Pyrotechnic Iodine Generation Application for BW Countermeasure

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Introduction

Historically, iodine has been used as a disinfectant, dating back over 150 years. Due to its small size, iodine is able to penetrate microorganisms' cell walls quickly; it then proceeds to cause cell death through the dislocation of protein synthesis and disruption of respiratory chain enzymes, lipid membrane function, and nucleic acid function. These directly toxic effects to the cell wall make microbial resistance to iodine extremely rare.

Concept

Develop an innovative method for the pyrotechnic generation of aerosolized iodine via a thermite reaction of iodine pentoxide and a metal fuel. Depending on the metal fuel selected, this reaction generates not only iodine, but also an antimicrobial metal oxide. This thermite is a simple two reactant/two product system wherein the metal powder reacts immediately with the oxygen in the iodine pentoxide, producing a metal oxide and iodine.

The iodine pentoxide/metal fuel mixture can be pressed into grenades, smoke pots, or other similar standard ammunition configurations to be used in a manner similar to a fumigant. The device would be placed in a contaminated room, initiated, and then allowed to sit undisturbed for the optimum contact time.

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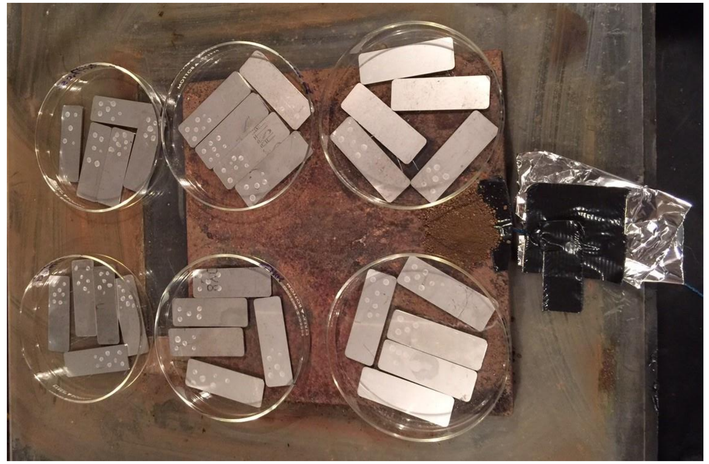
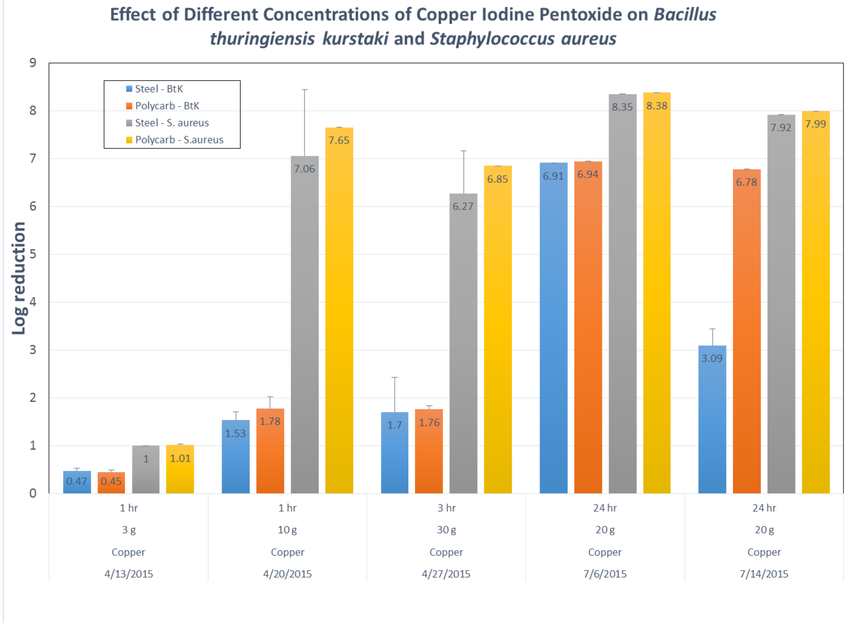
Results

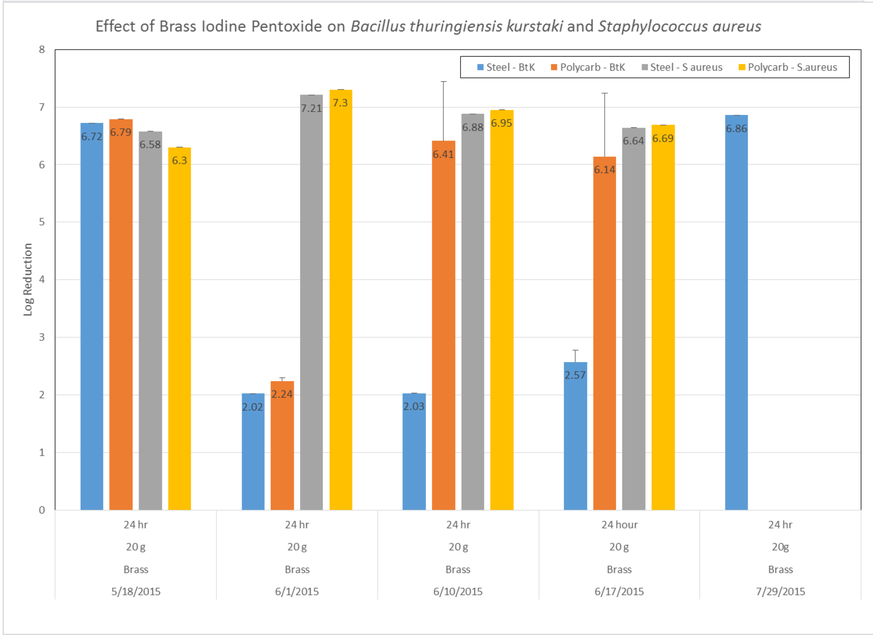
- Tested samples against spores of *Bacillus thuringiensis var. Kurstaki* and vegetative cells of *Staphylococcus aureus* on steel and polycarbonate surfaces
- Developed two successful thermite mixes using iodine pentoxide and a metal fuel
- Verified presence of I2 via Dräger tube
- Demonstrated 7 log reduction of both test surrogates on hard non-porous and hard porous surfaces
- Control thermite had no effect on organisms
- I2O5 + Metal ⟶ I2 + Metal Oxide



Future Efforts

- Optimize iodine pentoxide/metal ratio
- Test against additional surfaces
- Optimize contact time of iodine with the BW agent
- Test against additional BW agents
- Full scale chamber or room test
- Integrate material into a man portable full scale device for use by the Military and Non-Governmental Organizations





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