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GELLED FORMULATIONS FOR SUBWAY DECONTAMINATION

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Background

Bacillus anthracis is an endospore bacteria. It has the ability to survive in a dormant state for years, resistant to UV light, heat, desiccation, and organic solvents, maintaining the ability to revert back to a vegetative cell.

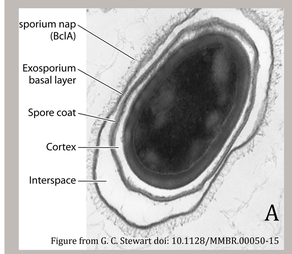


Figure from G. C. Stewart doi: 10.1128/MMBR.00050-15

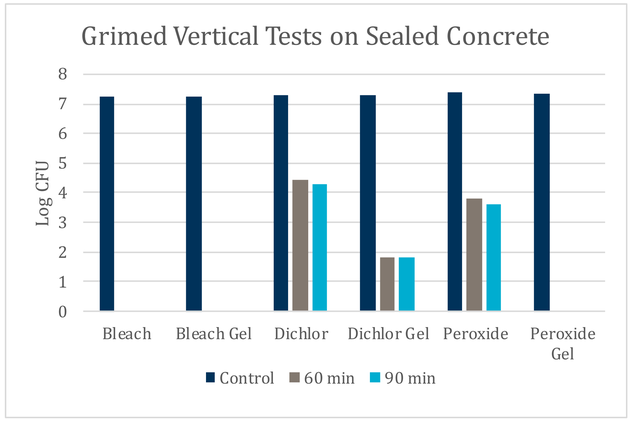
Challenges

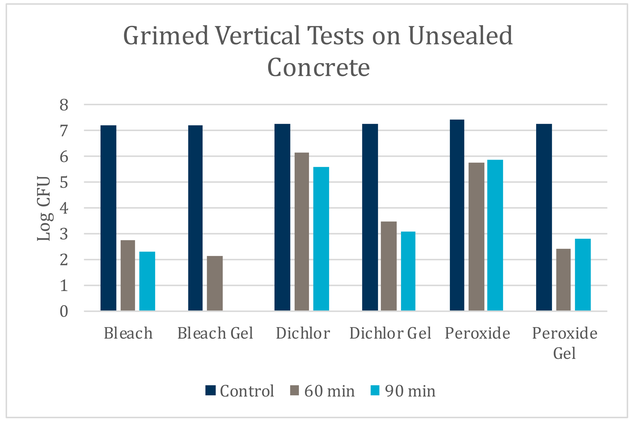
Several factors make enclosed areas, such as subway systems a challenge to decontaminate:

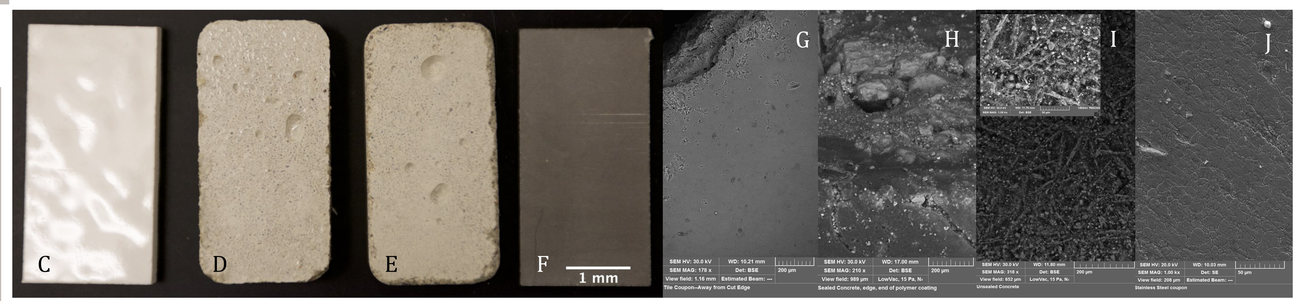
- Large surface areas in the tunnels consisting of hard-to-decontaminate materials such as unsealed concrete.
- Large, vertical, or downward-facing surfaces make desired contact times difficult with liquid decontaminants

- Large amounts of grime lower decontaminant efficacy.
- Cool surface temperatures (~55°F) lowers the efficacy of common decontaminants.

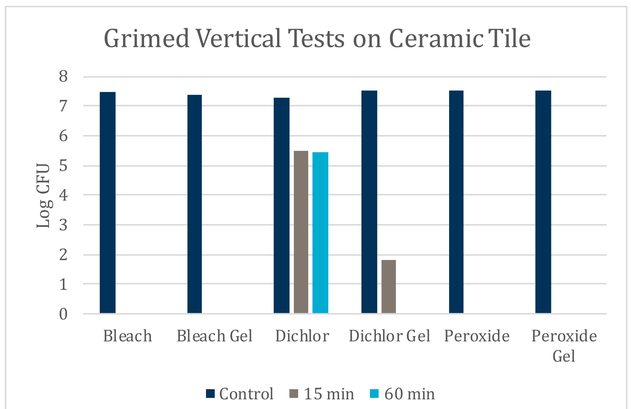
Results

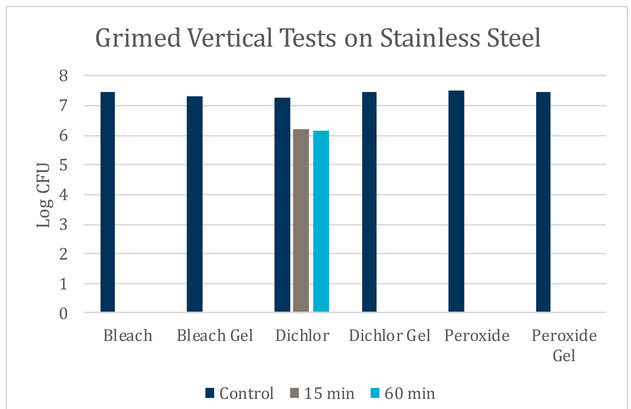






(A) Transmission electron micrograph of a *B. anthracis spore*; (B) Grimed ceramic tile coupons; (C) Ceramic tile; (D) Sealed concrete; (E) Unsealed concrete; (F) Stainless steel; (G-J) Electron micrographs of ceramic tile, sealed concrete, unsealed concrete, and stainless steel; (K) Gelled decon formulation





Decon Solutions

Decon solutions of activated peroxide, pH adjusted bleach, or dichloroisocyanuric acid (dichlor) were tested on ceramic tile, stainless steel, sealed concrete and unsealed concrete coupons to simulate subway surfaces. Gelled solutions were prepared by adding fumed silica to the solution. These formulations were evaluated on grimed and clean coupons at 55°F in horizontal and vertical orientations. *B. atrophaeus* was used as a surrogate endospore forming bacteria.

Interpretations

Coupon surface properties served as a predictive factor for decontamination efficacy. As expected, the most porous surface (unsealed concrete) proved most difficult to decontaminate. The addition of fumed silica allowed contact times to be increased drastically, improving decontamination ability on all surfaces.

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