Evaluation of cold weather decontamination methods

Jana Kesavan[1], Daniel McGrady[2], Melissa Sweat[3]
[1]U.S. Army Combat Capabilities Development Command Chemical Biological Center, Aberdeen Proving Ground, MD, [2]MAG Aerospace, Fairfax, VA, 3Defense Threat Reduction Agency, Fort Belvoir, VA.

Introduction: Water based decontamination methods are commonly used; however, these methods cannot be used in cold weather conditions. In addition, the sampling efficiency of cold weather decontamination methods are not known.

Objective: This study evaluated four cold weather decontamination methods (wiping, blotting, vacuuming, and tacky removal.

- Wipe removal with 2 lb of mass: Rags in a Box (dry) (Scott^{R} Paper Company), FiberTect (dry) (First Line Technology), FiberTect (wet-sprayed with Dahlgren Decon A from First Line Technology)
- Blotting removal with 2 lb of mass: non overlapping blots (wet FiberTech wipe), overlapping blots (wet FiberTech wipe)
- Vacuuming removal: used brush attachment with 1239 lpm (WindTunnel, Hoover)
- Tacky removal with 2 lb of mass: Duct tape (Scotch^{TM} brand, 3M), 3M^{TM} 2480, 3M^{TM} 2476

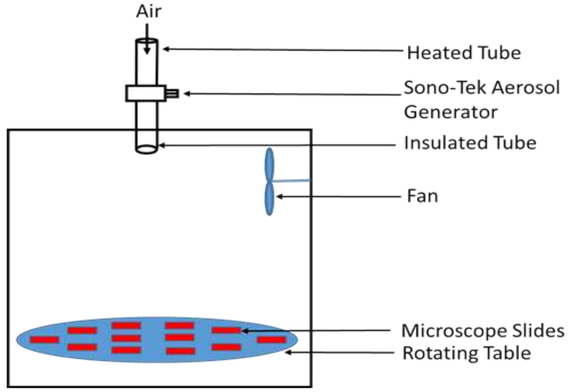
Methodology: *Bacillus atrophaeus var. globigii* (BG) was chosen as the test contaminant with culture analysis. Glass slides (7.5 by 2.5 cm^2) were selected as the test surface. Six slides were selected as controls and six slides were evaluated with each decontamination method.

Results: Vacuuming and non overlapping methods showed low decon efficiencies (30-37%) and these were statistically significantly lower than the other seven methods which had efficiencies of 86-95%. The decontamination efficiency of the seven high efficiency methods were not statistically significantly different.

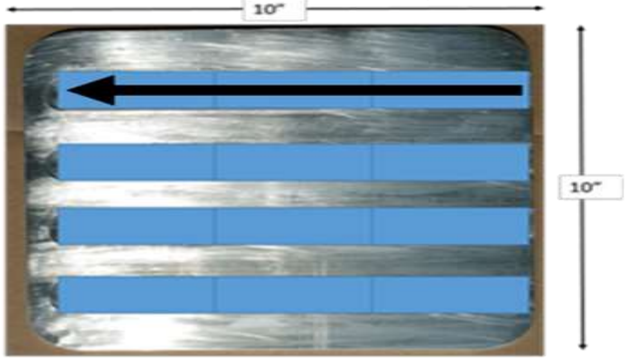
Discussion: This work provides the basis for future research in terms of the contamination removal efficacy of an expanded range of contaminants (including hazardous particulate chemicals, pharmaceutical based agents, and liquid contamination) as contaminants adhere drastically differently to various surfaces. Further, the work here provides a foundation for evaluating existing and novel methodologies for decontamination, particularly in the presence of adverse environmental effects (e.g., cold weather or low water) conditions.

For more information see publication: Jana Kesavan, Daniel McGrady, Melissa Sweat. Evaluation of cold weather decontamination methods, Am J Disaster Med. 17(1):13-21. 2022.

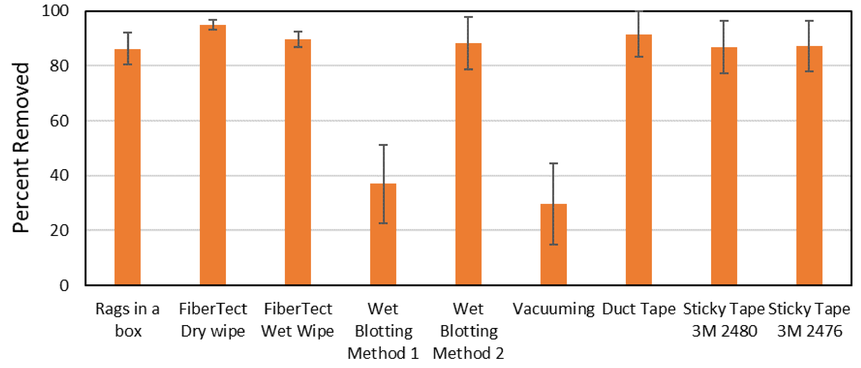
DEVCOM CBC @ DTRA CBD S&T Conference
Scan the QR Code to view all of CBC's
2022 DTRA CBD S&T Conference materials
https://cbc.devcom.army.mil/cbdst-conference/



Aerosolization and sample generation apparatus. Air enters the heated tube at the top and carries the Sono-Tek generated particles to the insulated tube. After exiting the insulated tube, the particles (bimodal: NMD at 1 and 3.4 µm and MMD at 1.4 and 4.8 µm) are allowed to deposit on the glass slides at the bottom of the chamber. The glass slides are rotated to ensure even distribution of particles.



Twelve microscope slides as installed in the custom aluminum tray. Arrow depicts the direction of the wiping motion during wiping experiments. Each row represents a new wiping activity. Two rows were wiped, and two were not. The unwiped samples served as the controls for the evaluation.



Amount of bacterial spores removed as a function of cold weather decontamination methods. High removal percentages are preferable.

	Percent Removed (%)	
Decon Method	Average (%)	Std. Dev.
Rag in a box	86.24	5.84
FiberTect (FT) Dry Wipe	94.93	1.77
FT Wet Wipe	89.53	2.79
Blotting Method 1 (FT)	36.95	14.16
Blotting Method 2 (FT)	88.23	9.56
Vacuuming	29.54	14.78
Duct Tape	91.44	8.27
3M 2480	86.77	9.57
3M 2476	87.12	9.30

Amount of bacterial spores removed as a function of decontamination method.

Acknowledgements: Funding was provided by the Director, Combat Capabilities Development Command Chemical Biological Center under the authorities and provisions of Section 2363 of the FY 2018 NDAA to develop new technologies, engineer innovations, and introduce game-changing capabilities. The authors also wish to acknowledge helpful conversations with Amanda Schenning throughout this work.