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Is Thermal Disinfection Efficient Against COVID-19?

The COVID-19 pandemic has brought forward the issue of global shortages of personal protective equipment (PPE), such as masks. Much research has tested various methods of mask decontamination for reuse. A new study looks into capabilities of thermal disinfection to eliminate viruses and bacteria.

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The main challenge with numerous disinfection techniques available for healthcare facilities around the world lies with the rapid deterioration of PPE protective properties. Therefore, a method is needed that could preserve these properties and enable safe reuse of respirators. The early released study (Daeschler et al. 2020) evaluated the performance of the one of the common technologies, thermal disinfection.

It has been reported that SARS-CoV-2 is highly sensitive to heat exposure being inactivated after five minutes of heating at 70°C. At the same time, the microfibres in common N95 respirator models endure temperatures over 130°C, which suggests that the filter may withstand repetitive exposure to 70°C.

The researchers inoculated four widely available models of N95 masks with SARS-CoV-2 and *Escherichia coli* and disinfected them in multiple cycles of varying temperature and humidity levels. They then assessed the PPE for structural integrity and protective functions.

They found that after a single dry heat treatment (70°C for 60 min), SARS-CoV-2 could not be detected in all mask samples. In turn, *E. coli* colonies were still detectable after dry heat treatment, but decreased with raising humidity levels until being virtually eliminated from masks treated at 70°C and 50% relative humidity.

In addition, changes in fibre diameters in the mask sample after ten disinfection cycles remained within the range for unprocessed N95 filters as specified in the U.S. patent (3.88 ± 2 µm). The respirators also continued to meet standards for fit, filtration efficiency and breathing resistance. As such, all tested groups maintained their fit properties (as measured by the OSHA standards and on the CSA Comfort Assessment Score scale), particle filtration efficiency and breathing resistance.

In conclusion, the authors suggest thermal disinfection at 50% relative humidity for up to ten times as the optimal cycle for the safe reuse of disposable N95 respirators. They note that this method process could be used in hospitals and long-term care facilities with commonly available equipment, and could be especially useful in low-tech regions.

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