

THREAT AGENT DEFEAT MODELING AND TESTING

Synthetic Dynamic Background Recipe Development For Biological Testing

Tiffany Sutton U.S. Army DEVCOM Chemical Biological Center

Aime Goad U.S. Army DEVCOM Chemical Biological Center

Francis D'Amico U.S. Army DEVCOM Chemical Biological Center

Angela Zeigler U.S. Army DEVCOM Chemical Biological Center

Jana Kesavan U.S. Army DEVCOM Chemical Biological Center

Gary Kilper Excet, Inc.

Charles Davidson Science and

Technology Corp **Jerold Bottiger** Excet, Inc.

The operational environment for biological aerosol (bioaerosol) detectors is highly dynamic. Background aerosol particle concentration levels are constantly changing depending on many factors, such as location, time of day, weather, human movement, season, and other disturbances such as wildfires and vehicular traffic. Critical to the Department of Homeland Security Countering Weapons of Mass Destruction Test & Evaluation (DHS CWMD T&E) Division in support of the Bio Detection for the 21st Century (BD21) program, DEVCOM CBC participated as subject matter experts and the test execution performer for the Indoor Assessment Demonstrator Test (IADT). DHS CWMD T&E was interested in characterizing the ambient background of an indoor operational environment and then using this dataset to generate dynamic indoor background recipe that can be used to reproduce that background in chamber bio-testing efforts. A suite of aerosol ground truth equipment was deployed at indoor settings to collect background samples and data over a period of three weeks. Equipment included two commercial particle monitors the Aerodynamic Particle Sizer (APS, TSI Incorporated), and the Wideband Integrated Bioaerosol Sensor (WIBS, Droplet Measurement Technologies). Physical samples were collected using Dry Filter Unit (DFUs) and a high-volume cyclone sampler. These were analyzed with a number of analytical techniques to identify molecular and biological constituents. Component makeup of the aerosols were used to inform the development of the background recipe. Particle monitor data were analyzed to characterize both aerosol concentration dynamics, and particle fluorescence which is related to the background bioaerosol component of the overall particle concentration. The analyses from the physical sample and particle monitors were used to create the synthetic dynamic recipe using CBC's proprietary Calliope chamber and aerosol generator. A 4.5-hour profile was selected from the background data and used to design a dynamic background, generated in the Calliope chamber.

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