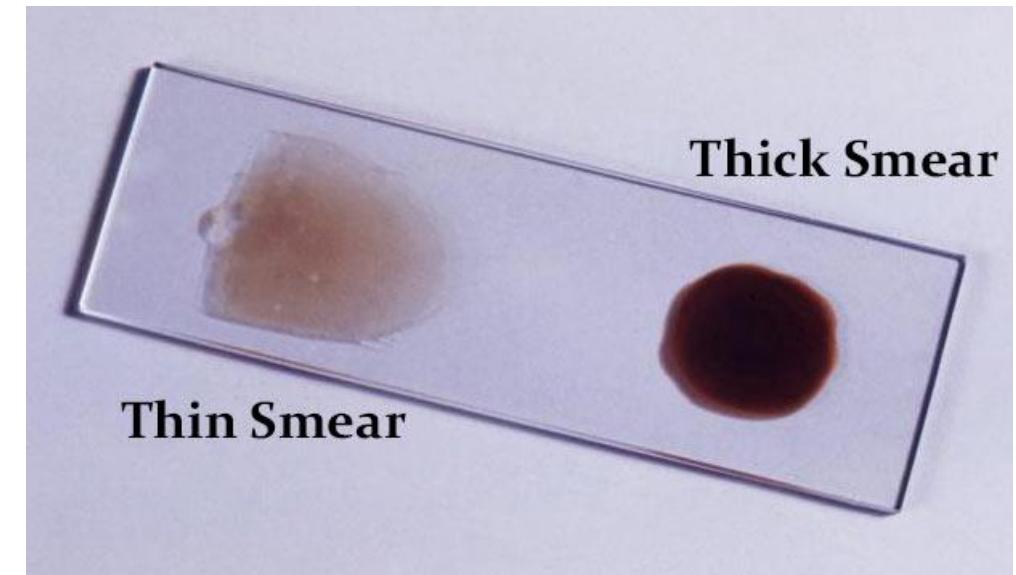


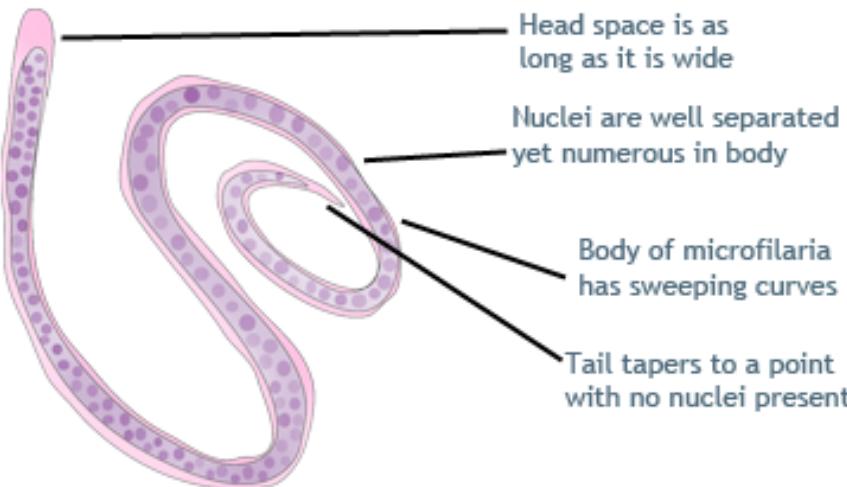
B

**THICK
SMEAR**



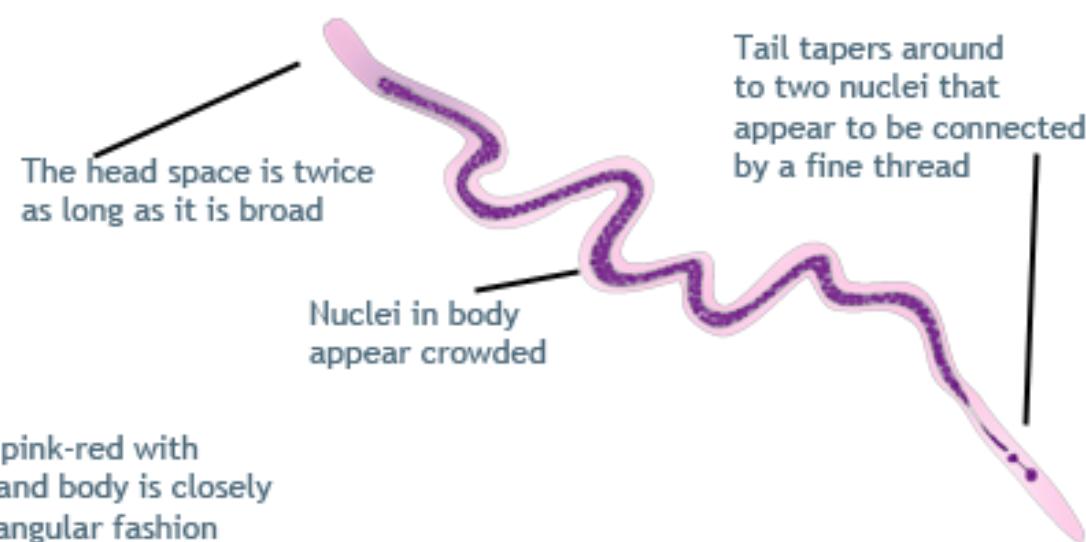
<http://textbookhaematology4medical-scientist.blogspot.sg/>





Brugia malayi

Sheath stains pink-red with Geimsa stain and body is closely folded in an angular fashion

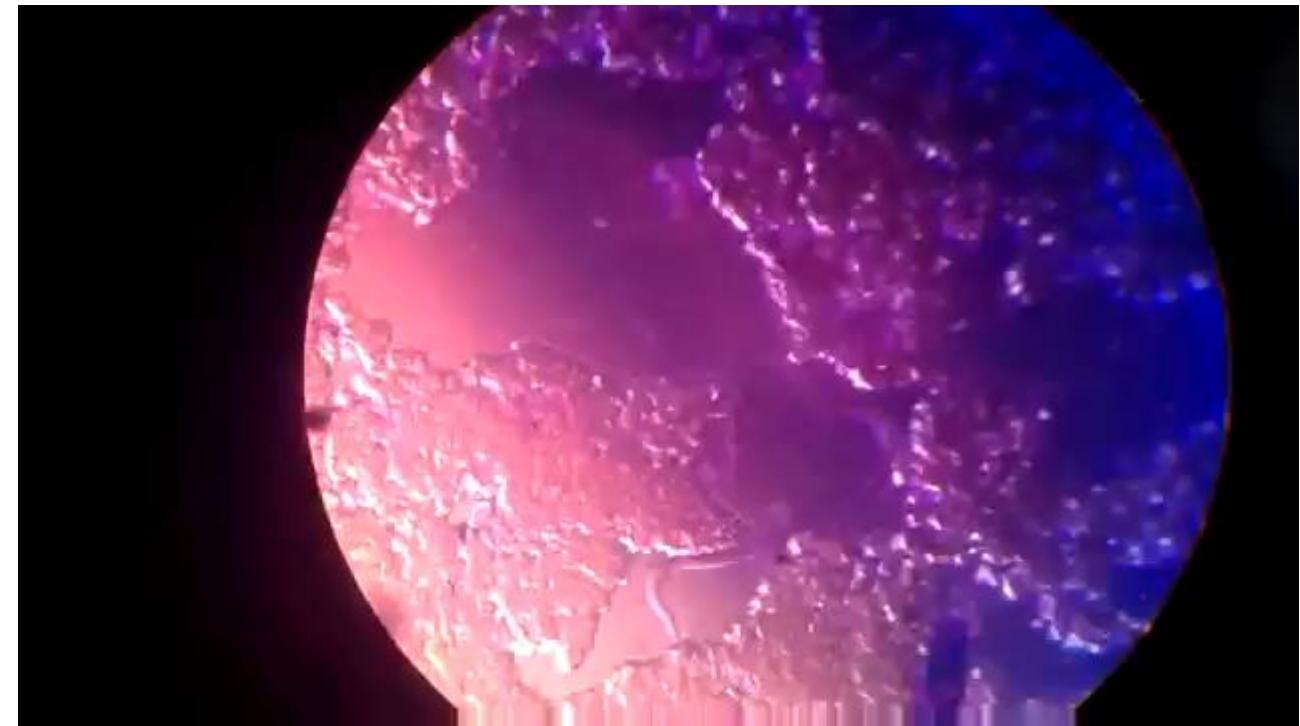
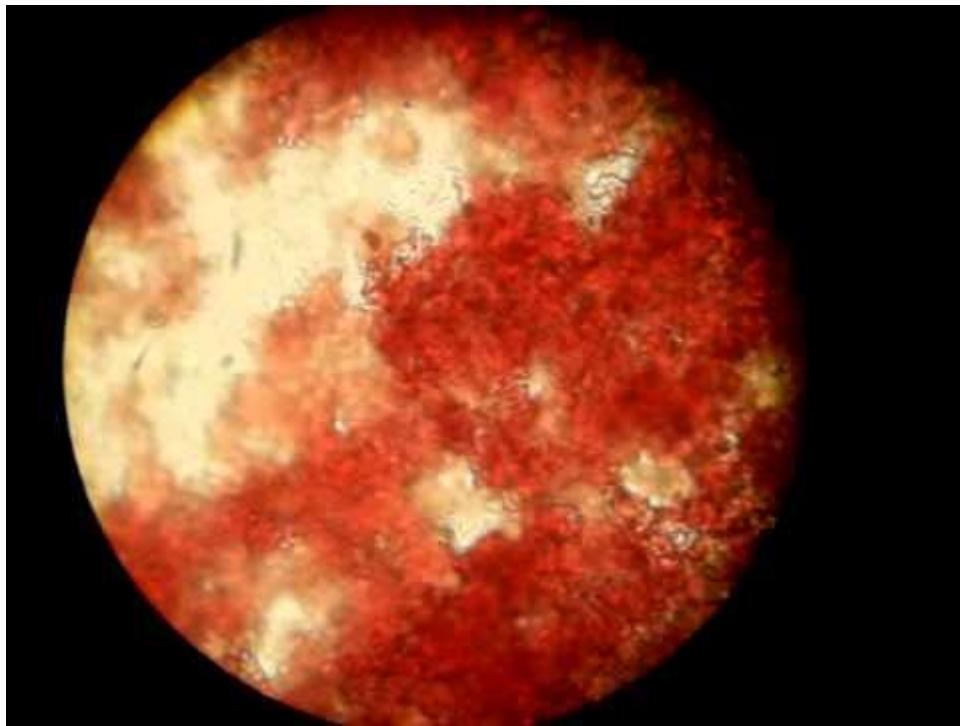


Wuchereria bancrofti
microfilariae

are found in the blood and are sheathed. The sheath typically stains pale pink with Giemsa.

2. Wet film

- 2-3 drops of blood + 1-2 drops of saline on a slide
- Examine under microscope for live (motile) mf



3. Concentration techniques

1. Knott's method

1ml of venous blood diluted with 9 ml of 2% formaline,
centrifuged & deposit examined for mf

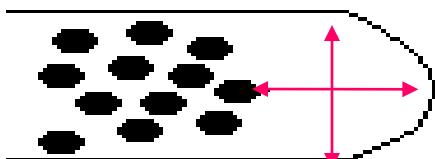
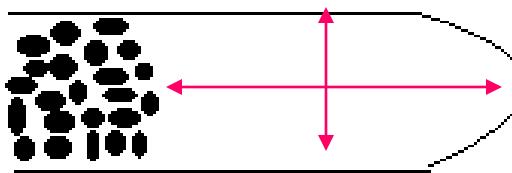
2. Membrane filtration method

1ml of venous blood diluted with 9 ml of saline, filtered
through a 5 µm nucleopore membrane and examine filter
membrane for mf

4 DEC provocative method

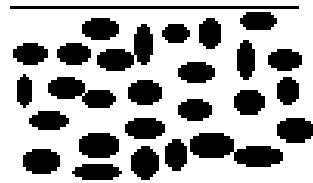
- Nocturnally periodic mf are provoked to come into the peripheral circulation during day time
- Patient is given **100 mg of DEC** and examine blood after 45- 60 minutes
- Sensitivity less than Thick blood film (night)

Comparison of microfilaria of *Wuchereria bancrofti* and *Brugia malayi*

	<u><i>W.bancrofti</i></u>	<u><i>B.malayi</i></u>
Sheath	+	+
Length	250-300μm	75-230μm
Appearance	Graceful, sweeping curves 	Irregular, kinky curves 
Cephalic space	Length=breadth (square in shape) 	Length =2*breadth (Rectangular in shape) 

Nuclear column

Discrete, round nuclei can be counted



Tail Tip

Pointed, free of nuclei



Nuclei blurred cannot be counted easily



Two distinct nuclei
(terminal + subterminal)





Left; Microfilaria of *B. malayi*

Below; Microfilaria of *W. bancrofti*

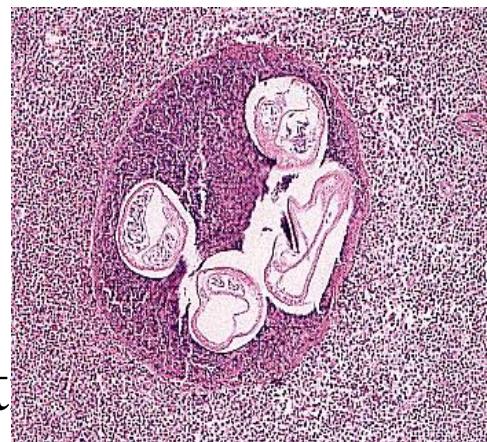


Photo
John Walker

Detection of adult worm:

- i. Biopsy of Lymph nodes – Histological examination
- ii. USS of Lymph nodes
 - Visualize the motile adult worms
 - “dancing worms” in superficial lymphatics (scrotal/ inguinal etc)

‘FILARIA DANCE SIGN’



5. Indirect methods; serological

a) Detection of circulating filarial antigens (CFA)

Card test (Immunochromatographic card test -ICT)

ELISA (Og4C3)

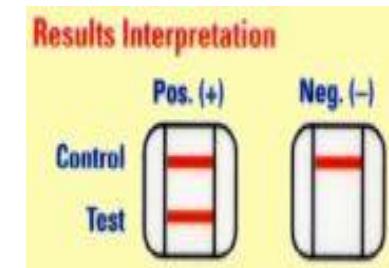
Advantages

Blood can be tested at any time of the day.

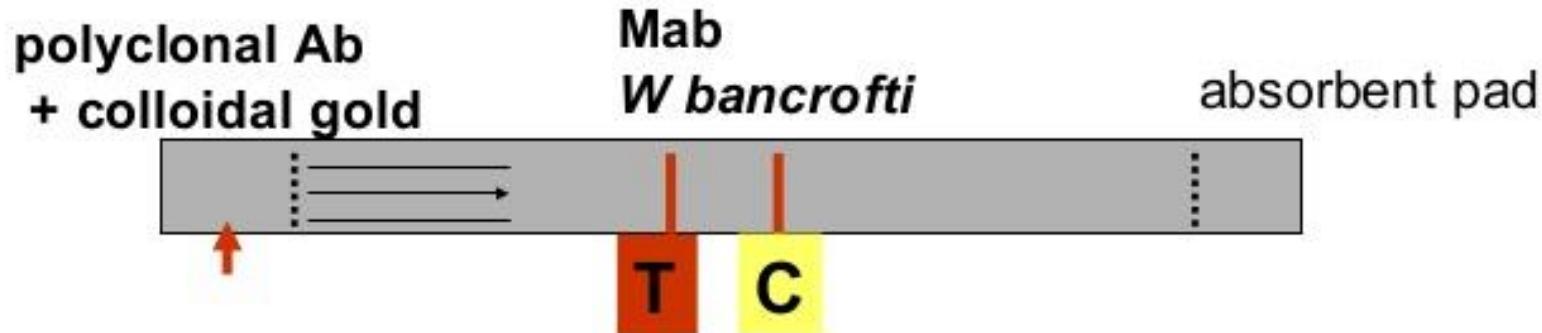
Indicate active infection

ICT card

- Easy to perform
- Quick results
- Ideal field test
but
- Expensive



Antigen detection strip (card) tests- RDTs



RDT = Rapid Detection Tests

=

Immunochromatographic Card Test

Serological diagnosis

b. Detection of antibodies specific for the filarial parasite

IFAT

ELISA

ICT for *Brugia* Spp

Disadvantages

- Cannot distinguish past/ present infections
- Cross reactivity

MANAGEMENT OF LYMPHATIC FILARIASIS

Treatment of acute attacks :

- If secondary infection is the cause appropriate systemic antibiotics/ anti-fungals
- Maintain hygiene
- Analgesics (paracetamol)
- Rest (avoid exercises)
- After the acute attack subside administer anti-filarial treatment (when acute attack is due to adult worms)

Treatment of chronic manifestations :

Management of hydrocoele

Early- drug treatment

Late-surgery

Management of chyluria

Nutritional support

Surgery / lymphangigraphy

Management of lymphedema

- Foot hygiene –washing with soap & water daily or bd
- Dry well
- Search for wounds – wash with antiseptics and apply topical antibiotic/ antifungal
- Limb elevation
- Appropriate exercises for affected part
- Use of foot wear
- Avoid trauma to affected part
- Properly applied bandages
- Systemic antibiotics (monthly penicillin IM/ oral)

EPIDEMIOLOGY OF FILARIASIS

What Is Epidemiology ?

A branch of medical science that deals with the incidence, distribution, and control of disease in a population

The sum of the factors controlling the presence or absence of a disease or pathogen.

**HISTORY AND EPIDEMIOLOGY
OF
FILARIASIS IN SRI LANKA**

Information available about the symptoms of filariasis from very early times
(3rd/4th B.C.)

e.g. In Buddhist history

Vessanthara Jathaka says “Jujaka” was suffering from elephantiasis in one leg

4th Century A.D. - King Buddadasa of Sri Lanka had described elephantiasis in his medical treatise

1879 - Cases of elephantiasis were detected

1892 – Cases of microfilaraemia were detected

According to historical evidence,

B.malayi infection was introduced into Sri Lanka in between 12th & 13th century A.D., as a result of Kalinga invasion (Abdulcadar,1962)

Wuchereria bancrofti infection was introduced by the Chinese army, invaded the country through port of Galle during 15th A.D.

(Galle legs)

Dassanayaka (1937-1939):

- 2 foci of *W.bancrofti* infection in Galle & Matara
- *B.malayi* was the main filariasis problem in Sri Lanka
- Vectors of Malayan Filariasis
Mansonia sp.
- Vector of bancroftian filariasis
Culex pipens fatigans

Until 1939;

Bancroftian filariasis was confined to Galle and Matara

Extension to the Southwestern coastal belt was due to the presence
of African troops with high microfilaria rates and high density
of vector mosquitoes in those areas

After World war
II

...

Dassanayaka (1947) –
showed new areas
of infection
(very heavy)
along the
S.W. coastal belt
specially
in urban areas

Bancroftian filariasis
became a problem,
many cases of lymphangitis
were recorded at the
Department of Health

ANTI FILARIASIS CAMPAIGN (AFC)

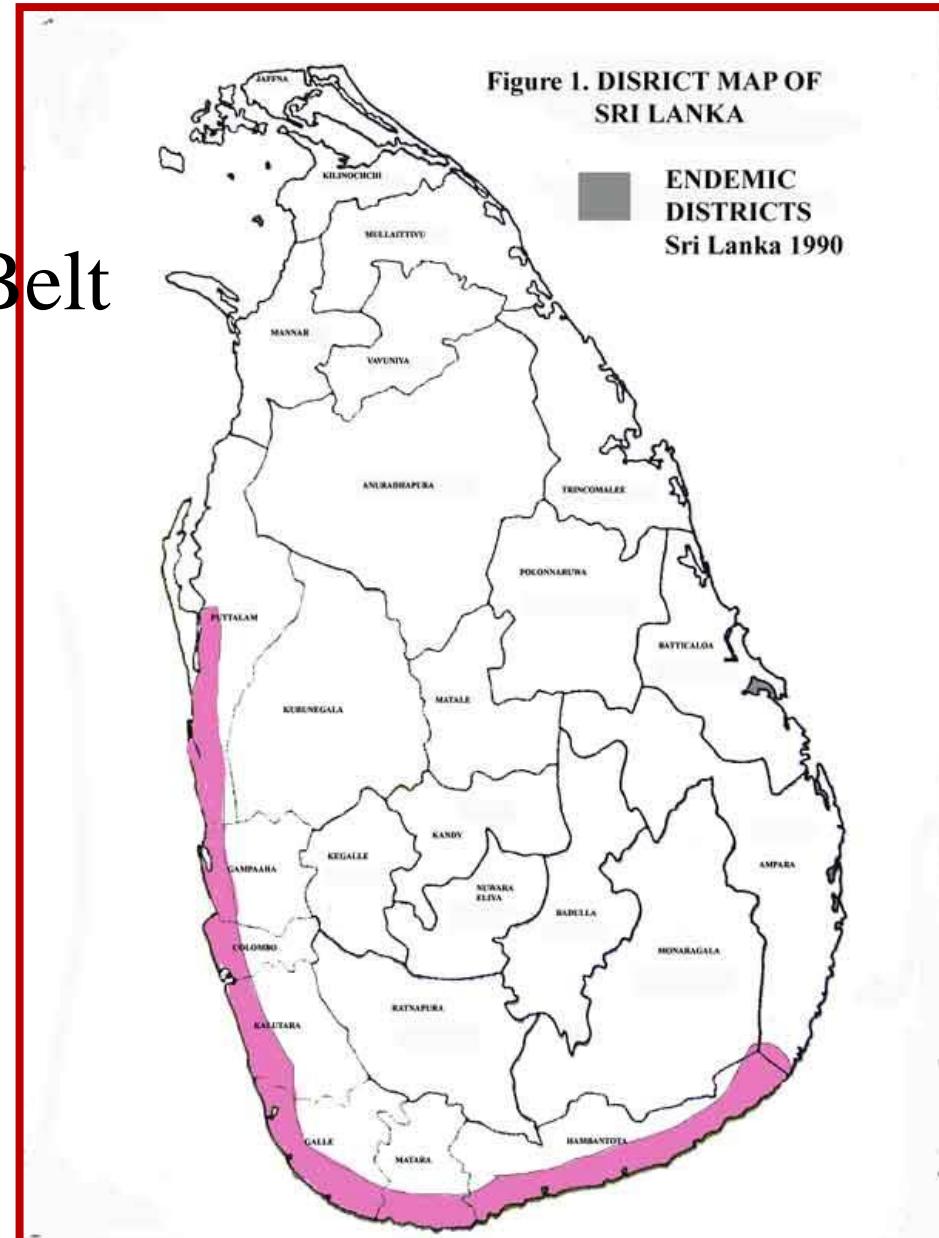
Launched a separate campaign for the control of filariasis
- On 24th October 1947

Sri Lanka was the 1st country in South East Asia to launch on a campaign of this nature for a health problem

Distribution of filariasis in Sri Lanka in the past;

Filariasis endemic belt,

South & South Western Coastal Belt
from Kataragama to Puttalam



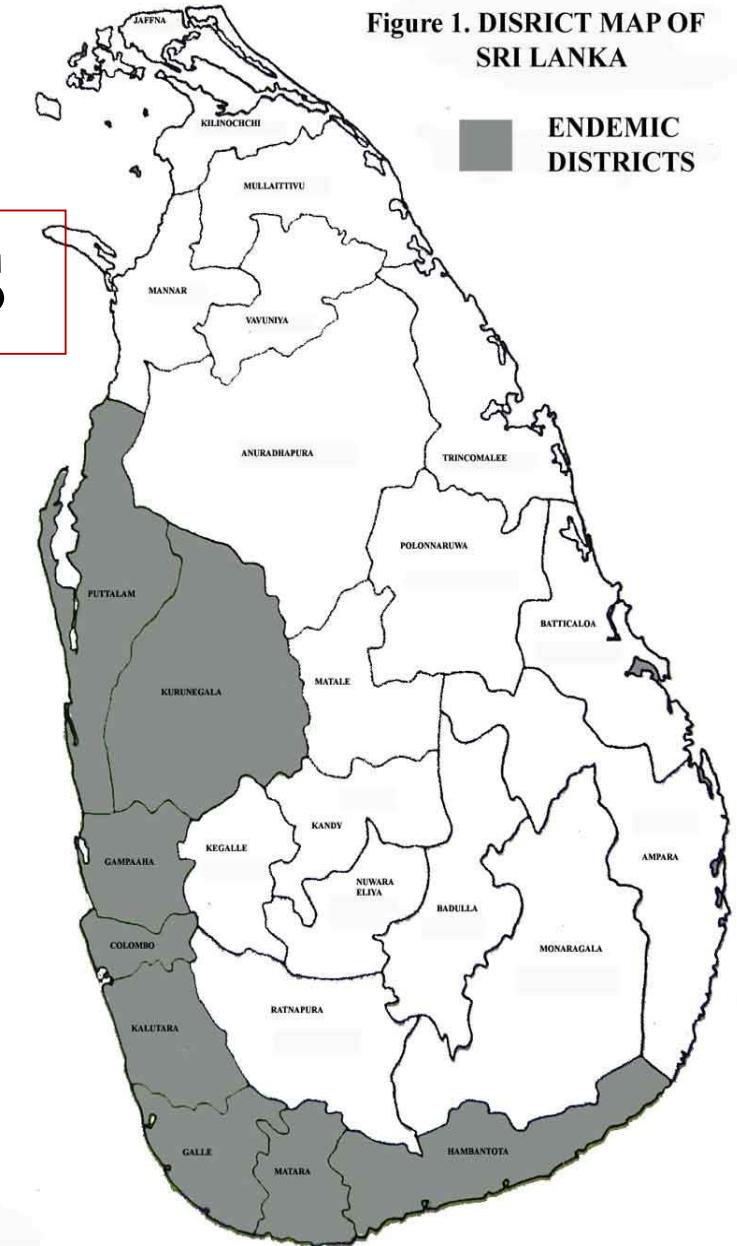
DISTRIBUTION OF FILARIASIS AT PAST,

3 PROVINCES COMPRISING 8 DISTRICTS

Western province
Southern province
North-western p.

Figure 1. DISRICT MAP OF SRI LANKA

ENDEMIC DISTRICTS



Internal pockets of filariasis,

Gampaha

Polgahawela

Kurunegala

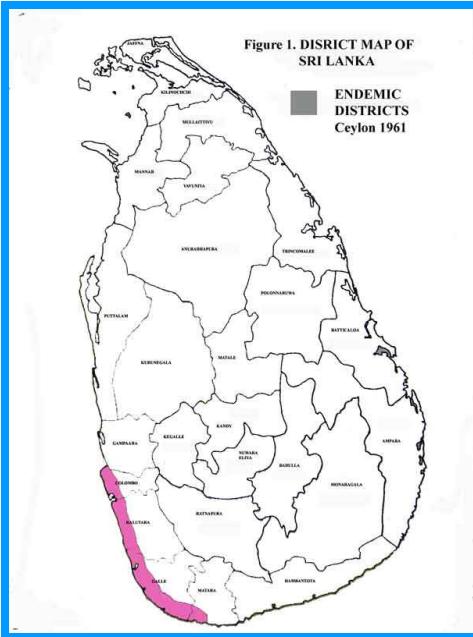
Kolonnawa

Nugegoda

Wellampitiya

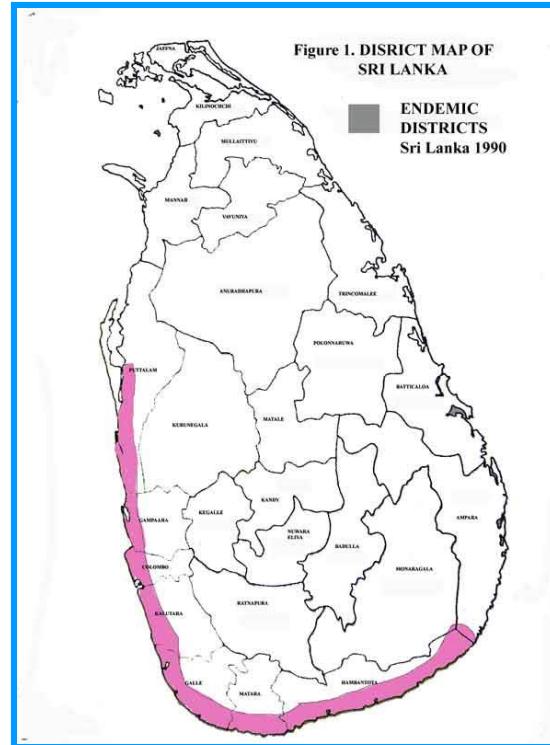
Veyangoda

Sri Lankan Distribution



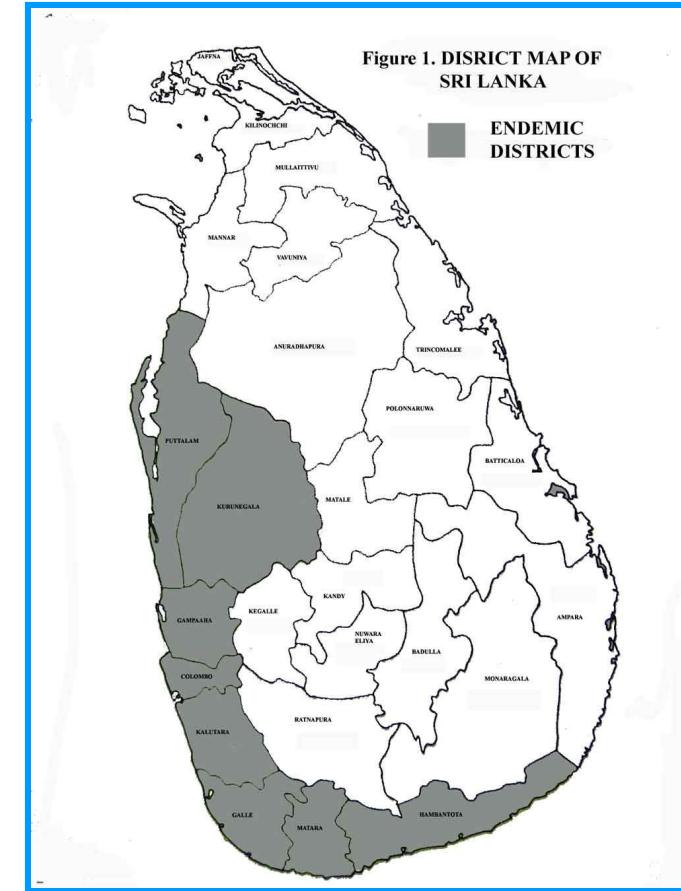
1961

W. Bancrofti
B. malayi



1990

W. bancrofti only
1964-67 eradication of *B.m*



2001

Filariasis is

- not a killer disease
- a chronic disease
- affects the social, mental & physical wellbeing of man

Heavy economic loss to the country

Filariasis Control

Vector borne disease: combination of 3 major factors:



Parasite



Appropriate
Environment

Man



Vector

Control programme in Sri Lanka - (AFC)

1. Parasite Control
 2. Vector Control
 3. Entomological Programme
 4. Health Education Programme
 5. Special Surveys
 6. Morbidity Control
- Selective treatment
- MDA
-
- ```
graph LR; A[1. Parasite Control] --> B[Selective treatment]; A --> C[MDA]
```

# Vector of bancroftian filariasis

- In Sri Lanka- 130 sp, of mosquitoes are recorded
- Only one species act as the vector of bancroftian filariasis



Common  
house mosquito  
(Female)

*Culex quinquefasciatus*

*(Culex pipens fatigans - earlier)*

# Breeding - Highly polluted water contaminated with organic material

Breeding  
sites



Permanent - catch  
pits, cess pits, drains,  
stagnated pits.

Temporary -  
discarded tins,  
cans with highly polluted  
water



- **Biting** - Nocturnal biter  
Feeds on human blood  
for maturation of eggs  
(anthropophagic)
- **Resting** - After the blood meal females  
rest on hangings, indoors etc.  
(endophilic)  
**residual spraying cannot be**  
**used for ,**  
**control of adult mosquitoes**

# BRUGIAN FILARIASIS (RURAL)

- Parasite- *Brugia malayi*



© 2002 Dept. Medical Entomology, ICPMR

- Vector - *Mansonia* sp

*M.uniformis*  
*M.anullifera*  
*M.indiana* (rare)

Vector breeding -

- Large and more permanent water collections with aquatic plants (Pistia, Salvenia)
- *Mansonia* larvae get attached to roots of aquatic plants to get oxygen.

## ★Rural Filariasis has been eradicated by

1. Effective campaign
  2. Large scale use of weedicides/herbicides to destroy aquatic plants
  3. Spraying DDT in malarious areas where the rural filariasis was endemic
- ★ Since 1960, main emphasis has been placed on *Wuchereria bancrofti*.

# **Global Program to Eliminate Filariasis**

**Aim- Eliminate LF by year 2020**

- Two main control strategies
  1. Interrupt transmission of infection (parasite) by mass chemotherapy (MDA)
  2. Alleviate & prevent both suffering and disability caused by disease

# National filariasis control program

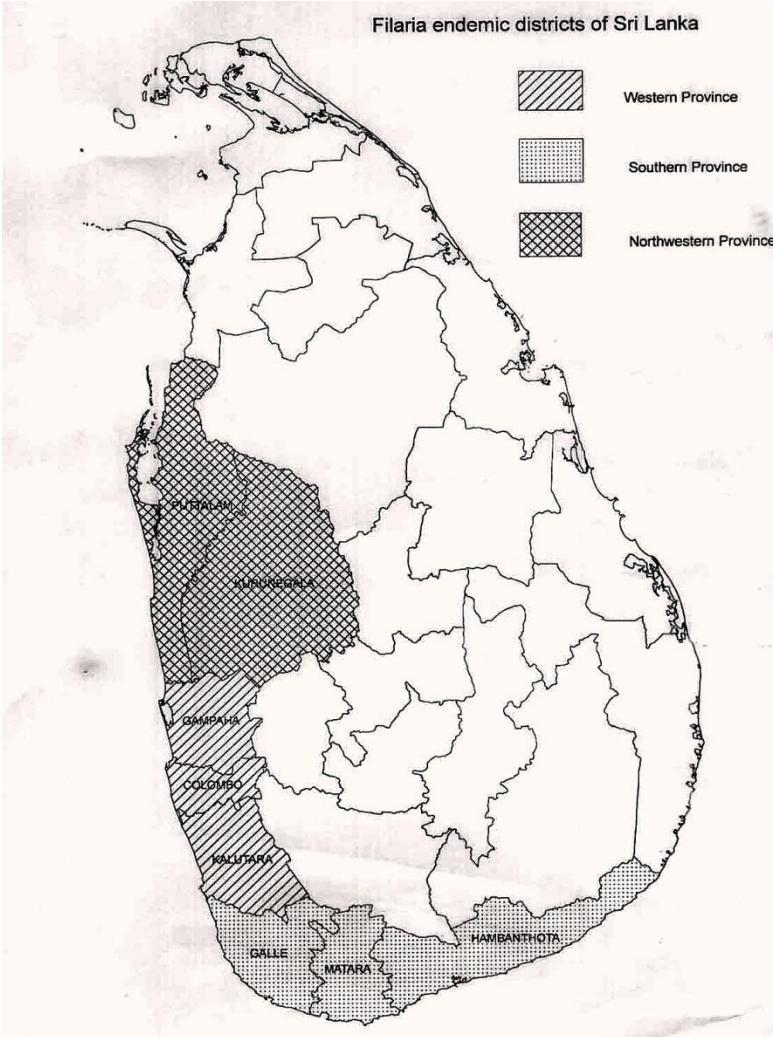
## AFC

Mass chemotherapy was implemented  
in the 3 endemic provinces in 2002



- Successfully completed 5 rounds of MDA

# Districts that were endemic for lymphatic filariasis in Sri Lanka



8 districts in 3 provinces were endemic

Provinces

- Western,
- Southern and
- North-western provinces

# PROGRAMME FOR ELIMINATION OF LYMPHATIC FILARIASIS (PELF)

- OBJECTIVE:

Elimination of LF from SL in 2020

- MEASURES:

- Mass Drug Administration (MDA)
- Morbidity control

Conducted by the Ministry of Health, AFC

# **Anti filarial drugs used in MDA**

- Diethylcarbamazine citrate (DEC)
- Ivermectin
- Albendazole

WHO recommends an annual mass drug administration of single doses of two medicines to all eligible people in endemic areas to interrupt transmission

**IN SRI LANKA WE USED DEC AND ALBENDAZOLE**

## Mass treatment (parasite control) :

Treatment of the entire at risk population for a period long enough to achieve a sustainable reduction of mf (Mass treatment)

- Yearly single dose of DEC 6mg/kg + albendazole 400mg for 5 years
  - or
- Yearly single dose of albendazole 400mg + ivermectin 200 $\mu$ g/kg
  - or
- Use of DEC fortified salt(6-12 months)

## **DEC 50-100mg base**

- Mainly microfilaricidal
  - Some macrofilaricidal effects
- 
- ✓ Reduces transmission of the parasite
  - ✓ Reverses some clinical effects;
    - TPE, proteinuria & haematuria
    - Early lymphoedema, hydrocoele
- 
- Dosage; 6mg/kg/day for 14 days
  - TPE 6mg/kg/day for 21 days

# IVERMECTIN

- ✓ Only microfilaricidal effects

## Indications

Areas where DEC is contraindicated (Mazzotti reactions)  
(areas co-endemic for lymphatic filariasis & onchocerciasis /  
loasis)

- Dosage 200µg/kg body wt
- Side effects similar but milder to those resulting from DEC

## **Albendazole 400mg**

- Single dose, co-administered with DEC or ivermectin achieves a sustained reduction of microfilaraemia
- Thought to reduce the fecundity of the adult female filarial worm
- High doses have macrofilaricidal effects

# Morbidity alleviation in LF

## Management of lymphoedema

- Foot hygiene –washing with soap & water daily or bd
- Dry well
- Search for wounds – wash with antiseptics and apply topical antibiotic/ antifungal
- Limb elevation
- Appropriate exercises for affected part
- Use of foot wear
- Avoid trauma to affected part
- Properly applied bandages
- Systemic antibiotics (monthly penicillin IM/ oral)

In May 2016, Sri Lanka and Maldives became the first countries in the WHO South-East Asia Region to be officially declared ‘filariasis free’.



Ministry of Health,  
Nutrition & Indigenous  
Medicine



World Health  
Organization  
Sri Lanka

## Joint Press Release

### Sri Lanka receives WHO Certification for Eliminating Lymphatic Filariasis

**Colombo, 21 July 2016:** Today, Sri Lanka received certification from WHO for having eliminated lymphatic filariasis, one of the oldest and most debilitating, neglected tropical diseases. Sri Lanka and the Maldives are the first countries in the WHO South-East Asia Region to reach this public health landmark. The Minister of Health of Sri Lanka, Dr. Rajitha Senaratne was presented with the certificate of validation by the WHO Regional Director, Dr. Poonam Khetrapal Singh during a ceremony which took place in BMICH, Colombo.

"The Ministry of Health has prioritized the elimination of this neglected tropical disease for several decades. We have now reached a major turning point, eliminating lymphatic filariasis as a public health problem. This achievement reflects the strong political commitment of the Ministry of Health, the tireless work of the Anti Filariasis Campaign and the dedication of our health workers to combat this disease," said Dr Rajitha Senaratne, Minister of Health, Nutrition & Indigenous Medicine.

The Anti Filariasis Campaign (AFC) was established in 1947 to combat lymphatic filariasis. Sri Lanka intensified mosquito control efforts; treatment of the infected population, disability prevention and control; and strengthened surveillance in order to stop the spread of infection and alleviate the suffering caused by lymphatic filariasis. The targeted campaigns to reduce the burden of the disease brought down the transmission rate from a peak of 24% during the 1930s to 0.03 % in 2008, allowing the country to work towards elimination status. Finally, in May 2016, WHO officially announced that Sri Lanka had achieved the elimination of lymphatic filariasis.

"This is a remarkable achievement for Sri Lanka. Lymphatic filariasis is a disease that should have no place in today's world. It is a disease that disfigures and disables. And it is a disease that stigmatizes and impoverishes. Most importantly, though, it is a disease that can be prevented and eliminated. In this regard, I congratulate Sri Lanka's health authorities for proving their mettle, and for lifting the burden of lymphatic filariasis from vulnerable communities across the country," stated Dr Poonam Khetrapal Singh, Regional Director, WHO South-East Asia Region while presenting the certificate of elimination to Sri Lanka.

The country's achievement provides strong inspiration for the seven countries in the region currently striving to eliminate this disease; Bangladesh, Myanmar, India, Indonesia, Nepal, Thailand and Timor-Leste and for the ongoing battle against all neglected tropical diseases.

For further information please contact:

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# Current activities of National AFC

Post-programme surveillance for certification of elimination

- Screening for filarial antigens among paediatric population
- Night blood surveys
- Entomological surveillance

## Current status

- Very low microfilaria rate
- Entomological surveillance show evidence of low grade infection among vector population
- Elimination successful ? ? ?

# WORLD EPIDEMIOLOGY

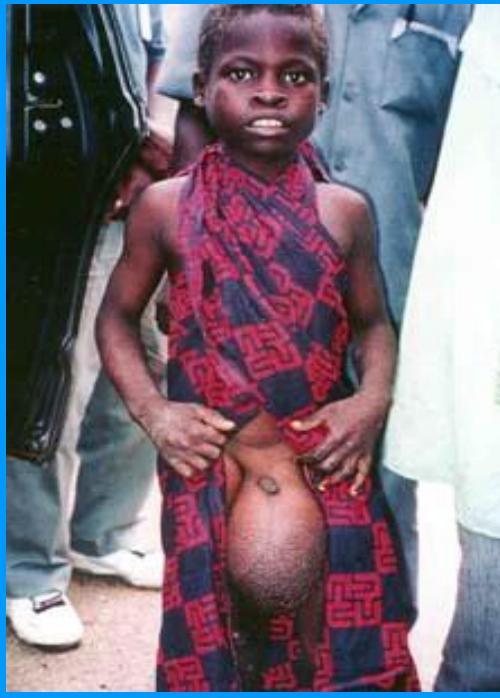
- Is a neglected disease of poor
- Involve in 73 countries
- 2nd common cause of permanent and long term disability

|           |   |              |
|-----------|---|--------------|
| Suffering | - | 128 million  |
| Threatens | - | 1100 million |

Elephantiasis - 15 million

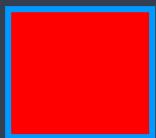
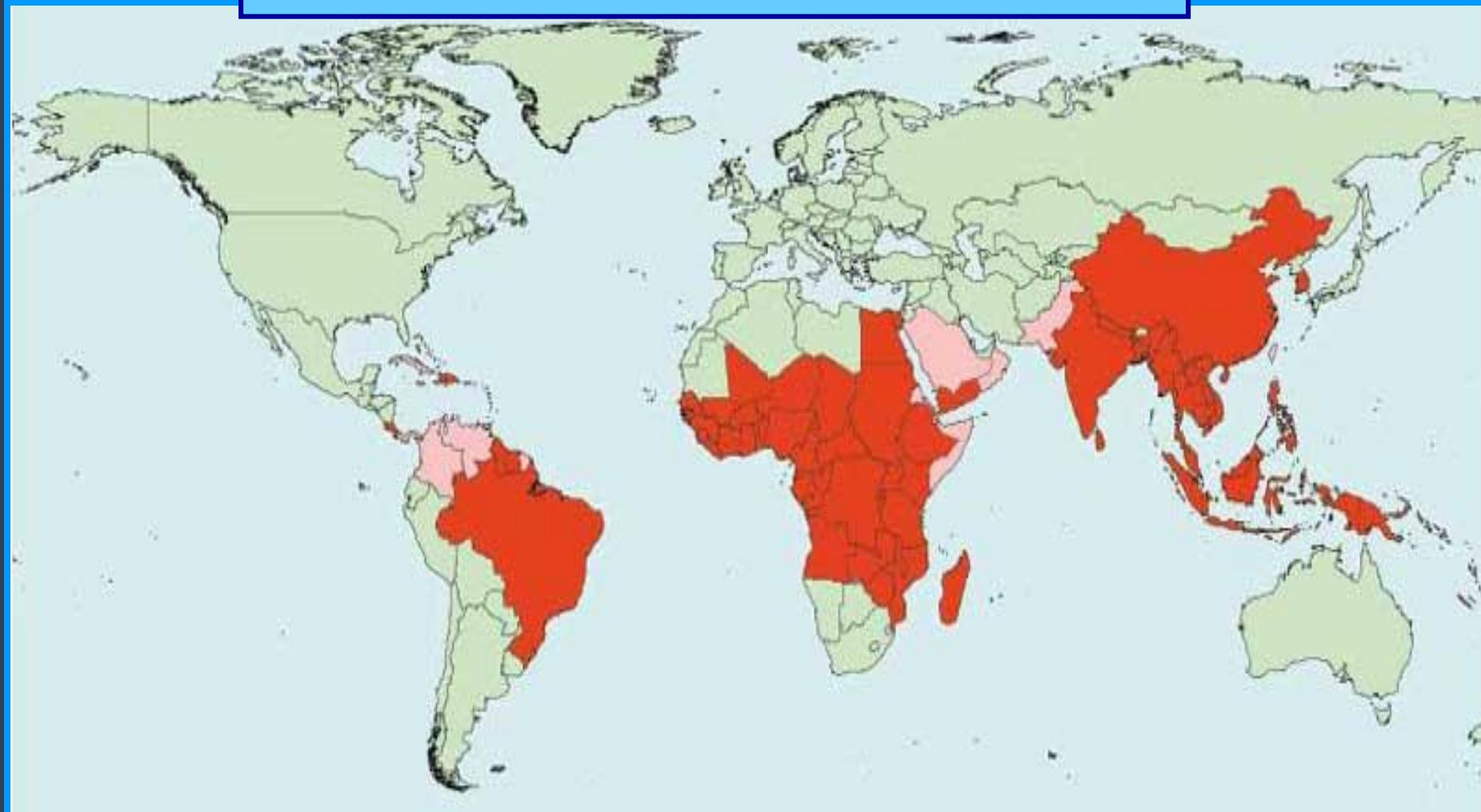


Lymphoedema -  
16.2 million

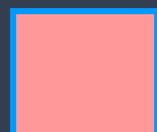


Hydrocoele  
- 27 million

## DISTRIBUTION OF FILARIASIS



Endemic



Uncertain



Non-endemic

# VECTOR CONTROL

Depends on

- Mosquito sp.
- Breeding sites
- Feeding habits
- Biting habits
- Resting habits
- Infection & Infectivity rates

# METHODS OF VECTOR CONTROL IN FILARIASIS

## A. Chemical control

- a). Adult Control (difficult)
- b). Larval Control (feasible & effective)

## B. Biological Control:

Most agents are under experimental level.

Eg: viruses, fungi, bacteria, protozoans, nematodes



Larvivorous fish -  
used in Sri Lanka to a  
certain extent

Bacteria -

*Bacillus sphaericus*

*B. thuringiensis*

- a spore forming organism
- highly toxic for some mosquito larvae
- Sri Lanka under experimental level

at MRI and use for Malaria control

## ii) Environmental Sanitation

### iii) Chemical Control

- Spraying of larvicides into the breeding places
- Sri Lanka (AFC)
  - Fenthion (Baytex)
  - weekly intervals using hand sprayers
  - concentration
    - $\frac{1}{4}$  fluid oz Fenthion in 2-2 $\frac{1}{2}$  gallons of water (effective only to larvae)

# IVC - Integrated Vector Control

Combination of  
more than one method,  
cost effective,  
appropriate control techniques (chemical, biological,  
environmental or management techniques) with  
community participation to achieve an effective  
degree of vector suppression.

# HEALTH EDUCATION

Best  
More economical  
Long term

- A) In blood filming
- B) In treatment- MDA
- C) Breeding sites/their control:
  - To eliminate, reduce the habitat of the vector
    - eg: Proper drainage
    - Filling of sites
    - Land leveling
    - Motivation for larvicing
- D) Preventive measures for mosquito biting

# PERSONNAL PROTECTION

(Protection from mosquito bites)

by using .....

- ★ Modification or manipulation of human behavior, habitation, site selection
- ★ Mosquito nets
- ★ Screening of doors and windows
- ★ Protective clothing
- ★ Insect repellents
- ★ Coils & vaporizers

# Mosquito nets.

1. Untreated nets - Act as a physical barrier

1. Insecticide treated nets

- Physical barrier
- Repel the mosquitoes
- Killing of mosquitoes
- Prolong insecticidal effect



- \* Protective clothing
  - Treated cotton anklets
  - long sleeves & trousers after dusk.
- \* Insect repellents
  - DEET (N,N-diethyl toluomide) liquid, stick or aerosol form applied to exposed areas of skin)
- \* Coils & vaporizers
  - gives overnight protection from insect bite due to pyrethroids



**THANK YOU**