



# The Eradicability of Lymphatic Filariasis and Onchocerciasis

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- In Theory
- In Practice



# Public Health Goals and Implications

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	<b>Intervention</b>	<b>Surveillance</b>
<b>Control</b>	✓	✓
<b>Elimination</b>	-	✓
<b>Eradication</b>	-	-



# Eradication: concepts

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- Elimination *vs.* eradication
  - “regional eradication”
- Essentials for elimination / eradication
  - Effective intervention tools
  - Effective diagnostic tools
    - (effective strategy for using them)
- Tools *vs.* ‘force of infection’



# Eradicating LF and Oncho

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*The problem of Lymphatic Filariasis*

# Lymphatic Filariasis (LF): clinical profile

Lymphoedema/  
elephantiasis



Genital damage/  
hydrocoele





# Lymphatic Filariasis (LF): epidemiological profile

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- 120 million people *infected* worldwide
- 40 million with *overt* disease; 80 million with *hidden* lymphatic and renal damage
- 1.1 billion people *at risk* of infection
- 80 countries endemic in tropics and subtropics
- Two species: *W. bancrofti* (90%); *B. malayi*
- Vector: mosquitos – numerous species, both urban and rural



# Lymphatic filariasis

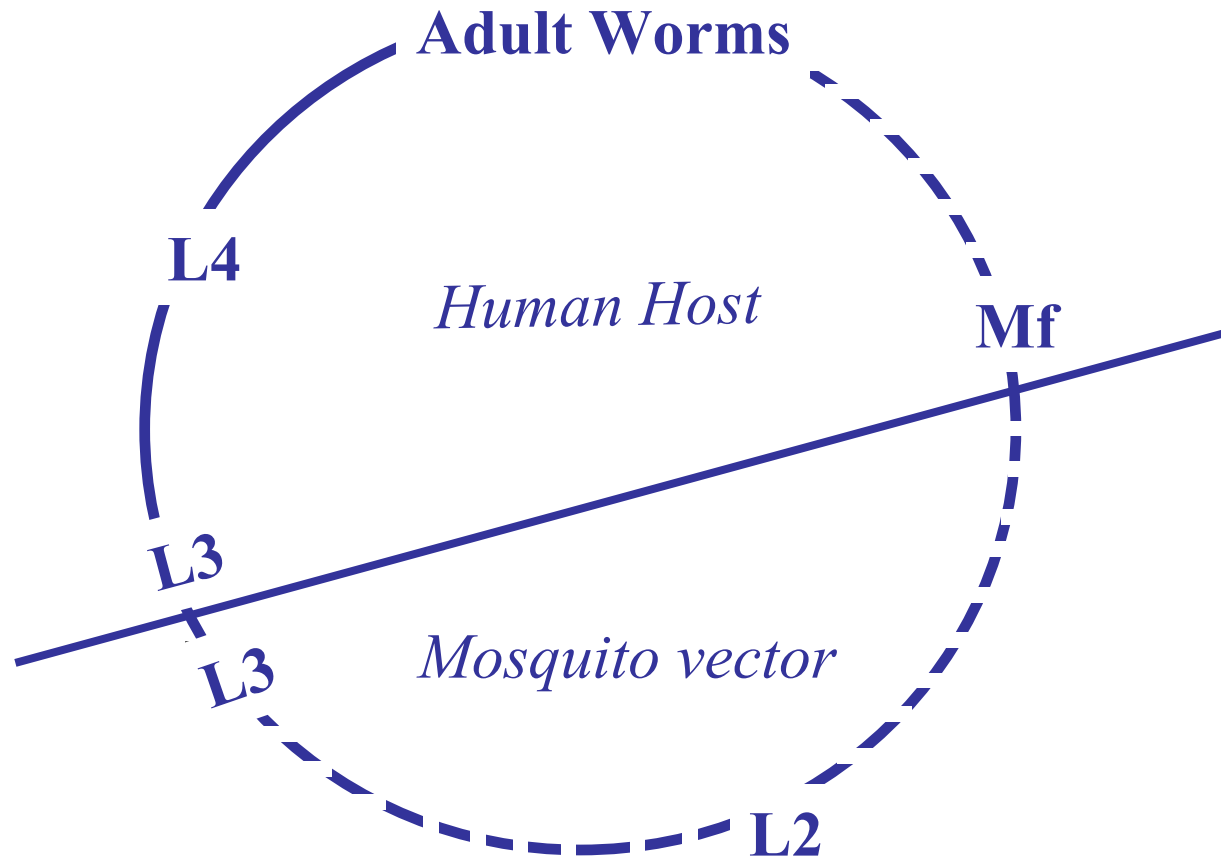
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*Essential tools for elimination*



# Lymphatic Filariasis: Life Cycle

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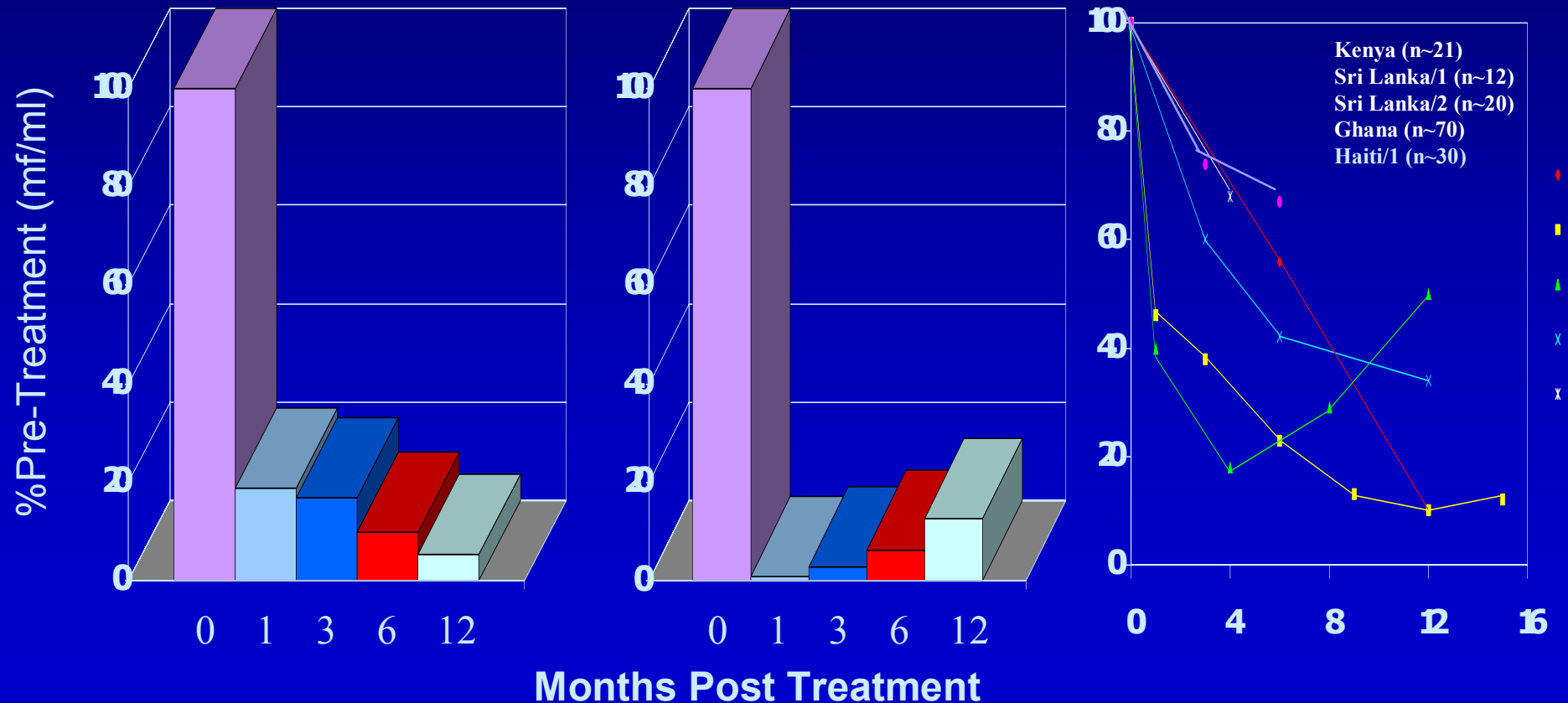
# Drug interventions: *single-dose* effectiveness

## Blood microfilaria levels (*W. bancrofti*)

### DEC

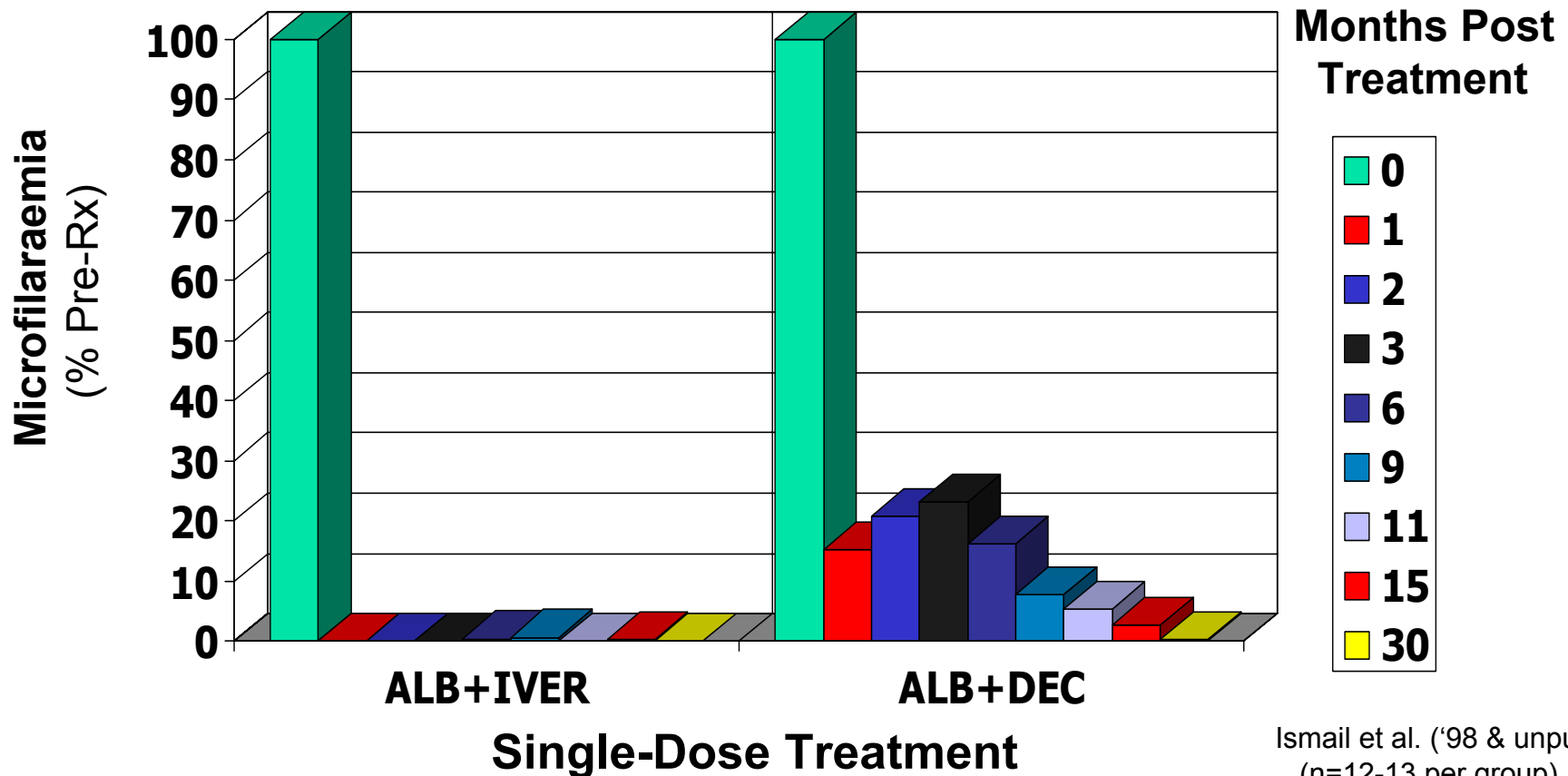
### Ivermectin

### Albendazole



# Albendazole + Ivermectin *or* DEC: *2-Drug Regimens*

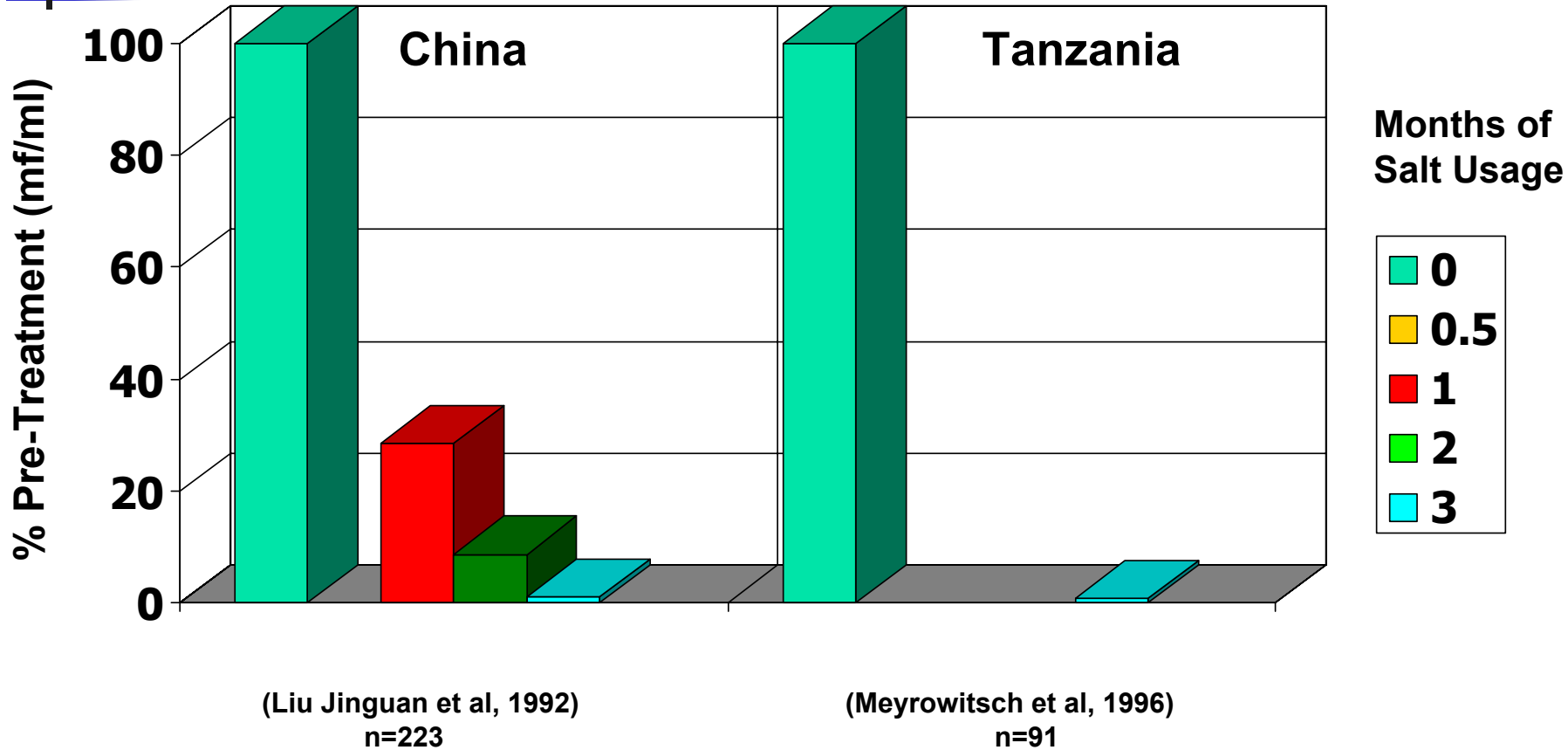
## Blood Microfilaria Levels (*W. bancrofti*)



Ismail et al. ('98 & unpub)  
(n=12-13 per group)

# DEC-Fortified Salt

## *Early Effects on Blood Microfilaria Levels*



***Wuchereria bancrofti***



## LF elimination: *strategy*

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➤ *Interrupt transmission*

- 'mass-drug-administration' (MDA) to entire 'at risk' population - *options:*

- ✓ single-dose, once-yearly 2-drug regimen for 4-6 years
- ✓ DEC-fortified table/cooking salt for 1 year

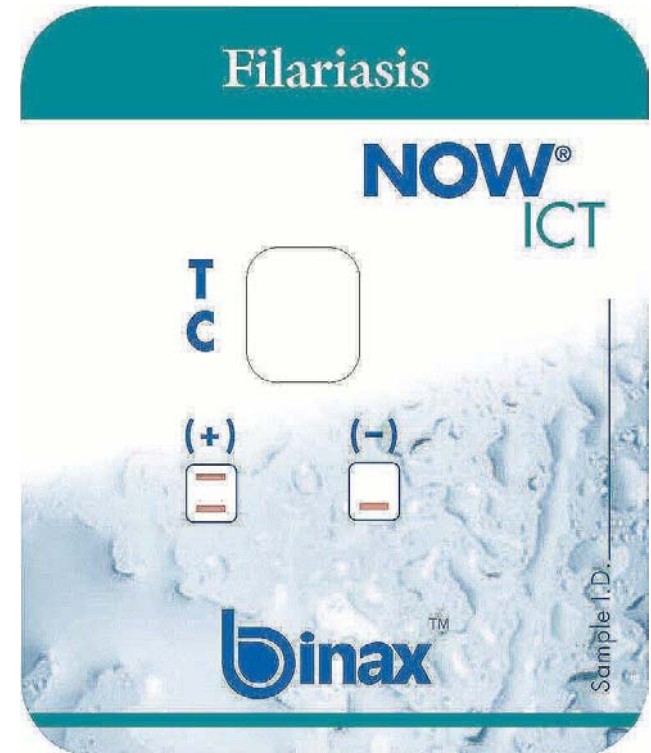
# *Traditional LF diagnostic: the blood film*

- Microscopic examination for microfilariae (mf)
- Parasites occur in blood only at night



# 'New' diagnostic: antigen-detection test (*W.bancrofti*)

- **High sensitivity (>95%)**
- **High specificity (99%)**
- **Positive night and day**
- Uses finger-prick blood
- Rapid (1-10 minutes)
- Field-useable
- Commercially available  
(cost: \$1.50/test for public health programmes)





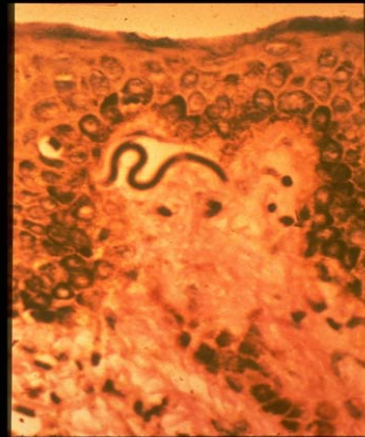
# Eradicating LF and Oncho

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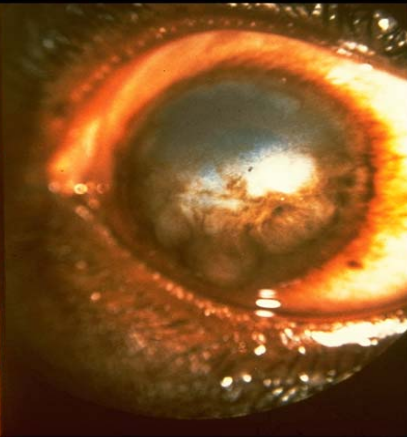
*The problem of Onchocerciasis*

# Onchocerciasis: clinical profile

Skin  
Disease



Eye  
Disease







# Onchocerciasis: epidemiological profile

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- 18 million persons infected; *99% are in Africa*
- 6.5 million with *skin disease*; 1/4 million *blind*
- 120 million persons at risk; *96% are in Africa*
- 36 countries endemic: 29 in Africa, 6 in the Americas & Yemen
- Vector: Blackflies (*Simulium spp.*) breeding in fast-running rivers or streams





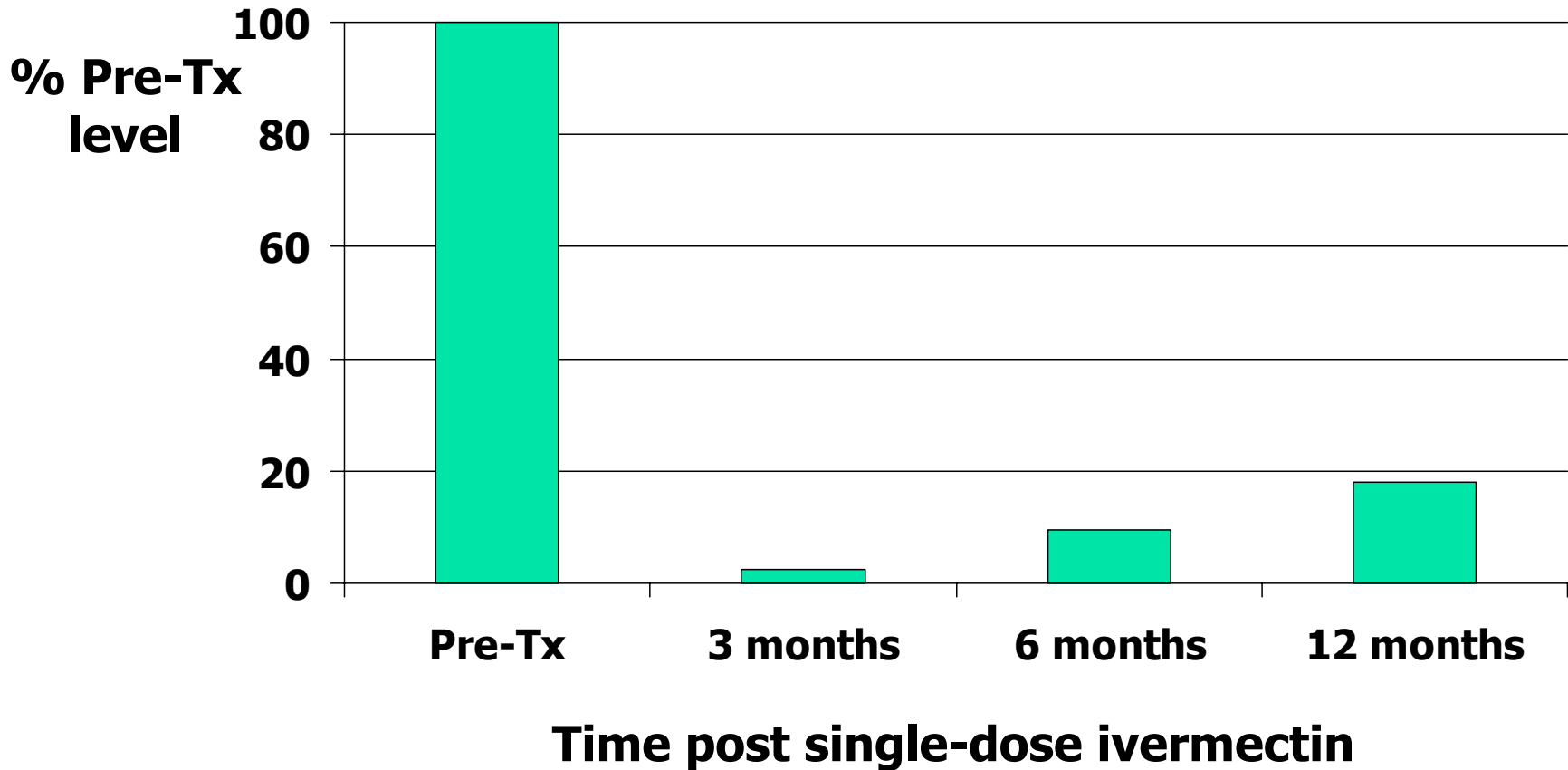
# Onchocerciasis

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*Essential tools for elimination*

# Drug intervention: *Ivermectin in onchocerciasis*

## Effects on skin microfilariae



# *Traditional oncho diagnostic: the skin snip*

- Skin snip
- Microscopic exam for microfilariae (mf)



# Comparison: tools for interrupting transmission

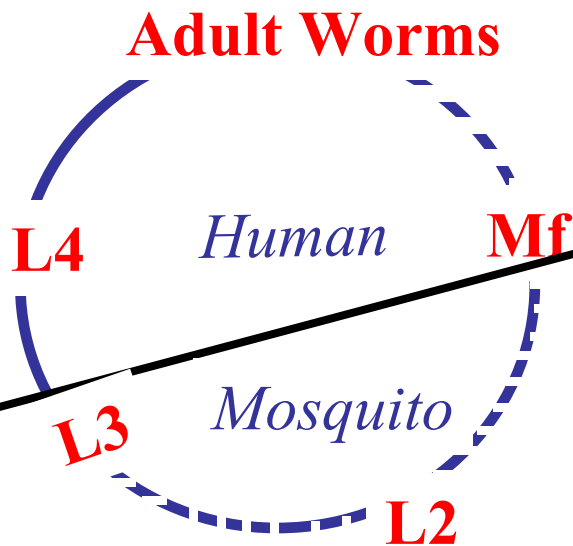
## *Lymphatic Filariasis*

**Human**

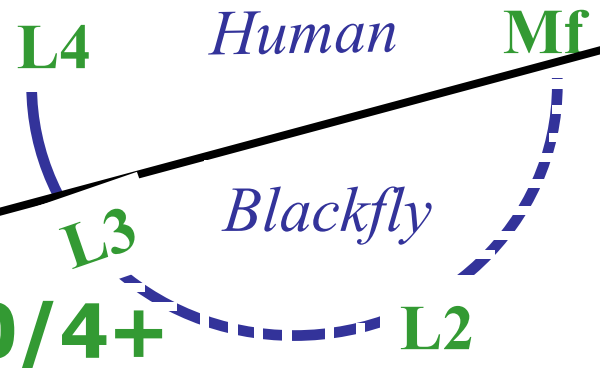
## *Onchocerciasis*

**4+ Intervention** **3+**

**4+ Diagnosis** **2+**



**Adult Worms**

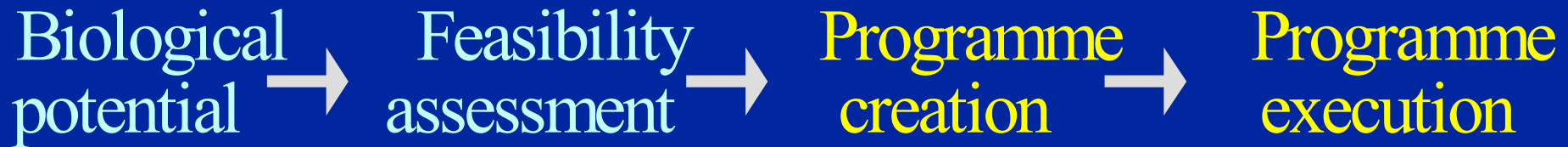


**1+ Intervention** **0/4+**

**2+ Diagnosis** **3+**

# Essential steps to 'elimination'

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- International commitment
- Political/social will
- Programme development
- Financial commitment



In practice

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*Lymphatic filariasis*



# LF Elimination: -international political commitment-

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- 1997: World Health Assembly Resolution
  - “Urges Member States.....to strengthen activities toward eliminating lymphatic filariasis as a public health problem.....”
  - “Requests the Director-General.....to mobilize support for global and national elimination activities.”



# LF Elimination: -financial commitment-



To donate all albendazole required for LF elimination; to support selected research and program activities



To expand Mectizan Donation Program to provide ivermectin for LF treatment where onchocerciasis co-exists



Long-term support of programme development and intervention in the countries and globally, through WHO and the LF support centres

UK



To support activities toward elimination of LF from all Arab Fund member countries

**Arab Fund for Economic  
and Social Development**

# Building Partnerships for Lymphatic Filariasis

Strategic Plan  
September 2009



## Global Alliance

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### *Strategic Plan*

- Targets
- Milestones
- Roles of partners



# Programs to Eliminate LF

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*Active in 2001*

*Projected in 2002*

➤ Country programs

**27**

**40**

➤ Population treated

**26 million**

**92 million**



In practice

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*Onchocerciasis*



# Onchocerciasis

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- *Political will & international support*
  - 1974: World Bank, WHO, FAO, 20+ national development agencies > **OCP**



# Onchocerciasis: goals and strategy

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Program

Activity

Goal

Tool

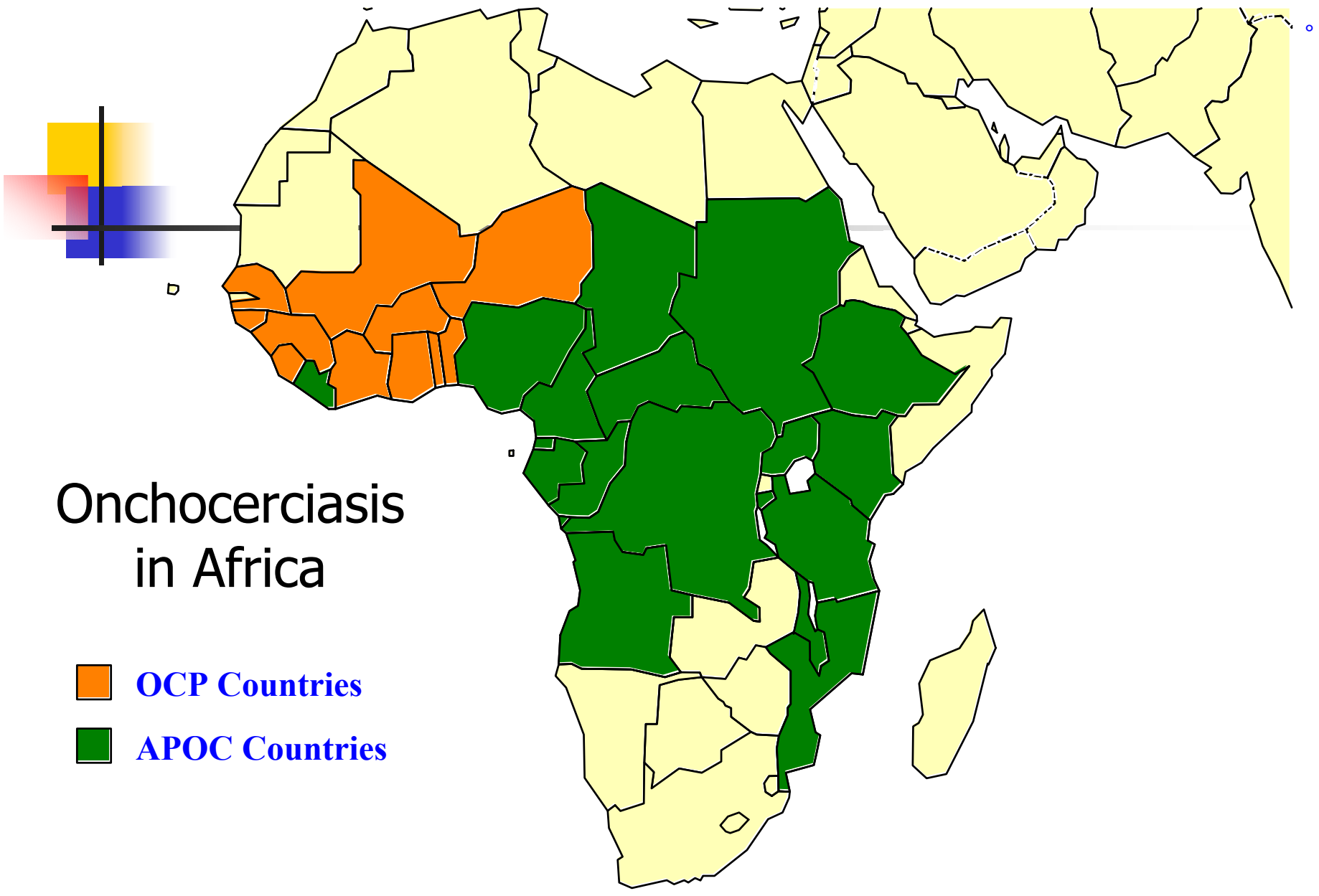
OCP

1970's-2002



Elimination

Pesticides

Onchocerciasis Control  
Programme



# Onchocerciasis in Africa

-  **OCP Countries**
-  **APOC Countries**



◀ The blackfly vector is controlled by applying biodegradable larvicides to the rivers each week using helicopters... or fixed-wing aircraft (below)



Stocks of larvicide are maintained in caches strategically positioned throughout the Programme area...



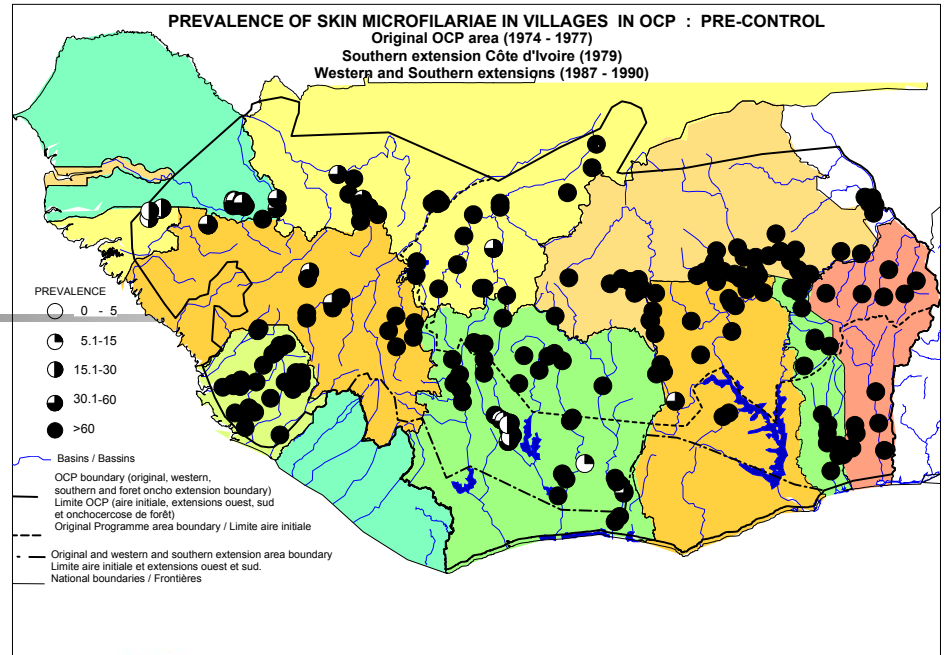
...along with fuel, so that the helicopters and fixed-wing aircraft can regularly replenish their tanks



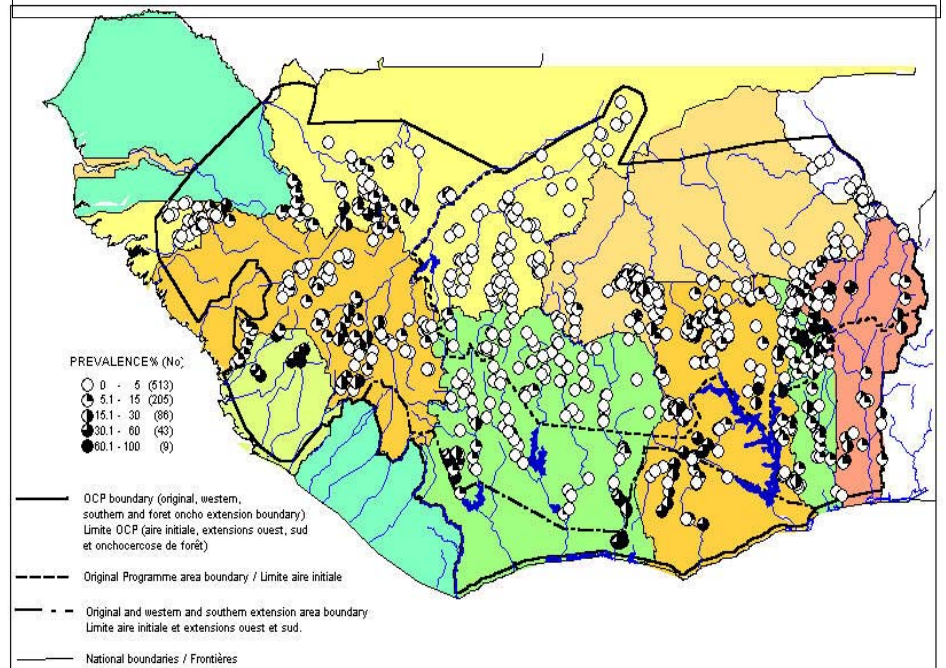


# Effectiveness of OCP

Pre-intervention  
(1975)



Post-intervention  
(1995)





# Onchocerciasis

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- *Political will & international support*
  - 1974: World Bank, WHO, FAO, 20+ national development agencies > **OCP**
  - 1987: Merck & Co., Inc. (Mectizan Donation Program)

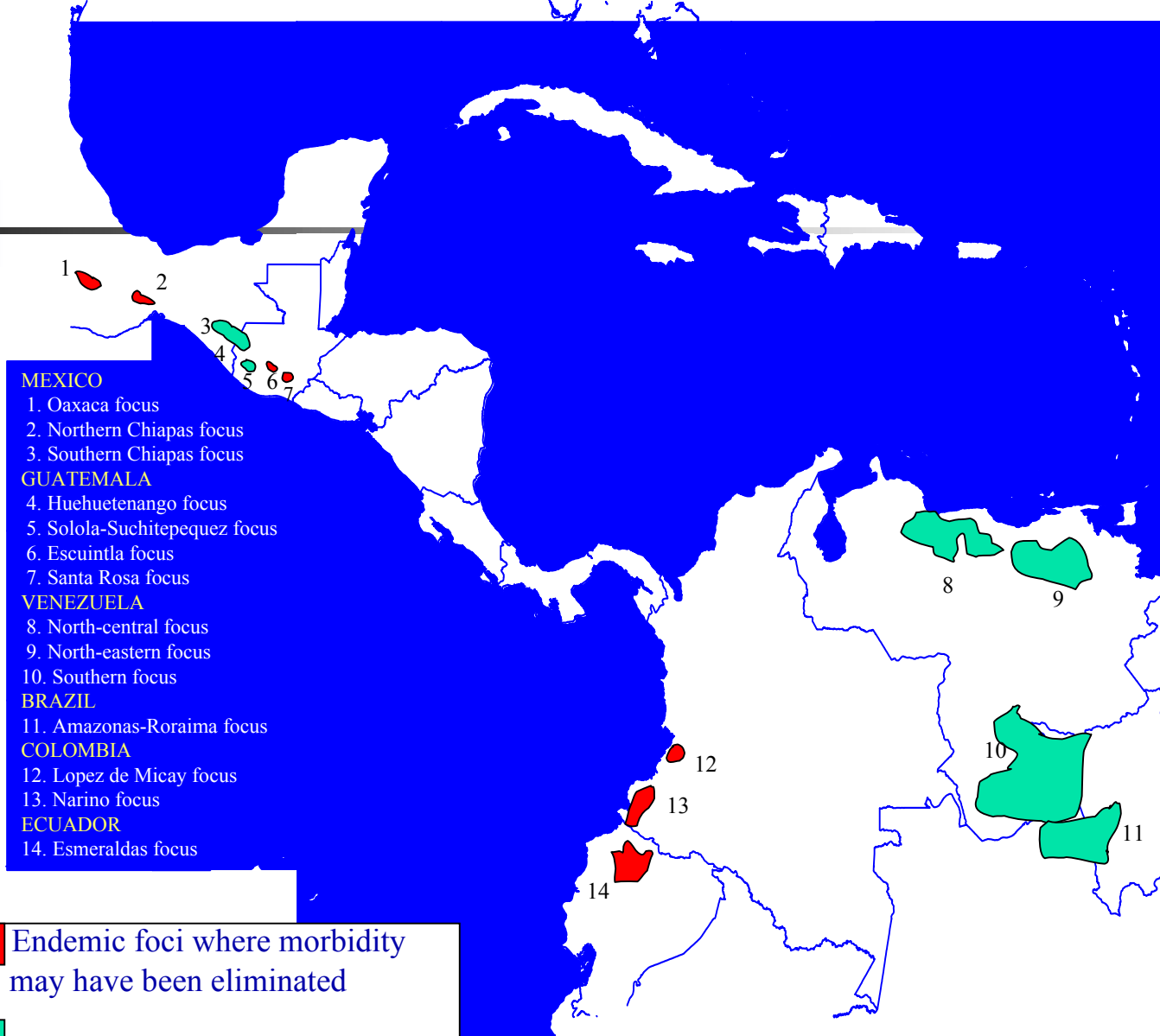


# Onchocerciasis: goals and strategy

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<u>Program</u>	<u>Activity</u>	<u>Goal</u>	<u>Tool</u>
OCP Onchocerciasis Control Programme	1970's-2002	Elimination	Pesticides [Ivermectin]
OEPA Onchocerciasis Elimination Program in the Americas	1992-00's	Elimination	Ivermectin (Mectizan)

# OEPA: Distribution of onchocerciasis in the Americas



Based on:  
Weekly Epidemiological Record 1996;71:278  
WHO Technical Report 852, 1995



# Onchocerciasis

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- *Political will & international support*
  - 1974: World Bank, WHO, FAO, 20+ national development agencies > **OCP**
  - 1987: Merck & Co., Inc. (Mectizan Donation Program)
  - 1995: World Bank, WHO, national development agencies, NGOs > **APOC**



# Onchocerciasis: goals and strategy

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<u>Program</u>	<u>Activity</u>	<u>Goal</u>	<u>Tool</u>
OCP Onchocerciasis Control Programme	1970's-2002	Elimination	Pesticides [Ivermectin]
OEPA Onchocerciasis Elimination Program in the Americas	1992-00's	Elimination	Ivermectin (Mectizan)
APOC African Programme for Onchocerciasis Control	1995-00's	Control (sustainable drug delivery)	Ivermectin (Mectizan)



# Eradicability of LF & Oncho: Conclusions

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	<b>LF</b>	<b>Oncho</b>
<b>Control</b>	4+	4+
<b>Elimination (Regional)</b>	4+	1+
<b>Eradication</b>	possibly	No