PROTECTION - SCIENCE AND TECHNOLOGY ADVANCES FOR CHEMICAL AND BIOLOGICAL PROTECTION

Large-scale Bioaerosol Experiments To Support Enhanced Bioprotection Of Facilities

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Building occupants face diverse biological threats, from intentional attacks with biological agents (e.g., weaponized spores), to contagious diseases. As a result of the COVID-19 pandemic, there has been an increasing awareness of and interest in mitigation strategies for reducing the risk of exposure to airborne pathogens in indoor settings. Simple, low-cost solutions that can operate continuously to provide increased protection against infectious aerosols will improve the level of protection against disease for occupants of Department of Defense (DoD) facilities both on and off the battlefield. The objective of the Enhanced Bioprotection of Facilities Program, led by the U.S. Army Corps of Engineers at the direction of the Defense Threat Reduction Agency, is to develop updated guidelines for the optimal use of collective protection measures that can improve resiliency of DoD barracks and administrative buildings against biowarfare and pandemic threats. The Center for Environmental Solutions and Emergency Response at the U.S. Environmental Protection Agency (EPA) is supporting the program through conducting room-scale controlled bioaerosol experiments to evaluate the effectiveness of various mitigation strategies and to inform the program's modeling efforts. Many technologies have the potential to reduce the risk of disease transmission in occupied spaces, but efficacy testing is often conducted using different test methods that are not representative of real-world use, making it difficult to predict technology performance in applied settings. In this work, experiments will be conducted with aerosolized surrogates for airborne pathogens (both spores and viruses) utilizing a 3000 ft3 bioaerosol test chamber located in EPA's Aerosol Test Facility in Research Triangle Park, North Carolina. Testing will be conducted at a sufficient scale such that findings can be extrapolated to application settings and in a systematic manner so that the efficacy of the various mitigation strategies can be directly compared. The test chamber features a customized HVAC system and can be used to simulate a range of environmental and airflow conditions. Initial experiments have been designed to simulate a conference room scenario, and a range of different pathogen reduction strategies will be evaluated (e.g., directional airflow, upgrading filtration, different ultraviolet radiation-generating devices) to quantify their effectiveness in minimizing exposure risk by reducing concentrations of infectious aerosols. Subsequent experiments will focus on simulating a building entryway, and technologies that could be used to reduce transport of biological contaminants from the outdoors to inside facilities will be assessed. The findings of this research will directly inform scientifically-based guidance and standards for improved protection of building occupants against a range of biological threats.