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A Review of Decontamination Methods for Filtering Facepiece Respirators

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ABSTRACT

During the current COVID-19 infectious disease pandemic, the demand for NIOSH-approved filtering facepiece respirators (FFR) has exceeded supplies and decontamination and reuse of FFRs has been implemented by various user groups. FFR decontamination and reuse is only intended to be implemented as a crisis capacity strategy. This paper provides a review of decontamination procedures in the published literature and calls attention to their benefits and limitations. In most cases, the data are limited to a few FFR models and a limited number of decontamination cycles. Institutions planning to implement a decontamination method must understand its limitations in terms of the degree of inactivation of the intended microorganisms and the treatment's effects on the fit and filtration of the device.

Keywords: N95 respirator, filtering facepiece respirator, decontamination, respirator reuse

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Novel Faceseal Technology Improves Outcomes of N95 Respirator Quantitative Fit Testing for Hard-to-Fit Individuals

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ABSTRACT

Background: The COVID-19 pandemic has highlighted the importance of respiratory protection for healthcare workers (HCWs) and patients alike. Presently, respiratory protective devices are worn in hospitals and healthcare settings globally. HCWs are generally required to wear N95 filtering facepieces respirators (FFRs) in high-risk settings and during certain high-risk procedures. According to OSHA, HCWs who are assigned NIOSH-approved N95 FFRs must be fit tested using either qualitative or quantitative testing protocols (QLFT and QNFT, respectively). However, HCWs often fail the initial fit test on the first N95 model chosen. A novel Faceseal technology was recently developed and successfully applied to commercial N95 FFRs. In this pilot study, we assessed how this technology affects the QNFT outcomes for subjects who had failed their initial N95 fit test.

Methods: Ten subjects who failed the QNFT with N95 FFRs on the first fitting were recruited to perform a QNFT study in which each subject was tested in triplicate on the same N95 model and with that same model modified with the novel Faceseal of a unique configuration, which is made of a thermoplastic copolymer, enhancing the respirator fit to the user's face. The fit factors (FFs) and passing rates were determined, and the results were compared.

Results: The Faceseal technology increased the overall FF for the entire cohort from 59.8 ± 18.3 to 163.2 ± 27.3 (threshold=100) and the test passing rate from 10% to 90%. This improvement was achieved for the hard-to-fit subjects due to reduction of the faceseal leakage, as the filter and respirator body were left unchanged.

Conclusions: The novel Faceseal technology significantly improved the QNFT outcomes for individuals who had previously failed OSHA fit testing on the same N95 FFR.

Keywords: N95 filtering facepiece, faceseal, fit test

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Qualitative Knowledge of Filtering Facepiece Respirators for Filtration Performance Tests during the COVID-19 Pandemic

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ABSTRACT

Background: During the COVID-19 pandemic, the pressure on health centers to obtain certified N95 filtering facepiece respirators (N95 FFRs) and the pressure on the FFRs production sector led to a diversification of FFRs' supply chains, with the approval of several government authorities.
Objective: The main issue then becomes whether these purchased FFRs are as effective as the FFRs commonly used in the pre-COVID-19 period.
Methods: The most efficient way is to test these FFRs under normative conditions. The setup used here allows to measure the pressure drop Δp (mbar) and the filtration efficiency E (%) of FFRs with a constant 85 Liter per minute. However, it would be useful to find visible markers that could indicate a possible defect (intentional or not) or a possible counterfeit.
Results and conclusions: The performance measurements and visual inspections of 43 types of FFRs are compared and analyzed in this paper. 35% of the FFRs received in the laboratory have a minimum filtration efficiency greater than 95%, and 28% have a minimum efficiency less than 80%. The results show that marks on FFRs are not a clear and precise indicator of the efficiency of the FFR. However, a visual inspection and a preliminary fit test can identify some ineffective FFRs.

Keywords: COVID-19, filtering facepiece respirator, filtration performance, aerosol, visual inspection, respirator certification.