Week 11 Lecture 1

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1 Administrative drivel

- Exam on friday!
  - covers through today's lecture
  - lecture images are up
  - study guide has more in it than the exam will cover, but will be updated today to contain just the relevant info

2 Diseases

- clicker q: What would happen if a virus infected and disables your APCs? T-cells would no longer be able to recognize antigens
  - This is not a common occurance!
  - This is one of the major problems with HIV
  - has anyone done this through Gain of function?
- Infectious disease is:
  - Transimittable
  - communicable
  - contagious
  - you can catch it from someone else
- Non-infectious diseases don't have the above properties
  - E.g. lung cancer can't be transmitted to others (aside from through second hand smoke I suppose)
- COVID is highly infectious
- the most important factor in spreading rate is the number of susceptible infectees
- probably know which diseases are infectious and not infectious out of the study guide list
- Types of infectioous diseases:
  - Viruses
  - bacteria
  - fungi
  - micro-organisms
  - parasites

- Example non-infectious diseases:
  - Cancer (usually)
  - kidney disease
  - liver cirrhosis
  - dietary difficiencies
  - genetic disorders
- Viruses:
  - parts:
    - spikes
    - envelope
    - capsid
    - nucleic acid (RNA or DNA)
    - some have head, sheath, tail fibers
    - all but nucleic acids are made of protiens
  - they can only reproduce by taking over the transcription mechanism of a cell
  - some viruses (bacteriaphages) kill bacteria
  - no metabolism
  - Non-living organisms
  - NOT made of cells
    - just a protein coat with DNA or RNA inside
  - DO NOT acquire and use energy
  - CAN NOT reproduce without a host cell
  - there are other non-living things that cause disease
    - e.g. mad cow disease is just a self replicating protien
- Steps of viral infection:
  - The surface has protiens that allow it to bind to cells
    - they must be the right shape for the host cell
    - so, who the virus attacks is fairly specific
  - They trick the cell into bringing the virus in
  - Take over the host cell machinery to produce the protiens that their nucleic acids code for
    - Reverse transcription is hijacked if RNA to turn it into DNA, transcription is hijacted if DNA
    - makes copies of itself
  - Viral copies break off of the host, allowing them to spread
- Viral diseases:
  - Rabies
    - no good treatments, deadly
  - flu
  - cold
  - measles
    - You've been vaccinated for, yay

  - polio
    * Jonas Salk gave us a vaccine in 1950s
    * muscle wasting illness (yikes)
  - zika
    * newer!
    * suddenly became common, and made it to florida
  - HIV
    * Taken out millions WW, 100ks in US in 80s, 90s
  - smallpox
    * Edward Jenner did the thing to vaccinate, but we have a real one now.
    * Only disease that we've eliminated from the wild! :D
      · killed out by vaccinating almost everyone
      · trying to do the same with polio, but wars are making it hard, along with cultures with stigmas against vaccines or outsiders
    * 2 places in the world have the virus in test tubes
  - hepatitis
    * A,B,C,E, C most common, degenerates liver and can kill you
  - Ebola
- Ebola – scary – symptoms
  - doesn't tend to reside in humans (but wild life can transmit to humans)
  - sudden fever
  - intense weakness
  - muscle pain and headache
  - vomiting
  - diarrhea
  - impaired kidney and liver function
  - internal and external bleeding
  - usually results in death in a matter of days
  - doesn't spread easily between humans, but is more common in cultures where people are in close contact with the dead bodies of infected
  - HIGH mortality – about 50% by as high as 90
  - 2014-16 outbreak
    * began in W. Africa
    * more than 28,000 cases (+4 in US)
    * more than 11k deaths (+1 in US)
  - Low infectiousness
    * ONLY via direct contact with infected body fluids (of which there can be a lot)
  - Tracking epidemics (who.int has system of reporting cases)
  - Subsequent smaller scale outbreaks are still happening
- Influenza and colds
  - Highly contagious
    * person-to-person

    * airborne
- Flu has low martality rate
    * usually less than 5 in 100k
    * up to 100 in 100k during pandemics
    * but high infectiousness == 20-30k+ deaths per year in the US, 291K-646K worldwide
        · Almost all of these are elderly, the immune-compromised, or the residents of the poorest countries
- "Common Cold" is caused by several different viruses