Abstract for the 6th Annual Meeting of the Consortium of Biodefense Researchers

Title: Degradation of Biological Weapons Agents in the Environment and its Implications for Terrorism Response

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Abstract:

We discuss here the impact on effective terrorism response of the viability degradation of biological weapons agents in the environment. We briefly review the scientific understanding and modeling of agent environmental viability degradation. In general, agent susceptibility to viability loss is greatest for vegetative bacteria, intermediate for viruses, and least for bacterial spores. Survival is greatest in soil, and progressively decreases in the following environments: textiles, water, hard surfaces, and air. There is little detailed understanding of loss mechanisms. We analyze the time behavior and sensitivity of four mathematical models that are used to represent environmental viability degradation (the exponential, probability, and first- and second-order catastrophic decay models). The models behave similarly at short times (< 30 minutes for our example case), but diverge to significantly different values at intermediate to long times. Hence, for a release event in which the majority of atmospheric exposure or deposition occurs over very short times, the current response models likely provide a good representation of the hazard. For longer time phenomena, including decontamination, the current model capabilities are likely insufficient. Finally, we implement each model in a simple numerical integration of anthrax dispersion, viability degradation, and dose response. Decay models spanning the current knowledge of airborne degradation result in vastly different predicted hazard areas. This confounds attempts to determine necessary medical and decontamination measures. Hence, the current level of understanding and representation of environmental viability degradation in response models is inadequate to inform appropriate emergency response measures.