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Academic Digest

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Welcome back to the fifth edition of the Inivos academic digest, where our team shares the most interesting and thought-provoking research across microbiology, personal protective equipment (PPE) and infection prevention and control.

Over November, there has been more research being focused and shifted towards the reprocessing and decontamination of PPE using Ultraviolet (UV) and hydrogen peroxide vapour (HPV) technologies, with papers published in the American Journal of Infection Control and PLOS One examining the feasibility of decontaminating FFR masks and gowns without affecting integrity and performance.

The next challenge will be evaluating the possibility of food products to serve as carriers for indirect transmission of SARS-COV-2. Papers in the Food Control journal and Indian Journal of Medical Microbiology emphasise the potential of SARS-CoV-2 to survive on meat and dairy products and the possible transmission through the faecal-oral route.

PPE Decontamination

An experimental study[1] in the Infection Prevention in Practice Journal examined the use of UV-C and dry heat on contaminated N95 masks and disposable hospital gowns with a swine coronavirus. Researchers reported that exposure to 60°C for 20 min, and UV-C at 1800 mJ/cm^2 for 5 min resulted in a 4-log reduction and inactivation of the surrogate virus. Even though integrity and fit testing weren't evaluated in this study, the authors provided supporting data from the literature that state using the same cycles did not hinder the efficiency of the tested masks and gowns.

Meanwhile, a research paper[2] in the American Journal of Infection Control has demonstrated the effectiveness of using a high dosage of UV-C light to decontaminate filtering facepiece respirator (FFR) masks. The researchers reported that a UV-C dose of >2 J/cm^2 applied to a single FFR mask within 1 minute was sufficient to cause >3log reduction on *Escherichia* virus (MS2). However, the researchers did not evaluate the integrity and performance of the tested masks after the decontamination cycle.

A systematic review[3] published in PlOS One journal explored the available options in the literature for N95 masks decontamination and reprocessing. Majority of the included studies (13/17) analysed the efficacy of UV-C light. The authors of these studies reported >log4 reductions on different pathogenic microbes such as *H1N1 influenzas, Clostridium difficile (c.diff)* spores and other highly-resistant microorganisms, without significantly impacting the filtering and physical parameters of the tested masks.

A review[4] published in the Journal of Dentistry provided an overview of 55 papers that determined the most used decontamination methods of N95 respirators. The authors concluded that hydrogen peroxide vapour and UV light are the most commonly cited interventions that successfully decontaminated N95 masks. However, masks integrity and performance after the decontamination cycles were not evaluated in this review.

Earlier this year, Inivos' own research with University Hospital Southampton[5] found that a process of laundering combined with low dosage (7.9%) hydrogen peroxide vapour using ProXcide decontamination technology effectively removed pathogens from sterile gowns without damaging garment integrity.

UV-C Light Efficacy

A research study[6] in the Biomedical Research International Journal analysed the efficacy of 3 disinfection methods in reducing bacterial counts in a computed tomography (CT) room, using UV-C light, plasma circulation air steriliser and a combination of both methods. The researchers found that all three methods provided significant results. However, combining UV-C light with the air disinfector yielded better outcomes than that of using each method alone.

A review[7] in the International Journal of Health Sciences provided an overview of 17 efficacy studies using different systems of UV light. Authors found that UV-C can be utilised as an adjunct to terminal manual cleaning because of its efficacy as a germicidal agent. Its efficacy in decontaminating hospital settings was shown against a wide range of pathogenic microorganisms such as Methicillin-resistant staphylococcus aureus (MRSA), vancomycin resistant-enterococci (VRE), *C.difficile* as well as influenzas virus, norovirus and coronavirus.

The findings correspond with Inivos' Ultra-V technology, which emits UV-C light rays specifically at a 254 nm wavelength to decontaminate spaces and surfaces effectively and efficiently without influencing safety measures. This is because UV-C light is the most effective and yet safest UV technology to decontaminate different settings without possessing a risk on individuals.

SARS COV-2: Survival on Food Products and Dry Surfaces

A literature review[8] in the Materials journal analysed the infectivity of SARS-CoV-2 on dry surfaces. Authors found that SARS-CoV-2 remains viable on the timescale of days on hard surfaces under ambient indoor conditions. Similarly, the virus is stable on human skin, signifying the necessity of hand hygiene amidst the current pandemic. There is an inverse relationship between SARS-CoV-2 surface persistence and temperature/humidity, and the virus is well suited to air-conditioned environments (room temperature, ~ 40% relative humidity). The authors reported that sunlight may rapidly inactivate the virus, suggesting that indirect transmission predominantly occurs indoors.

Another paper[9] in the Food Control journal demonstrated the ability of SARS-CoV-2 to survive on food products including meat and meat products, dairy products, bread, fruits, vegetables, and ready-to-eat foods as potential carriers. Authors reported the presence of SARS-CoV-2 RNA in faeces of several patients shows the possibility of viral faecal-oral route spread.

Those findings were further supported by a research study10 in the Indian Journal of Medical Microbiology, which have found that the RNA of SARS-COV-2 can be detected in nasal swab, throat swab and faecal samples but cannot be detected in serum and urine samples. The virus remained for a maximum of 24 days in the faecal samples of the tested patients, which might possess a risk on household contacts if a patient was discharged based on results only from nasal and throat swabs.

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