



**Disaster and Terrorism Response:
Emergency Preparedness Tools for Pharmacists and
Health-System Pharmacy Departments
FACT SHEET**

NERVE AGENTS

Nerve agents, also known as **organophosphates**, can present as pesticides, insecticides and warfare agents.

EXAMPLES:

Commercial pesticides such as dichlorpyrifos, malathion, and parathion.
Warfare agents—GA or tabun, GB or sarin, GD or soman, VX.

MECHANISM OF ACTION: Organophosphates inhibit the action of the enzyme acetylcholinesterase enzymes (which can become irreversible) resulting in an excessive imbalance of acetylcholine and a resultant cholinergic crisis. The flood of acetylcholine can affect muscarinic and nicotinic receptors throughout the body.

CLINICAL EFFECTS:

- Miosis
- Excessive secretions (bronchial, lacrimal, dermal, nasal, and salivary)
- Diarrhea
- Bradycardia
- Vasodilation
- Bronchoconstriction/spasms
- Skeletal muscle fasciculations/paralysis
- Seizures
- Respiratory depression

The presence, onset and severity of symptoms will depend on the route of exposure and the amount of nerve agent (the larger the amount, the more severe the symptoms). Miosis is likely to occur if the nerve agent is aerosolized or vaporized, but unlikely to occur via other routes unless the exposure amount is high. Excessive bronchial secretions pose the most immediate threat to health.

TREATMENT: Termination of exposure, personal protection of the caregiver, immediate decontamination of the victim and supportive care are the cornerstones of initial patient management. Pharmacological antagonism of the cholinergic crisis with atropine and pralidoxime will reduce the morbidity and mortality associated with nerve agent toxicity.

Atropine administration will reverse most clinical effects.

Adult dose of atropine ranges from 2-6 mg (IV or IM).

Customary initial pediatric dose is 0.5 mg (IV or IM).

The dose should be titrated to the reduction or elimination of bronchial secretions (not merely to the reversal of miosis).

Higher doses are sometimes required to reverse the cholinergic effects.

Pralidoxime, administered early, may restore the action of acetylcholinesterase and re-establish cholinergic balance. Pralidoxime must be administered within the first 24 hours to be effective and its effectiveness is agent dependent [e.g. more effective with GB (sarin) than GD (soman).]

Customary starting dose for adults is 1 gram IV over 15-30 minutes.

Customary starting dose for children, 20-40 mg/kg IV over 15-30 minutes.

Additional doses may be necessary.

Auto-Injectors. Both atropine and pralidoxime are available for IM injection as part of the Mark 1™ Kit (atropine 2 mg and pralidoxime 600 mg).

Benzodiazepines have activity against nerve-agent induced seizures.

Adults: diazepam 5-10 mg IV or IM.

Children: diazepam 0.2 – 0.5 mg/kg (not to exceed the adult dose) IV or IM.

Repeat every 5-10 minutes as needed to control seizures.

For 24/7 assistance in the emergency management of an actual or suspected chemical terrorism exposure, contact a Certified Regional Poison Information Center at 1-800-222-1222.

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