

## LESSON 2: SIZE and PREVALENCE

We start with two more great vocabulary words: prevalence and ubiquitous. Prevalence means how much there is of something. Ubiquitous means found everywhere.

We learn about three units of measure: the millimeter, the micron (or micrometer) and the nanometer. If you cut a millimeter into a thousand parts you get a micron, if you cut a micron into a thousand parts you get a nanometer. (If we wanted to go the next step down, we'd use the word "pico." So a picometer would be 1/1000 of a nanometer.)

Microns are used to measure things like cells and protozoans. Cells range in size from 30 to 150 microns. Protozoans range in size from 10 to 500 microns. The width of a human hair is about 80 to 100 microns, which makes it surprising that we can see it. Hair has color, reflects light very well, and is very long, all of which make it more visible. Spider silk is also only microns wide but can be seen because it reflects light so well.

Here are the viruses we drew:

**Pandora**: The largest virus ever discovered, at 1,000 nm (one micron). It infects single-celled amoebas.

**Pox family**: This family includes smallpox, cowpox and monkeypox. Cowpox was used for the first vaccine, which is where we get the word vaccine. "Vacca" is the Latin word for "cow."

**Parvo**: Causes severe illness in dogs, but some strains infect humans, also, causing what is called Fifth disease, which gets its name from the fact that it was number five in a list of childhood illnesses. Fifth disease causes rash and fever. Dogs are vaccinated against parvovirus when they get their annual shots at the vet.

**Polio**: Most often a mild disease, but can also be severe in some cases and attack the nervous system causing permanent paralysis. We vaccinate people against this disease now, but the virus is still out there.

**Hepatitis B**: Causes an infection of the liver, but can only be transmitted from person to person by contact with body fluids, most commonly blood. It can be passed from mothers to unborn babies, or through blood transfusions or from the use of dirty injection needles. There is now a vaccine for it.

**Zika**: This infection is transmitted by mosquitoes that live in the tropics or subtropics. Brazil and the Caribbean were the sites of the most recent outbreaks. It causes only mild symptoms in adults. The big concern is that when pregnant women catch it, their unborn children can acquire a birth defect called microcephaly, which means their head and brain grow too slowly and end up being so small that the baby will have many disabilities.

**Papilloma**: This virus attacks skin. There are different strains of papilloma, some causing the warts we get on our hands and feet. If you walk across floors in locker rooms, you are treading on millions of papilloma viruses. Other strains will attack soft tissues of the urogenital tract (the parts we use privately in the bathroom) but these are harder to catch than the wart kind.

**Rotavirus**: Vomiting and diarrhea. Yuck. Most of us have had one of these viruses at least once. They are highly contagious, but usually last only a few days.

**Adenovirus**: These cause upper respiratory infections, the ones we often catch during winter "cold and flu season." Though these viruses are not fun to catch, they are milder than the influenza viruses.

**Influenza**: These are the nasty flus that people sometimes die from. The most famous flu was the epidemic of 1918, right after World War I. The 1918 flu strain was unusual in that it hit younger people harder than older people.

**HIV**: Human Immunodeficiency Virus, which causes AIDS. It was unknown before the 1980s, and began as a disease prevalent only in the homosexual community, but it soon spread into Africa as a disease of heterosexuals. It can only be spread by contact with body fluids such as blood, urine, and other secretions. Unfortunately, unborn babies can be infected by their mothers. There are medicines now to treat this disease, so it is not as deadly as it used to be (if you have access to those medicines).

**Coronavirus**: Causes flu-like symptoms. The name "corona" comes from the way it looks, with a haze of light-colored rays going out from it, reminding us of how the sun looks during an eclipse, when you can see its corona.

**Measles**: Holds the record for being the most contagious of all viruses. Causes rash and fever. There is a vaccine for it.

**Rabies**: A disease that can infect both animals and humans. We have our dogs and cats vaccinated against it, which protects the human population. Rabies attacks the nervous system and is always fatal. Fortunately, it is slow and there is a several week window of opportunity to get a vaccination if you are bitten by a rabid animal.

**Herpes**: This is a whole family of viruses. Some strains cause ulcers in and around the mouth. Others cause chickenpox and shingles. Most everyone in the world is infected with several kinds of Herpes, usually picked up during infancy or childhood. They stay in your body for the rest of your life, but usually stay dormant (not active).

**Ebola**: A virus originating near the Ebola River in west Africa. Passed through blood contact. You don't want to hear symptoms.

**TMV**: Tobacco Mosaic Virus, the first virus ever discovered. Infects many plants besides tobacco.

**Mimivirus**: Considered a "megavirus" because of its huge size. It infects amoebas, in both fresh and ocean water. "Mimi" is short for "mimicking microbe" meaning that it fooled its discoverers into thinking it was a bacteria.

Most of what we learned about prevalence is written on the activity sheet and doesn't need further explanation.