Week 12 Lecture 0

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1 Administrative drivel

- A few make ups for the exam still need to be done
- Exam grades should be up by the end of the week – saturday at the latest

2 Diseases

- Viral diseases:
  - highly contagious
    - person-to-person
    - airborne
  - Flu has a low mortality rate
    - usually less than 5 in 100k
    - up to 100 in 100k during pandemics
    - highly infectious = 20-30kk+ deaths per year in US, 291k-646k world wide
      - most common among elderly, immune-compromised, or residents in poor countries
      - e.g. people on immuno-supresant drugs
      - not a trivial number – 20-30k is almost as many as die in car crashes yearly
      - This number dropped to 2k during the COVID pandemic, due to measures to reduce COVID infections.
  - "Common cold" is caused by several different viruses
- "Spanish Flu" epidemic of 1918
  - killed around 5% of the world's population (1 million in US)
  - Killed more people that both world wars combined
  - In todays number that would be
    - 350 million people (approximately the entire population of the US)
  - Still around, but we have vaccines and built up immunity
- Pandemics seem to happen about every 70 years
- Seasonal influenza:
  - Several types and subtypes:
  - Influenza virus Type A:

        * H1N1 (1918 spanish, 2009 swine)
        * $H_2N_2H_3N_2(2017-18badflu, maybe)$
* $H_5N_1(Birdflu2004)lotsofothersubtypes$
* often transissible among humans, birds, pigs
    - Type B and C
    - Flus live among other animals and jump to us

- Flu Vaccine production
    - Within each virus Type and Subtype, there are lots of mutant strains
        * Each mutant strain may carry unique antigens
    - more than 100 countries continually monitor flu strains and send represientative samples to the WHO to make a prediction of what flu strains will be prevelant
    - In Feb the WHO begins creating a vaccine to match predictions of the following season's flu antignes (they begin in Sept of S. Hemisphere flu)
    - If they're lucky, the flus that circulate are covered by the vaccine

- Vaccine safety
    - so, even if vaccines are effective, isn't there somme concern about side effects?
    - about 1 in a million will get severe side effects, most will get some side effects from vaccines
        * E.g. paralysis that takes 1/2-1 year to recover
    - Mercury preservatives blamed for
        * Developmental disorders (i.e. autism)
        * Elemental mercury: Hg the heavy metal itself
        * Methylmercury: $Hg^+ - CH_3$ in fish
            · Causes minomona disease
            · severe birth defects
            · this is why pregnant women are recommended to not eat fish
            · Mercury from coal burning goes from the atmosphere into the water through rain, and the herbivorous fish eat it, then the carnivore fish eat the herbivorous ones, building up even more in their fat.
        * Etheylmercury: $Hg^+ - CH_2 - CH_3$ In vaccines
            · Same as ethylalcohol, but with mercury
        * Mercury has 2 moes of action:
            · Binds to some nerve cell receptors, innterferes with nervous system (developement)
            · Binds to sulfur – important component in some amino acid, interfering with protien synthasis
        * Autism – 1998 study in *The Lancet* claimed a link between MMR vaccines and autism
            · lead to vaccine hesitancy, and this has persisted
            · This has not been able to be replicated...
            · but could not be refuted (over past 20 years)

            - The formulation of vaccines was changed removing the mercury, but autism continues to orise
            - *The Lancet* retracted the article due to methedological issues and conflicts of interest

- Viral treatments
    - Antibiotics **DO NOT WORK**
    - Wait it out
    - Anti-viral drugs
        * HIV
        * COVID
        * These reduce the severity of symptoms
    - vaccinations

- Bacteria:
    - e.g. cocci, strepptococci, staphylococci
        * cocci means sphere
        * bacteria tend ot be named by their shape
        * others are rods, cork screws, etc.
    - Human body has
        * around 30 trillion of our own cells
        * around 40 trillion are bacteria (2000 species)
            - mostly in the gut
            - also on the surface
            - these are helpful!
    - Diseases:
        * plague
        * Lyme disease
        * syphilis
        * tuberculosis
        * tetanus
        * cholera
        * leprosy
    - Treatment:
        * Antibiotics **DO** work
            - Break down or prevent formation of the bacterial cell walls
            - Interfere with bacterial ribosomes
            - Interfere with essential bacterial metabolic pathways
        * doesn't effect eukareotes
        * Histoory of antibiotics
            - 1928 – Alexander Fleming – Penicilin discovery in fungus

- 1940s – penicilin devveloped
- Pushed by infection-based death rate in WW1 concern of same things in WWII
- Team from Oxford, UK, developed it as a useful medication
- Eli Lilly in the US got production scaled up inn time for it to be used on the front
- Since then, we have on the order of 100 antibiotics
- Vancomycin, Tetracycline, Amoxilicillin, etc

- Clicker Q: why can't antibiotics be used on viruses? They dont have cell walls, ribosomes, or a matobolism