

# Chemical Warfare Agent Degradation and Decontamination

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- An invited technical paper prepared by ESD scientists Sylvia Talmage, Annetta Watson, and Nancy Munro in collaboration with their Army colleagues Veronique Hauschild (US Army Center for Health Promotion and Preventive Medicine) and Joseph King (US Army Environmental Center), has been published in the most recent issue of the journal *Current Organic Chemistry*; this special issue is devoted to the “hot topic” of Chemical Warfare Agents (CWA) and their Degradation Products (analytical and detection methods, structural development of new antidotes, etc.).
- This review paper summarizes agent-specific decontamination chemistry and reactions, and compares/contrasts numerous technologies.
- It is unlikely that a single technology will be applicable to all contamination scenarios, and knowledge of site-specific considerations such as amount and physical form of CWA released, matrices contaminated and resource availability are critical to determine the most appropriate technologies.
- “Natural attenuation” (time and weathering) is also a decontamination technology worthy of serious consideration
- Regardless of technology selected, attainment of clearance levels will require analytical confirmation.

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The decontamination of chemical warfare agents (CWA) from structures, environmental media, and personnel has become an area of particular interest in recent years due to increased homeland security concerns. In addition to terrorist attacks, scenarios such as accidental release of CWA from U.S. stockpile sites or from historic buried munitions are also subjects for response planning. To facilitate rapid identification of practical and effective decontamination approaches, this paper reviews pathways of CWA degradation by natural means as well as those resulting from deliberately applied solutions and technologies; these pathways and technologies are compared and contrasted. The authors then review various technologies, both traditional and recent, with some emphasis on decontamination materials used for surfaces that are difficult to clean. Discussion is limited to the major threat CWA, namely sulfur mustard, VX, and the G-series nerve agents. The chemical decontamination pathways of each agent are outlined, with some discussion of intermediate and final degradation product toxicity. In all cases, and regardless of the CWA degradation pathway chosen for decontamination, it will be necessary to collect and analyze pertinent environmental samples during the treatment phase to confirm attainment of clearance levels.

Talmage, SS, AP Watson, V Hauschild, NB Munro and J King. 2007. Chemical warfare agent degradation and decontamination. *Current Organic Chemistry*. 11: 285-298.