



21 June 2020

Action POC: Antolino Colon

**Subj: LITERATURE REVIEW, PREVENTION and HYGIENE – NAVAL
POSTGRADUATE SCHOOL COVID-19 RESPONSE**

Purpose: Promulgate information on what to do for prevention and hygiene COVID-19 Pandemic

Information:

- **Respiratory Infections can be transmitted via:**
 - **Via Droplets and Droplet Nuclei:** People with contagious respiratory infections may produce aerosols (<5um). All human mouth and nose activity such as singing, breathing, talking, laughing, coughing, and sneezing produce particles (bioaerosols) within the inhalable range for humans of <1 to >100 µm. ¹ Comparatively, coughing and sneezing produce greater quantities of particles^{2,3,4} that travel further due to the velocity of expulsion from the nose or mouth.⁵ These are forced respiratory maneuvers that generate high velocity, turbulent airflow release.
 - **Via Droplet or Contact:** Agent transmission by large (>5 um) droplets are considered an extension of direct contact because these droplets settle rapidly and travel only short distances from their sources. Direct contact is a common mode of transmission for agents infectious for the mucosa of the upper respiratory tract. For example, contaminated fingers as well as relatively large respiratory droplets generated by coughs or sneezes⁵ or water sprays or splashes can deliver infectious agents to the nose and mouth.⁶
- Whether Droplet and nuclei or contact transmission; The closer an individual is situated to a source then the greater the likelihood of large particles being inhaled prior to complete evaporation.¹
- It is not known, the number or viral particles inside a droplet needed to cause the disease. How susceptible an individual is will depend on the status of that individual's immune system. People with weakened immune systems have a greater likelihood of developing symptoms and severe illness. <https://www.cdc.gov/coronavirus/2019-ncov/travelers/map-and-travel-notice.html> Healthy individuals without a weakened immune system potentially need more viral particles to get sick.
- The 6 ft distancing rule is primarily for healthy non-symptomatic personnel (For the average person not working in a hospital). <https://www.npr.org/2020/03/28/823292062/who-reviews-available-evidence-on-coronavirus-transmission-through-air>

- **Infectivity**– Asymptomatic patients can transmit infection to contacts⁸ However asymptomatic patients shed the virus for a shorter time and were likely to be younger.⁹
 - Asymptomatic people were found to be about 50% less infectious than symptomatic persons.¹⁰ Latent infectious period unknown (est. 0-7 days). The major mode of transmission is through the upper respiratory tract.¹¹ Evidence is mounting that the viral shedding pattern in patients with SARS-CoV-2 is similar to influenza, and is similar between symptomatic and asymptomatic patients,¹² with suspected prolonged shedding of COVID-19 after recovery.
 - Key Differing factor from SARS-COV-1, is **presymptomatic/asymptomatic** transmission. In SARS-COV-1 viral replication occurs primarily in the Lower Respiratory Tract (LRT), while SARS-COV-2 viral replication occurs mostly in the Upper Respiratory Tract (URT).¹³ Viral loads with SARS-CoV-2, which are associated with symptom onset, peak a median of 5 days earlier than viral loads with SARS-CoV-1, which makes symptom-based detection of infection much less effective in the case of SARS CoV-2. The CDC reports that by 10 days after symptom onset, the ability to culture virus, a proxy measure of infectivity, approaches zero.
 - A smaller number of pathogenic particles are required to infect the lower respiratory tract (LRT) versus the upper respiratory tract (URT), and in comparison, the URT infections are protracted with reduced mortality.¹ We see this in SARS-COV-2, for which viral replication occurs mostly in the URT.¹³ It as well presents reduced mortality in comparison SARS-COV-1, which had a case fatality rate of 11%¹⁴ While the mortality rate for SARS-COV-2, age and risk factor dependent, is less than that commonly ascribed to severe community-acquired pneumonia (12–15%) but more than seasonal influenza (~0.1%) by 6–10x.¹⁵
 - Modeling suggests asymptotically infected persons were half as contagious as persons with observable symptoms. Which reinforces the value of testing and social distancing as prevention measures. (4)
 - Severe cases are more likely to transmit disease; **most new infections are within households** of infected patients, currently making household contacts the main transmission mode. From DHS SCIENCE AND TECHNOLOGY Master Question List
 - **Children of all ages are susceptible to COVID-19**, though generally show milder or no symptoms; up to 28% of children may be asymptomatic. From DHS SCIENCE AND TECHNOLOGY Master Question List
- **Severity** – Many COVID-19 cases are asymptomatic. Most symptomatic cases are mild, but severe disease can be found in any age group. Most symptomatic COVID-19 cases are mild (81%, n=44,000 cases).¹⁷

- Impact is severe in susceptible population. Between March 1, 2020, and May 30, 2020. The National overall cumulative hospitalization rate was 82.0 per 100,000 population. Among the 0-4 years, 5-17 years, 18-49 years, 50-64 years, and ≥ 65 years age groups, the highest rate of hospitalization is among adults aged ≥ 65 years (254.7 per 100,000), followed by adults aged 50-64 years (126.2 per 100,000) and adults aged 18-49 years (46.7 per 100,000)
<https://www.cdc.gov/coronavirus/2019-ncov/covid-data/covidview/index.html>.
 Locally Monterey County has approximately 10% of cases which are severe enough to necessitate hospitalization, as of 08Jun20.
- **Environmental Stability-** SARS-CoV-2 can persist on surfaces for at least 3 days and on the surface of a surgical mask for up to 7 days depending on conditions. If aerosolized intentionally, SARS-CoV-2 is stable for at least several hours. SARS-CoV-2 on surfaces is inactivated rapidly with sunlight.¹⁸ SARS-CoV-2 has an aerosol half-life (required for the activity of a substance taken into the body to lose one half its initial effectiveness) of 2.7 hours (particles $< 5 \mu\text{m}$, tested at 21-23°C and 65% RH).¹⁹
- **Decontamination-** Soap and water, as well as common alcohol and chlorine-based cleaners, hand sanitizers, and disinfectants are effective at inactivating SARS-CoV-2 on hands and surfaces.²⁰
- **Exposure pathway-**
 - SARS-CoV-2 is spread **primarily through close contact***
 - **Infectious Droplets** transmission,²¹ with **fomite transmission** remaining a possible it is not considered the primary transmission pathway, and **close-contact* aerosol transmission possible**²⁶ but unconfirmed, aerosol transmission would potentially occur within settings where people who are susceptible are in very close proximity for prolonged time with an infected person.
- **Infection-** Infection by SARS-CoV-2 may occur in susceptible individuals;
 - *Person-to-person, between people who are in close contact with one another²¹ (< 6 feet, > 15 min)*
 - *Via close contact* **droplet ($> 5 \mu\text{m}$ particle diameter) or aerosol ($< 5 \mu\text{m}$ particle diameter) transmission through respiratory droplets produced when an infected person coughs or sneezes.***
 - Via inhaled particles as small as aerosol (less than $5 \mu\text{m}$ in size; capable of staying suspended in the air for a time and easily inhaled into the lungs and distal alveoli) up to droplets (measuring greater than $20 \mu\text{m}$ in size; quickly pulled to the ground by gravity or, when inhaled, mostly deposited in the nasal cavity),²²
 - *Contamination of patient rooms with aerosolized SARS-CoV-2 in the human respirable range (0.25 - $2.5 \mu\text{m}$) indicates the potential for airborne transmission.²³*

- *Via, fomite transmission (germs left on surfaces)* direct inoculation of the respiratory epithelium (ie, touching a surface with live virus and then touching one's face).²³ However, this is not considered the primary transmission pathway.

Susceptible Population:

- Higher probability of infection and of severe outcome: Personnel who have weakened immune systems and certain risk factors have a higher probability of contracting the disease²⁵. Severe outcomes are expected regardless of age in people with chronic lung or heart disease, severe obesity (>40BMI), diabetes, chronic liver or kidney disease.

*Close Contact is defined by the CDC as within 6 feet of an infected person for at least 15 minutes starting from 48 hours before illness onset until the time the patient is isolated. However Any duration of exposure should be considered prolonged if the exposure occurred during performance an aerosol-generating procedure or event (singing, coughing, sneezing etc.).

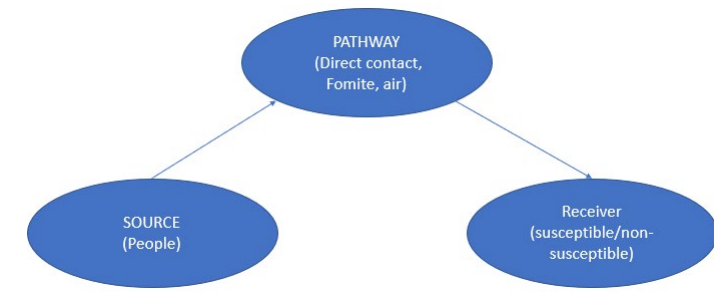
Actions/Prevention:

There is currently no vaccine to prevent COVID-19 infection. The best way to prevent infection with COVID-19 and other respiratory viruses is to take everyday, sensible steps including: <https://www.cdc.gov/coronavirus/2019-ncov/prepare/prevention.html>

- Stay home if you are sick
- Stay home if you are susceptible
- Wash your hands often with soap and water for at least 20 seconds. If soap and water are not available, use an alcohol-based hand sanitizer (60% alcohol).
- Avoid touching your eyes, nose, and mouth with unwashed hands.
- Avoid close contact with people who are sick. Stay at least 6 feet away from ill individuals.
- Cover coughs and sneezes
 - Cover your mouth and nose with a tissue when you cough or sneeze or use the inside of your elbow.
 - Throw used tissues in the trash.
 - Immediately wash your hands with soap and water for at least 20 seconds. If soap and water are not readily available, clean your hands with a hand sanitizer that contains at least 60% alcohol.
- Clean and disinfect frequently touched objects and surfaces. Per NPS Info paper on Cleaning
- If you haven't already, get an influenza shot; influenza is still circulating in our communities.
- Wear a face covering if you are sick or:
 - CDC is additionally advising the use of simple cloth face coverings to slow the spread of the virus and help people who may have the virus and do not know it from transmitting it to others. Cloth face coverings fashioned from household items or made at home from common materials at low cost can be used as an additional, voluntary public health measure.

<https://www.cdc.gov/coronavirus/2019-ncov/prevent-getting-sick/cloth-face-cover.html>

- the face coverings/masks prevent spread from individuals without symptoms, they don't protect you. These coverings do not seal around your face and provide very limited protection. Respirators such as N95's have to be fit-tested, that means they have to seal against your face and this provides the protection against particles along with the N95 material construction, which filters our 95% of particles >0.3um
- Break the triangle from source, via pathway to receiver:
 - **Control the Source;** Utilize face coverings when around other people. Disallow personnel who are showing symptoms to come on campus, as allowed in specific Phase of the NPS Plan.
 - **Control the receivers;** have susceptible/vulnerable populations self-identify and not come to campus to the maximum extent possible.
 - **Control the environment:** indoors, ensure properly working HVAC system by providing 35-50 CFM/person of outside air²². Clean high touch surfaces and Wash hands.



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