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State of Illinois
NERVE GAS AUTO-INJECTOR GUIDELINES
April 18, 2003

Purpose:

To provide Illinois EMS agencies with guidelines on the appropriate use of **Mark I** kits. The **Mark I** kit contains antidotes to be used in instances of exposure to nerve agents (Sarin, Soman, Tabun, VX) or to organophosphate agents (Lorsban, Cygon, Delnav malathion, Supracide parathion, Carbopenthion).

Equipment:

Each **Mark I** kit consists of two auto-injectors containing:

- Atropine Sulfate (**Atropine**) 2 mg in .7cc's
- Pralidoxime Chloride (**2 PAM**) 600mg in 2 cc's

Key Provisions:

Only those licensed emergency EMS providers that are governed by the State of Illinois EMS Act (210 ILCS 50/) are authorized by an EMS Medical Director to utilize the specialized equipment and medications needed in WMD incidents including **Mark I** auto-injectors. When appropriate conditions warrant, contact medical control. Other organized response teams not governed by the EMS Act may use the **Mark I** auto-injectors on themselves or other team members when acting under the Illinois Emergency Management Agency Act (20 ILCS 3305).

Guidelines:

The guidelines for the use of the **Mark I** kits were developed by the EMS Committee of the Illinois College of Emergency Physicians (ICEP). They were then adopted by the Illinois Medical Directors, Illinois Department of Public Health, and Mutual Aid Box Alarm System (MABAS), and the Illinois Terrorism Task Force to provide guidance to EMS agencies and providers who are a part of an EMS System.

There are ten provisions in the guidelines:

1. To utilize these kits you must be an EMS agency or provider within an Illinois EMS System and participate within an EMS disaster preparedness plan.

2. The decision to utilize the "Mark I" antidote is authorized by this State protocol.

3. At a minimum, an EMS provider must be an Illinois EMT at any level including First Responder with additional training in the use of the auto-injector.

4. **The Mark I kit is not to be used for prophylaxis.** The injectors are antidotes, not a preventative device. **Mark I** kits may be self-administered if you become exposed and are symptomatic. Exit immediately to the Safe Zone for further medical attention.

5. **Use of the Mark I kit is to be based on signs and symptoms of the patient. The suspicion or identified presence of a nerve agent is not sufficient reason to administer these medications.**

6. Atropine may be administered IM/IV in situations where **Mark I** kits are not available.

7. Auto-injectors are **NOT** to be used on children under 88 pounds (40 Kg). Pediatric **Mark I** injectors are currently being reviewed by the FDA.

8. If available Diazepam (Valium) or Versed may be cautiously given under direct medical control or by standing medical orders if convulsions are not controlled.

9. When the nerve agents has been ingested, exposure may continue for some time due to slow absorption from the lower bowel and fatal relapses have been reported after initial improvement. Continued medical monitoring and transport is mandatory.

10. If dermal exposure has occurred, decontamination is critical and should be done with standard decontamination procedures. Patient monitoring should be directed to the signs and symptoms as with all nerve or organophosphate exposures. Continued medical monitoring and transport is mandatory.

Personal Protection

The first priority when encountering a potential nerve-agent victim is self-protection. Personal protective equipment (PPE) and decontamination are key elements in the successful management of exposed casualties. All people entering a Hot Zone or working a decontamination station must wear full protective ensembles including full-body and respiratory protection. Do not cross contaminate yourself when handling patients in triage, treatment and staging areas or if have begun treatment in the Hot Zone.

Pre-hospital Management

Pre-hospital management for nerve agent or organophosphate poisoning is a two-pronged attack focusing on countering the poison with antidotes and preventing death by supporting respirations and controlling seizures. Because the primary cause of death from these agents is respiratory failure, aggressive airway control and ventilation are top priorities. With antidotal therapy, spontaneous respirations should resume within a short period of time.

Please notify the receiving hospitals prior to transport so they can prepare their facilities for your arrival and also consider activating local mass casualty protocols. Use prudent judgment in transferring patients to the hospitals.

Attached to this guideline is the State of Illinois “Mark I Protocol” based upon various federal agency recommendations for administration. **This Protocol is intended for EMS licensed health care professionals.** It may be used only with medical authorization and participation of the agency in an EMS disaster preparedness plan.

State of Illinois

PROTOCOL FOR THE USE OF MARK I KITS

March 18, 2003

Introduction:

Mark I kits are auto-injectors antidotes to be used when first responders are exposed to nerve agents and have signs or symptoms of nerve agent or organophosphate exposure, or when first responders treat victims in an MCI situation in the hot zone.

MARK I antidote kit

Use:

The **Mark I** kit is to be used only by those Illinois licensed emergency EMS providers that are governed by the State of Illinois EMS Act (210 ILCS 50/) and are authorized by an EMS Medical Director to utilize the specialized equipment and medications needed in WMD incidents including **Mark I** kits. When appropriate conditions warrant, contact medical control. Other organized response teams not governed by the EMS Act may use the **Mark I** auto-injectors on themselves or other team members when acting under the Illinois Emergency Management Agency Act (20 ILCS 3305).

NOTE: The Mark I kit is not to be used for prophylaxis. The injectors are antidotes, not a preventative device. **Mark I** kits may be self-administered if you become exposed and are symptomatic. Medical treatment is directed to relieving respiratory distress and alleviating seizures.

Contents: **Mark I** auto-injectors antidote kit contains:
Atropine (2 mg in .7cc total dose per injection)
2 PAM (Pralidoxime chloride) 600 mg in 2 cc total dose per injection.

Indications for use of the Mark I auto-injectors:

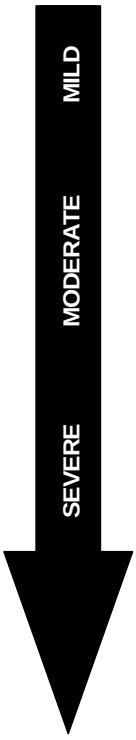
It is a concern that the use of auto-injectors could lead to administration of inappropriate and harmful **Mark I** doses during a non-chemical agent or minimal exposure situations. The auto-injectors are to be used only if the patient presents with signs and symptoms consistent with exposure to nerve or organophosphate agents.

Mnemonic for Nerve Agent Exposure
Salivation (*excessive production of saliva*)
Lacrimation (*excessive tearing*)
Urination (*uncontrolled urine production*)
Defecation (*uncontrolled bowel movements*)
Gastrointestinal distress (*cramps*)
Emesis (*excessive vomiting*)
Breathing Difficulty
Arrhythmias
Myosis (pinpoint pupils)

Signs and Symptoms of Nerve Agent Exposure

(From mild to severe)

Exposure



Signs & Symptoms

- Unexplained runny nose
- Tightness in the chest
- Difficulty breathing
- Bronchospasm
- Pinpoint pupils resulting in blurred vision
- Drooling
- Excessive sweating
- Nausea and/or vomiting
- Abdominal cramps
- Involuntary urination and/or defecation
- Jerking, twitching and staggering
- Headache
- Drowsiness
- Coma
- Convulsions
- Apnea

EXPOSURE	CLINICAL	TREATMENT
No Signs or Symptoms	None	Removal to Safe Zone, decontamination, observation & transport
Mild Exposure	SOB, wheezing, runny nose,	One Mark I Kit or Atropine 2mg IM/IV and 2 PAM 600mg IM (1 gram IV)
Moderate Exposure	Vomiting, diarrhea, Pinpoint pupils, drooling	One-Two Mark I Kits or Atropine 2-4 mg IM/IV and 2 PAM 600 -1200 mg IM (1 gram IV)
Severe Exposure	Unconsciousness, paralysis, cyanosis, seizures,	Three Mark I Kits or Atropine 6 mg IM/IV and 2 PAM 1800 mg IM or 1 gram 2 PAM IV repeated twice at hourly intervals Valium or Versed per Medical Control

If symptoms resolve, then only monitoring is necessary.

If severe signs and symptoms are present; three (3) Atropine auto-injectors and (3) three 2 PAM injectors should be administered in rapid succession (stacked).

1. Remove secretions
2. Maintain an open airway
3. Use artificial ventilation in necessary and possible
4. Repeat Atropine immediately as directed

Pralidoxime (2 PAM) is most effective if administered immediately after the poisoning but not before Atropine, especially for severe exposures.

If available Diazepam (Valium) or Versed may be cautiously given, under direct medical control, if convulsions are not controlled.

When the nerve agent has been ingested, exposure may continue for some time due to slow absorption from the lower bowel, and fatal relapses have been reported after initial improvement. Continued medical monitoring and transport is mandatory.

If dermal exposure has occurred, decontamination is critical and should be done with standard decontamination procedures. Patient monitoring should be directed to the same signs and symptoms as with all nerve or organophosphate exposures.

Listed below are antidotes based on patient's age.

Patient age	**Antidotes[1]**		**Other treatment**
	Mild/moderate[2]	**Severe symptoms[3]**	
Infant (0-2 years)	Atropine 0.05 mg/kg IM/IV 2-PAM: 15 mg/kg IM/IV	Atropine 0.1 mg/kg IM/IV 2-PAM: 25 mg/kg IM/IV	Assisted ventilations Repeat Atropine if patient condition warrants
Child (2-10 years)	Atropine 1mg IM/IV 2-PAM: 15 mg/kg IM/IV	Atropine 2 mg IM/IV 2-PAM: 25 mg/kg IM/IV	Assisted ventilations Repeat Atropine (2 mg IM) at 5-10 minute intervals
Adolescent (11-17)	Atropine 2 mg IM/IV 2-PAM: 600 mg IM/IV	Atropine 4 mg IM/IV 2-PAM: 25 mg/kg IM/IV	Until secretions have diminished and breathing
Adult	Atropine 2-4 mg IM/IV 2-PAM: 600 mg IM/IV	Atropine 6 mg IM/IV 2-PAM: 1800 mg IM/IV	Is comfortable or airway resistance has returned to
Elderly, frail	Atropine 1 mg IM/IV 2-PAM: 10 mg/kg IM/IV	Atropine 2-4 mg IM/IV 2-PAM: 25 mg/kg IM/IV	Near normal

1. 2-PAM solution need to be prepared from the ampule containing 1 gram of desiccated 2-PAM: Inject 3 ml of NS, 5% distilled or sterile water into ampule and shake well. The resulting solution is 3.3 ml of 300 mg/ml.

2. Mild/moderate: Localized sweating, muscle fasciculations, nausea, vomiting, weakness, and dyspnea
3. Severe symptoms: Unconsciousness, seizures, apnea, flaccid paralysis - see earlier charts.

PROCEDURE:

If you experience any or all of the nerve agent-poisoning symptoms, you must IMMEDIATELY self-administer the nerve gas antidote.

Injection Site Selection

- The injection site for administration is normally in the **outer thigh muscle** (Figure 1). It is important that the injections be given into a large muscle area.
- If the individual is thinly built, then the injections should be administered into the **upper outer quadrant of the buttocks** (Figure 2).

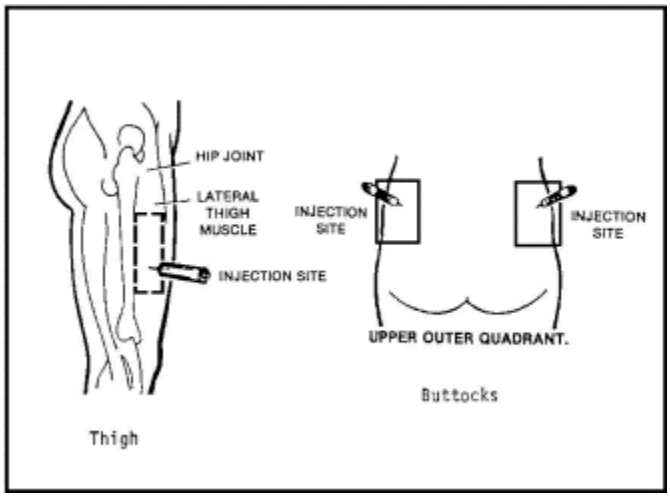
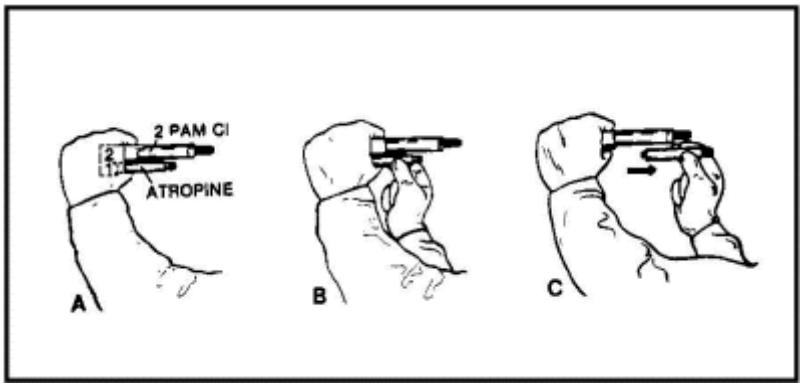


Figure 1 – Thigh injection site **Figure 2** – Buttocks injection site

Arming the Auto-injector:

- Immediately put on your protective mask.
- Remove the antidote kit.
- With your non-dominant hand, hold the auto-injectors by the plastic clip so that the larger auto-injector is on top (Figure 3A) and both are positioned at eye level.



- With your dominant hand grasp the atropine auto-injector (the smaller of the two) with the thumb and first two fingers (Figure 3B). DO NOT cover or hold the needle end with your hand, thumb or fingers – you might accidentally inject yourself. An accidental injection into the hand **WILL NOT** deliver an effective dose of the antidote, especially if the needle goes through the hand.
- Pull the injector out of the clip with a smooth motion (Figure 3C). **The auto-injector is now armed.**

Self-Administration of the Antidote:

- Hold the auto-injector with your thumb and two fingers (pencil writing position). Be careful not to inject yourself in the hand!

Figure 4

- Position the green (needle) end of the injector against the injection site (thigh or buttock) (Figure 4). DO NOT inject into areas close to the hip, knee or thighbone.
- Apply firm, even pressure (not jabbing motion) to the injector until it pushes the needle into your thigh (or buttocks). Using a jabbing motion may result in an improper injection or injury to the thigh or buttocks.
- Hold the injector firmly in place for at least 10 seconds. Firm pressure automatically triggers the coiled spring mechanism. This plunges the needle through the clothing into the muscle and at the same time injects the antidote into the muscle tissue.
- Carefully remove the auto-injector from your injection site.
- Next pull the 2 PAM auto-injector (the larger of the two) out of the clip (Figure 5).

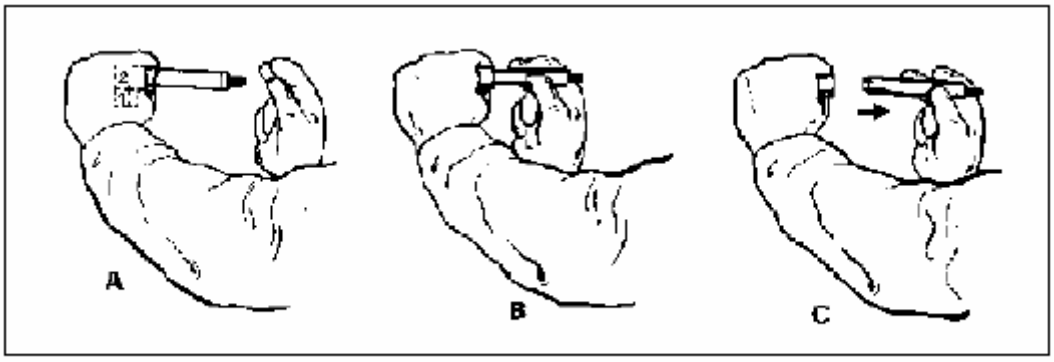


Figure 5 - Removing 2 PAM autoinjector from clip.

- Inject yourself in the same manner as the steps above, holding the black (needle) end against you outer thigh (or buttocks).
- Massage the injection site, if time permits.
- After administering the first set of injections, wait 5 to 10 minutes. After administering one set of injections, you should initiate decontamination procedures, as necessary, and put on any additional protective clothing.
- Once stabilized with Mark I dosages, Atropine only may be repeated every 10 – 15 minutes as patient condition warrants. (Note: multiple doses of atropine may be needed.)

Administering The Antidote To Another In The Hot Zone:

- Squat, DO NOT kneel, when masking the casualty or administering the nerve agent antidotes to the casualty. Kneeling may force the chemical agent into or through your protective clothing.
- Mask the casualty.
- Position the casualty on his or her side (swimmer's position).
- Position yourself near the casualty's thigh.
- The procedure for site selection and medication administration is the same as above.
- Atropine only should be administered as needed.
- Mark, label or tag victims who have been given **Mark I** injector antidote kits in a way that rescuers in the Warm Zone or triage areas can identify medication and dosage amounts given to the victim.

Figure 6 – Thigh and buttock administration to a casualty

NERVE AGENT TREATMENT

If Patient Exposed:
- Protect Emergency Responders
- Utilize Incident Command System
- Activate Regional EMS Disaster Plan
- Determine Decontamination Needs

WARM ZONE
Mild to Severe Exposures
- Reassess Patient & Triage
- Assist Ventilations
- Decontaminate Patient
- Contact Medical Control When Appropriate
- Initiate IV NS
- Repeat Atropine If Conditions Warrants

MILD EXPOSURE
SOB, Wheezing, Runny Nose

MODERATE EXPOSURE
Vomiting, Drooling, Pinpoint Pupils

Adult / Adolescent
- Inject One **MARK I** Kit (Second Dose)

OR
- Atropine: 2mg IM/IV

AND
- 2 PAM: 600 mg IM (1 Gram IV)

Infant (0-2 years)
- Atropine: 0.05mg/kg IM/IV
- 2 PAM: 15 mg/kg IM or IV slow

Child (2-10 years)
- Atropine: 1mg IM/IV
- 2 PAM: 15 mg/kg IM or IV slow

SEVERE EXPOSURE
Unconscious, cyanosis, seizures

Adult / Adolescent
- Inject One **MARK I** Kit (Second Dose)

OR
- Atropine: 2mg IM/IV

AND
- 2 PAM: 600 mg IM (1Gram IV)

If Patient Condition Warrants
- Inject One **MARK I** Kit (Third Dose)

OR
- Atropine: 2mg IM/IV

AND
- 2 PAM: 600 mg IM (1Gram IV)

Infant (0-2 years)
- Atropine: 0.1mg/kg IM/IV
- 2 PAM: 25 mg/kg IM or IV slow

Child (2-10 years)
- Atropine: 2mg IM/IV
- 2 PAM: 25 mg/kg IM or IV slow

HOT ZONE
Severe Exposures Only

Adult / Adolescent
- Assess Patient
- Inject one **MARK I** Kit
- Label or Tag Patient to Identify Dosage
- Remove Patient to Warm Zone

Children Under 88 Pounds
- Remove Patient to Warm Zone

Pediatric Dosages

	ATROPINE		2PAM (Pralidoxime)	
	0.05mg/kg	0.1mg/kg	15mg/kg	25mg/kg
40kg (88#)	(See Child Dosage)		600 mg	1000 mg
30kg (66#)	(See Child Dosage)		450 mg	750 mg
20kg (44#)	1.0 mg	2.0 mg	300 mg	500 mg
10kg (22#)	0.5 mg	1.0 mg	150 mg	250 mg
5kg (11#)	0.25mg	0.5 mg	75 mg	125 mg