

## EMS Subspecialty Certification Review Course

### 1.3.7.1.5 Organophosphates

2025



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## Nerve Agents

- Nerve agents are essentially OPP agents
- Tabun (GA), Sarin (GB), Soman (GD), VX
- Above 4 are most toxic of the chemical agents
- Penetrate skin, eyes, lungs
- Other sources of OPP include insecticides and herbicides: Most common suicide in agrarians
- Diagnosis made clinically; confirmed in laboratory



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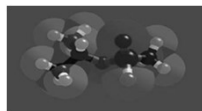
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## Chemistry of Nerve Agents

- Nerve agents are liquids at normal ambient temperatures
- G-agents volatile, non-persistent; vapor and liquid threat
- VX fairly non-volatile, persistent; liquid threat
- Vapor heavier than air



**Sarin = C<sub>4</sub>H<sub>10</sub>FO<sub>2</sub>P**  
Methylphosphonofluoridic acid, 1-  
methylethyl ester, or  
Isopropylmethanefluorophosphon  
ate



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## Pathophysiology at Muscarinic Sites

- **SLUDGE:** salivation, lacrimation, urination, defecation, GI symptoms, emesis
- OR
- **DUMBBELSS:** diarrhea, urination, miosis/muscle weakness, bronchorrhea, bradycardia, emesis, lacrimation, salivation/sweating

- Salivation
- Lacrimation
- Urination
- Defecation
- Gastroenteritis
- Emesis



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## Immediate Effects

### Neuromuscular

- Twitching
- Weakness
- Paralysis
- Respiratory failure

### Autonomic

- Reduced Vision
- Small pupil size
- Drooling
- Sweating
- Diarrhea
- Nausea
- Abdominal pain
- Vomiting

### Central Nervous

- Headache
- Convulsions
- Coma
- Respiratory arrest
- Confusion
- Slurred speech
- Depression
- Respiratory depression



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## Intermediate Syndrome

- A late effect of pesticide organophosphate poisoning
  - 1-4 days after initial clinical improvement
  - Symptoms include a return of weakness and neuromuscular symptoms
  - Patients may require additional supportive therapy or reintubation



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## Long term sequelae

- Peripheral neuropathies
- Persistent mitosis
- Neuropsychiatric sequelae
  - Nightmares, headache, anxiety



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## Treatment

- Self-protection - respiratory protection via PAPR or
- SCBA or properly fitted gas mask with appropriate filter
- Airway/ventilation
  - Often High resistance
- Antidotes Kits available = Mark 1
  - Duodote auto-injector
    - Atropine
    - Pralidoxime



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## Nerve Agents Treatment Atropine

- Antagonizes muscarinic effects
  - Dries secretions; relaxes smooth muscle
- Given IV, IM, ET
  - No effect on pupils (test?)
  - No effect on skeletal muscle
  - IV in hypoxic patient
- Starting dose - 2 mg
- Maximum cumulative dose - 20 mg
- Typical Side effects
  - Mydriasis
  - Blurred vision
  - Tachycardia
  - Decreased secretions and sweating



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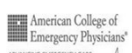
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### Treatment Caveat

- Atropine should be administered ***before other measures to*** reduce muscarinic effects and therefore facilitate adequate ventilation.
  - Given IV, IM, ET
  - Dries secretions; relaxes smooth muscle
  - May cause cardiac arrhythmias when given IV in the hypoxic patient
  - No effect on pupils or skeletal muscle
- How much to give?
  - Until secretions are drying or dry
  - Until ventilation is "easy"
- If conscious or casualty is comfortable
  - Do not rely on heart rate/pupil size (? test question)

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### Antidote Kit: Pralidoxime

- Also called 2-PAM Chloride**
- Removes nerve agent from AChE in absence of aging
  - 600 mg IM or 1 gram slowly (20-30) in IV infusion
  - Hypertension with rapid infusion
- No effects at muscarinic sites
- Helps at nicotinic sites
- New research controversial

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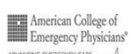
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### Pre-hospital Treatment

- If no signs or symptoms: Observe 1 (Vapor) – 18 hours (liquid)
- Symptomatic: Earliest Tx is DuoDote (Atropine 2.1mg+ 2PAM)
- Parenteral Atropine will not dilate: Only Homatropine drops
- Severe Exposure: Increasing Doses of Atropine IV q 5 min
- Maintain airway and ventilation as necessary
- Administer 2-PAM 1 g IV asap
- Diazepam 2-5 mg IV to prevent seizures
- Repeat 2-PAM in one hour- the antidote of choice
- All beneficial effects for enhancing survival are peripheral

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