



# Filariasis

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# Patrick Manson

- Born Scotland, worked in China for 23 yrs
- Pioneer in tropical medicine
- Posted to Formosa (Taiwan) as MO for the Chinese Imperial Maritime Customs
- Kept diary; described elephantiasis, leprosy and “heart disease” (was beriberi)
- 1871 - settled at Amoy [Xiamen], port on the Chinese mainland
  - saw many cases of elephantiasis, developed surgical method for removing extra tissue. records show he removed 1 ton of tissue/3 yrs
- Hypothesized and then proved via experiment with Hin-Lo that filariae are transmitted via mosquitoes
- The first-ever demonstration that mosquitoes can harbor infectious disease.

# Filarial Worms

- Lymphatic filariasis
  - *Wuchereria bancrofti*, *Brugia malayi*, and *Brugia timori*
- Subcutaneous filariasis
  - *Loa loa*, *Mansonella streptocerca*, *Onchocerca volvulus*, and *Dracunculus medinensis*.
- Serous Cavity filariasis
  - *Mansonella perstans* and *Mansonella ozzardi*
- Other filaria
  - *Dirofilaria immitis*

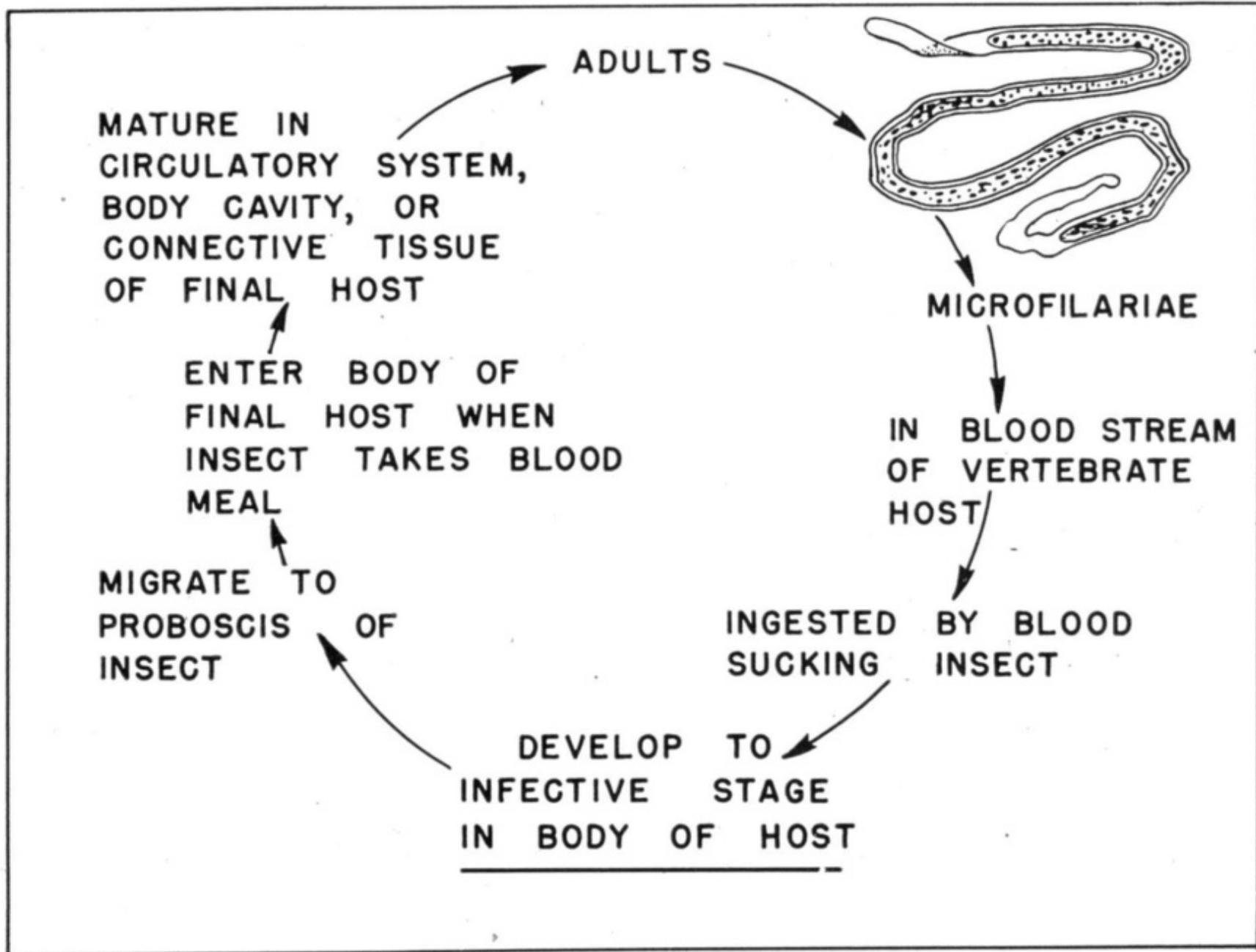
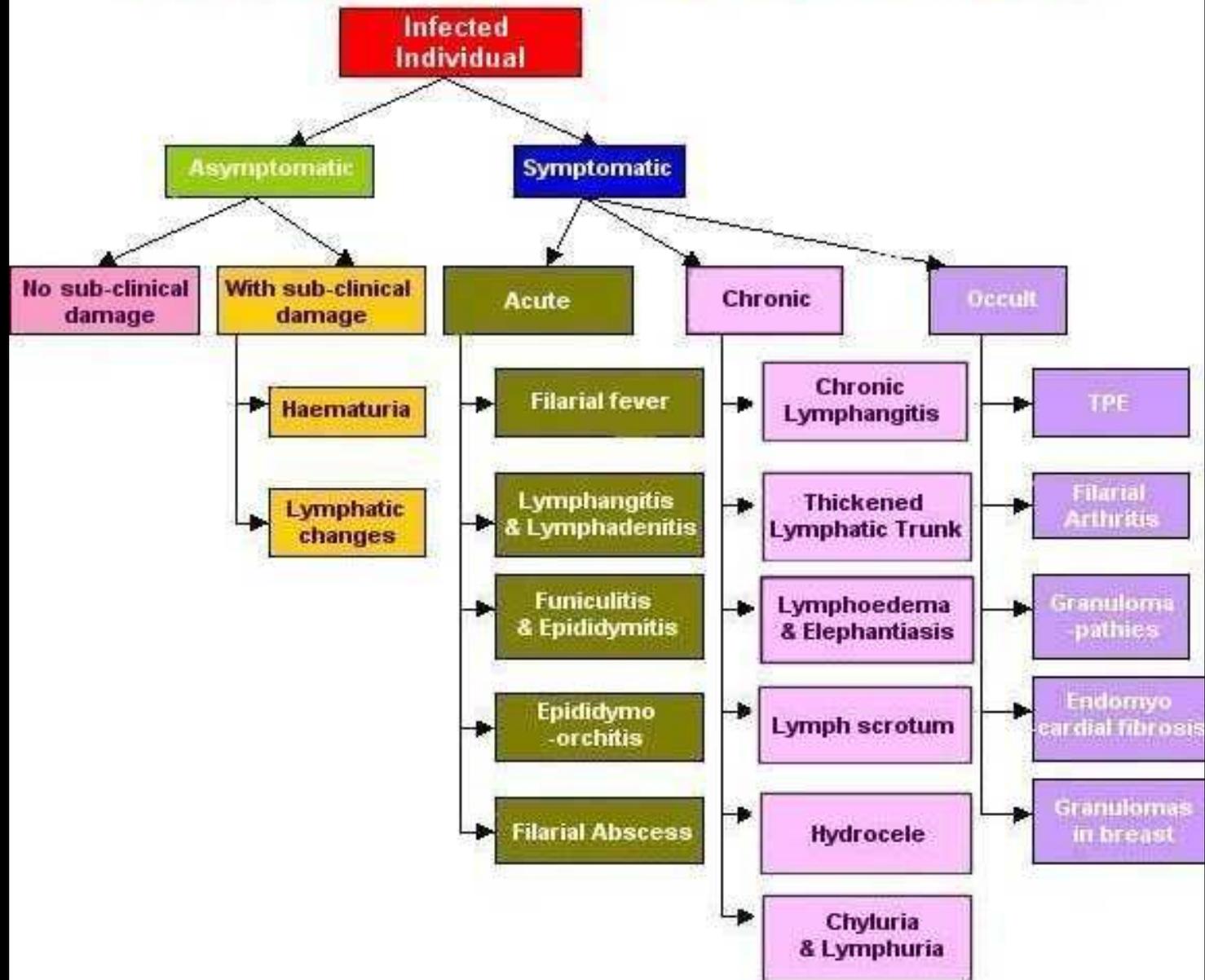
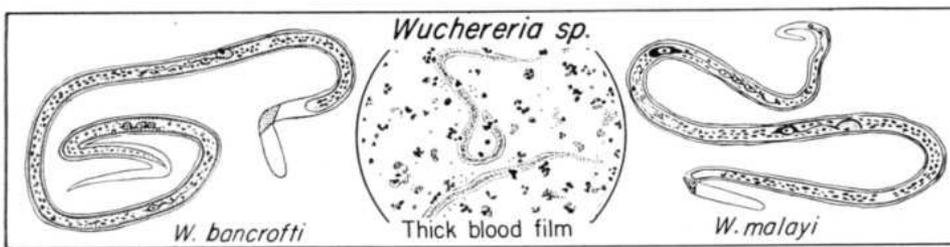


Fig. 179.—Nematode cycle—filarial worm type.

# FILARIASIS DISEASE SPECTRUM CHART





## FILARIASIS

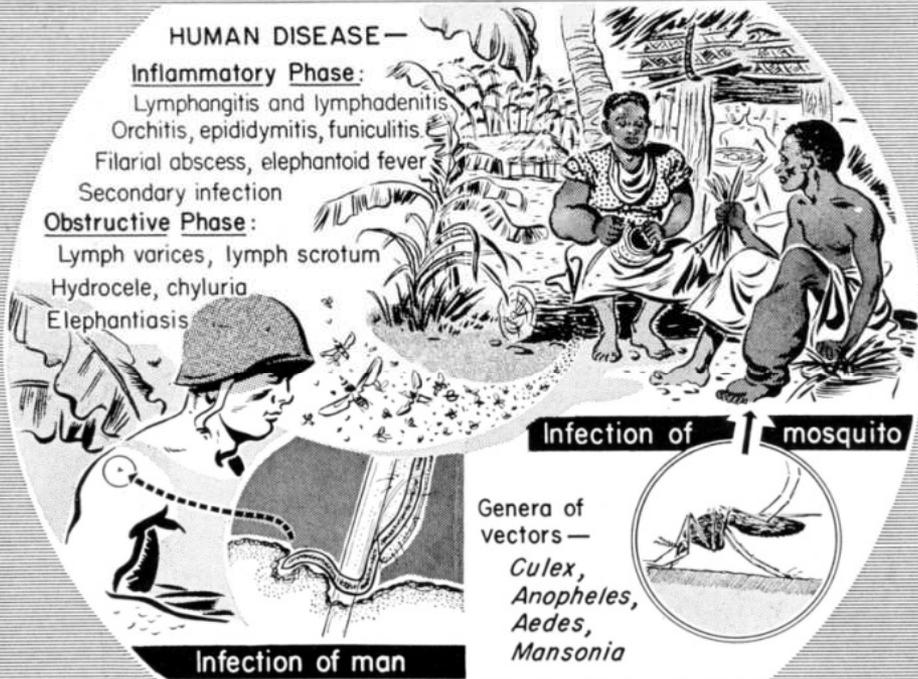
### HUMAN DISEASE —

**Inflammatory Phase:**

Lymphangitis and lymphadenitis  
Orchitis, epididymitis, funiculitis  
Filarial abscess, elephantoid fever  
Secondary infection

**Obstructive Phase:**

Lymph varices, lymph scrotum  
Hydrocele, chyluria  
Elephantiasis

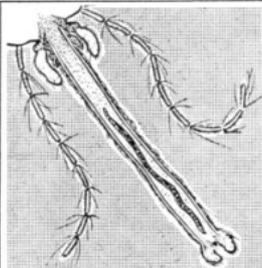


Genera of vectors —  
*Culex,*  
*Anopheles,*  
*Aedes,*  
*Mansonia*

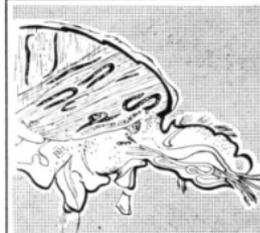


### EPIDEMIOLOGY

1. Reservoir: man
2. Vectors: mosquitoes—several genera, many species
3. Mosquito ingests microfilariae
4. Development in mosquito thorax
5. Infected mosquito bites man
6. Infective larvae penetrate human skin
7. Mature parasites in lymphatic system
8. Microfilariae in peripheral blood



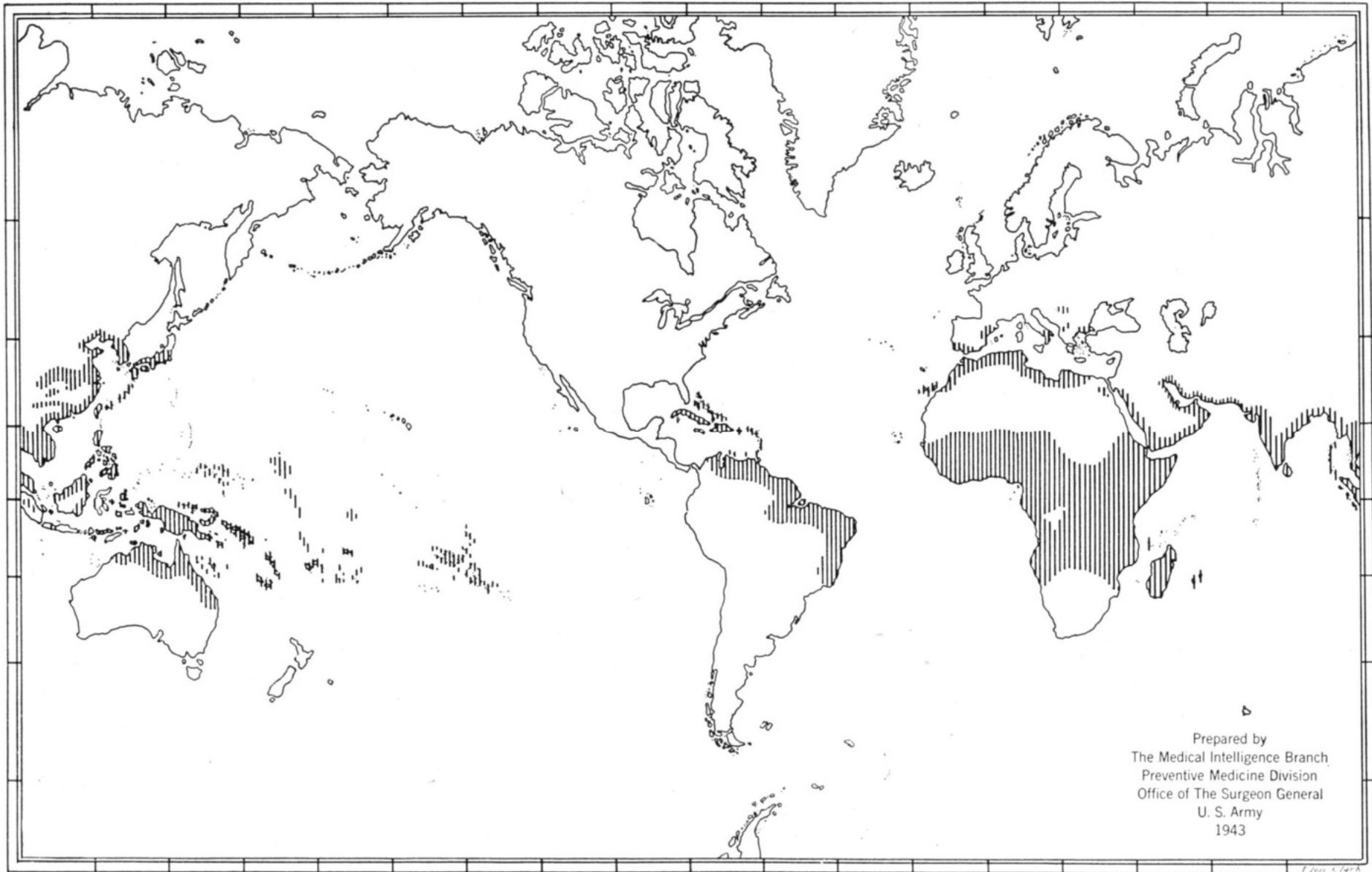
Dissection of proboscis



Development in mosquito

Fig. 182.—Epidemiology of filariasis.

# FILARIASIS (WUCHERERIA BANCROFTI)



Prepared by  
The Medical Intelligence Branch  
Preventive Medicine Division  
Office of The Surgeon General  
U. S. Army  
1943

Fig. 180.—Geographical distribution of filariasis due to *Wuchereria bancrofti*.





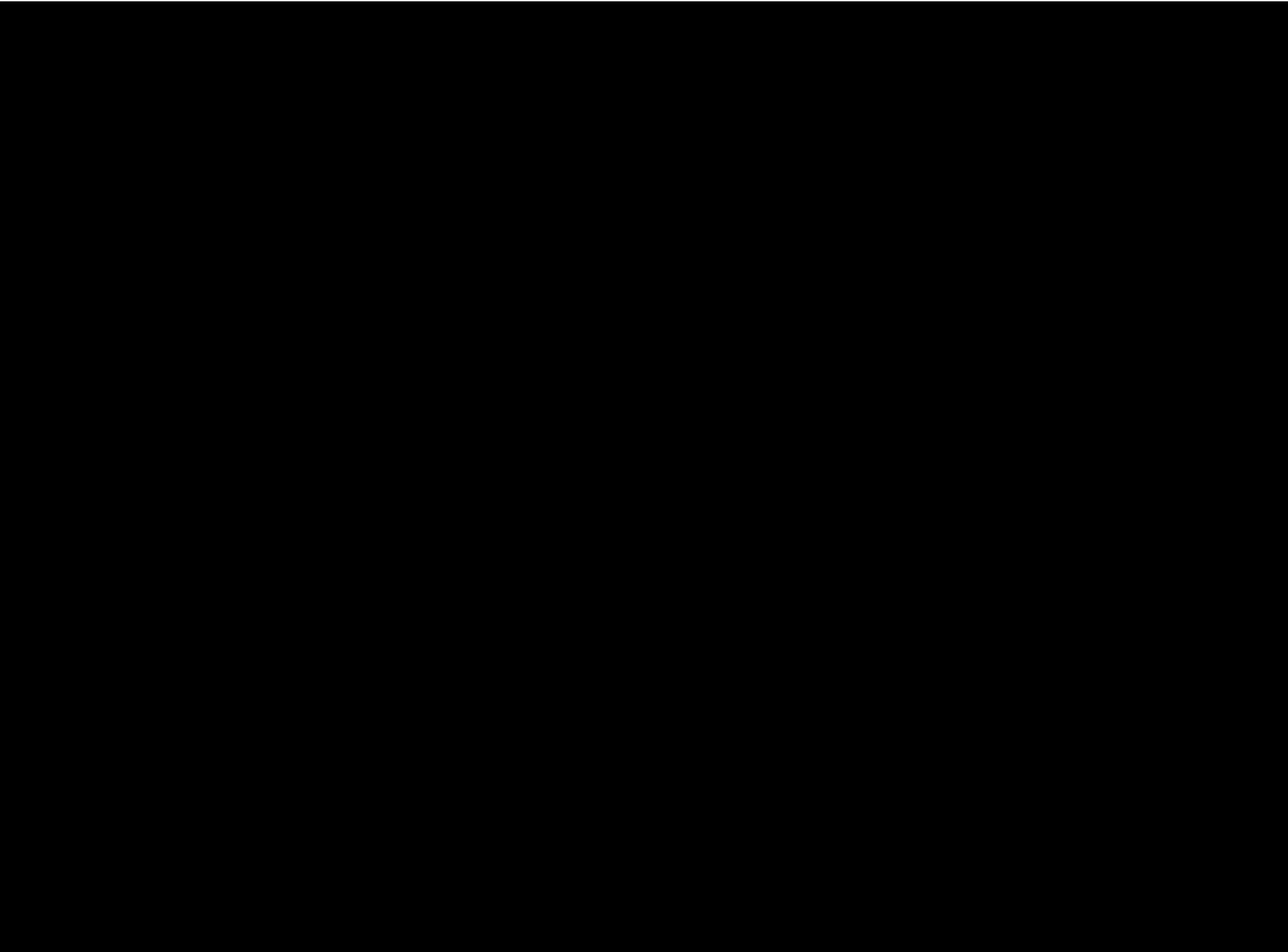
# LF: a very morbid disease

**Table 3. Infectious and parasitic diseases burden, worldwide and by region, 2001**

Disease	Disease burden worldwide, DALYs in thousands (%) <sup>a</sup>	Disease burden by region, % <sup>b</sup>					
		Africa	Southeast Asia	East Mediterranean	Western Pacific	The Americas	Europe
HIV/AIDS	88,429 (6.0)	65.0	15.4	1.9	2.2	3.1	1.0
Diarrheal disease	65,451 (4.3)	32.9	34.2	16.5	6.3	4.3	1.3
Malaria	42,280 (2.9)	85.2	8.7	4.8	1.0	0.3	0.1
Tuberculosis	36,040 (2.5)	24.8	44.3	8.3	15.3	2.6	4.7
Measles	26,495 (1.8)	57.1	26.1	11.5	4.4	0.0	0.9
Sexually transmitted disease <sup>c</sup>	12,404 (0.8)	41.4	34.8	10.7	5.1	5.1	2.9
<b>Lymphatic filariasis</b>	<b>5,644 (0.4)</b>	<b>34.2</b>	<b>49.6</b>	<b>8.7</b>	<b>7.2</b>	<b>0.2</b>	<b>0.03</b>
Trachoma	3,997 (0.3)	38.2	6.2	15.1	40.6	0.0	0.0
Leishmaniasis	2,357 (0.2)	17.0	67.3	11.8	1.1	2.5	0.3
Hookworm disease <sup>d</sup>	1,825 (0.1)	23.3	45.7	9.0	13.6	8.2	0.0
Schistosomiasis	1,760 (0.1)	80.6	0.2	11.5	2.9	10.4	0.0
Trichuriasis <sup>d</sup>	1,649 (0.1)	7.5	26.0	2.2	46.6	17.7	0.0
African trypanosomiasis	1,598 (0.1)	97.4	0.0	2.5	0.0	0.0	0.0
Ascariasis <sup>d</sup>	1,181 (0.1)	10.2	22.8	5.2	46.4	14.6	0.7
Onchocerciasis	987 (0.1)	95.0	0.0	4.7	0.0	0.3	0.0
Japanese encephalitis	767 (0.1)	0.0	45.2	10.6	44.3	0.0	0.0
Dengue	653 (0.0)	0.9	55.1	13.0	17.2	13.8	0.0
Chagas disease	649 (0.0)	0.0	0.0	0.0	0.0	99.8	0.0
Leprosy	177 (0.0)	9.0	67.2	9.0	4.0	10.2	0.0
All infectious and parasitic diseases	359,377 (24.5)	52.6	26.2	9.7	6.4	3.5	







# LF: clinical manifestations

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elephantiasis

# LF: clinical manifestations

19yo Haitian man  
May 2009

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# LF: clinical manifestations

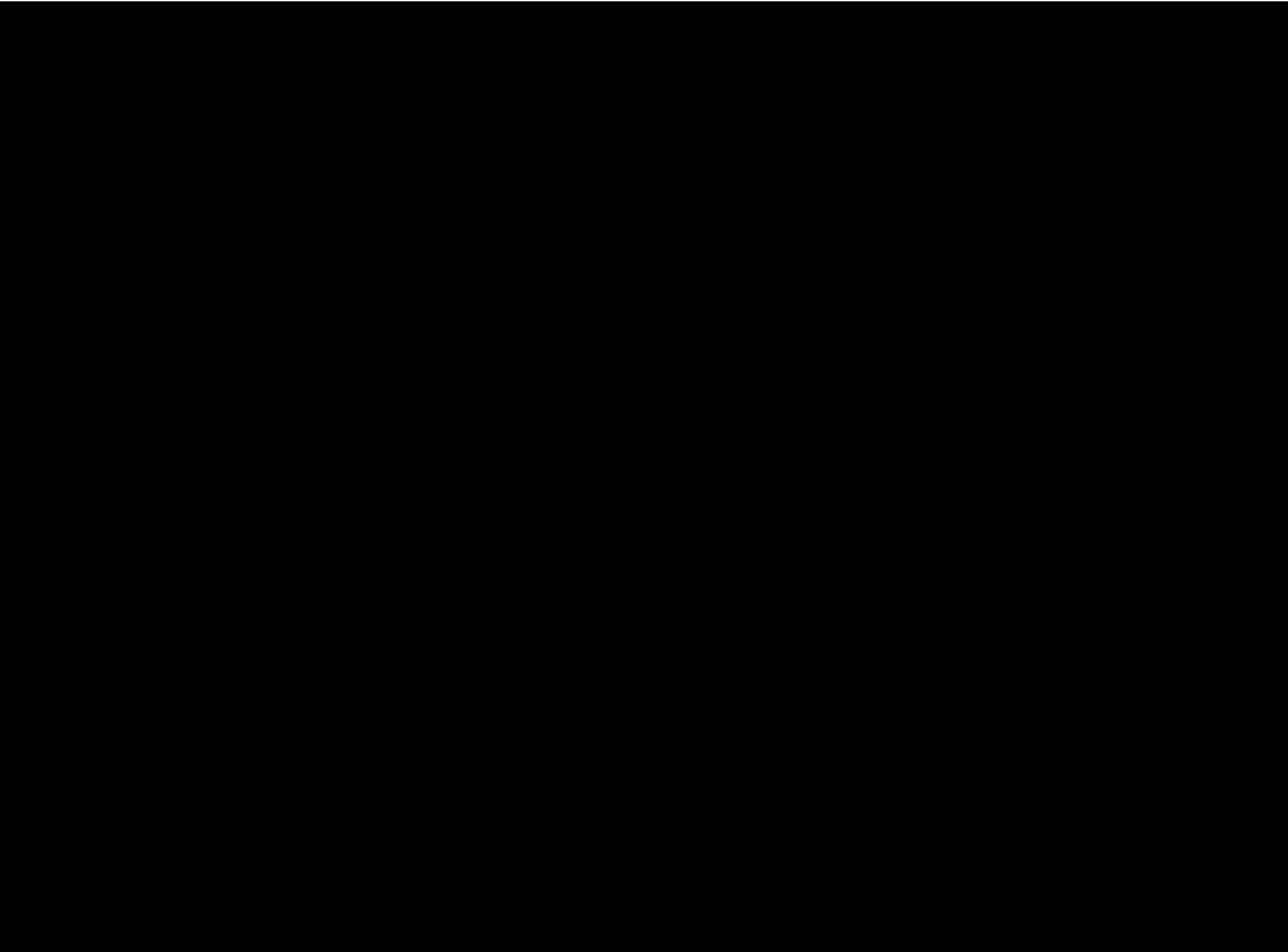
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# LF: clinical manifestations

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# Treatment

- Annual treatment of all individuals at risk (individuals living in endemic areas) with recommended anti-filarial drugs combination
  - diethyl-carbamazine citrate (DEC) and albendazole
  - or
  - ivermectin and albendazole
  - or
  - regular use of DEC fortified salt can prevent occurrence of new infection and disease



# ONCHOCERCIASIS, LOIASIS AND FILARIASIS MALAYI

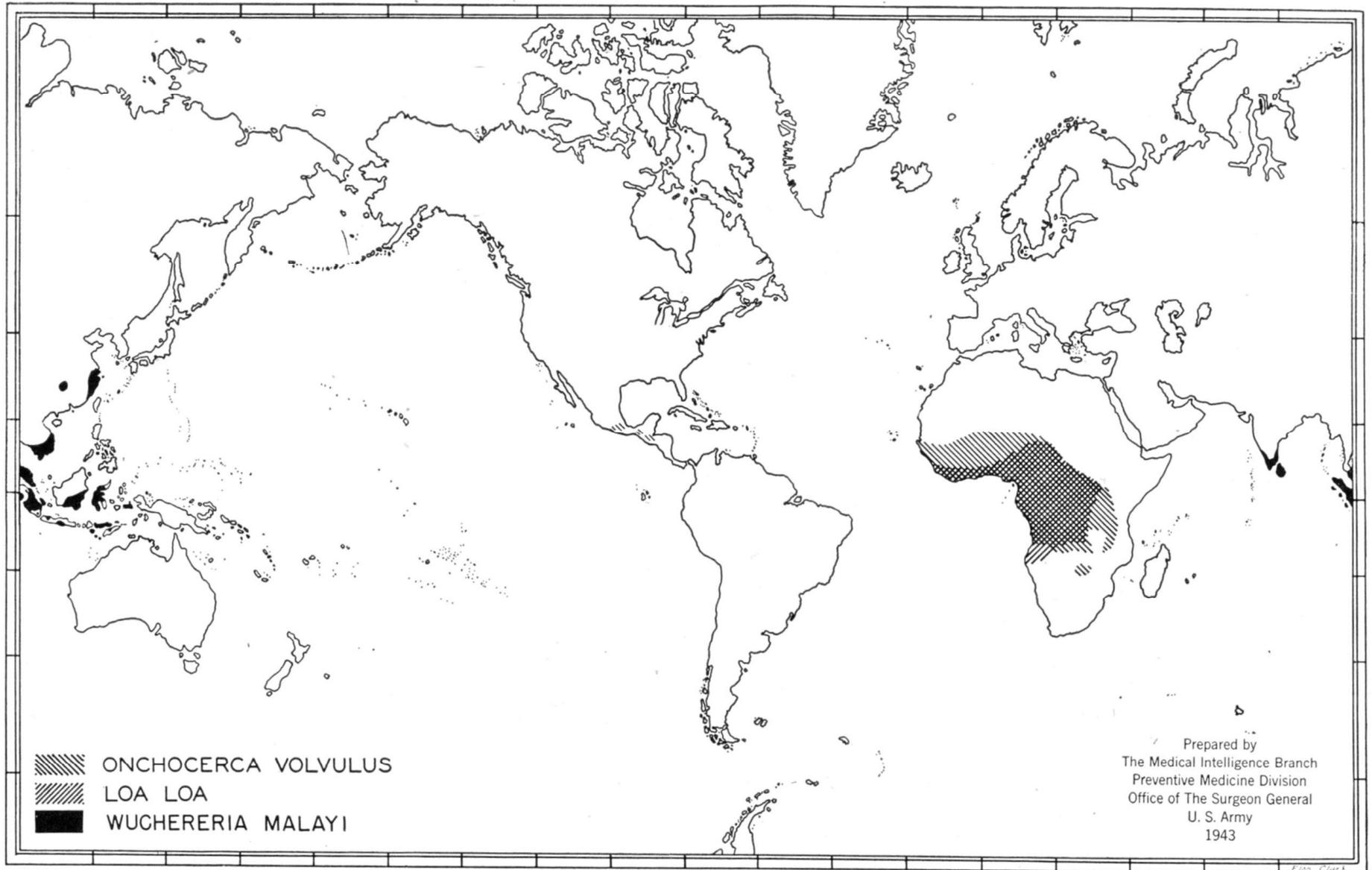
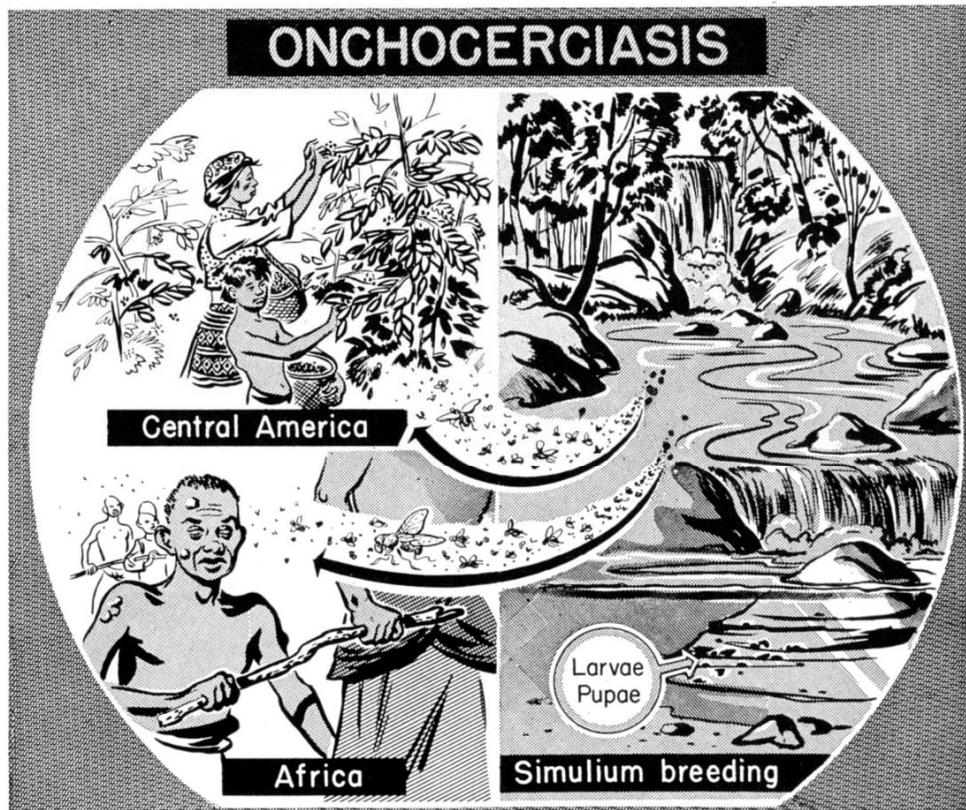


Fig. 193.—Geographical distribution of onchocerciasis, loiasis, and filariasis malayi.



EPIDEMIOLOGY		
<p style="text-align: center;">Larva</p> <p style="text-align: center;">Pupa</p>	<ol style="list-style-type: none"> <li>1. Reservoir: man</li> <li>2. Vectors: species of the black fly—<i>Simulium</i></li> <li>3. Larvae and pupae of fly attached to rocks in streams</li> <li>4. Fly bites infected host</li> <li>5. Larvae of <i>Onchocerca</i> develop in fly</li> <li>6. Infected fly bites man</li> <li>7. Adult <i>Onchocerca</i> in subcutaneous tissues</li> <li>8. Microfilariae in skin and eye</li> </ol>	<p style="text-align: center;"><i>Simulium</i> sp.</p>

Fig. 194.—Epidemiology of onchocerciasis.

# Onchocercal dermatitis

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# Onchocercal dermatitis

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# Onchocerciasis - Sowda

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# Onchocerciasis – Punctate Keratitis

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# Onchocerciasis – Sclerosing Keratitis

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# Onchocerciasis: skin snips



# Treatment

- Ivermectin (150–200 µg/kg orally, once or twice per year) is the drug of choice for onchocerciasis.
- Repeated annual or semiannual doses may be required (drug kills the microfilariae but not the adult worms)
- Antibiotic trials with doxycycline (100 mg orally per day) directed against *Wolbachia*, an endosymbiont of *O. volvulus*, have demonstrated a decrease in onchocercal microfilaridemia with 6 weeks of therapy
- Some experts recommend treating patients with 1 dose of ivermectin followed by 6 weeks of doxycycline
- Diethylcarbamazine (DEC) is contraindicated in onchocerciasis!!! (associated with severe and fatal posttreatment reactions)

# History of Presenting Illness

- 33 y/o Nigerian female
- Lived in U.S. for last 2.5 years
- 2 weeks post-op for resection of left foot pyogenic granuloma
- Re-admitted for surgical site infection

# History of Presenting Illness

- Plain films of left foot demonstrated possible subcutaneous gas
- Patient was s/p debridement on hospital day #1 when ID was consulted for antibiotic recommendations
- Claimed to have a fever, denied chills
- Wound discharge noted, blood cultures taken

# History

- PMHx: none
- PSHx: C-Section x 2
- Meds: Zosyn (Pip/Tazo) 3.375g IV q6h

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- All: NKDA
- SHx: Tob: none, EtOH none, Drugs none
- FHx: Non-Contributory
- Travel: none recent, last in Nigeria 2.5 yrs ago;  
Pets: none; Ill contacts: none

# Physical Examination

- Vitals: T=97.8°F; BP=130/90; HR=88; RR=16
- HEENT: Normal
- Lung: Clear
- Cardiac: RRR n1 s1/s2; I/VI SEM LSB
- Abd: benign
- Ext: RLE WNL; LLE wrapped and elevated
- LN: + shotty inguinal LN, + palpable SQ nodule medial thigh, mildly TTP
- Neuro: grossly intact

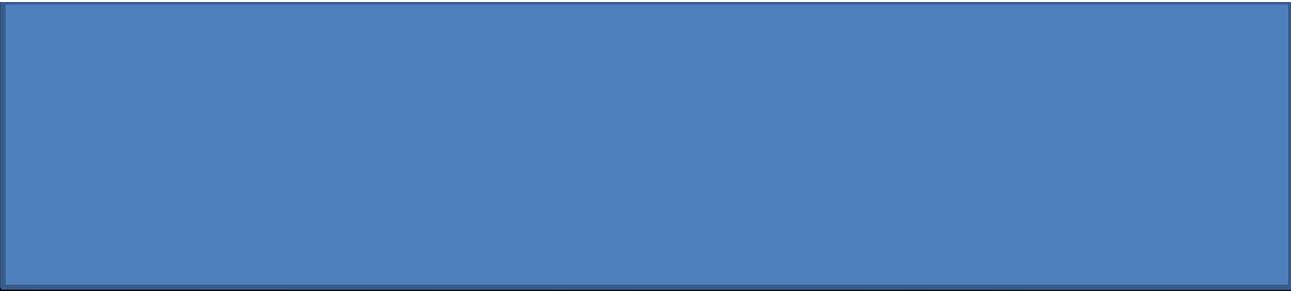
# Laboratory

- Wound Cx: many WBC, Mod GPC pairs, few small GNR
- WBC=8.1 HCT=37.0 PLT=232
- Poly=32 Lymph=28 Mono=7 Eos=32 Baso=1
- Na=143 K=4.1 Cl=99 HCO<sub>3</sub>=27
- BUN=13 Cr=0.8 Ca=9.5 Glu=90

# Laboratory (cont.)

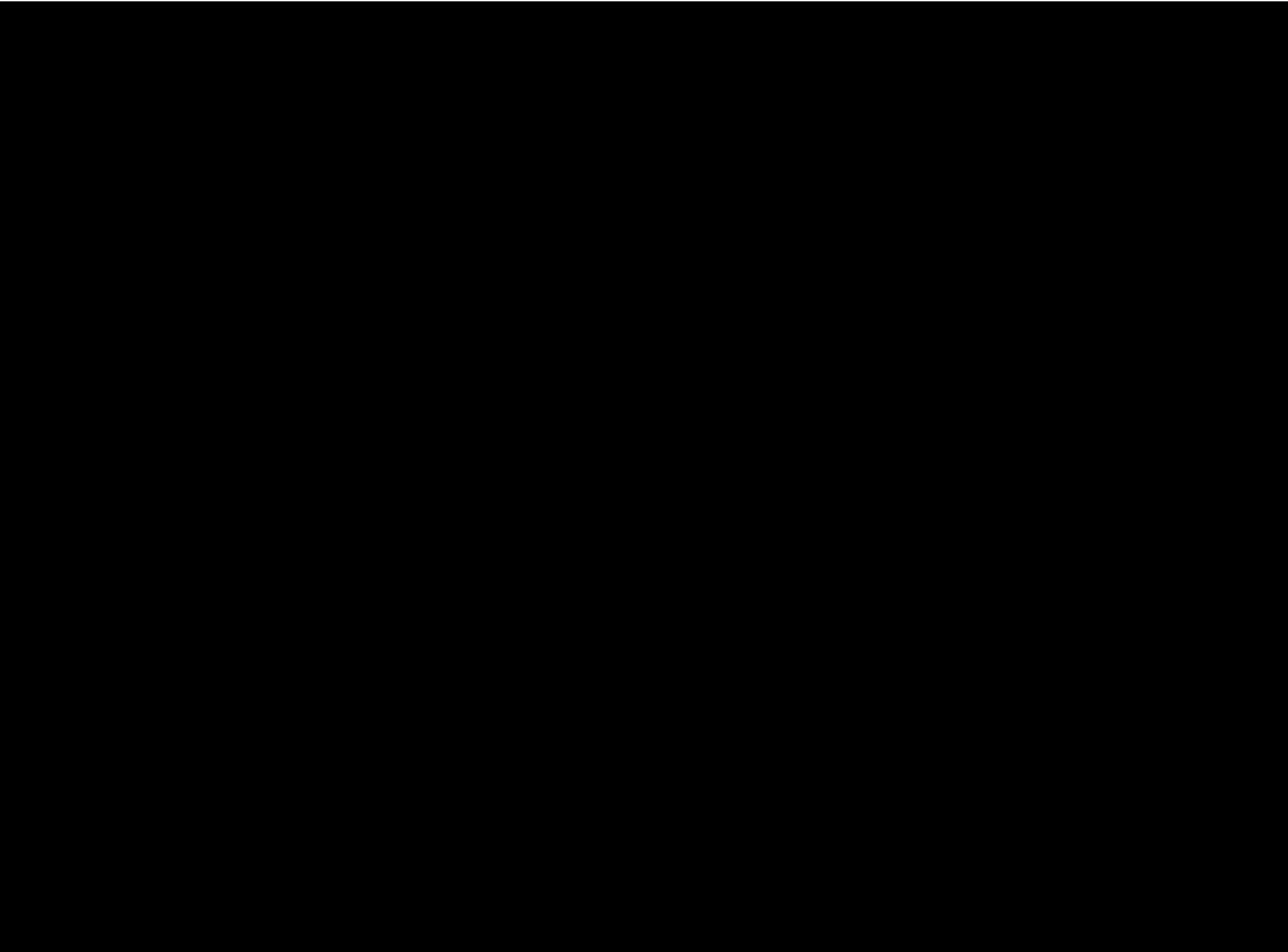
- Blood cultures taken at presentation turned positive
- Gram stain performed did not reveal bacteria
- Organism was found on differential slide
- Simultaneously, wet mount made





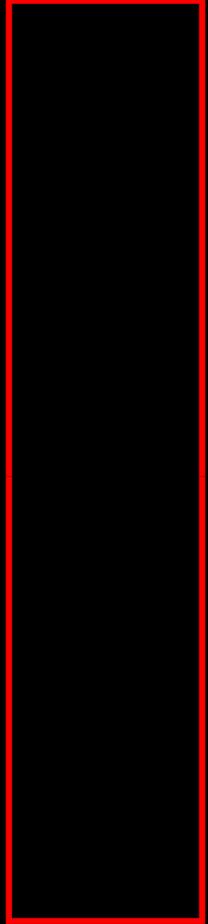
# Verification

- Patient info, slides, and video brought to third party for examination and comment
- Attempts at restaining of slides made
- Features on organisms noted that brought original diagnosis into question

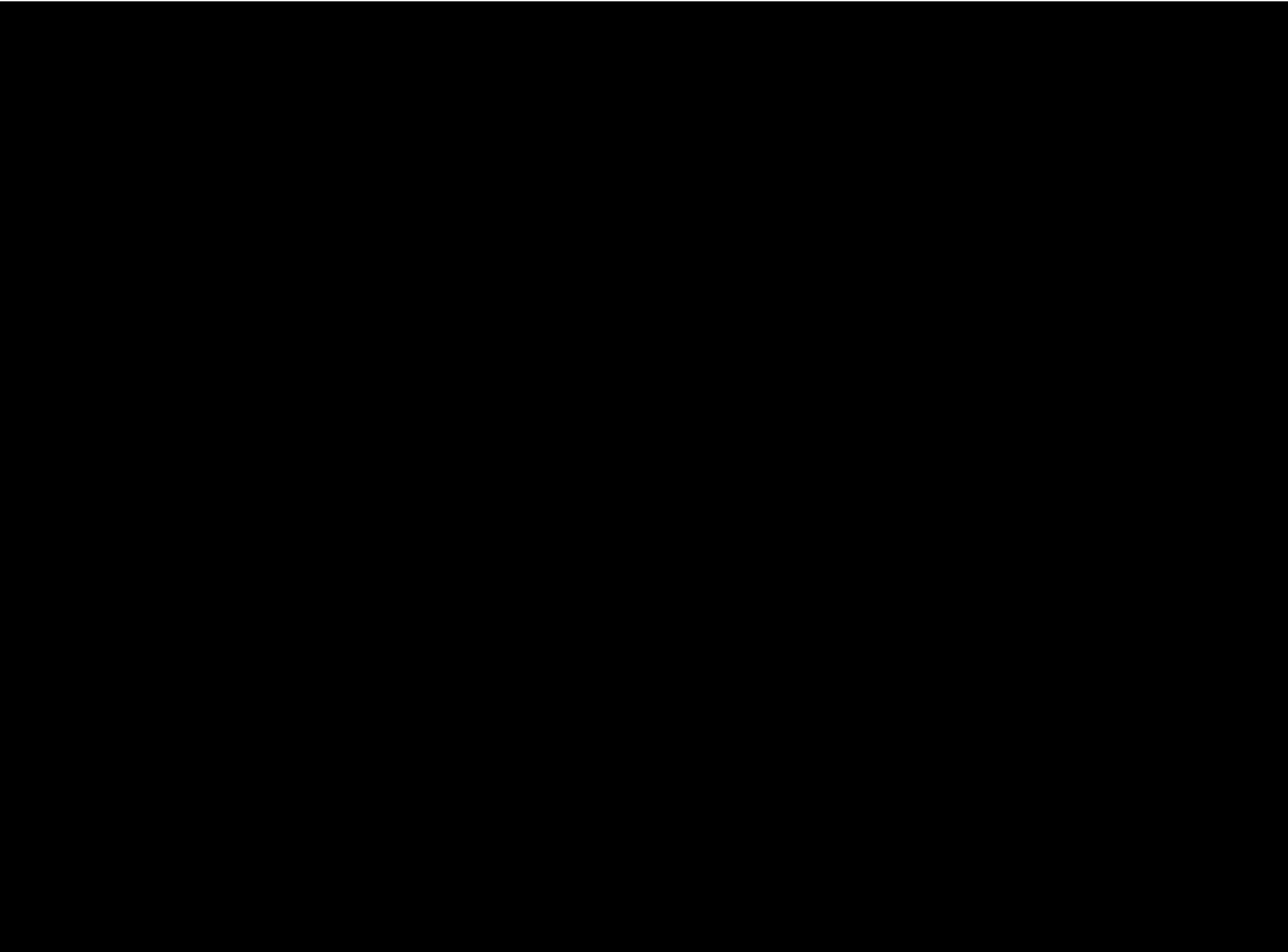


# Keys to Diagnosis

- Location of microfilariae
- Periodicity
- Morphology
  - Sheath
  - Cephalic head
  - Excretory pore







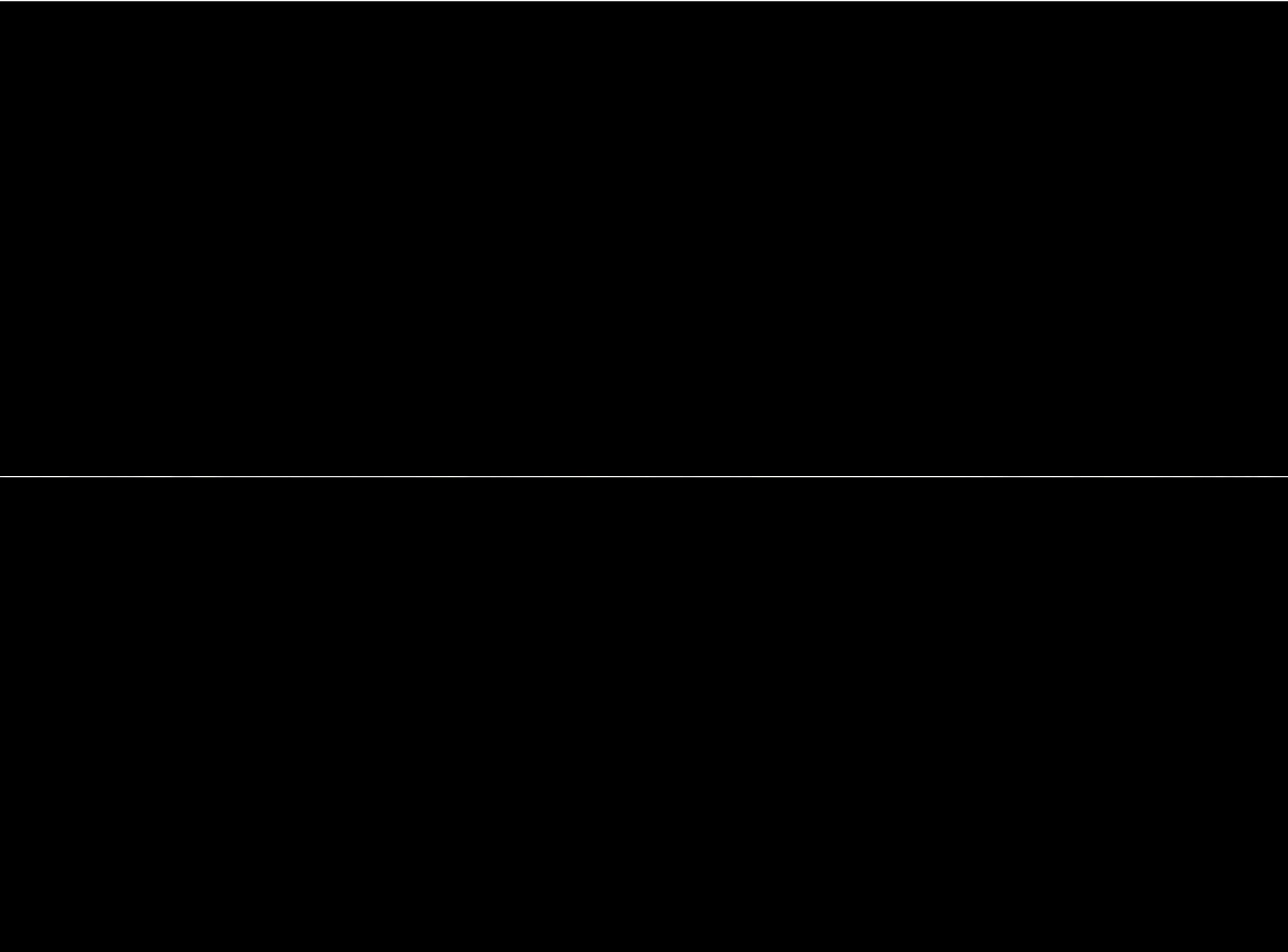
# Loiasis - Clinical

- Calabar Swellings
- Eye Worm
- Pruritis

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- Pain
- Fatigue, fever, arthritic pain
- Eosinophilia (up to 75%)
- Encephalitis – rare, associated with therapy

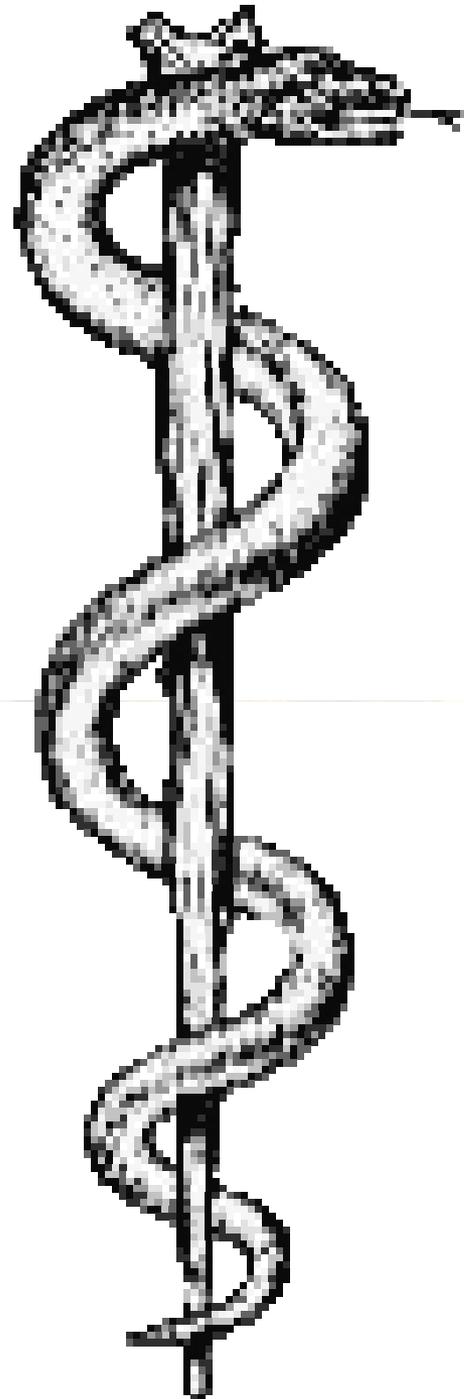




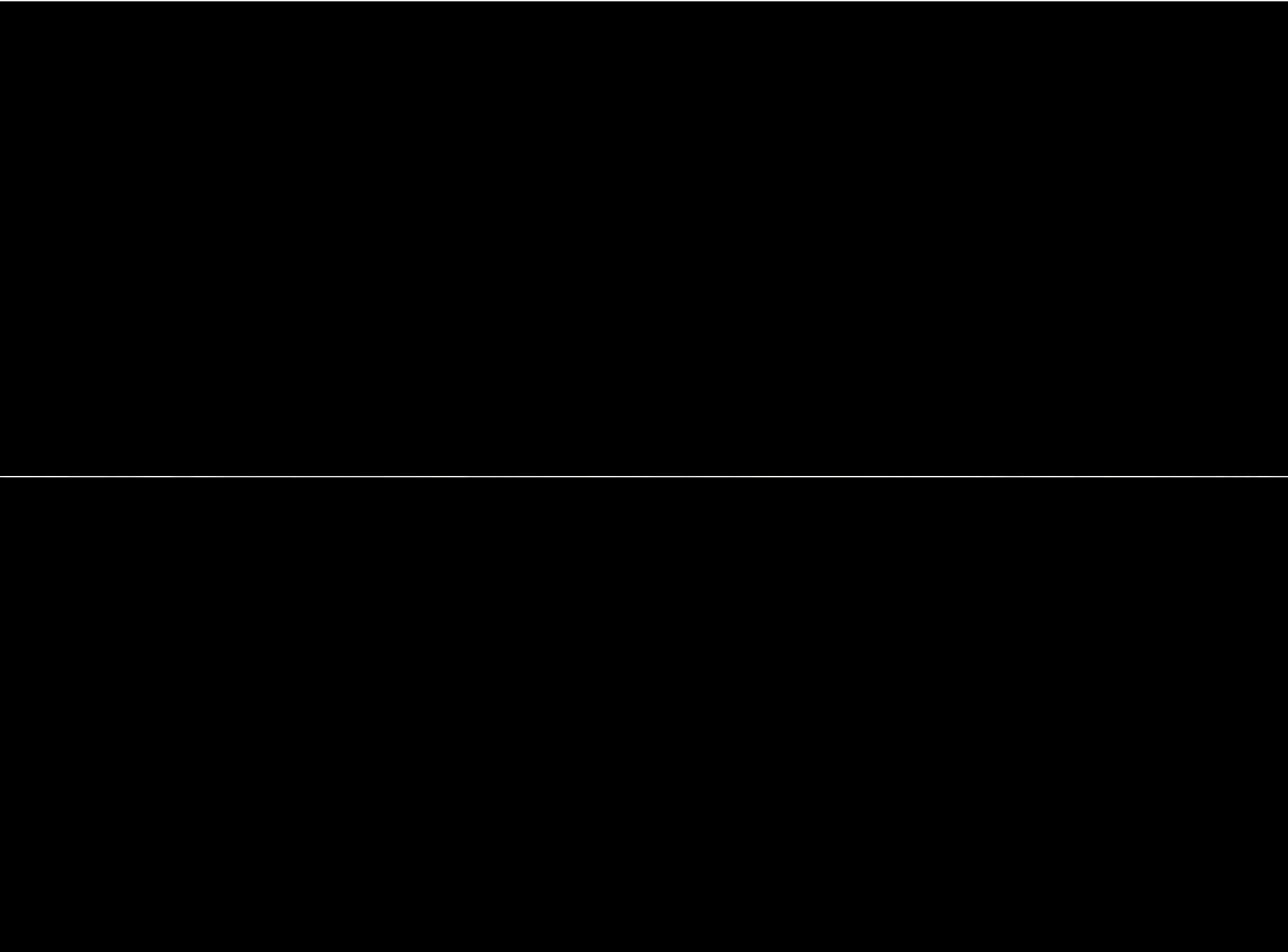
# Loiasis - Therapy

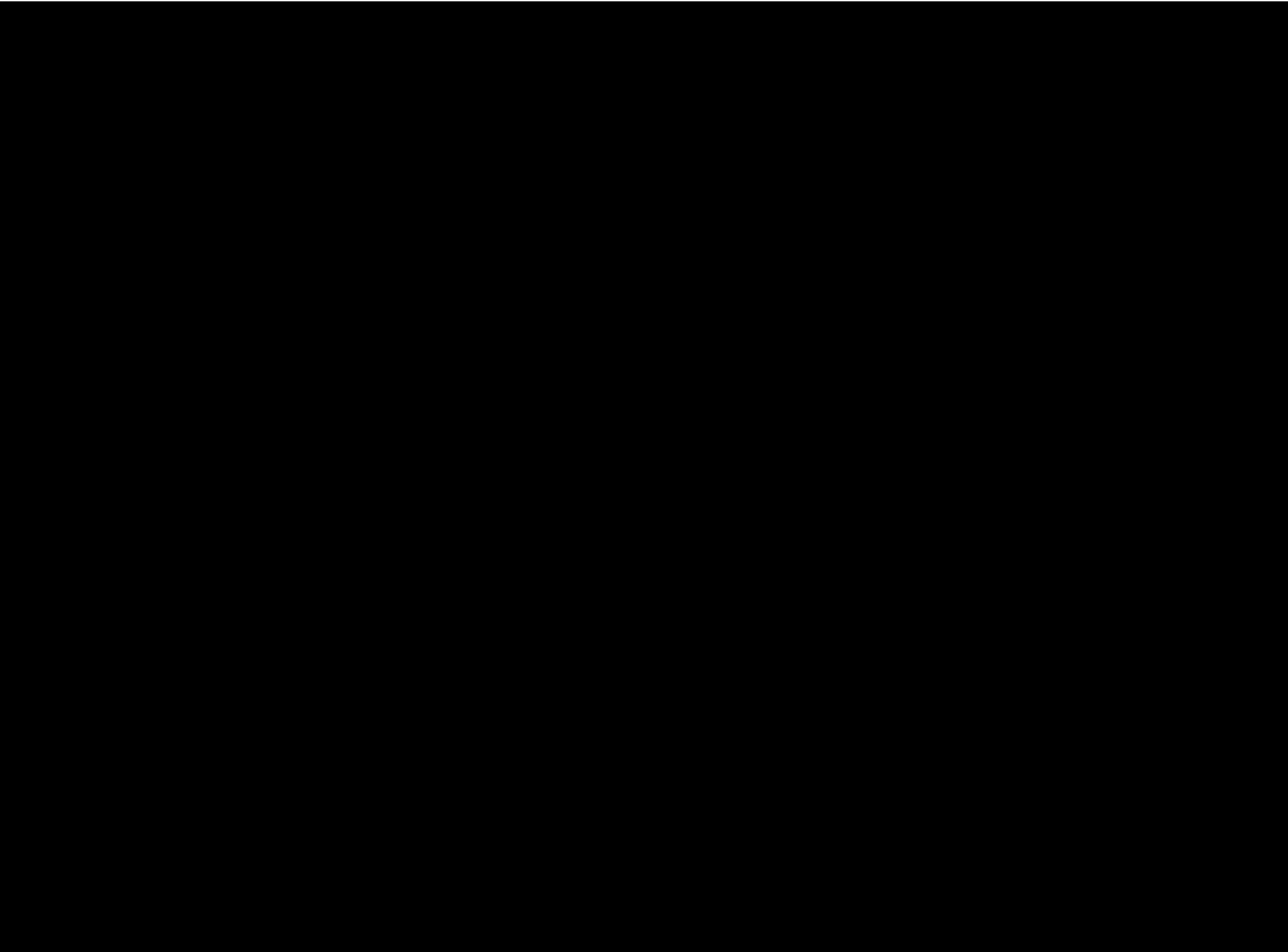
- Diethylcarbamazine (DEC) is Drug of Choice since 1951
  - 5 mg/kg in divided doses qd for 21 days
  - Kills microfilariae
  - Slower against adults
  - Given in escalating doses
  - May give with steroids
  - Consider plasapherisis if available
  - Adverse Drug Reactions: urticaria, fever, nausea, encephalitis



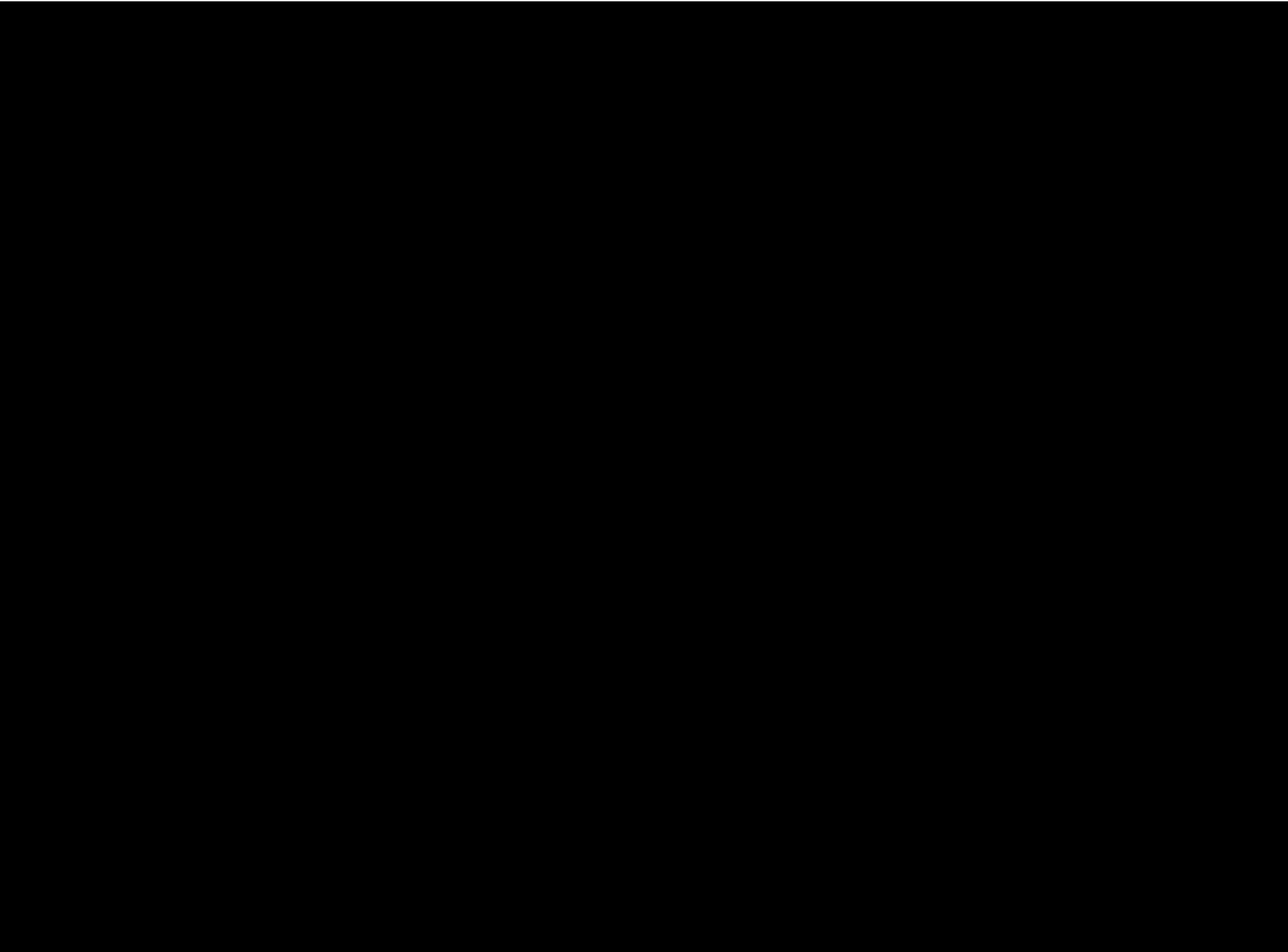


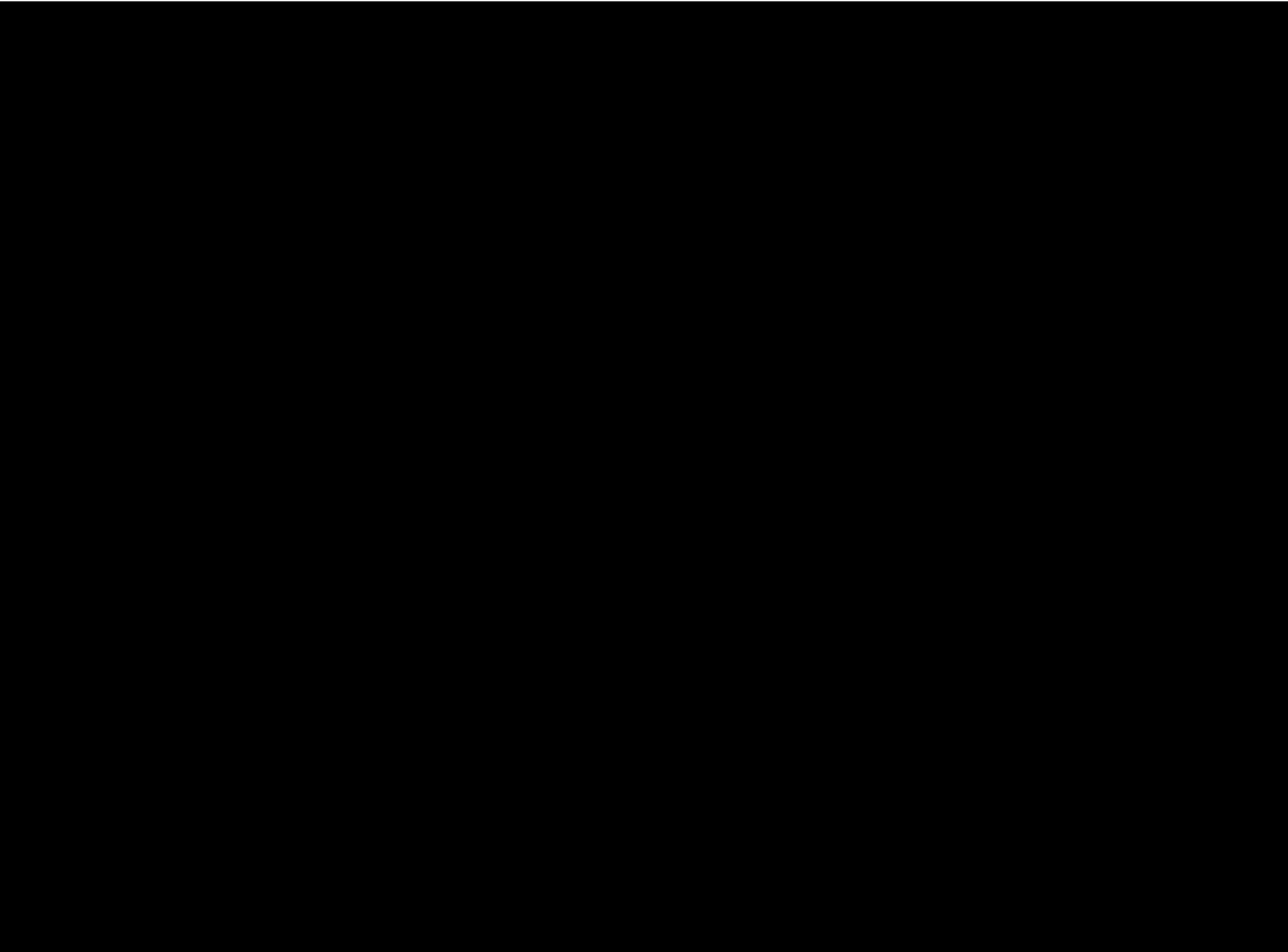
- “The fiery serpent” that afflicted the Israelites during their exodus
- Disease is more than 3,000 years old - discovered in calcified mummies
- Big enough scourge that it was recognized by Greek, Roman and Arab-Persian philosophers and physicians; indisputably a disease of antiquity
- May not be a human disease of the future
- Global eradication efforts spearheaded by the Carter Center in 1986--in partnership with WHO, CDC and UNICEF--have slashed the incidence
  - 1986, there were an estimated 3.5 million cases of Guinea worm in 20 countries in Africa and Asia
  - 2008, there were just 4,587 documented cases in 5 countries all within sub-Saharan Africa
- Soon to become the first parasitic disease to be eradicated--and second human disease to be eradicated, after smallpox.
- Furthermore, eradication would be achieved solely by behavioral measures, not by a vaccine or cure (as was done with smallpox)











Treatment????

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# Dirofilaria immitis

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