Human Health Lectures

Natural History Museum

Professor Eric Arts

* Origins of HIV and how it was introduced into the human population
* Around 1 in 5 children in Uganda have or will have HIV/AIDS
* Deaths from AIDS – 2,000,000 people every year
* Arts studies in Uganda, he comments on how few middle-aged people there are because of disease
* President’s Emergency Plan for AIDS Relief
  + $15 billion 5-year plan devoted to AIDS relief
* We are in a Crisis mode – Peter Mugyenyi
  + Unfortunately people are encouraged to get tested for HIV, but then find out that there is no cure
* Arts acts as if there are no other humanitarian problems in the world besides HIV/AIDS (My opinion, don’t write about it)
* We need an immediate solution, he says
* Where did HIV come from?
  + HIV was not transmitted to humans through some form of sexual contact
  + In the jungle, the only source of meat is generally non-human primates or monkeys
  + It most probably came from bush meat (butchered primates)
* So what is a virus anyways?
  + A submicroscopic infectious agent that is unable to grow or reproduce outside a host cell. It is non-cellular but consisting of a core of DNA or RNA surrounded by a protein-coat
    - Viruses do have a function in evolution
    - The reason we can digest starch is because of a retrovirus that infected ancestors
  + Retroviridae
    - Has an enzyme that copies the genomic RNA to DNA and can stably integrate or “hide” into the chromosomes of that cells
    - It is very difficult to get rid of the retroviruses because it “hides” in DNA
    - Phylogenetic trees – Lentiviruses (another subcategory of retroviruses)
* We used to believe that cancer was caused by retrovirus, but that’s not true
* HIV – Human Immunodeficiency Viruses currently infecting the HIV population
* HIV-1
  + Group M – global
  + Group N – very rare
  + Group O – rare
* HIV-2
  + Group A – epidemic West Africa
  + Group B – epidemic in West Africa
  + Groups C-H – unique cases
* There is a large genetic difference between the different HIVs
* Of the 33.4million cases of HIV, 22.4million are in sub-Saharan Africa
* Where did HIV come from?
  + Primates infected with lentiviruses
    - >30 species of African primates naturally infected with SIV
      * SIV infections: natural, acquired...
  + Most likely came from Africa, not South America
    - Who is the most likely candidate for spreading HIV?
      * Sooty mangabey is the closest to HIV-2
      * HIV-1 is more difficult to place
        + It’s most likely related to chimpanzees
        + There was a divergence in chimps as well
      * They sampled lots of chimpanzees to figure out where the HIV-1 may have come from
        + They took DNA from their feces and mapped out all the chimps in one area
        + They found that the ones that were infected with SIV that was closest to HIV-1 were mostly in southern Cameroon
      * They also studied gorillas and found a strain that may have evolved into a rare strain of HIV
* When did it get here?
  + If you trace back the jump from primates to humans it is around 1930
    - You can do this by measuring the amount of mutations in each generation
* Where has it gone?
  + SIVcpz jumps into humans somewhere in the Congo basin and it remains there for 50 to 60 years in local populations without spread
    - This is because the virus is not easily spread and the Congo basin was very impenetrable
    - The virus was probably taken around the world many times without epidemic.
    - How did it become an epidemic?
      * Slowly but surely it spreads
      * It was taken to Haiti and then started in the United States
      * Meanwhile it is spreading elsewhere into the world
      * There are many different strains in different parts of the world
* What is it doing?
  + SPREADING
* Is it changing?
  + The virus is not changing so much and hasn’t changed so much since the 80s
  + Competitive advantage of historical over recent isolates
    - The viruses from the 80s are actually more virulent
* How is the virus spreading?
  + When different subtypes of HIV infect the same population, one eventually overtakes the others
    - There is an advantage of subtype C in the population (this is recent study)
    - Measuring when developed AIDS by CD4 cells
      * The loss in Ugandan women of CD4 cells is much larger and happens faster that women in Zimbabwe
* The strains are different, but it’s hard to tell them apart.
  + There are genetically different
    - To compare the different viruses you “compete” them and see which ones “beat” the other ones in a survival game