Laboratory Testing Report

Efficacy of ReSPR units with NCC technology at continuously inactivating SARS nCoV2 on surfaces in a controlled laboratory environment

University of Wisconsin
SCHOOL OF MEDICINE AND PUBLIC HEALTH

Laboratory Testing Report

Sustained reduction of Microbial Burden on Surfaces through the Introduction of Photocatalytic Conversion technology

Executive Summary

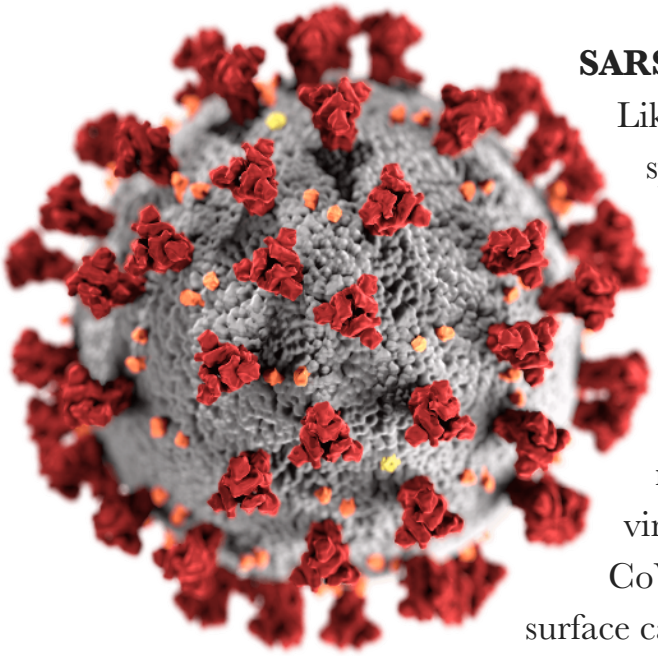
Severe acute respiratory syndrome coronavirus 2 (SARS-CoV-2) is the strain of coronavirus that causes coronavirus disease 2019 (COVID-19), the respiratory illness responsible for the COVID-19 pandemic. Colloquially known as simply the coronavirus, it was previously referred to by its provisional name, 2019 novel coronavirus (2019-nCoV), and has also been called human coronavirus 2019 (HCoV-19 or hCoV-19).The World Health Organization declared the outbreak a Public Health Emergency of International Concern on 30 January 2020, and a pandemic on 11 March 2020. SARS-CoV-2 is a Baltimore class IV positive-sense single-stranded RNA virus that is contagious in humans. As described by the U.S. National Institutes of Health, it is the successor to SARS-CoV-1, the strain that caused the 2002–2004 SARS outbreak.

Taxonomically, SARS-CoV-2 is a strain of severe acute respiratory syndrome-related coronavirus (SARSr-CoV). It is believed to have zoonotic origins and has close genetic similarity to bat coronaviruses, suggesting it emerged from a bat-borne virus. There is no evidence yet to link an intermediate animal reservoir, such as a pangolin, to its introduction to humans. The virus shows little genetic diversity, indicating that the spillover event introducing SARS-CoV-2 to humans is likely to have occurred in late 2019. Epidemiological studies estimate each infection results in 5.7 new ones when no members of the community are immune and no preventive measures taken.

The virus primarily spreads between people through close contact and via respiratory droplets produced from coughs or sneezes. It mainly enters human cells by binding to the receptor angiotensin converting enzyme 2 (ACE2).

This study was conducted to determine whether the NCC® Technology could continuously inactivate SARS nCoV2 in a controlled laboratory environment.

Test Microorganism Information



SARS nCoV 2

Like other coronaviruses, SARS-CoV-2 particles are spherical and have proteins called spikes protruding from their surface. These spikes latch onto human cells, then undergo a structural change that allows the viral membrane to fuse with the cell membrane. The viral genes can then enter the host cell to be copied, producing more viruses. Recent work shows that, like the virus that caused the 2002 SARS outbreak, SARS-CoV-2 spikes bind to receptors on the human cell surface called angiotensin-converting enzyme 2 (ACE2).

The results show material inactivation of SARS nCoV 2 with the use of the ReSPR unit with NCC® Technology; significantly reducing the risk of infection from this virus.

Individual results on surfaces within the test chamber showed significant reductions up to 93.19%. The continuous disinfection from low levels of Hydrogen Peroxide were found to exert a significant inactivation of the virus PFUs compared to the control microorganisms non-exposed to the ReSPR NCC technology.

Materials and Methods

Summary of the Procedure

One hour before starting the assay, a ReSPR device was placed inside the Biosafety cabinet (BSC) and turned on to saturate it with the oxidizing particles. Then, Aluminum foil pieces of 24mm x 24mm previously disinfected with 70% ethanol and exposed to UV light for 25 minutes, were individually placed at room temperature in a petri dish inside the BSC. A 200µl inoculum of 1 x 105 PFU of SARS-CoV-2 was placed and extended on each aluminum piece using a micropipette tip. Three replicates were prepared per treatment and enough samples were prepared to evaluate 18 exposure times (10, 20, 30, 50, 60, 120, 150, 180, 210, 240, 300, 360, 420, 480, 540, 600, 660 and 720 minutes) (Table 1). The same assay was repeated without the presence of the ReSPR device and used as control. Following each exposure time, 5ml of collection media (DMEM with 2%FBS) was added to each petri dish and the aluminum material was washed out by resuspending four to five times using a micropipette; the viral suspension was collected, mixed for homogeneity and aliquoted in 1ml centrifuge tubes. Each collected sample was immediately labeled and stored at -80°C for posterior titration assays.

The ReSPR (NCC) Technology

NCC® Technology utilizes a revolutionary and doped hydrophilic photo catalytic coating, consisting of a proprietary combination of transition elements to enhance efficacy of the coating. Activated by multiple specific wavelengths of a high intensity light, oxygen and humidity are extracted from the air to create a plasma of powerful oxidizers that targets air and surface pathogens. No ozone is produced. These oxidizers are extremely effective at destroying bacteria, viruses, fungi, volatile organic compounds (VOCs) and other environmental contaminants.
Most significantly, they are not harmful to humans, pets and plants, and are completely safe for indoor use in occupied spaces.

Results

The accumulated reduction of SARS-CoV-2 titer, calculated in relation to the initial inoculum (*XX*=6.85x104 PFU/ml), reached its maximum levels after 150 minutes of exposure, with a highest value of 93.19% (Figure 3).

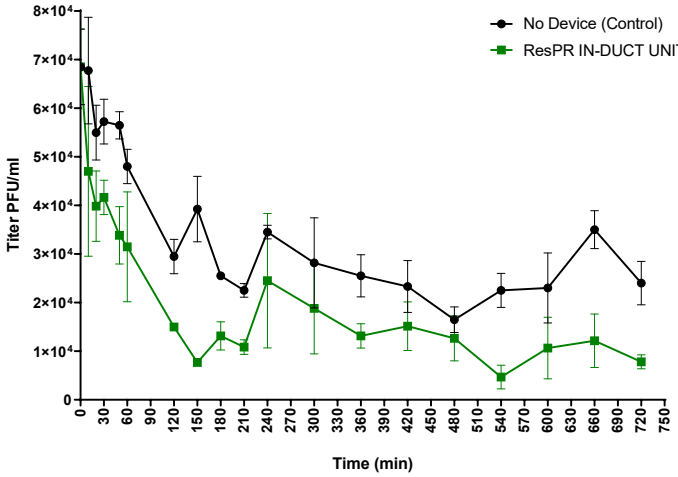
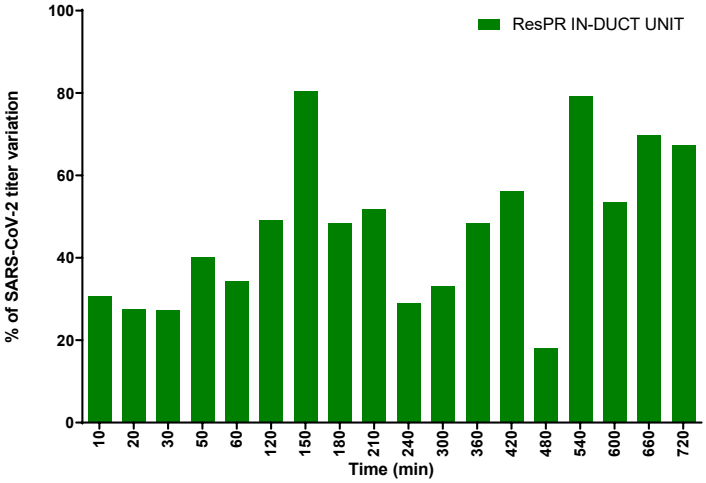


Figure 1. Mean titers and standard deviation of SARS-CoV-2 inoculum collected at 18 time points (from 0 to 720 minutes) from 24mm x 24mm aluminum foil pieces exposed to a ReSPR IN-DUCT device.

The titers for the ReSPR device showed variable reduction in relation to the control for each exposure time, this ranged between 18.18 % and 93.19% (figure 2).



Time (min)	10	20	30	50	60	120	150	180	210	240	300	360	420	480	540	600	660	720
ResPR IN-DUCT UNIT	30.63	27.58	27.22	40.12	34.38	49.15	80.47	48.37	51.85	28.99	33.14	48.37	56.25	18.18	79.26	53.62	69.71	67.36

Figure 2. Reduction (%) of SARS-CoV-2 mean titer in relation to control samples of the inoculum collected at 18 time points (from 10 to 720 minutes) from 24mm x 24mm aluminum foil pieces exposed to a ReSPR IN-DUCT device.

Conclusion

While using the ReSPR device, a maximum reduction of 93.19% of SARS-CoV-2 infectious particles on an aluminum surface was found. The biggest reduction levels of SARS-CoV-2 titer occurred after 150 minutes of exposure, accumulating up to 93.19% reduction of viral particles with respect to the initial inoculum titer, contributed by the ReSPR Pro device. Therefore, the ReSPR NCC technology has shown an inactivation effect on the viral titers for the evaluated exposure periods.

Contact Information

ReSPR Group Inc
3100 Monticello Ave, Suite 310
Dallas, Texas 75205
USA
tel: +1(214)396-1906
info@ReSPRgroup.com

Full laboratory reports available on request.