

COMBATting EMERGING BIOLOGICAL THREATS – PREPARING FOR THE FUTURE TODAY

Bacteriophage For Biothreat Remediation Against Bacillus Anthracis

Brianna Brasko United States Military Academy **Christopher Kovacs** Defense Threat Reduction Agency **Sophia McKenzie** United States Military Academy **William Rankin** United States Military Academy **Erika Rapp** United States Military Academy
Michael Labare United States Military Academy **Jason Barnhill** United States Military Academy

Bacillus anthracis is a Gram-positive soil-dwelling bacteria with global distribution. The bacterium causes Anthrax infection and is a Category A Select Agent with high bioterror potential, as evidenced by the Anthrax mailing attacks in the United States in the weeks following the terrorist attacks of September 11, 2001. Novel approaches to neutralize biothreats are necessary, especially for circumstances where deliberate contamination by *B. anthracis* is suspected. To this end, bacteriophage (phage) have garnered renewed interest as potential antimicrobial agents. Lytic phages exist ubiquitously in nature and are viral predators of bacteria. Following infection of their host bacterium, phage will replicate within the cell, then are released via viral burst, killing their host in the process. Their therapeutic application against recalcitrant bacterial infections has been well-documented with favorable clinical outcomes. Phage have also been deployed in agriculture and food manufacturing as a means to control contamination from pathogens.

Biothreat contamination in austere environments present the Warfighter with an unseeable challenge that can have devastating repercussions. Part of the mitigation strategy, therefore, requires potent decontamination in order to ensure the safety and mission readiness of Soldiers. Previous research efforts at the United States Military Academy had successfully identified and isolated a lytic phage (BaSTφ) with high potency against the avirulent *B. anthracis* Sterne 34F2 strain. In collaboration with the Warfighter Integration Office (RD-CBW) at the Defense Threat Reduction Agency, a study was initiated to assess the capability of a phage-based technology to remediate surfaces following exposure to *B. anthracis*. The BaSTφ was formulated into an aerosol spray for application. Militarily relevant surfaces (Army ACU, leather upper and rubber sole of combat boots, and stainless steel) were contaminated with *B. anthracis* Sterne 34F2 bacteria, then sprayed thoroughly with BaSTφ. All surfaces tested had greater than 5.0-log reduction of surviving bacteria, compared to recovery from control-treated surfaces.

This study demonstrated the potency of a novel phage spray technology for killing a surrogate biothreat agent, achieving greater than 99.99% kill on contaminated surfaces. The ubiquity of phages and the ease with which they can be isolated presents opportunities for future work examining similar decontamination approaches described here against other relevant pathogens or biothreat agents of concern.