

Scientists develop safe 'green' decontamination method

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Research by two Queen's scientists has resulted in an exciting new method for rapidly and safely destroying toxic agents such as chemical weapons and pesticides.

Recently completed testing by an independent European defence corporation has shown the researchers' method to be greater than 99 per cent effective when used on the deadly nerve agents Tabun, Soman and VX.

When tested in solution, full destruction of all three agents was achieved in less than 30 seconds. Testing on contaminated surfaces showed virtually complete decontamination of the agents in 10 minutes – the shortest of the time periods tested.

The technology is good news for organizations such as homeland security and emergency first-responders, says Davis Hill, Commercial Development Manager for PARTEQ Innovations, the technology transfer office of Queen's. "Both the speed and the benign nature of the method mean that facilities or equipment exposed to the contaminants could be cleared and ready for use almost immediately."

The method was developed by Drs. Stan Brown and Alexei Neverov, specialists in catalytic chemistry, who for several years have tested their approach using model compounds in their lab.

"Our research results with model compounds demonstrated the method

to be extremely effective, but the bigger question to us was, would it work on live agents”” Dr. Brown says. “These latest tests corroborate every result seen in our testing of this method over the past five years.”

Phosphorus-based chemical weapons, pesticides and related compounds act as acetyl cholinesterase inhibitors, meaning they block nerve impulses, leading to paralysis, respiratory failure and eventually death.

The Queen’s scientists invented mild, non-corrosive alcohol-based methodologies that are remarkably effective in destroying these types of organophosphorus agent in seconds.

The reaction products of the tested method are non-toxic, making it a “green” alternative to existing decontamination practices, which rely on caustic agents such as lye or bleach, and which can damage or destroy contaminated equipment or facilities.

With growing public demands to limit the use of toxic chemicals worldwide, the researchers’ method offers a safe, green option for destroying chemical weapons stockpiles, as well as for rapid cleanup of environmental spills. A more immediate application is in counteracting possible terrorist attacks using chemical weapons agents, such as in the Tokyo subway attack of 1995, which killed 12 people and left more than 5,500 others ill.

The decontamination methodology has no special environmental requirements, meaning it can be easily stored and used at all temperatures and under most conditions.

“This seemingly simple chemical method offers an elegant, rapid and clean solution to a difficult problem,” says Dr. Dupont Durst, Head of the Chemical Methodology Team at the U.S. Army Edgewood Chemical Biological Center.

Source: Queen's University

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