Implen Journal Club | September Issue

Welcome to our September issue of the #Implen #JournalClub in 2021.

This month's issue of the NanoPhotometer® Journal Club is covering the topic of COVID-19 which continues to spread quickly globally, with more than 180 million confirmed cases to date and a mortality rate of about 2% with serious impacts on global public health and economy. Although some

drugs and vaccines have been approved for the treatment and prevention of SARS-CoV-2 infection, the development of effective drugs is still urgently required. Zhao et al. recently reported in Nature communication the identification of two potent neutralizing antibodies (nmabs), nCoVmab1 and nCoVmab2, from a large naïve human phage-displayed Fab library. Both of these antibodies could efficiently neutralize authentic SARS-CoV-2 and have the potential to be powerful weapons to fight against this infectious disease as potential therapeutics and prophylactics for fighting SARS-CoV-2 infection. The NanoPhotometer® N60 was used in this study to measure the purified protein concentrations with the corresponding extinction coefficient.

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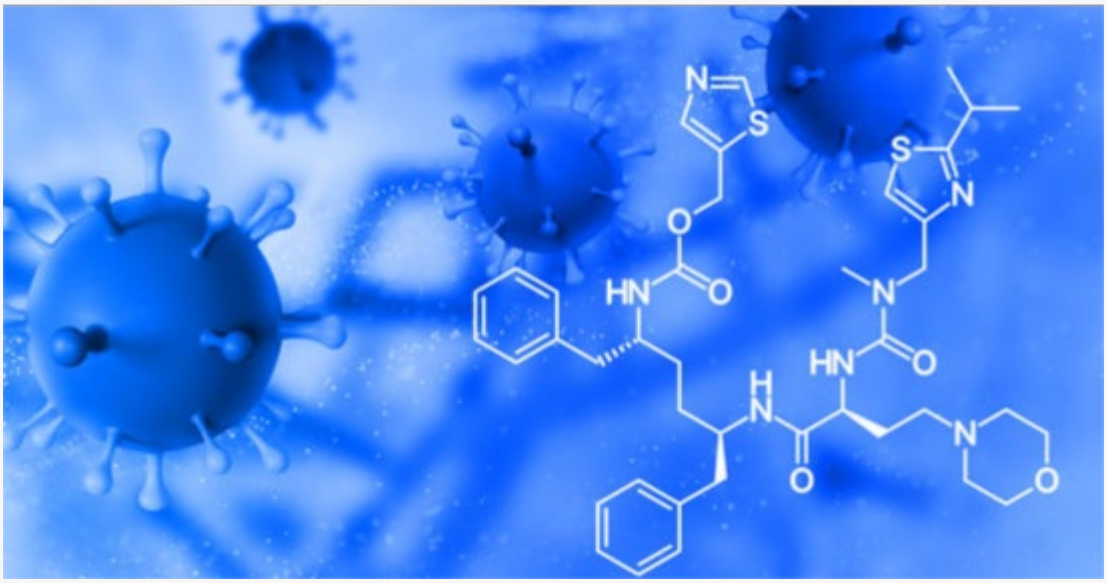

Next, NanoPhotometer® Journal club highlights another potential therapeutic combination. Currently, there are limited therapeutic options against SARS-CoV-2 and testing of a number of drug regimens has led to conflicting results. Complete inhibition of SARS-CoV-2 replication will likely require combinations of antivirals, as combinations are needed to minimize drug-resistance mutations and stably suppress replication of RNA viruses. Shytaj et al. introduced cobicistat as a new candidate for inhibiting SARS-Cov-2 replication and for designing combination therapies aimed at blocking or reversing the onset of COVID-19. Cobicistat was identified as a therapeutic candidate for treating SARS-CoV-2 infection by performing a structure-based virtual screening of the Drugbank library of compounds approved for clinical use as repositioned drugs offer the advantage of a well-known safety profile and the possibility of faster clinical testing, which is essential during a sudden epidemic outbreak. Cobicistat which is an FDA approved drug booster that blocks the activity of the drug metabolizing proteins Cytochrome P450-3As and P-glycoprotein, was shown to block SARS-CoV-2 replication with its antiviral effect being exerted through inhibition of spike protein-mediated membrane fusion. When cobicistat was used in combination with the putative CYP3A target and nucleoside analog remdesivir, a synergistic effect on the inhibition of viral replication was observed with the ability to potently abate viral replication leading to an almost complete rescue of infected cell viability. Cobicistat was shown to have a dual activity both as an antiviral drug and as a pharmacoenhancer, thus potentially constituting a basis for combined therapies aimed at complete

suppression SARS-CoV-2 replication. The NanoPhotometer® P-Class P300 was used to measure the concentration of RNA extracted from cell lysates.

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Continuing with this month's COVID-19 issue of the NanoPhotometer® Journal Club, we are highlighting findings reported by Amoah et al. in the International Journal of Hygiene and Environmental Health on the detection of SARS-CoV-2 on contact surfaces within shared sanitation facilities. The COVID-19 pandemic has claimed over 3.9 million lives and infected another 184 million globally. The primary mode of transmission of the SARS-CoV-2 virus, the causative agent for COVID-19, is through respiratory droplet, with the contamination of contact surfaces with SARS-CoV-2 reported as a potential route for the transmission of COVID-19. The contamination of key contact surfaces with SARS-CoV-2 in shared toilets was found to be widespread based on detection and quantification of the nucleic acid on contact surfaces, with 54–69% of the contact surfaces studied being contaminated; the highest prevalence of contamination being on the floor, tap and handles indicating areas of high hand contact had the highest possibility of being contaminated, with the highest likelihood of infection with COVID-19 on the toilet seat. A significant reduction in viral loads on the contaminated surfaces was observed after cleaning, showing the potential of effective cleaning on the reduction of contamination, and that cleaning of shared sanitation facilities should include surfaces with high contact frequency, such as the toilet seat, tap handle and internal latch given the potential risks for COVID-19 infections in the event that intact infectious viral particles are deposited on these contact surfaces. This calls for the implementation of risk reduction measures, such as regular washing of hands with soap, closing the lid of the water closet while flushing, strict adherence to wearing face masks, and effective and regular cleaning of shared facilities. The Nanophotometer® NP80 was used to quantify and determine the quality of the RNA extracted prior to amplification.

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With this final article of this month's COVID-19 issue, we are covering how wastewater-based epidemiology has been used as a tool for surveillance of COVID-19 infections and is currently being proposed as a cost-effective complimentary approach for COVID-19 surveillance at the community-level. The clinical-based surveillance and screening has been limited by cost, turnaround time and possible underestimation of the severity of the infection spread occasioned by asymptomatic COVID-19 cases. This method captures the totality of symptomatic, pre-symptomatic and asymptomatic carriers within a specific community, which is usually not the case with clinical surveillance. The incorporation of population normalization to the wastewater-based epidemiology data provides the additional opportunity for determination of patterns, trends and possible comparison across catchments with different population sizes, ultimately helping in infection hotspot identification. Amoah et al. presented in the journal of Environmental Research the first use of Adaptive Neuro-Fuzzy Inference System (ANFIS) to determine the potential impact of physico-chemical characteristics of wastewater on the detection and concentration of SARS-CoV-2 RNA in wastewater. Among the parameters assessed using the ANFIS model, ammonia and pH showed significant association with the concentration of SARS-CoV-2 RNA measured. This study has shown that SARS-CoV-2 concentration in wastewater could be due to the shedding rate in the connected population, as reported in literature and corroborated in this study via the observed association with increasing ammonia concentration. The Nanophotometer® was used in this study to determine the quality and quantity of the extracted RNA.

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