COVID-19: Focus on surface disinfection

William A. Rutala, PhD, MPH, CIC[1], David J. Weber, MD, MPH[1,2]

[1]UNC School of Medicine and [2]UNC Health, Chapel Hill, NC 27514

In the recent years, we have witnessed the emergence of a number of new infectious diseases, many of which were major public health threats. Since the outbreak of *Legionella* in 1976 and AIDS in 1981, later demonstrated to be due to HIV in 1983, many emerging infectious diseases have had important infection prevention strategies and challenges. An outbreak of novel coronavirus (SARS-CoV-2) that causes coronavirus disease 2019 (abbreviated COVID-19) has spread rapidly, with cases confirmed in more than 100 countries.

Coronaviruses are a large family of viruses that are common in people and many different species of animals, including camels, cattle, cats, and bats. Coronaviruses, such as SARS-CoV-2 and MERS-CoV, cause an acute respiratory illness in humans and are transmitted from animals-to-humans. Bats are likely the main mammalian reservoir.[1]

MERS (Middle East respiratory syndrome), SARS (severe acute respiratory syndrome) and now COVID-19 may be transmitted from person-to-person most commonly among close contacts (within about 6 feet) via respiratory droplets from coughs and sneezes of an infected person. SARS, and likely COVID-19, is also transmitted via contact (direct and indirect). For example, it is possible that a person can acquire COVID-19 by touching a contaminated surface or object and then touching his or her own mouth, nose or eyes.

Over the past decade, there has been a growing appreciation that environmental contamination of hospital surfaces make an important contribution to infection transmission for many pathogens. Studies with epidemiologically important pathogens (e.g., MRSA, VRE, *C. difficile*) have shown that surfaces are contaminated and the frequency of hand contamination correlates to the frequency of environmental contamination. While the level of surface contamination with COVID-19 is not known, studies with other epidemiologically important pathogens have shown that disinfection leads to decreased transmission. Further, studies of coronaviruses have demonstrated that they may survive on surfaces for hours to days depending on temperature and humidity. Unfortunately, many studies have shown that disinfection of surfaces is suboptimal and effective disinfection requires not only an effective product and importantly, effective practice.

The combination of product and practice results in effective surface disinfection, including the reduction of risk via viral removal and/or inactivation of pathogens. The criticality of practice is highlighted by studies that demonstrate surface contamination with epidemiologically-important pathogens is due to a failure to thoroughly disinfect surfaces rather than a faulty product.

While there are many factors that could influence the efficacy of disinfection, the surface must be completely and thoroughly wiped with an adequate number of antimicrobial wipes effective against the target pathogen (or harder to inactivate microorganisms) and a contact time specified by the label instructions.

The perfect disinfectant or product for healthcare disinfection has not been introduced; however, there is a wide array of excellent disinfectants that offer a range of characteristics. As of March 10, 2020, the CDC recommendation on disinfectant products for COVID-19 is to use an EPA-registered disinfectant on List N on the EPA website that has qualified under EPA's emerging viral pathogens program for use against SARS-CoV-2.[2-4]

The rationale for this recommendation is if disinfectants inactivate harder to inactivate microorganisms (e.g., mycobacteria, non-enveloped viruses) than coronaviruses, they should be expected to inactivate COVID-19. This logic is based on the recognition by the CDC[4] and the EPA[2] that certain microorganisms can be ranked with respect to their tolerance or resistance to chemical disinfectants (i.e., Spaulding classification model). With this approach, the most susceptible to most resistant tiers of microorganisms are: lipid (i.e., enveloped) or medium-sized viruses (e.g., coronaviruses); vegetative bacteria (e.g., *S. aureus*); fungi (e.g., *Candida, Aspergillus*); non-lipid (i.e., non-enveloped) or small viruses (e.g., poliovirus, rhinovirus); mycobacteria (e.g., *M. tuberculosis*); coccidia (*Cryptosporidium*); and the most resistant, spores (e.g., *C. difficile*).[5] With this conservative approach, EPA divided the viruses into three subgroups based on size and type of virus: enveloped viruses (easiest to inactivate such as coronavirus); large (50-100nm) non-enveloped viruses (such as adenovirus and rotavirus, harder to inactivate than enveloped viruses); and small (<50nm) non-enveloped viruses (hardest to inactivate such as rhinovirus).[2] This hierarchy is used to determine a product's anticipated efficacy against an emerging viral pathogen.[2]

SARS-CoV-2 is an enveloped virus and the easiest to inactivate of the three subgroups of viruses. Based on the EPA emerging viral pathogen criteria, an EPA-registered, hospital disinfectant must have a disinfectant efficacy claim against at least one small or one large non-enveloped virus to be eligible for use against an enveloped emerging viral pathogen.[2] EPA has published a "List N" that identifies which registered products have this designation on their Master Label.[3] PDI EPA-registered disinfectants that are included on List N include: Super **Sani-Cloth**® Wipes (9480-4), **Sani-Cloth**® Bleach wipes (9480-8), **Sani-Cloth**® AF3 wipes (9480-9), **Sani-Cloth**® Prime Wipes (9480-12), **Sani-Prime**® Spray (9480-10), **Sani-24**® Spray (42182-9) and **Sani-HyPerCide**™ Spray (9480-14). For example, Super **Sani-Cloth**® wipes are bactericidal, mycobactericidal and virucidal with an efficacy claim against not only one small, non-enveloped virus (i.e., rhinovirus) but also two large, non-enveloped viruses (i.e., adenovirus and rotavirus). It also has a claim against the human coronavirus 229E.

In summary, thorough and complete application of an EPA-registered disinfectant per the manufacturer's instructions, that is included on EPA's List N,[3] to surfaces as well as good personal hygiene, including hand hygiene, minimize contact with your face, and respiratory hygiene/cough etiquette should minimize transmission of viral respiratory pathogens such as COVID-19.

References

1. Weber DJ, Sickbert-Bennett EE, Kanamori H, Rutala WA. 2019. New and emerging diseases (Ebola, MERS-CoV, carbapenem-resistant Enterobacteriaceae, Candida auris): Focus on environmental survival and germicide susceptibility. Am J. Infect Control. 47:A29-A38.

2. Environmental Protection Agency. Process for Making Claims Against Emerging Viral Pathogen not on EPA-Registered Disinfectant Labels. https://www.epa.gov/pesticide-registration/guidance-registrants-process-making-claims-against-emerging-viral-pathogens

3. List N: Disinfectants for Use Against SARS-CoV-2. https://www.epa.gov/pesticide-registration/list-n-disinfectants-use-against-sars-cov-2

4. CDC: Interim Infection Prevention and Control Recommendations for Patients with Suspected or Confirmed Coronavirus Disease 2019 (COVID-19) in Healthcare Settings, March 10. https://www.cdc.gov/coronavirus/2019-ncov/infection-control/control-recommendations.html?CDC_AA_refVal=https%3A%2F%2Fwww.cdc.gov%2Fcoronavirus%2F2019-ncov%2Fhcp%2Finfection-control.html

5. Rutala WA, Weber DJ, HICPAC. Guideline for disinfection and sterilization in healthcare facilities, 2008. https://www.cdc.gov/infectioncontrol/guidelines/disinfection/index.html

Drs. Rutala and Weber provide consultation to PDI.

Contact person:
William A. Rutala, PhD, MPH, CIC
Professor of Medicine
UNC School of Medicine
Director, Statewide Program for Infection Control and Epidemiology (SPICE)
Division of Infectious Diseases, UNC School of Medicine
brutala@med.unc.edu
Phone: 919-843-0025 (ID SOM); 919-966-6383 (SPICE)

400 Chestnut Ridge Road, Woodcliff Lake, New Jersey 07677
800.999.6423 pdihc.com

PDI03203009

BE THE DIFFERENCE®