

CBRN Hazards: Nerve Agents

Part 1 of 2: Exposure, Onset, Clinical Features, Diagnostic Testing

Antidotes exist (atropine, pralidoxime, benzodiazepines); administration is time-critical.

Agent Overview

Nerve agents are organophosphorus compounds developed as chemical warfare agents. All nerve agents inhibit acetylcholinesterase (AChE), the enzyme that breaks down acetylcholine, causing it to accumulate. Inhibition becomes irreversible over time ("aging") at a rate that varies by agent; oximes must be given early and are ineffective once aging is complete.

Class	Agents
G-series	Tabun, sarin, soman, cyclosarin
V-series	VX
Fourth-generation (Novichok)	A-series agents

Exposure and Onset

- **Routes of exposure:** Route determines speed of onset and initial symptom pattern.
 - **Inhalation:** seconds to minutes
 - **Dermal/ocular:** minutes to hours; up to 18 hours with low-dose liquid exposure
- **Onset and duration:** Respiratory and ocular symptoms may be earliest signs, with systemic progression at higher concentrations. Dermal exposure may produce only localised effects initially; systemic onset can be delayed. Novichok dermal exposure has been associated with onset delayed by days and a prolonged clinical course.

Patients with no symptoms after suspected vapour exposure have not been significantly exposed; vapour effects have no latent period.

Clinical Features

- Clinical features of nerve agent poisoning result from excess acetylcholine at muscarinic, nicotinic, and central nervous system (CNS) receptors. Severity depends on dose and route of exposure.

System	Clinical Features by System
Eyes	Miosis (most common); mydriasis may occur; blurred vision, eye pain, lacrimation
Respiratory	Rhinorrhea, bronchospasm, bronchorrhea, dyspnea Respiratory failure (primary cause of death results from bronchospasm, bronchorrhea, respiratory muscle paralysis, and central apnea)
Cardiovascular	Variable and can include collapse; bradycardia & hypotension (muscarinic predominance) or tachycardia & hypertension (nicotinic predominance)
Gastrointestinal	Nausea, vomiting, abdominal cramping, diarrhea, involuntary defecation
Neuromuscular	Fasciculations, weakness, flaccid paralysis
CNS	Anxiety, agitation, confusion, seizures, loss of consciousness, apnea
Other	Excessive salivation, diaphoresis, urinary incontinence

- **Key signs and symptoms of nerve agent exposure can be recalled using the mnemonics:**
 - **Muscarinic effects:** DUMBBBELS (Defecation, Urination, Miosis, Bradycardia, Bronchorrhea, Bronchospasm, Emesis, Lacrimation, Salivation)
 - **Nicotinic effects:** Days of the week MTWTF (Mydriasis, Tachycardia, Weakness, Twitching/Tremors, Fasciculations)

Diagnostic Tests

- **Contact the Ontario Poison Centre for case-specific clinical guidance: 1-800-268-9017.**
- Diagnosis is clinical. Treat on suspicion; do not wait for confirmatory results. Investigations including chest x-ray, ECG and bloodwork should be ordered based on clinical presentation and severity but should not delay antidote administration.
- **Cholinesterase Levels:**
 - Send if available without diverting from patient care. Results will not be available in real-time and do not change acute management; may support diagnosis and inform ongoing care later. In a mass casualty, routine testing of all patients is not recommended; contact Ontario Poison Centre for guidance on testing.
 - **Red blood cell (RBC) cholinesterase:** most specific, confirmatory
 - **Plasma (pseudo) cholinesterase:** less specific, often faster turnaround

This fact sheet is part of a just-in-time resource series for first receivers and was co-authored by Public Health Ontario (PHO) and Ontario Poison Centre (OPC). Contact OPC for 24/7 clinical guidance: 1-800-268-9017. See the [CBRN Reference List](#) for the full list of references used in these fact sheets.

The information in this document is current as of June 2026.