

## Foam rapidly degrades chemical/biological warfare agents

Sandia National Laboratories chemist Maher E. Tadros, in protective gear, sprays a foam that he and Sandia chemist Mark D. Tucker have developed to decontaminate chemical and biological warfare agents. The foam is a combination of a mild nucleophile such as hydroxyl peroxide carbonates commonly found in toothpastes, a positively charged nontoxic surfactant often found in hair conditioners, and hydrotropes found in detergents. Hydrotropes solubilize and catalyze the neutralization of the agents.

The foam reacts rapidly with agents, is nontoxic and noncorrosive, and could be produced at a cost of 15 cents per lb. Testing of the foam against the nerve gases VX and Soman and against mustard gas was conducted by Illinois Institute of Technology (IIT) in Chicago because Sandia can use only simulants. The half-life of the reaction "is in the neighborhood of two to 10 minutes," Soman being neutralized very quickly and mustard gas reacting much more slowly, Tadros explains. The foam has been shown by NMR to cleave the P-S bond in the agents.

Using a simulant for the biological warfare agent anthrax, the foam achieved a 7-log kill, meaning only one anthrax spore out of 10 million is alive after one hour. IIT will test the foam against live anthrax next month.

How the spores are killed is not known. Researchers speculate that the surfactants damage the spore's protective protein wall and allow nucleophiles—oxidizing agents—to attack the genetic material inside. The foam development is part of the Department of Energy's Chemical & Biological Nonproliferation Program.

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