

Introduction:

Go through syllabus.

Preliminary comments:

We will obviously concentrate on biology first

But the course is “infectious diseases and society”

as we go through our survey of diseases, we will try to discuss how these diseases impact society.

- how has AIDS affected humans?
- also, historical - the black death had enormous impacts on society
- we will NOT get into the details of the biology of these diseases (e.g., we won't discuss biochemistry and such in any depth)

Also: the syllabus (except for the grading part) is not written in stone. If you'd rather cover different diseases or discuss other topics related to infectious disease, let me know and perhaps we can fit it in or re-arrange things.

For the first week or two, we'll stick with the syllabus, though.

Infectious disease: a definition, and some (non-human) examples:

A disease caused by a pathogen. A pathogen is a disease causing organism.

What are some examples?

- bacteria (tetanus, plague, *E. coli*)
- viruses (AIDS, smallpox, flu)
- fungi (athlete's foot, yeast infections)
- protozoa (malaria, sleeping sickness)
- parasites (tapeworms, shistosomiasis, pinworm)
- weird things like prions.

Most of these are also contagious:

- they can spread from one individual to another through various means:
 - airborne, vector, bodily fluids, etc.

Note that infectious diseases don't affect just people. The impacts of diseases of animals, crops,

pets, etc. can have profound consequences. Three examples:

Potato blight: caused by an algae (relative).

- destroyed the potato crop in Ireland (exact figures seem hard to come by).
- estimates are that over 1 million people starved. An additional 2 million emigrated.
- even today, there is a lot of controversy (how the government did or did not respond, etc.)
- caused by an algae (several strains) - can spread through the air.
 - infected plants show spots on the leaves (look like water damage). Easy to miss the initial infection since it doesn't show marked damage to the plant.
 - spreads out, and eventually kills the stem, and thus the plant.
 - survives from one year to next on infected tubers that are left in the ground.
 - severe infections can actually cause whole fields to "stink".
 - fungicides often can be used to some effect.
 - older potato strains are more susceptible.

Chestnut blight: caused by a fungus.

- The American Chestnut (*Castanea dentata*) was one of the most important tree species on the east coast.
 - Range went from Main to Mississippi, along the Appalachians, and down through the midwest.
 - Fruit was desirable to wildlife and humans
 - Timber was highly valued due to being rot-resistant (used in poles, fences, cabins, furniture, etc.). The trees also grew very straight for considerable length.
 - Some specimens grew up to 100 feet tall, particularly in the southern Appalachians.
 - One of the most common trees in forests. Estimates indicate up to 4 *billion* American Chestnuts were extant throughout its range. Now there are only shoots.
- What happened?

- People have been interested in Chestnuts for a long time. As a result, many foreign Chestnuts were imported throughout the years.
- The exact origin of the Chestnut blight (*Cryphonectria* (formerly *Endothia*) *parasitica*) is unclear. What we do know is that this disease was discovered in New York City in 1904.
 - Presumably came in with Asian or Japanese chestnut trees. Recent research seems to point the finger at the Japanese chestnut.
- Chestnut blight enters the tree through openings or sores in the bark:
 - spreads throughout the inner part of the tree, and winds up killing the cambium.
 - everything above this point dies, and so the tree mostly dies.
 - root stock is still around and is healthy; it starts sending up new shoots.
 - new shoots get to about 10 to 12 feet in height, then are overtaken by the blight.
- End result - on the east coast there are basically no healthy “adult” Chestnut trees. A few larger trees survive out west where they were planted as “imports”.
- Some comments:
 - People realized what was happening. By 1912 - 1913, it had started to spread throughout much of the northeast.
 - Funds were appropriated to study the problem.
 - Fungicides, tree surgery, chemical agents did not work. Neither did trying to isolate areas from the blight (wind borne spores!).
 - Eventually blight reached Georgia, and then World War I intervened (funds were re-allocated).
 - Essentially, within 40 years the American Chestnut in the East was mostly destroyed.
 - This represented 50% of the value of Eastern Hardwood timber.
 - Because the wood was of such high quality, large dead trees continued to be visible for decades after it was all over.

Hoof and mouth disease:

- affects domestic & wild animals
- caused by a virus:

- spreads readily through the air - one of the most communicable diseases known (spreads very fast!)

- virus can enter animal through the lungs. The virus often heavily infects the throat region, and then spreads throughout the body.

- virus causes painful vesicles to appear over many areas, particularly the feet (hooves) and mouth.

- infected animals become very lethargic - many do not eat due to painful vesicles around the mouth. Often they don't even walk but just lay around (vesicles on feet are very painful). These vesicles are also filled with viruses, so the disease can spread rapidly.

- Older and younger animals often die. Healthy adult animals often survive, but are rarely productive after having the disease (don't produce milk, don't gain much weight, etc.)

- Because the disease is so infectious (and because of lack of effective treatment):

- infected animals are generally destroyed ASAP, before to try to stop the disease from spreading.

- this can have huge economic impacts. While the U.S. has been relatively free of hoof and mouth, other countries have been seriously affected:

- in 2001 the U.K. had to destroy (burn) over 7 million sheep and cattle to stop the disease.

- some sobering television pictures a few years ago.

- obviously there is a lot of debate over whether so many animals had to be destroyed.

- Incidentally, it's not just domestic animals that are affected. In Africa, for example, many wild antelopes, gazelles, buffalo, etc. can get the disease.

- It is endemic in many parts of the world.

Bottom line: non-human infectious diseases are still tremendously important to society, and we may get back to a few more of these.

Anyhow - most of the class will deal with human diseases.

But first - we need to understand how our bodies defend against disease.