Modeling the Risk of SARS-CoV-2 Transmission from Environmental Surfaces

Since first reported in late 2019, the coronavirus disease (COVID-19) has quickly spread across the globe leading to one of the most devastating pandemics of the 21st century. While direct person-to-person transmission of SARS-CoV-2, the etiological agent of COVID-19, appears to be the primary route of transmission, the contraction of SARS-CoV-2 from various surfaces in the environment is also considered a potential contributor to the disease transmission as the infected individuals shed virus onto environmental surfaces through sneezing, coughing, and breathing. In this study, we develop a mathematical model to predict the probability of detecting SARS-CoV-2 in environmental reservoirs during the COVID-19 outbreak in a community. Furthermore, we extend our model to quantify the contribution of environmental virus to COVID-19 cases in a community. We validate our model using experimental data with many swab samples collected from commonly touched surfaces across San Diego County. Our model, which can describe transmission dynamics of COVID-19 within San Diego County, allows us to compute the risk for an individual to encounter virus in the environment. The results indicate that the persistence of virus on some environmental surfaces can significantly increase COVID-19 cases in a community. This research is done in collaboration with Dr. Forest Rohwer (Biology, SDSU).

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