HIV and Zika in Africa: what do these illnesses teach us?

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"Ex Africa semper aliquid novi."

Out of Africa (comes) always something new:
Pliny the Elder (AD 23 to 79)
Overview

• Burkitt lymphoma

• HIV

• Zika

• Proposal for Lukwiya Mathew speaker series on emerging epidemics from Africa
Burkitt lymphoma

Before treatment

After treatment
Burkitt lymphoma: a multi-factorial disease model

- Plasmodium falciparum malaria
- Host genetics
- Genetic abnormalities
- EBV

Factors:
- Antigenic stimulation
- Immunosuppression
HIV

Luc Montanier
Robert Gallo
Global Size of HIV Epidemic

People living with HIV

1. People living with HIV (all ages)
People living with HIV

3. People living with HIV (all ages) - by region
People living with HIV_HIV Prevalence_Population: Adults (15-49)

1. HIV Prevalence
People living with HIV_Number of people living with HIV_Population: All ages

1. Number of people living with HIV

![Graph showing the number of people living with HIV by region.](chart)
1920-1930

1. Humans butcher chimpanzees infected with SIV.
2. The virus is carried by people travelling along the river ...
3. ... to Kinshasa, where the epidemic begins.
The diagram illustrates the evolutionary relationships between different simian immunodeficiency viruses (SIV) and human immunodeficiency viruses (HIV). The timeline suggests that the spread of HIV may have occurred from simians to humans, with key events in the 1920-1930 and 1960's periods. The image shows a chimpanzee, a simian species, which is relevant to understanding the transmission of these viruses.
Lessons from HIV

- The HIV epidemic was preceded by a long period of undetected zoonotic infections.
- Globalization set the stage for the spread of HIV.
- African countries lacked capacity to detect the early events.
In a Remote Ugandan Lab, Encounters With the Zika Virus and Mosquitoes Decades Ago

By JOSH KRON  APRIL 5, 2016

ZIKA FOREST, Uganda — In the 1940s, colonial researchers slashing through tropical brush stumbled upon this forest near the lapping waters of Lake Victoria. With its cool, wet climate, the swampy area was a giant petri dish for virologists.

They decided to make it a field site for a research institute nearby in Entebbe, an outpost of what was then the Buganda Kingdom. There, samples of mosquitoes, birds, bats and other mammals were analyzed. Of prime interest was yellow fever, thought to originate in the area.
Zika Virus

• April 1947: A new virus is isolated from serum of a pyrexial rhesus monkey caged in the canopy of Zika Forest

• Jan 1948: A second isolation made from a lot of *A. africanus* taken from the same forest. The virus is named Zika Virus, after the local forest
  - Cross neutralization tests show that Zika virus is not related to yellow fever, Hawaii dengue nor to the FA and GD VII strains of Theiler's mouse encephalomyelitis virus

• No studies in Uganda since

Zika Virus

- Transmitted by *Ae aegypti* mosquitos
- No known non-primate reservoir
- First infection in humans documented in 1964 & 1973 – laboratory acquired
- Clinical cases detected in Indonesia (fever, anorexia, diarrhea, constipation, abdominal pain, and dizziness) in 1981;
- Outbreak on Yap island in 2007 – conjunctivitis, rash and arthralgia
Global Distribution of Zika Virus

Red – human isolation; Yellow – serological positivity
First detection of autochthonous Zika virus transmission in a HIV-infected patient in Rio de Janeiro, Brazil

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A B S T R A C T

Since May 2015, Brazil’s Ministry of Health has reported autochthonous transmission of Zika virus (ZIKV) in some states of the country. Simultaneous circulation of Dengue, Chikungunya and ZIKV in the coun-
Zika Virus in Brazil

- 38 year old HIV infected man in Rio De Janeiro sought medical attention in May 2015
- Patient denied travel history in the 30 days before presentation
- Patient diagnosed with HIV in 2006 was on treatment
- Patient was positive for 800 bp amplicon of flavivirus genus and ZIKV was confirmed after blast analysis
Global Distribution of Zika Virus
Global Distribution of Zika Virus

Map showing countries where Zika virus has been reported.
Microcephaly in ZIKV Infection
The global citizen
Impact of Zika virus globally

• Infection linked to microcephaly
• In the US local infections have been identified
• Epidemiological analysis suggest ZIKV likely to be a major public health problem
• The ZIKV scare cast a shadow on the Rio Olympics, showing the power of UEES events
Lessons from ZIKV

- ZIKV was preceded by a long period of undetected zoonotic infections.
- Globalization set the stage for the spread of HIV.
- African countries lacked capacity to detect the early events.
Lessons

● Infections of major global significance likely to emerge from Africa

● Globalization is likely to accelerate the spread and impact of such infections

● African countries can be assisted to develop capacity to monitor and detect the early events
Asteroid Defense Program
Mathew Lukwiya: Ebola champion
This epitaph is dedicated to Dr. Mathew Lukwiya and all those health workers who worked tirelessly to contain the Ebola epidemic (September - December 2000). And in appreciation of all those persons who continue to serve the sick and work hard for the future of this hospital. Service to the sick is a call which deserves continuous dedication. This epitaph is a gift from the University of Naples to St. Mary's Hospital Lacor.
Mathew Lukwiya
Epidemic Prediction Center at Erice

- African scientist working on emerging infections to develop prediction models to identify future threats

- A plan to catalogue threats and develop a response plan

- Heighten awareness of these threats to African Governments and their partners