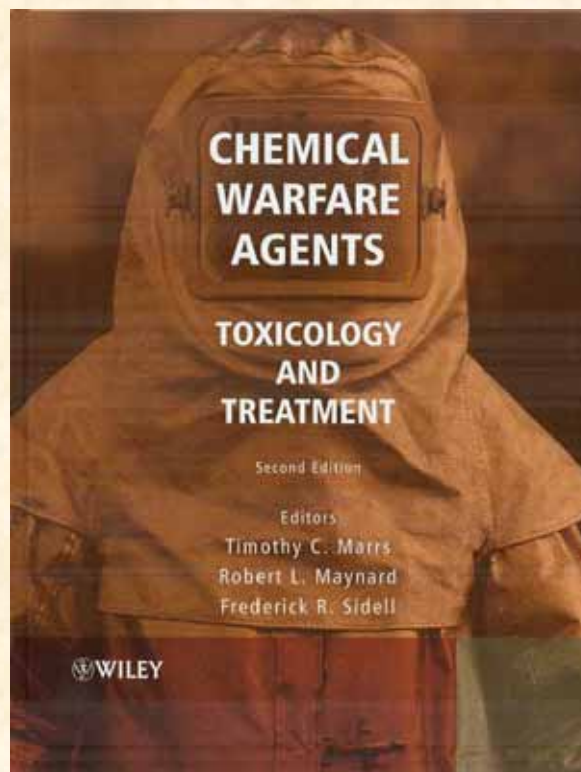


Fate of Chemical Warfare Agents in the Environment

Contact: Annetta Watson, watsonap@ornl.gov, 865-576-2125; DOD/US Army Environmental Center, US Army Center for Health Promotion and Preventive Medicine

- ↪ An invited chapter “The fate of chemical warfare agents in the environment,” authored by SS Talmage, NB Munro, AP Watson, JF King and V Hauschild has been published in the 2nd edition of the volume *Chemical Warfare Agents: Toxicology and Treatment*, John Wiley & Sons, Ltd., © 2007 (pp. 89-125).
- ↪ Chapter represents review of military and open literature performed over the past decade, and compiles agent fate reactions as well as toxicity of agent degradation products.
- ↪ Volume edited by staff of UK National Poisons Information Service and UK Health Protection Agency



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DOD/US Army Environmental Center, US Army Center for Health Promotion and Preventive Medicine

Under environmental conditions, chemical warfare agents can undergo multiple degradation processes such as hydrolysis, oxidation, dehydration and photolysis. These baseline degradation reactions vary in rate and completeness, depending upon reaction temperature and pH as well as presence of free radicals and catalysts. Examination of degradation product data evaluated in this analysis indicates that, in most cases and given sufficient time, agent dispersed (or leaked or spilled) in humid air, moist soils or in marine or freshwater bodies would degrade by environmental reactions and yield less toxic compounds when compared to the parent agent. Notable exceptions are lewisite oxide and EA 2192, the latter a toxic product of VX hydrolysis. In the body and appendices of this chapter, reaction chemistry is summarized and all products known to result from nerve and vesicant chemical warfare agent degradation are characterized as to chemical, physical and toxic properties.

Talmage SS, Munro NB, Watson AP, King JF, and Hauschild V. 2007. "The fate of chemical warfare agents in the environment." Chapter 4, pp. 89-125 in Marrs RC, Maynard RL and Sidell FR (eds), *Chemical Warfare Agents in the Environment: Toxicology and Treatment*, 2nd Ed. John Wiley & Sons, Ltd., Chichester, West Sussex, UK.