

## NEXT-GENERATION BIOAEROSOL DETECTION & IDENTIFICATION

# Biodiversity Of The Operational Aerosol Background Environment

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Detection and identification systems for biological defense must operate in challenging outdoor environments and be capable of monitoring very low levels of aerosolized biological agent threats. The natural background is typically the limiting factor for detector performance in the field in terms of sensitivity and false alarm rate. Therefore, it is important to characterize the aerosol profile in the operational environment to develop an understanding of how it impacts performance of detection systems. Such knowledge can lead to enhanced detection algorithms and improved test and evaluation (T&E) methods. The objective of this work was to develop a data collection and processing method to characterize the operational environment with respect to current and emerging bioaerosol detection technologies. The method aims to quantify the biological aerosol particle load versus particle size in the respirable range (0.5–10  $\mu\text{m}$ ) using modern optical particle monitors and ultraviolet light induced fluorescence (UV-LIF). The method also characterizes the biodiversity of the aerosol particles using DNA sequencing applied to physical aerosol samples collected onto dry filters. Sequencing results provide a taxonomical breakdown of the biological aerosol constituents to identify bacteria, fungi, and virus components. To demonstrate the aerosol background differences versus geographical locations, data was collected in a mid-Atlantic location, as well as a desert location. The end product of this effort is a pilot data set that can be used by technology developers to support bioaerosol detector technology development and design more operationally relevant T&E protocols. Extended background collection campaigns are very expensive in terms of resources and manpower. The methodology workflow that was refined in this work will enable researchers to develop more effective cost estimates and streamlined protocols for future collection efforts.

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