COVID-19 Science and Medicine Updates

Compiled by University of Maine faculty and students

GLOSSARY OF CLOSELY RELATED TERMS – v1

Pandemic, Epidemic, Outbreak, Endemic – **Endemic** is the baseline level of a disease in a community. **Epidemic** refers to a sudden increase in the number of cases of a disease in a given population. **Outbreak** is similar to Epidemic, but refers to a discrete geographic area. **Pandemic** is an epidemic that has spread over many countries and continents.

Quarantine, Self-Isolation, Social/Physical Distancing – **Quarantine** refers to removing oneself from interaction with other people when they have been exposed to the virus or are at risk of coming down with the virus; often quarantine could be imposed by state or federal law. **Self-isolation** is when you have suspected or confirmed infection, and isolate yourself at home or at a hospital, with caregivers using appropriate protective equipment. **Social/physical distancing** refers to canceling group gatherings and limiting person-to-person contact by increasing physical distance by 6+ feet; this includes behaviors like school closures, working from home, canceling events, and visiting with friends and relatives digitally and not in person.

Respirator, Ventilator, CPAP, ECMO – **A respirator** is a facemask with filters that can remove particles of a certain size. **A ventilator** assists the lungs with moving oxygen into the body. **CPAP**, or continuous positive air pressure, is a mask or nosepiece that delivers continuous air pressure, often used for sleep apnea. **ECMO**, or extracorporeal membrane oxygenation provides oxygenation to a patient's blood outside the body, in the case of lung and heart problems.

Incubation Period, Infectivity, Mortality Rate, Reproductive Rate – **Incubation Period** is the period between exposure and the onset of initial symptoms. COVID-19 has a very long incubation period of 2-14 days, during which time people can be contagious but not have symptoms. The median incubation period is just over 5 days, with 97.5% of people developing symptoms within 11.5 days of infection. **Infectivity** is the ability of a pathogen to infect cells, based on strategies to overcome

detection or reconnaissance by the host cells. **The mortality rate**, or death rate, for COVID-19 is estimated at 10x that of influenza, with an average of 1% of the population. **The reproductive rate, or Ro (R naught),** is an indication of the transmissibility of a virus is the number of new cases of the disease an infected person will cause while they are infectious. This rate for COVID-19 is estimated at 2.2-2.7, while for seasonal influenza it is ~1.5 and for measles it is 12-18.

Virus, Novel Human Virus – **a Virus** is an infectious agent smaller than bacteria, that requires a host cell to replicate. A virus consists of a small RNA or DNA genome surrounded by a protein coat, and some viruses, like SARS-CoV-2 are further surrounded in a lipid envelope. Viruses can cause a variety of diseases in plants, animals, and humans. **SARS-CoV-2, or COVID-19, is a novel human coronavirus** (like MERS or previous SARS) that began as an outbreak in China in Dec 2019. Human-to-human transmission first occurred during this time, having jumped as a zoonotic transmission from animals to humans. Because COVID-19 is a novel human virus, there are no humans with immunity (from previous exposure or vaccines).

Viral Load, Viral Shedding, Disease Vector, Viral Host, Immunity – **Viral load** is the amount of virus being carried by an infected individual, and being shed into their environment. This is usually measured by quantitative PCR. **Viral shedding** is the process, or period of time, when infected individuals release viral particles that are produced during viral reproduction in the host individual, and therefore the infected people are contagious during this period. Viral shedding can occur in asymptomatic people. A **disease vector** is an organism that carries pathogens from person to person or place to place, in the case of some viruses this could be mosquitos or ticks. A **viral host** is the organism and its cells that allow a virus to reproduce; viruses cannot reproduce outside of a host and during infection they insert their genetic material (DNA or RNA) into the host cells and take over the host cell's functions. **Immunity** is achieved through presence of antibodies to a microbe in a person's system. Active immunity is achieved through antibody production when a person is exposed to an antigen (foreign substance), or through vaccination. Passive immunity is the transfer of antibodies, such as maternal transfer to newborns.

Antibodies, Antibiotics, Anti-Viral, Vaccine, Viral Receptor – Antibodies are produced by the body to neutralize or destroy toxins or disease-carrying organisms, including viruses. **Antibiotics** can not kill viruses, and instead are natural or synthetic compounds that can slow the growth of, or kill, bacteria. **Antiviral medications** are used to treat viral, not bacterial, infections, often by reducing viral reproduction. **Vaccines** provide active immunity to a virus, by delivering the antigen (or the part of a microorganism recognized by your immune system, to encourage B lymphocytes to produce antibodies specific to that virus). These are either dead/inactivated viruses delivered with an adjuvant, that boosts the body's response to the antigen, or a live attenuated virus that has been modified to not cause disease and contains naturally-occurring adjuvants. Vaccines produce an immune response that leads to immunity to a disease, without causing the disease itself. Long-term protection requires maintained

levels of antibodies in a person's body, capable of fighting off exposure to that virus. A **viral receptor** is a component of a person/host's cells that is recognized by the virus and exploited to gain entry to the host cells, causing an infection. The known receptor for COVID-19 is called ACE-2 and is expressed in the oral mucsoa, vascular endothelial cells, lung, kidney, GI tract, cardiac tissue, and other tissues meaning those cell types are susceptible to COVID-19 infection.

Viral vs Bacterial Pneumonia – Pneumonia is an infection in one or both lungs, caused by bacteria, viruses, or fungi. With this infection, the airways swell and become inflamed, and the air sacks in the lungs become filled with fluid. Influenza (Flu) and SARS-CoV-2 (COVID-19) are examples of viruses that lead to viral pneumonia.

Clean, Sanitize, Disinfect – **Cleaning**, using a detergent like soap, removes dirt and impurities, and can physically remove germs. Soap destroys the lipid envelope of SARS-CoV-2 so is an effective method to inactivate the virus. **Sanitizing** reduces the number of germs (bacteria, viruses) on surfaces and objects, while **disinfection** kills germs on surfaces using specific chemicals like bleach or alcohol.

Droplets, Aerosol, Airborne – **Droplets**, or water droplets in the air that contain inclusions such as physiological materials and viruses, are often greater than 5 microns and are produced by coughing and sneezing. Since they are heavier, they fall to the ground more quickly and typically travel only 3-6 feet. **Aerosols** are smaller droplets that can travel further and stay in the air for longer. **Airborne** diseases are able to stay suspended in the air for longer periods and are therefore more transmissible, such as measles.

Epidemiologist, Infectious Disease Expert, Virologist – Epidemiologists search for the cause of disease, identify people who are at risk, determine how to control or stop the spread or prevent it from happening again. **An infectious disease expert** is expert in the diagnosis and treatment of diseases caused by microorganisms, including bacteria, viruses, fungi and parasites; infectious diseases are the second leading cause of death worldwide. **A virologist** conducts research on viruses and how they function.

CDC, WHO – **CDC** is the centers for disease control and prevention, headquartered in Atlanta, GA, works to protect the United States from health, safety, and security threats. CDC branches are also found in each state, such as the Maine CDC. **WHO** is the World Health Organization, headquartered in Geneva, Switzerland, works worldwide to promote health, keep the world safe, and serve the vulnerable.

Other Commonly Used Terms:

Fomites – porous and non-porous surfaces that can become contaminated with pathogenic microorganisms

Exponential Growth - increase in incidence with a rapid doubling time; COVID-19 has a doubling time of about 2.5 days

Flattening the Curve – When a large number of people become sick over a short period of time, hospitals and healthcare resources become overwhelmed and there can be a shortage of supplies, medical equipment, and healthcare personnel. If the same number of patients become sick over a longer period of time, this removes the burden on the hospitals and healthcare system.

Self-Monitoring – checking oneself for symptoms (for COVID-19, this includes fever, dry cough, shortness of breath or difficulty breathing)

Herd Immunity – when a community is protected from a virus, by a combination of vaccination and immunity (antibody production by the immune system) in people who previously had the disease, for a large portion of the population

Zoonotic Disease – diseases spread between animals and people. COVID-19 is a disease that originated in animals and is newly infectious in humans.

Useful sources:

https://www.cdc.gov/csels/dsepd/ss1978/lesson1/section11.html

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https://labblog.uofmhealth.org/rounds/how-scientists-quantify-intensity-of-an-outbreak-like-covid-19

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