

- Person-to-person transmission
 - Tuberculosis, Influenza, *H. pylori*

- Tuberculosis
 - This is a huge public health problem world
 - High morbidity, mortality
 - One person gets infected every second worldwide
 - A third of the world's population is believed to be infected
 - Around 5% of these people will get sick
 - Latent infection – living TB organisms are replicating in your lungs, but they're controlled – not a public health threat
 - When people actually get sick, the bacteria multiply out of control, and they get sick and become a public health threat
 - 10-15 million Americans have latent disease
 - Big problem for people who are HIV positive
 - Transmission – droplet nuclei
 - This comes out when you cough
 - The TB organisms are so light that they can stay suspended in the air for a very long period of time
 - If you inhale them, they'll make their way all the way to the bottom of your lung and infect you
 - Even talking can transmit it into the air
 - The closer the contact the greater the likelihood of transmission, particularly if you're in an enclosed air space like a bus or a plane
 - However, you usually won't be at risk of getting infected unless you're in closer contact with somebody who has TB
 - Conditions that increase the risk of progression to TB disease
 - People with the latent infection are no different from anyone else in terms of energy, appetite, etc.
 - Factors like HIV infection make you much more likely to get actively sick
 - Also substance abuse, recent infection, diabetes, and many other factors
 - TB morbidity
 - From 1953-1984, reported cases decreased by 5-6% every year
 - At that time, it seemed like we had gotten the disease under control
 - However, from 1985 to 1992, it increased by 20% again
 - Since then, it has dropped a bit
 - People had spent so much time building an infrastructure to defend against TB, but when it looked like it was under control, people thought it wasn't a problem and moved the money elsewhere, allowing it to reemerge

- Like this, a number of diseases that we may have previously thought we had under control are reemerging, such as cholera
 - Part of the problem is that world travel is so easy these days, making transmission from one part of the world to another much easier
- Testing for TB
 - This skin test can identify people with latent infection
 - Even if these people never become immuno-suppressed, they can still benefit from treatment, so that they don't develop the active disease
 - You inject components of the TB cell wall under the skin
 - Adaptive immune response – Type IV hypersensitivity, delayed-type hypersensitivity (DTH)
 - Your helper T cells will have a memory for TB if you've been infected before, and thus they will react against the injected materials. The activated macrophages are what causes the swelling.
 - The swelling that develops is hard, not soft like a blister
 - If they find that you're PPD positive, they'll take a chest X-ray to investigate further
 - You can't necessarily use this skin test for someone with active TB though.
 - If they're immuno-suppressed, it won't even come out positive
 - To detect active TB, you collect sputum specimens from their coughing
 - You can make a presumptive diagnosis very quickly this way
 - You culture the specimen to confirm the diagnosis
 - Unfortunately, TB grows very slowly, so this can take weeks
- Treatment of TB
 - Somebody with active TB is a public health risk, and needs to be quarantined
 - Somebody with latent TB needs to take the treatment to prevent them from becoming a public health risk
 - Sometimes its very difficult to get these people with latent TB to take these drugs – they don't want to, because the drugs can make them sick
 - The principles of treatment can sometimes be very complicated, particularly with people who are immuno-suppressed
 - Treatment typically starts with four different drugs these days
 - With latent TB, it might just be two drugs
 - The treatment lasts for many months
- Influenza
 - There's a lot of concern about new, emerging types of influenza

- The virus has been around for a long time, but it changes quickly
 - Epidemics can occur across continents
 - The big concern is what's going to happen when the virus changes quickly
 - Contagious, respiratory illness caused by viruses
 - Can cause moderate or severe illness, and it can kill you
 - The best way to prevent illness is by getting a vaccination each fall
 - Each year about 5 to 20 percent of the population gets the disease
 - 36,000 die of it each year in the U.S.
 - Avian influenza
 - There are three types of influenza – A, B, and C
 - A is the most common – can be transmitted from animals to people
 - Avian influenza is common in birds, and usually doesn't make them sick
 - If you're in contact with these animals, then you're at risk
 - Eating birds shot in the wild is more dangerous, more likely to infect you
 - Birds raised on farms will be singled out if they suddenly get sick and die, so you won't eat that meat
 - Influenza A H5N1 is a concern right now
 - The virus that caused the huge epidemic in 1918 was H1N1
 - H5N1 is found in birds and creates a huge problem for bird farmers – it's been economically devastating in parts of Southeast Asia
 - People were illegally using vaccines to keep the birds from getting sick
 - The vaccine prevents active illness, but not infection, so that the birds could be shedding the virus, and the birds would still stay alive and go on the market as meat
 - The Spanish flu pandemic of 1918-1919
 - 20 to 50 million people died worldwide
 - It is believed to have been so deadly because it was a relatively new virus
 - There is a fear of a recombinant virus being created from birds and pigs
 - If something like this came back, it could be catastrophic
- *Helicobacter pylori*
 - Above a third of the world's population are infected with *H. pylori*
 - Most of these people have no active disease
 - There is likely some damage to the lining of the stomach, but you won't know unless you look at it microscopically
 - Peptic ulcer disease – ulcers occur in the lower part of the stomach or the duodenum – caused by *H. pylori*
 - Gastric ulcer disease – ulcers occur further up, in the proximal stomach – not caused by *H. pylori*
 - The infection is usually picked up when you're young

- It's much less prevalent in the developed world today than it used to be
- Infected people are at much higher risk for gastric cancer
- Gastric cancer is a huge problem in Japan, to the extent where people with no health problems get endoscopies once a year to check for it
- The incidence in the U.S. is one seventh of what it is in Japan
- This kind of variance in different cancers is common – incidence of particular kinds of cancer can vary by a factor of twenty in different nations
- Before *H. pylori* was studied, people thought that bacteria couldn't survive in the low pH of the stomach.
- *H. pylori* survives by living in the lining of the stomach, benefiting from the tools that our epithelial cells use to raise their pH
- The bacteria itself doesn't directly cause ulcers or cancer – the bacteria induces an immune response, and it is the ongoing inflammation that actually leads to disease
- Since our bodies can't eradicate *H. pylori*, the ongoing inflammation causes problems
- People have tried to create an immune response that will actually get rid of *H. pylori*, but so far attempts at vaccines have only increased the inflammation without eradicating the bug, thus exacerbating the problem