K. MARK I / DuoDote Kits (Atropine and 2-PAM Auto-Injectors)

1. Inclusion Criteria

a) Nerve agents are a group of highly toxic chemicals that may be released in a WMD event. These agents act to inhibit cholinesterase, and therefore prolong the effects of acetylcholine. These agents are potent, long-acting, and all bind to acetylcholine irreversibly unless an oxime is given.

b) Nerve agents include Tabun (GA), Sarin (GB), Soman (GD) and GF. There are also V agents, such as VX.

c) The G-type agents evaporate (become vapor) or may be dispersed in the air by weapons. When a person inhales this vapor, effects begin within seconds to minutes.

d) The V-type agents are oily and evaporate very slowly. They persist on the ground, foliage, etc., for long periods. Exposure to this liquid on the skin causes effects to start as soon as 10 minutes or as long as 18 hours after contact. The vapor hazard from these is not as great as from the G-type agents.

e) Many insecticides currently in use are organophosphates and are chemically related to nerve agents. The organophosphate insecticides may have a slower onset and a longer lasting effect compared with nerve agents.

f) Characteristic signs and symptoms may identify nerve agent poisoning. After vapor exposure, early manifestations of poisoning occur in the eyes, nose, and airway. With liquid/dermal contact exposure, early manifestations occur in the skin and the GI tract. Thus, when looking at the chart below, consider the mechanism of release and the associated signs and symptoms (refer to the chart below with the mnemonic P-SLUDGE-MC). (NOTE: This mnemonic is used for all organophosphate toxicity. Pupillary response occurs only with vapor exposure and will not be seen unless there is direct liquid contact with the eye. Urinary incontinence is also very rare.)

Nerve Agents
Signs and Symptoms of Chemical Agents

			Vapor Exposure	Liquid Exposure
Mild	**P -**	Pinpointing pupils	✓	Not Seen
	S -	Salivation	✓	Not Seen
	L -	Lacrimation (tearing)	✓	Not Seen
Severe	**U -**	Urination	✓	✓
	D -	Defecation	✓	✓
	G -	Gastrointestinal; pain/gas	✓	✓
	E -	Emesis (vomiting)	✓	✓
	M -	Muscle twitching	✓	✓
	C -	Convulsions	✓	✓
	B -	Bradycardia	✓	✓
	B -	Bronchospasm	✓	✓
	B -	Bronchorrhea	✓	✓

CHEMPACK

Adult Nerve Agent Exposure Treatment

Mild Exposure	**Moderate Exposure**	**Severe Exposure**
Patients who can walk and talk who may present with miosis, rhinorrhea, increased salivation, nausea	Patients with mild dyspnea, ataxia, miosis, or muscle cramping	Patients who may have severe respiratory distress, seizures, extreme SLUDGEM (See below)
Atropine **2mg** IM + Pralidoxime **600mg** IM	Atropine **4mg** IM + Pralidoxime **1200mg** IM	Atropine **6mg** IM + Pralidoxime **1800mg** IM + [Diazepam **10mg** IM **OR** Midazolam **10mg** IM]
May repeat 3-5 minutes until symptoms resolve	**May repeat 3-5 minutes until symptoms resolve**	**May repeat 3-5 minutes until symptoms resolve**

*****AUTO-INJECTORS SHOULD BE USED FOR ALL ADULT EMS PATIENTS*****

Medications may come packaged as either DuoDotes, Mark I Kits, ATNAA kits, individual Atropen + 600mg Pralidoxime Autoinjectors, or in individual medication vials

2mg Atropens are not available in all CHEMPACK caches

Adult Vial Medication Directions:

Atropine (0.4mg/ml in 20mL): Draw up medication in 5mL syringe (5mL)

Pralidoxime (300mg/mL): For Intramuscular (IM) injection: Add 3.3mL of sterile water into a single 1-gram vial, which results in a 300mg/mL concentration. Do not exceed 2mL per IM injection

Diazepam & Midazolam (5mg/mL in 10mL): draw up 2mL in 3mL syringe for IM administration for initial dose of 10mg IM

S– Salivation
L– Lacrimation (tear production)
U– Urination
D– Defecation
G– Gastrointestinal distress
E– Emesis
M- Muscle Twitching & Miosis (constricted pupils)

CHEMPACK
Pediatric Nerve Agent Exposure Treatment

Mild Exposure
Patients who can walk and talk who may present with miosis, rhinorrhea, increased salivation, and nausea

Weight (Kg)	Atropine Dose (IM)
Less than 10 kg	**0.5mg**
10 kg – 25 kg	**1 mg**
26 - 50 kg	**2 mg**
Over 50 kg	**2 mg**

May repeat 3-5 minutes until symptoms resolve

Moderate Exposure
Patients with mild dyspnea, ataxia, miosis, or muscle cramping

Weight (Kg)	Dose (IM))
Less than 10 kg	Atropine **1mg** + Pralidoxime **600mg**
10 kg – 25 kg	Atropine **2mg** + Pralidoxime **600mg**
26 kg - 50 kg	Atropine **2mg** + Pralidoxime **1200mg**
Above 50kg	Atropine **2mg** + Pralidoxime**1200mg**

May repeat 3-5 minutes until symptoms resolve

Severe Exposure
Patients who may have severe respiratory distress, seizures, extreme SLUDGEM (See below)

Weight (Kg)	Dose (IM)
Up to 25kg	Atropine **2mg** + Pralidoxime **600mg** + [Diazepam **2.5mg** **OR** Midazolam **2.5mg**]
26 kg - 50kg	Atropine **4mg** + Pralidoxime **1200mg** + [Diazepam **5mg** **OR** Midazolam **5mg**]
Above 50kg	Atropine **6mg** + Pralidoxime **1800mg** + [Diazepam **10mg** **OR** Midazolam **10mg**]

May repeat 3-5 minutes until symptoms resolve

Atropine/ Pralidoxime may come packaged as either DuoDotes, Mark I Kits, ATNAA kits, individual Atropen + Pralidoxime autoinjectors, or in individual medication vials.

Treatment via Atropine & Pralidoxime Autoinjectors is preferred

CANA autoinjectors are not indicated for pediatric patients less than 50kg

Pediatric Vial Medication Instructions:

Atropine (0.4mg/mL, 20mL): Draw-up medication in 3mL, 5mL, or 10mL syringe as indicated

Pralidoxime (300mg/ mL) Add 3.3mL of sterile water into a single 1 gram vial, which results in a 300mg/mL concentration. Do not exceed 2mL per IM injection

Diazepam & Midazolam (5mg/mL, 10mL) Draw 0.2mg/kg IM to a maximum 10mg

Color Coding and unit amount for Atropens
0.5 mg auto-injector (blue)
1 mg auto-injector (red)
2 mg auto-injector (green) (May not be available in all CHEMPACK caches)

S– Salivation
L– Lacrimation (tear production)
U– Urination
D– Defecation
G– Gastrointestinal distress
E– Emesis
M- Muscle Twitching & Miosis (constricted pupils)

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g) EMS clinicians must know the following MILD, MODERATE, and SEVERE signs and symptoms of nerve agent poisoning. When clinicians recognize most or all of the symptoms listed below, they must IMMEDIATELY receive treatment (first aid or buddy aid).
   (2) MILD poisoning (self-aid). Casualties with mild symptoms may experience most or all of the following:
      (a) Unexplained runny nose
      (b) Unexplained sudden headache
      (c) Sudden drooling
      (d) Difficulty in seeing (dimness of vision, constricted pupil)
      (e) Tightness in the chest or difficulty in breathing
      (f) Wheezing and coughing
      (g) Localized sweating and muscular twitching in the area of the contaminated skin
      (h) Stomach cramps
      (i) Nausea without vomiting
   (2) MODERATE effects would be the above, but also include more severe effects such as diarrhea, moderate to severe difficulty breathing, and some skeletal-muscular twitching/fasciculations. The progression of symptoms from mild to moderate indicates either inadequate treatment or continuing exposure to the nerve agent.
   (3) SEVERE symptoms. Clinicians with severe symptoms will not be able to treat themselves and must receive prompt buddy aid and medical treatment. Casualties with severe symptoms may experience most or all of the MILD symptoms plus most or all of the following:
      (a) Impaired thinking
      (b) Increasing wheezing and increased difficulty breathing
      (c) Severe pinpoint pupils
      (d) Red eyes with tearing
      (e) Vomiting
      (f) Severe muscular twitching and general weakness
      (g) Involuntary defecation
      (h) Convulsions
      (i) Unconsciousness
      (j) Respiratory Failure
      (k) Bradycardia
h) Prevention of poisoning
   (1) In the setting of an exposure to a nerve agent, the most rapid absorption occurs through the respiratory tract. When it is suddenly determined that clinicians are in the “hot zone,” do not look for the invisible vapor cloud. Clinicians should hold their breath until they don and clear their breathing apparatus or protective masks. Once masked, a clinician will then give the alarm to other clinicians. This may be done with hand signals or through the mask. If a fellow clinician is severely poisoned with altered consciousness in the hot zone, the initial, less-poisoned masked clinician should mask the casualty.

(2) When the masked casualty is severely poisoned after exposure to vapor and liquid, they should be decontaminated by removing clothing, blotting the agent (if a liquid exposure), and diluting the agent by using a flush with large amounts of water. Decontamination should be done as soon as possible, but it will usually occur in the warm zone or a safe area.
(3) When treating a severely poisoned casualty, the treating clinician should take care to avoid exposure to the liquid agent (which could occur when kneeling next to the casualty). Squatting next to the casualty while masking or treating him/her will help the caregiver to avoid exposure to liquid nerve agent.
(4) Do not administer nerve agent antidotes before actual exposure to nerve agents or development of clinical symptoms occurs. Nerve agent antidotes may degrade performance in the hot zone (creating a heat-stressed clinician) and should be administered only when symptoms and signs of nerve agent poisoning are present.

1. Treatment

a) The ABC priorities of prehospital treatment require modification to AABCs (Antidote then ABCs). The antidote (Atropine and 2-PAM) should be given as soon as possible, because toxic exposure to the nerve agent will make ventilation difficult. If the antidote is not immediately available, prevent further exposure to the nerve agent, provide ABC support, and evacuate the patient to an area where the antidote is available.
b) Based on signs and symptoms in a mass casualty incident (MCI) or on-site chemical testing that confirms nerve or organophosphate agent presence in a mass casualty incident, a certified EMR or EMT may administer MARK I/DuoDote kits (up to total of three kits) as buddy care to public safety personnel or when directed to do so by an ALS clinician. The midazolam 5 mg or diazepam 10 mg auto-injector (CANA) can only be administered by an ALS clinician when three MARK I/DuoDote kits are administered in a severe exposure. Medical consultation is not required in these situations.