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Academic Digest

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

Over September, we saw two key themes emerging. As in August, several papers were published investigating the effects of various decontamination methods to reduce pathogens on PPE, as well as how the different processes impacted garment integrity and fit.

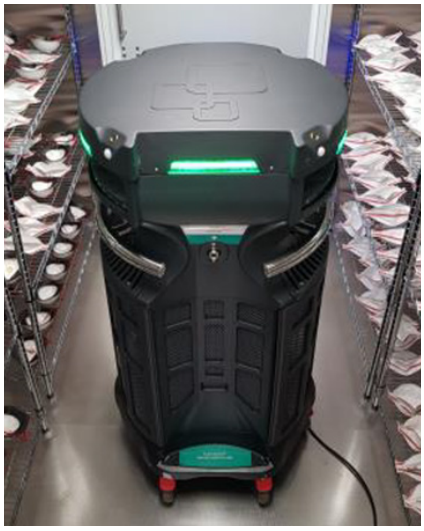
This month, we also saw increasing efforts dedicated to understanding and addressing the spread of SARS-CoV-2 through air recirculation, with papers in Annali di Igiene and Environment International considering the role of air processing in infection control.

Decontamination of PPE

In September, the trend for research investigating the effectiveness and safety of decontaminating PPE for reuse continued. This month, three papers have been published on the subject – variously investigating the suitability of hydrogen peroxide, ultraviolet-C light (UV-C) and dry-heat.

In the Journal of Hospital Infection,[1] a systematic review by O'Hearn *et al* found that the evidence so far suggests that decontaminating N95 and SN95 masks with UV-C does not impair mask efficacy and safety. The researchers noted that only two studies reviewed mask fit following UV-C irradiation and, while the existing evidence did not suggest compromise, future research should delve further into the impact on garment fit.

Meanwhile, in the American Journal of Infection Control,[2] researchers examining the disinfection capacity of hydrogen peroxide plasma for the reuse of PPE also found favourably. Using five different dilutions of SARS-CoV-2 on artificially contaminated N95 masks, researchers concluded the process significantly damaged the pathogen's genetic material as it could not be detected following the process.



A third paper, again in the Journal of Hospital Infection,[3] investigated the effects of hydrogen peroxide vapour (HPV), UV-C and dry heat. The first paper to describe the effects of decontamination technology against a surrogate virus (in this case, infectious porcine respiratory coronavirus) on PPE, it also demonstrated reduced infectivity by all three methods.

Earlier this year, Inivos' own research with University Hospital Southampton[4] 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.

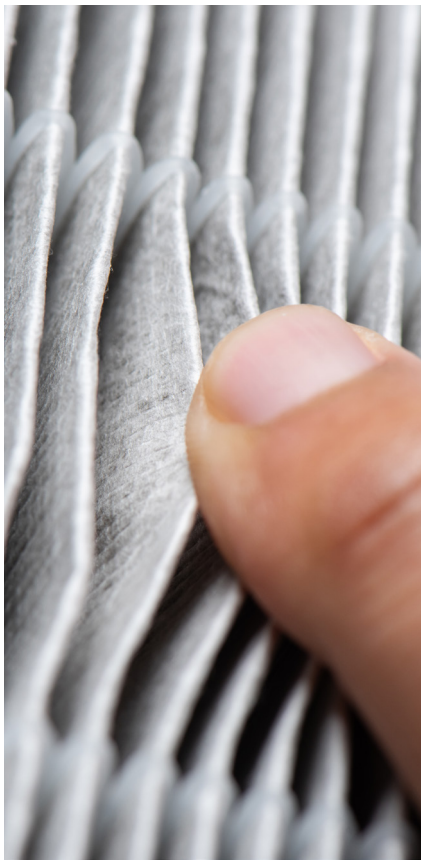
SARS-CoV-2

An in-vitro study in the American Journal of Infection Control[5] found UV-C decontamination to be effective at removing SARS-CoV-2 from surfaces. Researchers at Hiroshima University found UV-C could reduce viable SARS-CoV-2 by up to log10 and recommended further evaluation of UV-C against real-world surfaces.

An observational study across three acute hospitals in a single National Health Service (NHS) Trust, published this month in the Journal of Hospital Infection,[6] found that hospital-acquired SARS-CoV-2 infection is not associated with increased mortality compared with community acquired infection. Researchers found that biological sex, age-adjusted Charlson comorbidity index (ACCI) and Scottish Index of Multiple Deprivation (SIMD) scores were stronger indicators of 30-day mortality than the source of infection.

Air Filtration and Treatment

Preliminary data published in Annali di Igiene[7] this month also supports the use of UV-C decontamination on high efficiency particulate air (HEPA) filters. Researchers D'Orazio and D'Alessandro compared the microbial load on HEPA filters which had been irradiated with UV-C against those which had not been irradiated. Their findings suggest that UV-C decontamination can extend the life cycle of HEPA filters, and improve hospital air quality, by reducing the microbial load.



Correspondence from a group of respiratory, built environment and air quality academics to Environment International[8] also argue in favour of improving ventilation in hospitals and other buildings. Considering that small airborne particles are a likely transmission vector of SARS-CoV-2, researchers suggest that improving air controls and reducing contaminated air should be recognised as a means of reducing transmission of coronavirus. As well as avoiding recirculating air and minimising the number of individuals in an indoor space, the group led by Lidia Morawska also advises the use of decontamination technology such as UV-C to reduce pathogens in high-risk areas.

1. O'Hearn, K., et al. (2020). "Decontaminating N95 and SN95 masks with ultraviolet germicidal irradiation does not impair mask efficacy and safety." J Hosp Infect 106(1): 163-175. Accessed 11 October 2020. Available at: https://doi.org/10.1016/j.jhin.2020.07.014

2. Ibanez-Cervantes, G., et al. (2020). "Disinfection of N95 masks artificially contaminated with SARS-CoV-2 and ESKAPE bacteria using hydrogen peroxide plasma: Impact on the reutilization of disposable devices." Am J Infect Control 48(9): 1037-1041. Accessed 11 October 2020. Available at: https://dx.doi.org/10.1016%2Fj.ajic.2020.06.216

3. Ludwig-Begall, L. F., et al. (2020). "The use of germicidal ultraviolet light, vaporized hydrogen peroxide and dry heat to decontaminate face masks and filtering respirators contaminated with a SARS-CoV-2 surrogate virus." J Hosp Infect. Accessed 12 October 2020. Available at: https://doi.org/10.1016/j.jhin.2020.08.025

4. University Hospital Southampton NHS Foundation Trust (2020). "Reprocessing of PPE Garments for re-use by clinical staff by Vaporised Hydrogen Peroxide". Accessed 12 October. Available at: https://www.hygiene-solutions.co.uk/reprocessing-ppe-reuse

5. Kitagawa, H., et al. (2020). "Effectiveness of 222-nm ultraviolet light on disinfecting SARS-CoV-2 surface contamination." Am J Infect Control. Accessed 12 October. Available at: https://doi.org/10.1016/j.ajic.2020.08.022

6. Khan, K. S., et al. (2020). "Does nosocomial SARS-CoV-2 infection result in increased 30-day mortality? A multi-centre observational study to identify risk factors for worse outcomes in COVID-19 disease." J Hosp Infect. Accessed 13 October 2020. Available at: https://doi.org/10.1016/j.jhin.2020.09.017

7. D'Orazio, A. and D. D'Alessandro (2020). "Air bio-contamination control in hospital environment by UV-C rays and HEPA filters in HVAC systems." Ann Ig 32(5): 449-461. Accessed 12 October 2020. Available at: https://doi.org/10.7416/ai.2020.2369

8. Morawska, L., et al. (2020). "How can airborne transmission of COVID-19 indoors be minimised?" Environ Int 142: 105832. Accessed 12 October 2020. Available at: https://doi.org/10.1016/j.envint.2020.105832