Investigating Decontamination and Reuse of Respirators in Public Health Emergencies

Performer: Battelle Memorial Institute ● **Project leader:** William Richter
Contract value: $435,285 ● **Project dates:** August 2014 - July 2016

Background

While everyone else exits, they rush in. Protecting the health and safety of first responders and healthcare workers is an essential part of planning for public health emergencies. Personal protective equipment (PPE) items such as respirators, protective clothing, and eye protection are standard supplies.

One of many preparedness and response challenges is ensuring adequate supplies of this protective equipment during an emergency, when responders may need to don additional protective gear, or replace used equipment more rapidly as they treat an increased number of patients.

One type of respirator routinely used to protect workers from biological hazards is known as an N95 filtering facepiece respirator (FFR, pictured). These respirators protect the wearer by removing contaminants from the air. Currently, these respirators must be discarded after one use, but in emergency response circumstances such as an emerging infectious disease (pandemic influenza, for example) or intentional release of a biological threat agent, reuse of these respirators may be necessary to maintain adequate supplies.

Project Description

To investigate the potential for reusing respirators in emergency situations, FDA has awarded an 18-month contract to Battelle Memorial Institute. Battelle will conduct tests to evaluate the feasibility of using a commercially available hydrogen peroxide vapor technology to decontaminate N95 respirators.

Based on recommendations from an interagency respirator equipment working group known as Project BREATHE, this pilot-scale testing will evaluate respirators during and after as many as 50 decontamination cycles. The testing will examine the ability of hydrogen peroxide vapor to decontaminate respirators, and it will determine if the respirators maintain their structure and function after multiple decontamination cycles.

Project Outcomes

The project will address three areas related to decontamination of N95 respirators:

- Optimizing decontamination parameters
- Evaluating the impact of repeated decontamination cycles on functional performance of the respirators
- Assessing efficacy of repeated decontamination for up to 50 cycles

This project will demonstrate the feasibility of FFR decontamination and reuse, and establish testing methods for future investigation of additional decontamination technologies—important steps in ensuring continued and sustainable protection of our nation's health workers, responders and patients during public health emergencies.

Accomplishments (updated August 2016)

This project offered a comprehensive pilot-scale study that evaluated the efficacy of hydrogen peroxide vapor (HPV) for decontamination of N95 respirators against a single organism using the Bioquell Clarus C HPV decontamination system. The study measured filter efficiency, fit, and differential pressure after exposure to up to 50 decontamination cycles. This study:

- Established the parameters of the HPV decontamination cycle to ensure a 6-log reduction in organism viability
- Evaluated the mechanical integrity and performance of the N95 FFR following exposure to up to 50 cycles of HPV decontamination
- Confirmed that decontamination was still achieved even after 50 repeated cycles of biological aerosol exposure/HPV decontamination

The project successfully demonstrated the feasibility of a test approach to evaluate FFR reuse and establish testing methods for future investigation of additional decontamination technologies.

Additional Reading

Final Report for the Bioquell Hydrogen Peroxide Vapor (HPV) Decontamination for Reuse of N95 Respirators (PDF, 1.14 MB), provided by Battelle

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Related Links

- Masks and N95 Respirators
- MCMi in Action: Protecting National Health and Security
- About MCMi
- CDC NIOSH: More information on respirators
- CDC NIOSH: Respiratory protection research
- N95 Day info from CDC