CONCURRENT SESSION 1 – BIOLOGICAL AGENT DECONTAMINATION

Outdoor Systems Trial Using Full-Scale Agricultural Equipment for Wide Area Decontamination of *Bacillus anthracis* Surrogate Spores

Ehsan Gazi | *Defence Science and Technology Laboratory, Salisbury, U.K.*

Bacillus anthracis (*B. anthracis*) is widely regarded as an important biological warfare agent of both civilian and military concern. The attribute that sets it apart from other pathogenic micro-organisms is its ability to form highly resistant spores, which increases its environmental persistence and resistance to decontamination procedures. The only previous attempt to decontaminate open land contaminated with *B. anthracis* was at Gruinard Island, where 500,000 L per ha of formaldehyde (5% – 37 % v/v) was used [1]. However, such an approach would pose significant logistic, technical and economic challenges if it was to be employed for the recovery of civil or military sites [2].

We intended to solve these challenges by developing a rapid and practical decontamination system for the operational recovery of contaminated installations using less than 3000 L/ha of decontaminant. To achieve this goal we exploited state-of-the-art spray application technologies and formulation chemistry used in the agricultural industry, spore germination techniques and a novel decontaminant based on the targeted release of chlorine dioxide. Spores of B. thuringiensis HD-1 cry- were employed as a surrogate for virulent *B. anthracis*. However, key performance attributes were validated against a range of virulent *B. anthracis*.

Preferred formulations for decontamination were developed through laboratory, environmental chamber, wind-tunnel and finally full-scale outdoor trials. During outdoor trials we achieved all essential success criteria on all surface types (4-Log10 reduction on wood, steel and cement). Results using steel surfaces approached that required for desirable performance (6-Log10 reduction). Significant loss of spore viability was found by environmental exposure alone (up to 3-Log10 over 72 h). However, active decontamination was more effective (up to a further 3.6-Log10 reduction in viable spores). Pre-germination before decontamination with chlorine dioxide was not found to have a benefit.

References

[1] Manchee RJ, Broster MG, Stagg AJ, Hibbs SE. Appl Environ Microbiol 1994; 60:4167–4171.
[2] Canter, D. A. Chem. Health Safety 2005; 12:13-19.

The authors gratefully thank US Defense Threat Reduction Agency (DTRA) for funding this work under contract reference HDTRA1-12-D-0003.