Title: Respirator filtration efficiency before and after decontamination by moist heat incubation: particle size dependence

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The decontamination and reuse of respirators have been proposed to mitigate the shortage of N95 or similar high-efficiency respirators during pandemics. The NIOSH respirator filtration efficiency (FE) test protocol defined in 42 CFR Part 84 Subpart K has been used to verify if decontamination procedures can maintain a minimum FE above 95% for some respirators. However, the defined size range of sodium chloride test aerosol is limited and may not include the most penetrating particle size for all respirators. Here, FE was measured for N95 and KN95 respirators before and after ten decontamination cycles by moist heat incubation (MHI). A custom-designed setup was used to determine the size-specific FE for particle aerodynamic diameters between 0.07 and 1.97 µm. For two of the three respirators tested, FE was not reduced at any size after ten cycles of MHI. For the third respirator, FE was below 95% before MHI cycles and decreased to 81% after MHI cycles. The most penetrating particle size for this respirator was outside the range defined in NIOSH protocol and further increased after MHI cycles. From this study, it is recommended that a wider test particle range, including particle sizes up to the micrometer size range, should be used when testing the FE of respirators and facemasks used during pandemics. The risk of disregarding respirator performance at larger sizes is notable in the context of filtering infectious aerosols where infectious load increases with size.