

**The Control of River Blindness in West Africa: an example of what we will discuss in ecology and evolutionary biology during the last part of the semester**

*Outline of Lecture 1*

**Ecology of a Human Disease**

- A. What is Onchocerciasis?**
- B. What causes it?**
- C. How is it controlled?**
- D. What happened after Onchocerciasis was controlled?**
- E. Geopolitics and disease control programs**
- F. Skin pigmentation and human evolution**

**A. What is Onchocerciasis?**

Onchocerciasis—or river blindness—is a human disease that may result in 10-30% of villagers in West Africa becoming blind.

It is known from Africa and parts of South America, but 99% of the blindness from it occurs in West Africa.

Early stages include rashes, severe itching. Blindness results from immune response.

**B. What causes it?**

1. It is transmitted by the black fly  
*Simulium damnosum*
2. It is caused by the filarial worm  
*Onchocerca volvulus*

**C. How is it controlled?**

1. Control of the black fly vector through insecticide applications (30,000 miles of river per week for 20 years)

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2. Control of parasitic worms through chemotherapy (distribution of Ivermectin drugs to 7 million people in 11 severely affected countries)
3. The control is based on biodiversity—of the vector and parasite, the insecticides used, drugs distributed, and non-target fauna
4. This disease is an example of evolution and ecology in disease control!

D. What happened after Onchocerciasis was controlled?

1. Food is now grown to feed an additional 17 million people
2. However, unplanned resettlement of river valleys freed from Onchocerciasis led to unsustainable agriculture and soil erosion
3. Distribution of bed nets for malaria control and drugs for lymphatic filariasis

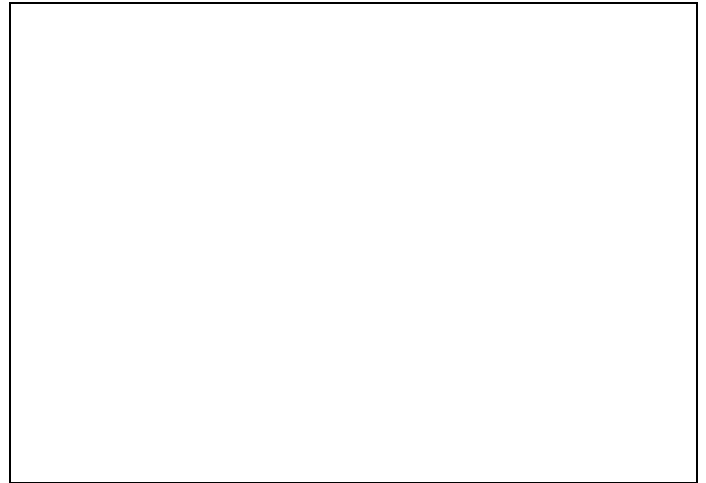
E. Geopolitics (wars, political strife) can affect the most successful disease program

F. Skin pigmentation has involved 5 million years of evolution.

1. What is the color of chimpanzee's face?
2. Hair becomes a disadvantage with increased activity because of evaporative cooling. Melanin skin evolves 1.6 MYA.

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- G. Ultraviolet light has negative and positive aspects.
1. Causes DNA damage, breaks down foliates important for neurelation.
  2. But UVB catalizes vitamin D production through the skin
  3. Humans are on a razor's edge of skin pigmentation: too dark or too light?



- H. The balance between skin pigmentation and available sunlight may be affected by human migrations, and cultural habits, etc.
1. Why do females tend to have lighter complexions, on average, than males?
  2. Malnutrition and continued poverty.
  3. Why are these examples one illustration of the 3<sup>rd</sup> segment of Biology 1B?



- I. For further information on the evolution of human skin color see:

Jablonski, N.G. and G. Chaplin. 2003. Skin deep. *Scientific American* 13:72-79.

