HAZARDOUS MATERIALS

MEDICAL MANAGEMENT

PROTOCOLS,

SECOND EDITION

Prepared By

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1320	Dinitrophenol	N.1.1	36
1354	Trinitrobenzene	N.1.1	33
1477	Nitrates	N.1.1	35
1478	Sodium nitrate and potash mixture	N.1.1	35
1496	Sodium chlorite	C.2.1	43
1547	Aniline	N.1.1	57

INDEX OF HAZARDOUS MATERIALS AND APPROPRIATE PROTOCOLS

U.N. NUMBER	CHEMICAL NAME	PAGE NUMBER	DOT GUIDE
1547	Aromatic nitrogen compounds	N.1.1	57
1547	Aryl amines	N.1.1	57
1577	Dinitrochlorobenzene	N.1.1	56
1578	Nitrochlorobenzene	N.1.1	55
1588	Cyanide/cyanide salts	C.3.1	55
1593	DichloromethaneIMethylene chloride	H.1.1	74
1596	Dinitroaniline	N.1.1	56
1597	Dinitrobenzenes	N.1.1	56
1600	Dinitrotoluene, liquid	N.1.1	56
1610	Halogenated solvents/degreasers	H.1.1	58
1614	Hydrogen cyanide, absorbed	C.3.1	57
1614	Hydrocynac acid	C.3.1	13,57
1648	Methyl cyanide	C.3.1	28
1662	Nitrobenzene	N~1.1	55
1663	Nitrophenol	N.1.1	55
1664	Nitrotoluene	N.1.1	55
1679	Potassium cuprocyanide	C.3.1	55
1680	Potassium cyanide	C.3.1	55
1689	Sodium cyanide	C.3.1	55
1702	Tetrachioroethane	H.1.1	55
1708	Toluidine	N.1.1	55
1710	Trichloroethylene	H.1.1	74
1715	Acetic anhydride	A.1.1	39
1748	Calcium hypochlorite, dry (C12 > 39%)	C.2.1	45
1760	Corrosives, acids (various)	A.1.1	60
1788	Hydrobromic acid/Hydrogen bromide	A.1.1	60
1789	Hydrochloric acid/Hydrogen chloride	A.1.1	60
1790	Hydrogen fluoride, solution	H.2.1	59
1791	Hypochlorite solution	C.2.1	60
1796	Nitrating acid, mixture	A.1.1	73
1805	Phosphoric acid	A.1.1	60
1826	Mixed acid	A.1.1	60
1828	Sulfur chloride	A.1.1	39
1829	Sulfur trioxide	A.1.1	39
1830	Sulfuric acid(< 51%)	A.1.1	39
1831	Sulfuric acid, fuming/Oleum	A.1.1	39
1832	Sulfuric acid, spent	A.1.1	39
1833	Sulfurous acid	A.1.1	60
1842	Acetic acid solution	A.1.1	29
1848	Propionic acid	A.1.1	60
1863	Jet fuel	P.4.1	27
1865	Propyl nitrate	N.1.1	30
1885	Benzidine	N.1.1	53
1888	Chloroform	H.1.1	55
1889	Cyanogen bromide	C.3.1	55
1897	Perchloroethylene/Tetrachloroethylene	H.1.1	74
1906	Sludge acid	A.1.1	60
1918	Cumene/Isopropylbenzene	P.4.1	28
1958	Dichlorotetrafluoroethane	H.1.1	12

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U.N. NUMBER	CHEMICAL NAME	PAGE NUMBER	DOT GUIDE
1959	Diflurorethylene	H.1.1	22
1969	Isobutane	P.4.1	22
1978	Propane	P.4.1	72
1982	Tetrafluoromethane	H.1.1	12
1983	Chlorotrifluoroethane	H.1.1	12
1987	Alcohols	P.4.1	26
1993	Fuel oil	P.4.1	57
1999	Road asphalt/Tar, liquid	P.4.1	27
2018	chloroaniline, solid	N.1.1	53
2019	Chloroaniline, liquid	N.1.1	55
2020	Pentachlorophenol	P.1.1	53
2031	Nitric acid (>40%)	A.1.1	44
2032	Nitric acid, fuming	A.1.1	44
2038	Dinitrotoluene, solid	N.1.1	56
2044	Dimethyl propane	P.4.1	22
2046	Methyl propyl benzene	P.4.1	27
2049	Diethylbenzene	P.4.1	29
2050	Diisobutylene	P.4.1	26
2055	Styrene, monomer	P.4.1	27
2188	Arsine	A.3.1	18
2191	Fumigants	M.1.1	15, 55
2199	Phosphine	P.5.1	18
2208	Calcium hypochlorite, dry (C12 10% to 39%)	C.2.1	35
2209	Formalin	F.1.1	29
2212	Asbestos, blue	A.4.1	31
2237	Chloronitroaniline	N.1.1	53
2241	Cycloheptane	P.4.1	27
2244	Cyclopentanol	P.4.1	26
2246	Cyclopentene	P.4.1	27
2253	Dimethylaniline	N.1.1	57
2256	Cyclohexene	P.4.1	29
2261	Xylenol	P;4.1	55
2272	Ethylaniline	N.1.1	55
2274	Ethylbenzylaniline	N.1.1	53
2275	Ethylbutanol	P.4.1	26
2294	Methyl aniline	N.1.1	57
2296	Methylcyclohexane	P.4.1	27
2297	Methylcyclohexanone	P.4.1	26
2302	Methyl hexanone/ Methyl isoamyl ketone	P.4.1	26
2315	Polychlorinated biphenyls/PCB's	P.6.1	31
2316	Sodium cuprocyanide, solid	C.3.1	53
2317	Sodium cuprocyanide solution	C.3.1	53
2325	Trimethylbenzene	P.4.1	26
2337	Phenyl mercaptan	H.3.1	57
2347	Butyl mercaptan	H.3.1	27
2362	Dichloroethane	H.1.1	27
2363	Ethyl mercaptan	H.3.1	27

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U.N. NUMBER	CHEMICAL NAME	PAGE NUMBER	DOT GUIDE
2384	Dipropyl ether	P.4.1	26
2398	Methyl butyl ether	P.4.1	26
2402	Propyl mercaptan	H.3.1	27
2404	Proprionitrile	C.3.1	28
2432	Diethyl aniline	N.1.1	57
2457	Dimethylbutane	P.4.1	27
2465	Dichloroisocyanurate/ Dichlorotriazinetrione	C.2.1	42
2468	Trichloroisocyanurate/ Trichlorotriazinetrione	C.2.1	42
2517	Chlorodifluoroethane	H.1.1	22
2553	Coal tar naphtha	P.4.1	27
2553	Painters' Naphtha	P.4.1	27
2588	Propoxur	P.2.1	28
2590	Asbestos, whit~	A.4.1	31
2601	Cyclobutane	P.4.1	22
2608	Nitropropane	N.1.1	26
2612	Methyl propyl ether	P.4.1	26
2617	Methylcyclohexanol	P.4.1	26
2618	Methyl styrene/Vinyl toluene	H.1.1	27
2627	Nitrites	N.1.1	35
2670	Cyanuric chloride	C.3.1	60
2672	Ammonia, solution/Ammonium hydroxide	A.2.1	60
2710	Dipropyl ketone	P.4.1	26
2757	Lamnate	P.2.1	55
2757	Methomyl	P.2.1	55
2758	Carbamate pesticide, flammable liquid	P.2.1	55
2783	Organophosphate pesticides, various	P.3.1	55
2784	Organophosphates, flammable	P.3.1	28
2789	Acetic acid, glacial (>80%)	A.1.1	29
2790	Acetic acid (10% to 80%)	A.1.1	60
2796	Electrolyte, acid	A.1.1	39
2831	1,1, 1-Trichloroethane/ Methylchloroform	H.1.1	74
2880	Calcium hypochlorite, hydrated	C.2.1	45
2991	Carbamate pesticide, flammable liquid, n.o.s.	P.2.1	28
2992	Carbamate pesticide, n.o.s.	P.2.1	55
3070	Dichlorodifluoromethane &Ethylene oxide	E.1.1	18
3071	Mercaptan mixture, n.o.s.	H.3.1	57
3071	Mercaptoethanol	H.3.1	28, 57
9037	Hexachloroethane	H.1.1	53
9090	Ammonium sulfite	H.3.1	.31
9126	Fumaric acid	A.1.1	31

II. INTRODUCTION TO PROTOCOLS

Health care providers who care for injured persons exposed to hazardous materials must know how to evaluate and manage a contaminated victim's medical problems while protecting themselves and others from potential hazardous exposure (secondary contamination). The following treatment protocols provide succinct, step-by-step information on how to manage medical problems arising from the most common kinds of hazardous materials (“hazmat”) episodes.

These protocols are designed for use by “EMS hazmat entry team members," paramedics or other rescue health workers in the field, and hospital emergency department physicians and nurses. The protocols are intended as *guidelines.* They may require modification depending on the resources of a particular hospital or the needs of a particular patient. It is essential for the safety of health care personnel and patients that hospitals and emergency medical services agencies have a written plan for management of the contaminated victim, and that their personnel are trained to follow it. In all incidents, health care providers should immediately contact their base hospital, if prehospital care provider, or Regional Poison Control Center for advice on managing victims of hazardous materials exposure.

Controversies abound in the evolving field of environmental toxicology. For this reason, the protocols are sometimes vague or ambiguous. For example, no consensus exists on what specific protective gear, if any, is appropriate for emergency departments and prehospital medical care providers because most authorities agree that it is unacceptable to provide sophisticated protective gear to persons who have not been previously properly fitted and trained in its use.

It is imperative that proper decontamination has been initiated by the hazmat team or other trained responders in the hot zone/decontamination area. Rescuers who are trained to use self contained breathing apparatus, to select the appropriate chemical protective suits, and know how to function in them, are the only ones who should assist with decontamination or enter the hot zone.

Federal OSHA has established new hazardous materials training requirements for responders who are called to a spill. The requirements are identified in OSHA 29 CFR 1910.120. California OSHA is developing similar regulations (Section 5192, Title 8, California Code of Regulations). These regulations will be no less stringent than that currently required by federal OSHA. California OSHA enforces these standards, not the Authority.

The Federal 29 CFR 1910 final rule applies to EMS. If an employer expects to respond to a hazardous materials incident, then he must train his employees about the hazards involved and the role that they will be expected to play. The rule states that: "Training shall be based on the duties and function to be performed by each responder of an emergency response organization" (p.9329).

The NIOSH EPA hazardous waste site operations document is helpful in defining the EMT's role. It categorizes "medical support" as involving "off-site personnel" (p.3-3). Ambulance personnel "provide emergency treatment procedures appropriate to the hazards on site." Decontamination is carried out by others under the direction of the Decontamination Station Officer(s) (p. 3-4). In California, the Authority has taken the position that the person doing the decontamination would probably be a firefighter (hopefully trained as an EMT-I) who is responsible for decontaminating personnel as well as victims. Given most EMS personnel's daily medical duties, training, and responsibilities at a hazmat spill site ([,articularly if they are not part of the fire service) they should be trained at least at the "First Responder Awareness Level."

EMT-IIs and paramedics should be trained at the "First Responder Operations Level" if they are expected to select and don protective equipment, conduct rescues, decontaminate victims or response personnel. In any case, these two EMS classifications should take a course on the medical management of hazmat victims that is based on these protocols or their equivalent. Fire service personnel, who may also be EMTs, will be trained at a higher level because of their fire service duties and functions. All of this must be consistent with the hazmat role that the local EMS agency has defined for EMS personnel. Again, it is the employer's responsibility to see that their personnel are properly trained to meet these requirements.

"First responders at the awareness level are individuals who are likely to witness or discover a hazardous substance release and who have been trained to initiate an emergency response by notifying the proper authorities of the release. They would take no further action beyond notifying the authorities of the release" (p. 9329). Given their typical daily responsibilities and training, EMTs clearly are not responsible for making a rescue wearing protective gear, for controlling and containing the release, stopping its spread, or for decontamination of protective equipment. However, they can provide medical care to a fully decontaminated victim. The federal rule does not specify how many hours of training are necessary for this level. We have evaluated the rule and recommend no less than four hours of training as being sufficient to meet the OSHA requirements for this category of responder. Additional medical training to manage hazardous materials victims would probably be necessary.

"First responders at the operations level are individuals who respond to releases or potential releases of hazardous substances as part of the initial response to the site for the purpose of protecting nearby persons, property or the environment from the effect of the release. They are trained to respond in a defensive fashion without actually trying to stop the release from a safe distance, keep it from spreading, and prevent exposures." ~. 9329). Eight hours of training is required for this level by Federal OSHA. Again, additional medical training to decontaminate and mange victims would probably be necessary. A four to six hour medical management course would fill this need.

The Authority's interpretation of Federal 29 CFR 1910.120 and of the draft California OSHA regulations is that EMTs should not be required to wear special protective gear, SCBA or respirators unless they have been trained to use them and their responsibilities at the scene require it. In the vast majority of cases, they should be trained to recognize a hazardous materials incident and be able to initiate a response. Decontaminated victims should be brought to them for medical care so that untrained and unprotected EMTs are not put at risk.

In all cases, employers should consider SARA III and all OSHA requirements for training their employees(Federal OSHA, FR 54: 9294-9336; Cal OSHA, General Industrial Safety Orders, Section 5192, draft 8, December 13, 1990; and, Code of California Regulations, Sections 3203, 3220, 5141, 5144, *5155*, 5192 and 5194). According to California OSHA staff, many of these requirements apply to hospital emergency departments, too. Your local California OSHA office should be contacted if you have any questions. Again, the Authority does not enforce state or federal OSHA regulations.

A hazardous materials Basic First Responder Course approved by California Specialized Training Institute (805-549-3535) and EMS hazardous material medical management and planning courses offered by the University of California, Davis' Hazardous Substances Program (1-800-752-0881), provide a good introduction to how a hazmat response is organized, what to do if a prehospital health care provider is first on the scene, management of medical care, and planning a response.

These protocols do *not* address accidents involving *radioactive materials*. Radioactive materials incidents require unique strategies, monitoring equipment and specialized consultants. Well-established protocols already exist for their management (call Oak Ridge National Laboratories - 615-576-3131 - for information).

III. THE CONCEPT OF SECONDARY CONTAMINATION

An essential question to ask is, "What is the risk of secondarv contamination (to rescuing personnel, transport vehicles, hospital emergency departments) from this chemical?" It is traditionally axiomatic in hazardous materials emergency management that chemicals should be considered both highly toxic and highly contaminating to personnel, vehicles, and the environment. However, a great many chemicals are very highly toxic *only* in the high concentrations found in the immediate exposure area (hot zone) but pose *hale or no risk* to persons outside the hot zone. Small amounts of some chemicals may produce relatively little acute toxicity, but because they are suspected of causing cancer or other chronic disease they are considered to create a risk of secondary contamination.

Tables 1 and 2 list selected examples of hazardous substances which carry a high vs. a low risk for *secondary contamination.* The lists are meant to be illustrative, not exhaustive. Note that highly toxic chemicals. may be found in *either* list. The Regional Poison Control Center or base hospital can assist you in determining the potential for secondary contamination of other hazardous materials.

SUBSTANCES WITH SERIOUS POTENTIAL FOR SECONDARY CONTAMINATION:

Unless the victim has been properly decontaminated, substances like those listed in Table 1 may persist in significant amounts on the victim's clothing, skin, hair, or personal belongings, and may jeopardize health care workers or other attendants. Recommended protective gear should be worn (Table 5 or Table 7). Reducing the potential for chemical exposure from any form of mouth-to-mouth resuscitation, including use of pocket one-way valve mouth-to-mouth resuscitation devices should be carefully considered when the victim has been exposed to one of the listed gases. If resuscitation efforts are necessary, a bag valve mask with reservoir device or manually triggered oxygen powered breathing device, should be applied to the patient. Contact with even lightly contaminated skin or clothing should be minimized prior to decontamination. *Proper decontamination by adequately protected personnel must be carried out before the victim is treated by pre hospital or emergency department personnel.*

Table 1: Substances with a High Risk for Secondary Contamination

Examples:
! Acids, alkali & corrosives (if concentrated)
! Asbestos (large amounts, crumbling)
! Cyanide salts & related compounds (e.g., nitriles) and hydrogen cyanide
! Hydrofluoric acid solutions
! Nitrogen-containing and other oxidizers which may produce methemoglobinemia (aniline, aryl amines, aromatic nitro-compounds, chlorates, etc.)
! Pesticides
! PCBs (polychlorinated biphenyls)
! Phenol and phenolic compounds
! Many other oily or adherent toxic dusts and liquids

THE CONCEPT OF SECONDARY CONTAMINATION

SUBSTANCES WITH LITTLE RISK FOR SECONDARY CONTAMINATION:

Many of the substances listed in Table 2 are highly toxic. However, even if they persist in the victim's clothing, skin, hair, or personal belongings after removal from hot zone, they are not likely to jeopardize health care workers or rescuers and are not likely to secondarily contaminate vehicles or the emergency department. *On-scene decontamination, if indicated, is desirable especially clothing removal and victim wash, but not essential.*

Table 2: Substances with a Low Risk for Secondary Contamination

Examples:
! Most gases and vapors unless they condense in significant amounts on the clothing, skin or hair
! Weak acids, weak alkali and weak corrosives in low concentrations (excluding hydrofluoric acid)
! Weak acid or weak alkali vapors (unless clothing soaked and excluding hydrofluoric acid vapor)
! Arsine gas
! Carbon monoxide gas
! Gasoline, kerosene & related hydrocarbons
! Phosphine gas
! Smoke/combustion products (excluding chemical fires)
! Small quantities of common hydrocarbon solvents (e.g., toluene, xylene, paint thinner, ketones, chlorinated degreasers)

IV. BASIC DECONTAMINATION PROTOCOL

In a properly functioning hazardous materials response, victims will be decontaminated in the decontamination corridor (Table 1) by properly suited hazmat team members. This will include removal of wet or exposed clothing, flushing affected skin and hair with water, and soap or shampoo wash if needed (i.e., for oily or adherent substances). The following basic decontamination protocol should be followed for all contaminated victims.

Table 3. Basic Decontamination Protocol

1.	Determine the need for decontamination by consulting the appropriate protocol and calling your Regional Poison Control Center.
2.	For advice on selection of specific protective clothing, you may also contact CHEMTREC at (800) 424-9300 or the AAR Bureau of Explosives at (202) 835-9500. If the proper protective equipment is not available, or prehospital or hospital staff have not been trained to use it, call for assistance from the local usually fire department, hazmat team.
3.	Evaluate ABCs, stabilize spine (if trauma suspected), establish patent airway and breathing, if indicated. Move victim away from contact with hazardous material to a clean area. Rescuers in level "A" (fully encapsulated suit with self-contained breathing apparatus) equipment may not be physically able to do anything more than drag victims on to a back board and then drag them out of the Hot Zone. If not breathing, and if physically possible to quickly accomplish, give oxygen using bag valve mask with reservoir device or manually triggered oxygen powered breathing device.
4.	If ambulatory, victims should be directed to leave the hot zone, assist others with evacuation, and decontaminate themselves following the directions below under the direction of the decontamination supervisor.
5.	If clothing has been contaminated, strip the victim and double-bag clothing, then flush the entire body with plain water for 2-5 minutes. Clothing contaminated with dust should be removed dry with care taken to minimize any dust becoming airborne If circumstances, time, and practice allow, a dust mask or respirator should be placed over the victim's nose or mouth. Dust should be brushed off of the face prior to fitting the mask or respirator
6.	Flush exposed eyes and other body surfaces with copious plain water for 2-5 minutes. Eye irrigation should continue for at least 10-15 minutes preferably with saline.
7.	If contaminant is oily or greasy, soap and/or shampoo may be used followed by additional water flushing.
8.	Clean under nails with scrub brush or plastic nail cleaner.

V. PREHOSPITAL CARE

A. Field Response

Because chemicals are used extensively in our society, the potential for hazardous materials accidents exists almost everywhere. Hazardous material incidents range from relatively confined site-specific events to rapidly expanding accidents that endanger a sizable community. Regardless of its size, an incident's successful management requires pre-planning and interagency coordination.

Managing the victims of a hazardous materials incident necessitates the coordination of many resources and agencies. Roles of various agencies vary to some extent according to the county's hazardous material area plan. Generally, fire fighters and law enforcement officers are the first to arrive on scene and may obtain important information about the chemicals involved. They will designate an Incident Commander to manage incident operations at the scene. Special Hazardous Material (Hazmat) Units (either Health Department or Fire Department) may be available to provide additional guidance in identifying and managing the hazardous materials and to perform decontamination of equipment, environment, victims, and personnel. Emergency Medical Services (ambulance) personnel transport the victims who have already been decontaminated (if necessary) and manage their medical problems en route to the hospital. In the event of a disaster, the county Office of Emergency Services and the local EMS agency will become involved in resource coordination. Finally, the local hospital emergency department will receive and care for the victims.

The emergency medical service prehospital providers responding to a hazardous materials incident have five goals:

Table 4. Five Goals or Pre-Hospital Provider

C	To protect themselves and other prehospital responders from any significant toxic exposure;
C	To obtain accurate information on the identity and health effects of the hazardous materials and the appropriate prehospital evaluation and medical care for victims;
C	To minimize continued exposure of the victim and secondary contamination of health care personnel by ensuring that proper decontamination (if necessary) has been completed prior to transport to a hospital emergency department;
C	To provide appropriate prehospital emergency medical care consistent with their certification; and,
C	To prevent unnecessary contamination of their transport vehicle or

B. Hazard Information About Specific Chemicals

Every effort should be made to obtain accurate information about the health hazards of the toxic materials involved in the incident, the potential for secondary contamination, and the level of decontamination required, if any. Information may be Obtained from the Incident Command Safety Officer, the base hospital, or the Regional Poison Control Center.

C. Prehospital Provider Protection

Prehospital health care providers who are not members of the hazardous materials team and properly outfitted with protective gear should not enter the contaminated area (hot zone and decontamination corridor, as shown in Diagrams 1 and 2 or page 12 and page 13) but instead must wait at the perimeter for decontaminated victims to be brought to them. It is assumed that members of the hazardous materials team working in the hot zone and decontamination area are trained and capable of providing initial airway and spine stabilization and basic decontamination. Rescuers wearing level "A" (fully encapsulated suit with self-contained breathing apparatus) equipment will probably experience several factors that will limit their ability to provide emergency care in the hot zone such as: Vision impairment, reduction in dexterity (lifting, disentangling, etc.), limited air support, and heat stress. Other factors such as the number of rescuers allowed into the hot zone will also limit what care can be given.

The table below "Emergency Medical Services Vehicle Equipment for Hazardous Materials Incidents," identifies how an ambulance should be outfitted to respond to a hazmat incident.

EMERGENCY MEDICAL SERVICES
VEHICLE EQUIPMENT FOR HAZARDOUS MATERIALS INCIDENTS *

Table 5. EMS Vehicle Equipment for Hazardous Materials Incidents

C	Binoculars to assess scene from a safe distance.
C	Plastic (1-2O mil, preferably clear) trash bags (3 or. 4 mil) to isolate and dispose of contaminated articles and toxic vomitus. Plastic sheeting to cover floor of ambulance the rare case where a contaminated victim must be transported, or if the victim might vomit ingested toxic material.
C	A large supply of oxygen to treat breathing problems caused by exposure to Hazardous Materials. (More than is usually carried.)
C	A large wash basin, bucket, or plastic waste basket which can be lined with a trash bag collect contaminated eye wash water or vomitus.
C	Disposable plastic coated blankets (or "chucks") to soak up and isolate liquids from a decontaminated patient Use these for absorbing toxic vomitus.
C	Disposable gowns and slippers for patients who must remove contaminated clothes at scene and for EMS personnel (Long sleeve gowns) to cover outer clothes.
C	Disposable surgical or examination gloves.
C	Surgical or other paper masks.
C	Waterproof disposable shoe covers.
C	Splash goggles or face shields to protect EMS personnel from splashes while they work on the patient.
C	Inexpensive stethoscopes blood pressure cuffs and other gear which can be discarded if contaminated.
C	Isotonic saline and IV tubing for eye irrigation.
C	A Bag Valve Mask (BVM) or similar device in lieu of mouth to mouth respiration (Pocket masks are NOT acceptable.)
C	Liquid soap for washing off oily contaminants.
C	Epsom salts for soaking hydrofluoric acid burns.
C	Shears or sharp knife for removing clothing from victim.
C	Copy of the current "DOT" Emergency Response Guidebook a copy of these protocols and other appropriate medical management protocols

Source: Based on a that prepared by the Contra Costa/ Solano County Joint Emergency Medical Service Hazardous Materials Response Program.

Additional equipment is necessary for handling radiation contamination. See: Emergency Department Radiation Accident Protocol. Leonard RB, Ricks RC. Annals of Emergency Medicine. 9:9:462-70, 1980. Also, see Medical Management of Radiation Accidents. Mettier FA. Kelsey, CA Ricks RC. CRC Press, Florida, 1989.

D. Prehospital Decontamination

Unprotected EMS responders must advise on and observe the decontamination procedures from a distance to ensure that they are properly carried out. They should practice with the local hazmat team to become familiar with the steps involved. If there **is any doubt about** the potential for **secondary contamination, decontaminate** the victim. A contaminated appendage can be washed without wetting the whole body if that is the only part contaminated. Clothing covering the rest of the body and exposed skin should be carefully checked for contamination.

If victims are already properly decontaminated before they are brought to health care providers at the perimeter of the hot zone/decon area, they will pose very little, if any, risk to the prehospital health provider or their vehicle. Thus, health care providers will not generally need to use any specialized protective gear, even for substances considered as potential secondary contaminants.

In many cases (e.g., corrosive materials in the eye; oily pesticide skin exposure), prehospital health care personnel may need to repeat or continue decontamination procedures (e.g., eye irrigation; soap/water skin wash) after receiving the victim at the perimeter. Although specialized protective gear should not be necessary, it is prudent for providers to don the protective gear listed in the Table 5. (Some of these items are often carried as a "communicable disease" kit.) All leather items, wool or other highly absorbent materials that cannot be decontaminated should be removed prior to providing care.

No provider should put on a respirator or other specialized gear unless that worker has been previously fitted and trained in its use.

If the transport vehicle is inadvertently contaminated, advice from the local environmental health department, hazardous materials team, or local hazardous materials spill clean-up companies should be sought on how to determine the level and location of the contamination and on how to clean it up. Advice should also be sought on how to preserve evidence for law enforcement, and dispose of or clean contaminated clothing and personal items.

E. Prehospital Triage

Victims with obvious significant illness or injury will need rapid transport and treatment after initial stabilization and basic decontamination is carried out. In virtually all cases, patients with serious trauma or medical illness can be quickly stripped and flushed with water prior to delivery to prehospital health providers outside the hot zone. This is true even in cold or inclement weather. If this cannot be performed because of acute life-threatening conditions or other circumstances, then the vehicle must be protected and those providing care during transport and driving the vehicle must be properly fitted and trained with the appropriate level of specialized protective gear. However, every effort should be made to decontaminate the victim at the scene if the means to do so are available. In those jurisdictions where a prehospital provider might be placed in such a situation without assistance from a properly trained hazmat specialist, advance arrangements for additional training and protective equipment should be made.

Consult the specific protocols for recommended prehospital care of exposed victims. *Note that some of the management protocols may exceed the EMT-II or paramedic scope of practice in a local area. Refer to your local EMS agency medical director for guidance.*

Victims with few or minimal symptoms are not necessarily safe from progression of illness. Many toxic substances have delayed onset effects, which may appear several hours later, after the victim has returned home. If the toxic substance is known, obtain consultation from the Regional Poison Control Center to determine if delayed effects might be seen and for guidance on triage of asymptomatic or mildly symptomatic exposure victims. Any persons suspected of being exposed should be seen and evaluated by emergency department staff.

F. Decontamination of Prehospital Personnel

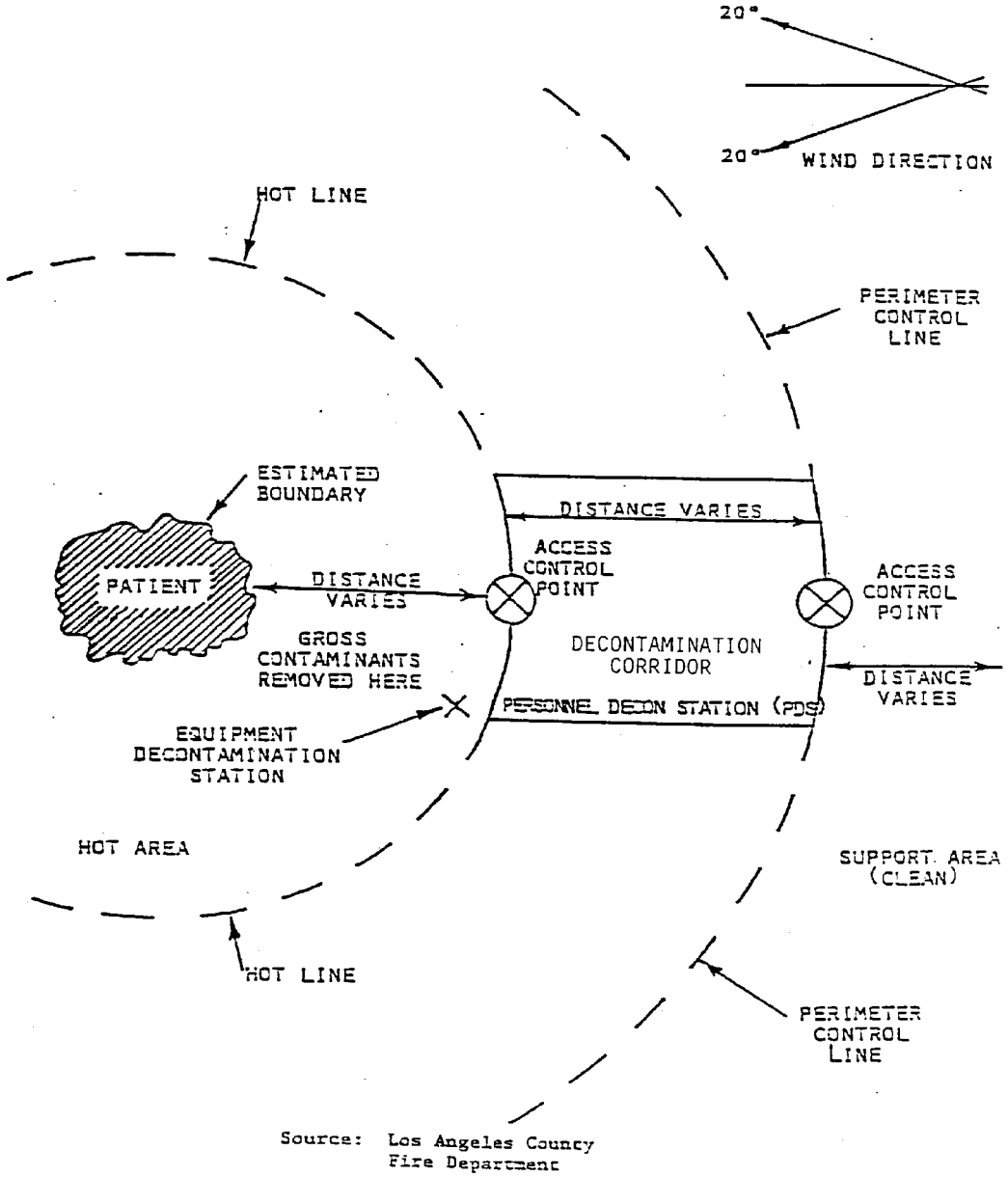
Prehospital workers will not normally need personal decontamination. In those rare circumstances where they have been in the hot zone or have attended to a victim who was not properly decontaminated, they should consider themselves to be potentially contaminated. Consult the lists above or knowledgeable sources to determine the risk of secondary contamination, since in many, if not most cases, no personal decontamination will be necessary. Information can be obtained from the Incident Command Safety Officer at the scene, the base station hospital, or the Regional Poison Control Center. **If in doubt, decontaminate.**

G. Victim and Response Personnel Follow-up

The names, addresses, and telephone numbers of all personnel and victims who have been or may have been exposed at a hazmat scene should be recorded for future notification if it is subsequently determined that medical evaluation or treatment is required.

DIAGRAM 1

ORGANIZATION OF
HAZARDOUS MATERIAL INCIDENT AREA



Source: Los Angeles County
Fire Department

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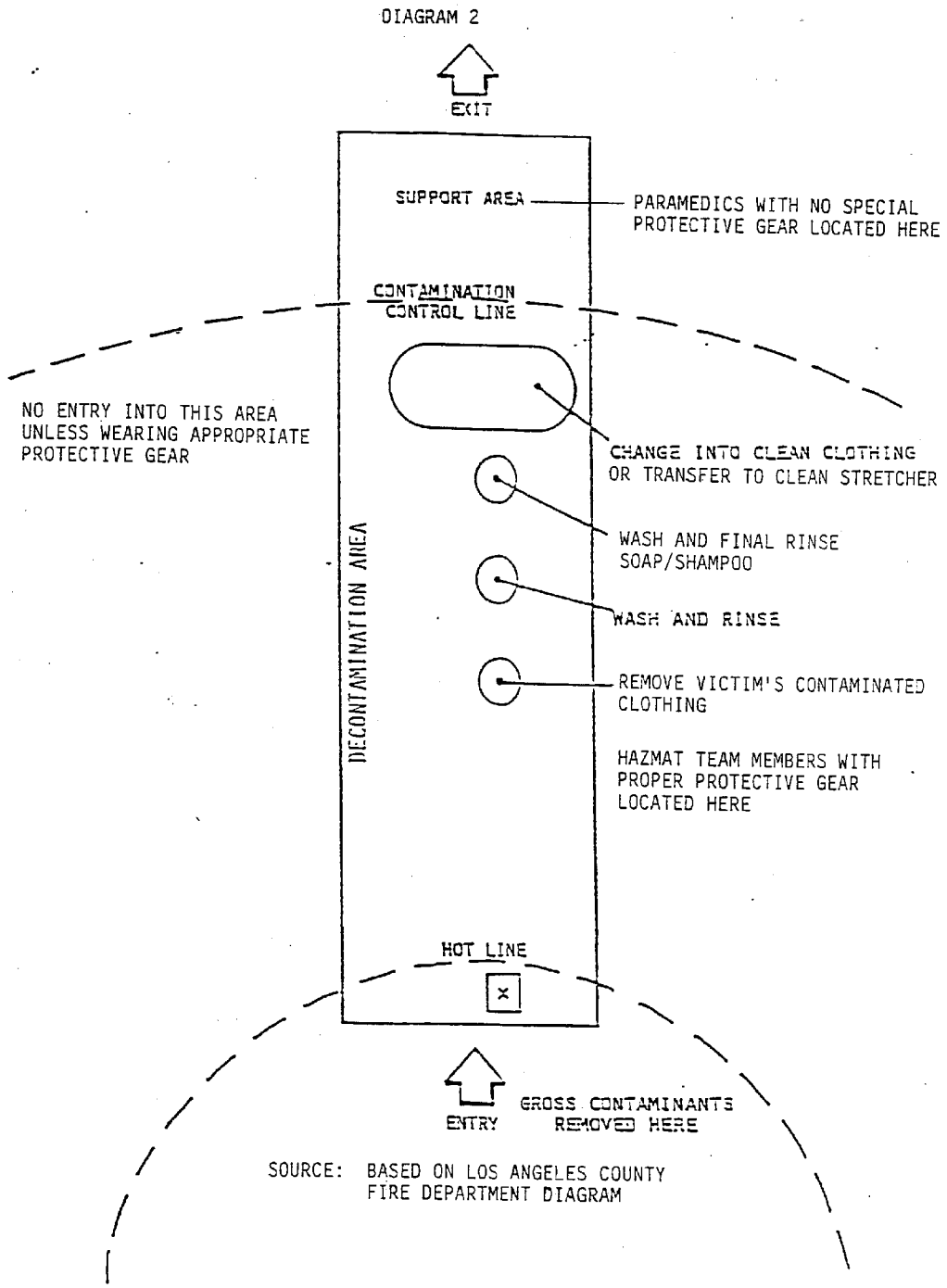
Source: L.A. County Fire Dept.



Source: Based on L.A. County
Fire Dept. Diagram

VI. EMERGENCY DEPARTMENT CARE

In managing a victim who has been exposed to a hazardous material and who may be contaminated or who is not known to have been adequately decontaminated before arrival at the hospital, the emergency department staff has five goals:

Table 6. Emergency Department Goals

C	To protect hospital staff members from any significant toxic exposure;
C	To minimize any additional exposure of the victim to the toxic substance (eg, in the event that the victim's clothing is soaked);
C	To evaluate quickly whether the victim is in immediate danger of dying a needs immediate endotracheal intubation, CPR or other emergency procedures;
C	
C	To quickly determine the toxic identity and effects of the hazardous materials and to provide specific treatment if indicated; and,
C	To prevent hospital contamination and to protect passers-by from any significant toxic exposure

A. Preplanning and Need to Determine Risk for Secondary Contamination

An important part of any chemical disaster pre-planning is to survey the area surrounding the hospital to determine which types of hazardous materials are used by local industries. It is noteworthy that the JCAH Accreditation Manual for Hospitals, 1986, calls for hospitals to participate in community planning whenever feasible (Section 3.1.1.1). The emergency department administrator should become familiar with the county Hazardous Material Area Plan which identifies procedures to be used to coordinate the management of hazardous materials and to establish roles and responsibilities for government agency actions in response to a hazardous material incident. The name of the agency responsible for preparing and maintaining the Hazardous Material Area Plans in your region can be obtained from the Office of Emergency Services, Hazardous Materials Division (916-427-4287).

In order to obtain more detailed information on specific chemicals used by nearby industries, some emergency departments have obtained copies of the Material Safety Data Sheets (MSDSs) from local industries and keep them on file. According to federal and state legislation, employers must provide the information contained on an MSDS to health care providers who need the information to care for an affected patient.

The information must be provided without regard to "trade secrets" in an emergency. However, it is not generally practical to keep large numbers of MSDSs in an indexed, usable filing system which can be relied upon in an emergency. MSDSs contain basic chemical, reactivity, and toxicology data, but are usually very limited in medical treatment information and are of variable technical quality. In addition, they rarely provide information regarding the potential for secondary contamination or recommendations for decontamination. The Regional Poison Control Centers are the best sources of acute health effects information on hazardous materials.

To locate information about the risk for secondary contamination of health care personnel, other patients in the department, and the hospital facility, call the Regional Poison Control Center
(see page 36).

B. The Contaminated Victim

In the ideal situation, victims will already be properly decontaminated before they are brought to the emergency department, and they will pose very little, if any risk to the hospital health provider or the facility.

However, a written protocol must be prepared for those situations where a victim, heavily contaminated with a highly toxic chemical, arrives at the emergency department (e.g., a walk-in). If a victim contaminated by a substance with serious potential for secondary contamination has already entered the emergency department, separate zones should be set up by the emergency room charge person:

1) the contamination area,
2) a designated decontamination area (preferably outside), and
3) a clean zone.

The contaminated area should be marked and isolated. Personnel must not be allowed to indiscriminately enter or leave these zones unless checked for contamination.

The best course of action for most facilities is to call the fire department hazmat team (if there is one) to come to the emergency department and set up a decontamination area outside the ambulance entrance. A practical alternative is to provide simple but effective decontamination outside the ambulance entrance using an inflatable "kiddie" pool, or shower, and soap (Green soap(R), New Dawn (R), or any mild dishwashing detergent). The victim can often remove his/her own clothing and wash off the material. Provide plastic bags for double-bagging contaminated clothing, and if available, a tent or curtain for victim privacy. Victims who are not ambulatory can be decontaminated by appropriately protected and trained hospital staff on a protected gurney in the same area. Establishing the decontamination area outside of the emergency department is important because of the potential risk of secondary contamination by inhalation of toxic vapors or dusts.

If the hospital emergency department is located in a highly industrialized area and can expect to receive contaminated victims, consideration should be given to training staff to use Self-contained Breathing Apparatus (SCBA) and other appropriate protective equipment. The local hazmat team or an industrial hygienist should be consulted about training requirements, equipment, frequency of training, and other relevant safety details. The county health department should be contacted to determine how to dispose of the contaminated water.

C. Protective Clothing for Hospital Staff

If proper decontamination has been carried out prior to transport, no specialized protective gear should be required for hospital staff. Disposable surgical gowns, aprons, gloves and shoe coverings may be appropriate (Table 7). In the vast majority of circumstances, the equipment in the following table will adequately protect emergency department staff as they remove soaked clothing, wash the victim's skin/hair with soap/shampoo, or perform eye irrigation. With very concentrated acids or caustics or with substantial amounts of oily or lipid-soluble liquids (e.g., pesticides), disposable Tyvek or Saranex coveralls and unmilled nitrile gloves will probably offer sufficient protection until the victim can be decontaminated. Advice on appropriate suits and gloves can be obtained from the local hazardous materials team, or the Regional Poison Control Center. Hospital staff should remove all leather items, wool clothing and other materials that cannot be easily decontaminated. Consideration should be given to obtaining disposable medical equipment. Personnel without adequate personal protective equipment should not be in close proximity to victims who are grossly contaminated or being decontaminated.

If simple outdoor decontamination is not possible, arrangements should be made in advance with a qualified industrial hygienist to obtain special protective respiratory equipment and to provide training in its proper use.

No provider should be asked to put on a respirator or other specialized gear unless that worker has been fitted and trained in its use.

Table 7. Suggested Equipment List for Management of Hazardous Materials Contamination, Part I.

The following emergency supplies should be stored in an area near the emergency department rear entrance and checked periodically (e.g., quarterly):

- **!** Written procedures for handling chemically contaminated victims.
- **!** Protective clothing for staff:

  For 'most circumstances: Disposable gowns, surgical masks, plain latex gloves (enough for double gloving), shoe covers, splash goggles (at least two pair), aprons, caps. At least some of the gowns, aprons and shoe covers should be impervious to water.

  For heavy chemical or corrosive contamination: At least 2 Tyvek or Saranex suits and 2 pair unmilled nitrile gloves (be sure to check with Poison Control or Hazmat team to see if they are compatible with the particular hazardous substance involved).

  Note: Respiratory protective gear is not generally available and, in addition, should. not be used unless it is properly maintained and staff have been properly fitted and trained in its selection and use. Therefore, if inhalation exposure is a risk, decontamination should be done outside.
- **!** Decontamination supplies:

  Inflatable “kiddie" pool (large) with foot operated air pump (or other means of collecting decontamination water), large plastic tarp to place under pool forming an outer containment area, 55 gallon plastic trash cans to hold water, mild dish washing detergent or soap in squeeze bottle, sponges, absorbent pads for washing, nail brush, tent or curtain for privacy, exterior wall water outlet/shower nozzle hooked up to luke warm (or cold) water supply.

  Metal gurney or morgue table for non-ambulatory patients.

  Alternatively if a dedicated decontamination room is provided, plans must be made for separate exhaust ventilation, adequate ventilation (at least 6 changes/hour), plastic sheeting to cover floor, 2 inch tape to secure plastic, means of containing contaminated water, and respiratory protective gear for staff who may be in an enclosed space with volatile hazardous materials. (Note, any employee required to use a respirator must be medically cleared, fitted, and trained.)

  Plastic bags for double bagging contaminated clothing (preferably clear).

  Diking or absorbent material: Dikes can be made by taping the edges of a large plastic tarp or sheets of plastic draped over a ladder turned on its side or rope strung horizontally, Absorbent materials such as kitty litter, pillows, diapers, or other similar material may be useful to absorb spills.

Table 7. Suggested Equipment List for Management of Hazardous Materials Contamination, Part II.

	Saline and IV tubing !or eve irrigation set-up.
	Note that special "decontamination solutions" and neutralizing. agents are not recommended except in specific rare circumstances {e.g., hydrofluoric acid). Water (and perhaps soap) are the recommended means of decontaminating victims. Extra care needs to be given to victims contaminated with water-reactive substances: Consult your poison control center.
!	Other supplies:
	Wall Suction with disposable collection bag to hook up to gastric tube to remove and isolate toxic vomitus.
	Extra medical supplies or equipment which. could be taken out of service temporarily if contaminated (including crash cart with ambu bags, defibrillator, EKG monitoring equipment, IV stands, etc).
	Inexpensive medical equipment which could be disposed of if contaminated (including stethoscope, blood pressure cuff, etc.)
	Tape and rope for marking off perimeters
	Plastic sheeting (4 mil) for covering floor or covering entrance to and floor of decontamination area for materials with high potential for secondary contamination.
	2 inch tape for securing plastic.
	Cotton-tipped applicators and stoppered glass containers for swabs of hazardous materials for laboratory analysis, or evidence for later prosecution of the party responsible for the hazmat spill.
!	Special medical treatment supplies:
	See specific treatment protocols

Source: Based on a list prepared by the Contra Costa/ Solano County Joint Emergency Medical Service Hazardous Material Response Program. Additional equipment is necessary for handling radiation contamination. See: Emergency Department Radiation Accident Protocol. Leonard RB. Ricks RC. Annals of Emergency Medicine. 9:9:462-70. 1980. Also, see Medical Management of Radiation Accidents. Mauler FA, Kelsey. CA Ricks RC. CRC Press, Florida. 1989.

D. Decontaminating the Victim

If decontamination is required, a thorough wash-down of the victim's skin for a few minutes with plenty of soap and water is generally adequate (see Section IV, p.20, for basic decontamination protocol). However, for chemical contamination of an open wound, gentle scrubbing or irrigation of the wound for 5-10 minutes or longer is advisable, using lukewarm water. With eye exposures, irrigation of the eyes with sterile saline should be carried out for at least 15-30 minutes. Check conjunctival sac PH if exposure was to an acid or alkaline material. Contaminated facial and nose hair and ear canals should be gently irrigated with normal saline, using frequent suction. If there is **any doubt about contamination, decontaminate the victim.** A contaminated appendage can be washed without wetting the whole body if that is the only part contaminated. Clothing covering the rest of the body and exposed skin should be carefully checked for contamination. Following decontamination, specific medical management of the victim can be addressed.

Gastric lavage should be performed if ingestion is suspected. Use wall suction and an isolated collection bag to avoid exposure to liquid or vapors of toxic vomitus. Administer activated charcoal after lavage is completed.

E. Medical Management or the Victim

In a life-threatening emergency, a decision to delay patient care because of concerns about contamination and possible exposure of hospital staff will require considerable clinical judgement. Delay may be necessary with certain extremely hazardous substances present in significant quantities on or near the victim. The Regional Poison Control Center (see pp.22-24) can provide emergency assistance in making these decisions. In reality, a delay in starting treatment because of such concerns will only rarely be required. Attention to the basic ABCs of life support (airway, breathing, and circulation) should be given if it does not pose a significant risk to the care giver.

The most important step for the Emergency physician is to get information about <u>what</u> hazardous substances are involved and what estimated <u>dose</u> the victim received. This information will often have been obtained by the EMS personnel, fire, police, or Hazmat team responding to the episode. If this information does not accompany the victim to the Emergency Department, the hospital staff can direct the EMS, fire or police who accompany the patient to obtain the information from the Incident Commander at the scene.

F. Decontamination or Hospital Staff and Clean Up

Health care workers who attend to victims who have not been previously decontaminated should consider themselves to be potentially contaminated. Consult the lists in Section II.B. above or the Regional Poison Control Center to determine the risk of secondary contamination. In many (if not most) cases, no personal decontamination will be necessary. However, if *in doubt, decontaminate.*

Procedures for post-emergency clean-up including disposal of contaminated wastes should be addressed by written protocol. Hazardous waste must be disposed of properly, and not mixed with non-hazardous trash. Advice on disposal of hazardous waste can often be obtained from the Health Department or the Hazmat team.

In dealing with the problem of contaminated corpses, the important objectives are to limit the spread of contamination within the hospital and to protect transport personnel and personnel in the coroner's office or other pathology staff. A corpse with known or suspected significant contamination can be easily decontaminated in the emergency department, particularly if a contamination zone has already been established and other decontamination activities are being carried out. Depending on the nature of the contaminant, the clothing can be removed and double bagged, and the body washed. Be careful to save samples or swabs of the material, if not already identified, as legal evidence. These can be saved in a sealed, clean test tube or specimen container.

The contaminated corpse should be double body-bagged. The body bag should have a prominent label indicating that the corpse is contaminated and the nature of the contaminant. Emergency department staff should record the telephone number of the coroner or pathologist on the label for more information about the nature of the contamination. All deaths resulting from toxic exposure are coroner's cases and the hospital staff should notify the Coroner's office.

G. Security

The emergency department hazardous materials incident protocol should indicate that hospital security or engineering staff will be notified to help with isolating and managing a potential contamination problem.

A protected and trained security person assigned to the decontamination zone can assist in handing equipment and supplies in to the contaminated zone, and completing the double-bagging of contaminated clothing or other articles before handing them out to the clean zone. Security or engineering personnel can also assist in preventing the spread of contaminated puddles of water on the floor (by the use of dikes, for example), in securing the ventilation system if necessary so that contaminated air does not circulate to the rest of the building, and in setting up an outdoor decontamination station.

H. After the Incident

Hospitals are subject to two major reporting requirements with regard to hazardous materials victims:

! Occupational Illness or Injury: Illnesses or injuries occurring in the course of employment must be reported by the treating physician in a "Physician's First Report of Occupational Ill ness or Injury." New versions of this form were released in 1989 and are available by calling (415) 557-1924.

In the event of a death occurring in the course of employment, employers are responsible for calling the Occupational Safety and Health Administration (OSHA). Cal-OSHA is responsible for all employers except federal agencies.

- Pesticide Poisoning: The State of California mandates that illnesses due to pesticide poisoning, even if not occupational in origin must be reported by telephone within 24 hours to the local health officer for the area in which the poisoning occurred. A follow-up written report, submitted on a "Physician's First Report of Occupational illness or Injury" or a comparable form must be submitted within one week of the telephone report.

Following the completion of the response to the incident, a critique should be conducted with all of the staff involved. Only by a thorough review of the events can mistakes be corrected and procedures modified for improving the management of future incidents.

VII. SOURCES OF ACUTE HEALTH HAZARDS INFORMATION

A. California's Poison Control Centers
February 1991

University of California Davis Medical Center
Regional Poison Control Center
2315 Stockton Boulevard
Sacramento, CA 95817

Public: (800) 342-9293
Local: (916) 453-3692

Medical Director:
(916) 734-3564
Administration:
(916) 453-3414
FAX: (916) 734-7796

Medical Director: T. E. Albertson, M.D., Ph.D.
Director: Judy Alsop, Pharm.D.

Counties Served:

Alpine	Glenn	Plumas	Solano	Yolo
Amador	Lake	Sacramento	Stanislaus	Yuba
Butte	Lassen	San Joaquin	Sutter	
Calaveras	Modoc	Shasta	Tehama	
Colusa	Nevada	Sierra	Trinity	
El Dorado	Placer	Siskiyou	Tuolumne	

San Francisco General Hospital
San Francisco Bay Area Regional Poison Control Center
1001 Potrero Avenue, Room 1E86
San Francisco, CA 94110

Public: (800) 523-2222
Local: (415) 476-6000
Hazardous Materials:
(415) 821-5338

Administration:
(415) 821-5524
Education Materials:
(415) 821-5265
Health Education:
(415) 821-8554
FAX: (415) 821-8513

Medical Director: Kent R. Olson, M.D.
Director: Thomas E. Kearney, Pharm.D.

Counties Served:

Alameda	Marin	San Mateo
Contra Costa	Mendocino	Sonoma
Del Norte	Napa	
Humboldt	San Francisco	

Santa Clara Valley Medical Center
Regional Poison Control Center
751 South Bascom Avenue
San Jose, CA 95128

Public: (800) 662-9886
Local: (408) 299-5112

Medical Director: Michael Collins, M.D.
Director: Gary Everson, Pharm.D.

Health Education:
(408) 299-5112
FAX: (408) 386-2344

Counties Served:

Monterey	Santa Clara
San Benito	Santa Cruz
San Luis Obispo	

Fresno Community Hospital
Fresno Regional Poison Control Center
Fresno and R Streets
P.O. Box 1232
Fresno, CA 93715

Public: (800) 346-5922
Local: (209) 445-1222

Health Education:
(209) 442-6000
Ext. 5759

Medical Director: Rick Geller, M.D.
Director: Brent R. Ekins, Pharm.D.

Counties Served:

Fresno	Kings	Mariposa	Tulare
Kern	Madera	Merced	

Los Angeles County Medical Association
Regional Poison Control Center
1925 Wilshire Boulevard
Los Angeles, CA 90057

Public: (213) 484-5151
(800) 777-6476
Physician/
Hospitals Only:
(213) 664-2121
(800) 825-2722

FAX: (213) 413-5255

Medical Director: Mare Bayer, M.D.
Administrator: Michael Weiland

Counties Served:

Los Angeles	Ventura	Santa Barbara

University of California San Diego Medical Center
San Diego Regional Poison Center
225 Dickinson Street
San Diego, CA 92106-9981

Public: (800) 876-4766
Local: (619) 543-6000

Health Education:
(619) 543-3666
FAX: (619) 692-1867

Medical Director: George Shumaik, M.D.
Director: Anthony Manoguerra, Pharm.D.

Counties Served:

San Diego
Imperial

University of California Irvine Medical Center
Regional Poison Control Center
101 The City Drive, Building 1, Route 78
Orange, CA 92668

Public: (800) 544-4404
Local: (714) 634-5988

Health Education:
(714) 634-5730
FAX: (714) 937-7858

Medical Director: Philip Edelman, M.D.
Director: Richard Thomas, Pharm.D.

Counties Served:

Inyo
Mono
Orange
Riverside
San Bernardino

B. Other Sources of Information about Toxics and Hazmat Spills

The California Department of Health Services has compiled a directory of sources of information about toxics, "The Toxics Directory: References and Resources on the Health Effects of Toxic Substances." Hazard Identification and Risk Assessment Branch

California Department of Health Services
2151 Berkeley Way
Berkeley, CA 94704
(415) 540-3063

VIII. HAZARDOUS MATERIALS

MEDICAL MANAGEMENT

PROTOCOLS

UNKNOWN MATERIAL

FORMS:

This section assumes that a victim has been exposed to a hazardous material which cannot be identified in the form of a gas or vapor, liquid, or solid/dust.

BACKGROUND:

Every attempt should be made to identify the substance involved using placards, shipping papers, or other means. However, if such identification is impossible, responders should make worst case assumptions about the material. Rescuers should assume that the material may be:

a. Poisonous by inhalation, ingestion, and cutaneous absorption;

b. Corrosive (either acidic or alkaline);

c. Lipid soluble, and therefore able to penetrate certain types of protective clothing and protective gear, and able to be absorbed through intact skin;

d. Oily and persistent on skin and clothing, and therefore difficult to decontaminate; and,

e. Reactive and likely to give rise to irritant or poisonous gases on contact with water or heat.

POTENTIAL FOR SECONDARY CONTAMINATION:

Victims contaminated with an unknown liquid or solid/dust material should be assumed to be carry a risk of secondary contamination. If the victim's only exposure was to small amounts of gas or vapor, the risk of secondary contamination to health care personnel away from the scene is probably very small. Theoretically, small amounts of gas might be trapped in a victim's clothing. In such a situation once the clothing had been removed and double-bagged, the risk to rescuers would be minimal. However, if the exposure involved an aerosol which might condense on a victim's skin or clothing, there would be a potential for secondary contamination until decontamination had been carried out. For exposures involving direct contact with an unknown liquid or solid material or dust, rescuers should assume that the victim poses a risk of secondary contamination until decontaminated. When in doubt, decontaminate the victim (see Section IV, p.20).

UNKNOWN MATERIAL

PATIENT MANAGEMENT IN THE HOT ZONE/ DECON AREA:

1. In general, until the possibility of fire, explosion, or serious reactivity has been ruled out, rescuers will not enter the Hot Zone. Once entry appears to be feasible, rescuers should don fully encapsulated protective clothing and gloves capable of withstanding both corrosives and hydrocarbon solvents, and self-contained breathing apparatus.

2. Quickly evaluate and support ABCs. Stabilize the spine (if trauma suspected), establish airway and breathing, and consider high flow supplemental oxygen by bag valve mask with reservoir, if possible and practical.

3. Remove and double bag clothing. Flush skin with water spray for 1 - 2 minutes. If the victim complains of eye irritation, have the victim remove contact lenses if able to do so. Irrigate exposed eyes if symptomatic.

PREHOSPITAL MANAGEMENT AFTER INITIAL DECONTAMINATION:

1. If victim is NOT decontaminated and responder is properly trained, don protective equipment (self-contained breathing apparatus) capable of withstanding brief exposure to both corrosives and hydrocarbon solvents. Activate basic decontamination protocol (see Section IV, p.20). If these requirements cannot be met, request assistance from the local hazmat team or your Regional Poison Control Center. In addition, wash oily contaminated areas, including skin or hair, with soap and/or shampoo.

2. Re-evaluate airway, intubating the trachea if victim is unconscious or has developed severe respiratory distress. Continue to provide high-flow oxygen by mask. Attach cardiac monitor.

3. Support BP if needed, with IV crystalloid solutions. Treat bradycardia with atropine or other modality appropriate to the patient's clinical status.

4. Consider aerosolized bronchodilators if significant wheezing is present.

5. Continue to flush affected skin and eyes with copious water or saline. Remove contact lenses and irrigate eyes with saline via plain IV tubing, for at least 10-15 minutes or until symptoms of pain or irritation have resolved.

6. Even if significant ingestion is suspected, do not induce vomiting. Instead, if the victim is conscious and able to protect the airway, immediately dilute with 1 glass of water and give activated charcoal 60 - 100 grams if available. *Do NOT give activated charcoal if a corrosive is suspected.*

7. Continue to irrigate injured eyes or exposed areas of skin for at least 15 to 20 minutes if the victim continues to complain of discomfort.

8. Treat seizures with diazepam (Valium):

   5 - 10 mg IV for an adult; and,

   1-2 mg IV for children.

MANAGEMENT IN THE HOSPITAL:

1. If victim is NOT decontaminated and responder is properly trained, don protective equipment capable of withstanding brief exposure to both corrosives and hydrocarbon solvents, and self-contained breathing apparatus. Activate basic decontamination protocol (See Section IV, p.20). If these requirements cannot be met, request assistance from the local hazmat team or your Regional Poison Control Center. In addition, wash oily contaminated areas with soap and/or shampoo.

2. Evaluate and support ABCs (airway, breathing, and circulation).

3. Obtain arterial blood gases, chest x-ray, and electrocardiogram in seriously symptomatic patients. Administer high flow oxygen if the victim has respiratory distress or altered mental status. Aerosolized bronchodilators will probably be helpful, and are seldom contraindicated, for most cases of bronchoconstriction due to hazmat exposures. Monitor cardiac rhythm.

4. DIAGNOSTIC CONSIDERATIONS - For a hazmat victim with cardiorespiratory collapse, consider the diagnosis of generalized cellular poisoning (cyanide p. C.3.1., azide, sulfide p. H.3. 1., for example). Always consider the diagnosis of carbon monoxide poisoning (see p. C. 1.1). In the appropriate setting, consider the diagnosis of exposure to anti-cholinesterase pesticides and the possible use of atropine in a patient with bradycardia, wheezing, seizures, and/or other signs of cholinergic stimulation (see p. P.2.1 and P.3.1). Consider the diagnosis of methemoglobinemia for patients with cardiopulmonary distress (see p. N. 1.1). If there is a concomitant likelihood of cyanide exposure, as for example through smoke inhalation, nitrites should generally not be used to treat methemoglobinemia. If the hazmat victim appears to have suffered substantial skin exposure to a corrosive liquid, be aware that patients with significant hydrofluoric acid exposure, as manifested by painful burns or dramatic respiratory injury, may require prophylactic IV calcium as well as specialized treatment for exposed skin areas (seep. H.2.1).

5. Treat seizures with diazepam (Valium):

   5 - 10 mg IV for an adult; and,

   1-2 mg IV for children.

6. Appropriate lab studies, in addition to other routine and indicated studies such as electrolytes and glucose and anion and osmolar gap, might include carboxyhemoglobin, methemoglobin, calcium, plasma and RBC cholinesterase levels, liver function studies, methanol level, and serum lactate.

7 Treat skin and eye exposures with copious irrigation, for at least 15 to 20 minutes. If eye irritation persists, perform a fluorescein and slit-lamp examination to rule out corneal injury.

8. In patients who present with initial symptoms of respiratory irritation or distress, be alert for the development of delayed onset pulmonary edema, up to 24 hours after the exposure.

9. In cases of significant ingestion, treat as for other types of toxic ingestion with gastric lavage and/or administration of activated charcoal (unless ingestion of a corrosive is suspected); do not induce vomiting. Consider saving a sample of gastric contents for possible subsequent lab analysis, but isolate them in a closed container as soon as possible. Be aware that gastric washing may contain volatile material that could potentially expose hospital personnel to noxious vapors. If corrosive injury to the victim's esophagus is suspected, consider consultation with gastroenterologist or surgeon for possible endoscopy.

FOR ADVICE ON CLINICAL MANAGEMENT, CALL YOUR
REGIONAL POISON CONTROL CENTER AT:
(___)___-____

ACIDS & ACID MISTS
(NOT Including Hydrofluoric Acid)

FORMS:

Gas, liquid (variable concentrations), mixtures with water, and aerosolized dusts.

BACKGROUND:

Acids act as direct irritants and corrosive agents to skin and moist mucous membranes. Severe burns may result. Generally, these substances have very good warning properties; even fairly low airborne concentrations of acid mists, or vapors produce rapid onset of eye, nose and throat irritation. Inhalation of higher concentrations can produce cough, stridor, wheezing, chemical pneumonia or non-cardiogenic pulmonary edema. Occasionally, pulmonary edema may be delayed for several hours, especially with low-solubility gases such as nitrogen oxides (given off by nitric acid). Ingestion of acids can result in severe injury to the airway, esophagus and stomach.

POTENTIAL FOR SECONDARY CONTAMINATION:

Small amounts of acid mists can be trapped in clothing after an overwhelming exposure but are not usually sufficient to create a hazard for health care personnel away from the scene. However, clothing which has become soaked with concentrated acid may be corrosive to rescuers. Once the victim has been stripped and flushed with water, there is no significant risk of secondary contamination. Decontamination is not necessary for victims with inhalation exposure only.

PATIENT MANAGEMENT IN THE HOT ZONE/ DECON AREA:

1. Rescuers should don agent-specific protective clothing and gloves, and self-contained breathing apparatus particularly if mists or vapors are present.

   Ambulatory patients should be instructed to remove themselves from the hot zone and to decontaminate themselves under the direction of the decontamination supervisor.

2. Quickly evaluate and support ABCs. Stabilize the spine (if trauma suspected), establish airway and breathing, and consider high flow supplemental oxygen by bag valve mask with reservoir, if possible and practical.

3. Flush exposed skin with water spray. If clothing has been soaked by acid or acid spray, remove and double-bag clothing and flush skin for I - 2 minutes. Remove contact lenses and irrigate exposed eyes if symptomatic.

ACIDS & ACID MISTS
(NOT Including Hydrofluoric Acid)

PREHOSPITAL MANAGEMENT AFTER INITIAL DECONTAMINATION:

1. If victim is NOT decontaminated and responder is properly trained, don appropriate agent-specific protective equipment and self-contained breathing apparatus. Activate basic decontamination protocol (see Section IV, p.20). If these requirements cannot be met, request assistance from the local hazmat team or your Regional Poison Control Center.

   If victim is decontaminated, don appropriate protective equipment consistent with risk of secondary contamination (Section **m,** p.18, and Table 5, p.23).

2. Evaluate and support ABCs (airway, breathing and circulation). Re-evaluate airway, intubating the trachea if victim has developed severe respiratory distress. Provide high-flow oxygen by mask. Attach cardiac monitor.

3. Aerosolized bronchodilators (e.g., metaproterenol) may be helpful for victims with wheezing.

4. Continue to flush affected skin and eyes with copious water or saline. Remove contact lenses and irrigate eyes with saline via plain IV tubing, for at least 10-15 minutes or until symptoms of pain or irritation have resolved.

5. Victims with minimal or quickly resolving symptoms probably do not require immediate evaluation in the emergency department. However, remember that with certain acids and low-solubility gases (e.g., fuming nitric acid forming nitrogen oxides) pulmonary edema may occur after a delay of 12-24 hours.

6. **Ingestion: DO NOT induce vomiting.** Immediately dilute with 1 glass of water or milk.

MANAGEMENT IN THE HOSPITAL:

1. If victim is NOT decontaminated and responder is properly trained, don appropriate agent-specific protective equipment and self-contained breathing apparatus. Activate basic decontamination protocol (see Section IV, p.20). If these requirements cannot be met, request assistance from the local hazmat team or your Regional Poison Control Center.

   If victim is decontaminated, don appropriate protective equipment consistent with risk of secondary contamination (Section III, and Table 7, p.31).

   Remove and double-bag clothing if not already done. Wash exposed skin copiously with water. Decontamination is probably not needed for acid exposures unless the victim's skin or clothing has been soaked with acid liquid.

2. Evaluate ABCs (airway, breathing, and circulation). Watch for signs of airway closure and laryngeal edema, such as hoarseness, stridor, or retractions.

3. Administer oxygen by mask. Bronchodilators may be helpful for wheezing. Intubate if patient manifests severe respiratory distress from pulmonary edema or upper airway swelling. Obtain arterial blood gases and chest x-ray if respiratory distress is present. If respiratory distress is present or if exposed to low-solubility gases such as nitrogen oxides, admit and observe 24 to 48 hours for possible delayed onset of pulmonary edema. Severe upper airway edema may necessitate endotracheal intubation or cricothyrotomy.

4. If the patient complains of eye irritation, check for the presence of contact lenses and remove, then irrigate eyes copiously with saline via plain Iv tubing for at least 10-15 minutes, or until symptoms of pain or irritation have resolved. Consider fluorescein or slit-lamp examination to rule out corneal injury.

5. If a significant ingestion occurred, consider endoscopy to evaluate injury to the esophagus and stomach.

6. Advise patient that full recovery is generally the rule, but cases of chronic airway disease have been reported following severe exposures. Advise and arrange for follow-up in case victim begins to experience respiratory distress. After exposure to oxides of nitrogen, sudden severe relapse may occur two to three weeks later.

FOR ADVICE ON CLINICAL MANAGEMENT, CALL YOUR
REGIONAL POISON CONTROL CENTER AT:
(___) ___-____

Date Revised: 11/01/90

AMMONIA (LIQUID AND GAS)

FORMS:

Gas (anhydrous) and liquid (aqueous solutions, variable concentrations).

NOTE: Liquified compressed gas may produce cryogenic (freezing) hazard as it is released into the atmosphere.

BACKGROUND:

Ammonia (NH_3) is a direct irritant and alkaline corrosive agent to moist mucous membranes and, to a lesser extent, to intact skin. Ammonia has very good warning properties. Even fairly low airborne concentrations produce rapid onset of eye, nose and throat irritation. Higher concentrations can produce cough, stridor, wheezing, chemical pneumonia or non-cardiogenic pulmonary edema. The onset of pulmonary edema is usually rapid but may occasionally be delayed for 12-24 hours. Ingestion of concentrated ammonia solutions (e.g., > 5%) may cause serious corrosive injury to the esophagus and stomach.

POTENTIAL FOR SECONDARY CONTAMINATION:

Small amounts of ammonia vapor can be trapped in clothing after an overwhelming exposure but are usually not sufficient to create a hazard for health care personnel away from the scene. However, clothing which has become soaked with concentrated liquid ammonia may be corrosive to rescuers. Once the victim has been stripped and flushed with water, there is no significant risk of secondary contamination.

PATIENT MANAGEMENT IN THE HOT ZONE/ DECON AREA:

1. Rescuers should don agent-specific protective clothing and gloves, and self-contained breathing apparatus.

   Ambulatory patients should be instructed to remove themselves from the hot zone and to decontaminate themselves under the direction of the decontamination supervisor.

2. Quickly evaluate and support ABCs. Stabilize the spine (if trauma suspected), establish airway and breathing, and consider high flow supplemental oxygen by bag valve mask with reservoir device or manually triggered oxygen powered breathing device, if possible and practical.

3. If clothing has been soaked by liquid ammonia, remove and double-bag. Flush skin with water spray for 1 - 2 minutes. Remove contacts and irrigate exposed eyes if symptomatic.

PREHOSPITAL MANAGEMENT AFTER INITIAL DECONTAMINATION:

1. If victim is NOT decontaminated and responder is properly trained, don appropriate agent-specific protective equipment and self-contained breathing apparatus. Activate basic decontamination protocol (see Section Iv, p.20). If these requirements cannot be met, request assistance from the local hazmat team or your Regional Poison Control Center.

   If victim is decontaminated, don appropriate protective equipment consistent with risk of secondary contamination (Section III, p.18, and Table 5, p.23).

2. Evaluate ABCs (airway, breathing, and circulation). Watch for signs of airway closure and laryngeal edema, such as hoarseness, stridor, or retractions.

3. Administer oxygen by mask. Bronchodilators may be helpful for wheezing. Intubate if patient manifests severe respiratory distress from pulmonary edema or upper airway swelling. Obtain arterial blood gases and chest x-ray if respiratory distress is present. If respiratory distress is present or if exposed to low-solubility gases such as nitrogen oxides, admit and observe 24 to 48 hours for possible delayed onset of pulmonary edema. Severe upper airway edema may necessitate endotracheal intubation or cricothyrotomy.

4. Aerosolized bronchodilators (e.g., metaproterenol) may be helpful for victims with wheezing.

5. Continue to flush affected skin and eyes with copious water or saline. Remove contact lenses and irrigate eyes with saline via plain IV tubing, for at least 10-15 minutes or until symptoms of pain or irritation have resolved.

6. Victims with minimal or quickly resolving symptoms after brief inhalation exposure probably do not require immediate evaluation in the emergency department.

7. Ingestion: DO NOT induce vomiting. Immediately dilute with 1 glass of water or milk.

MANAGEMENT IN THE HOSPITAL:

1. If victim is NOT decontaminated and responder is properly trained, don appropriate agent-specific protective equipment and self-contained breathing apparatus. Activate basic decontamination protocol (see Section Iv, p.20). If these requirements cannot be met, request assistance from the local hazmat team or your Regional Poison Control Center.

If victim is decontaminated, don appropriate protective equipment consistent with risk of secondary contamination (Section III, and Table 7, p.32).

2. Evaluate and support ABCs (airway, breathing, and circulation). Watch for signs of airway closure and laryngeal edema, such as hoarseness, stridor, or retractions. Severe upper airway edema may necessitate endotracheal intubation or cricothyrotomy.

3. Provide 02 by mask. Intubate if patient manifests severe respiratory distress, from pulmonary edema or upper airway swelling. Obtain arterial blood gases and chest x-ray if respiratory distress is present. If severe respiratory distress is present, admit and observe for 24 hours for delayed-onset pulmonary edema.

4. If the patient complains of eye irritation, check for the presence of contact lenses and remove, then irrigate eyes copiously with saline via plain IV tubing for at least 15 to 30 minutes, or until symptoms of pain or irritation have resolved. Consider fluorescein or slit-lamp examination to rule out corneal injury.

5. Remove and double-bag clothing if not already done. Wash skin copiously with water.

6. Cardiac monitor; l2-lead EKG.

7. Advise that full recovery is generally the rule, but cases of chronic airways disease have been reported following severe exposures.

FOR ADVICE ON CLINICAL MANAGEMENT, CALL YOUR
REGIONAL POISON CONTROL CENTER AT:
(___) ___-____

Date revised: 7/31/90

ARSINE GAS

FORMS:

Gas, may be generated in metal ore processing and electronic component manufacturing.

BACKGROUND:

Arsine (AsH_3) is an extremely toxic and nearly odorless gas (it has a slight odor of garlic). It is used widely in the microelectronics industry and occasionally occurs as a by-product in metallurgy and pesticide manufacturing. Arsine's effects are quite distinct from other arsenic compounds; even in very small quantities, inhaled arsine produces acute hemolysis (rupture of red blood cells), which can result in cardiac decompensation due to anemia, or renal failure due to massive kidney deposition of hemoglobin. Symptoms may be delayed for 2-24 hours, and include weakness, abdominal and flank pain, brown urine, and jaundice. Massive acute exposure appears capable of causing immediate death by an unknown mechanism.

POTENTIAL FOR SECONDARY CONTAMINATION:

Very small amounts of arsine can be trapped in a victim's clothing after an overwhelming exposure. but are not usually sufficient to create a hazard for health care personnel away from the scene.

PATIENT MANAGEMENT IN THE HOT ZONE/ DECON AREA:

1. Rescuers should don agent-specific protective clothing and gloves, and self-contained breathing apparatus.

   Ambulatory patients should be instructed to remove themselves from the hot zone and to decontaminate themselves under the direction of the decontamination supervisor.

2. Quickly evaluate and support ABCs. Stabilize spine (if trauma suspected), establish airway and breathing, and consider high flow supplemental oxygen by bag valve mask with reservoir, if possible and practical.

3. If gas is likely to be trapped in clothing (i.e., significant exposure in an enclosed area), remove and double-bag clothing. Flush skin with water spray for 1 - 2 minutes.

ARSINE GAS

PREHOSPITAL MANAGEMENT AFTER INITIAL DECONTAMINATION:

1. If victim is NOT decontaminated and responder is properly trained, don appropriate agent-specific protective equipment and self-contained breathing apparatus. Activate basic decontamination protocol (see Section Iv, p.20). If these requirements cannot be met, request assistance from the local hazmat team or your Regional Poison Control Center.

   If victim is decontaminated, don appropriate protective equipment consistent with risk of secondary contamination (Section III, p.18, and Table 5, p.23).

2. Evaluate and support ABCs (airway, breathing and circulation). Re-evaluate airway, intubate the trachea if victim has developed severe respiratory distress. Administer supplemental high-flow oxygen by mask. Attach cardiac monitor.

3. Checking the color of a recently voided urine specimen may be useful for screening in a mass casualty incident involving exposure to arsine. With massive hemolysis the urine may appear dark orange, red or brown. However, be aware that signs of hemolysis may be delayed for several hours after exposure.

4. If the urine is grossly dark brown, suggesting hemolysis, then administer IV (normal saline) fluid bolus, 500-1000 cc, en route to hospital.

5. Continue to flush affected skin and eyes with copious water or saline. Remove contact lenses and irrigate eyes with saline via plain Iv tubing, for at least 10-15 minutes or until symptoms of pain or irritation have resolved.

MANAGEMENT IN THE HOSPITAL:

1. If victim is NOT decontaminated and responder is properly trained, don appropriate agent-specific protective equipment and self-contained breathing apparatus. Activate basic decontamination protocol (see Section Iv, p.20). If these requirements cannot be met, request assistance from the local hazmat team or your Regional Poison Control Center.

   If victim is decontaminated, don appropriate protective equipment consistent with risk of secondary contamination (Section III, and Table 7, p.32).

2. Evaluate and support ABCs (airway, breathing, and circulation).

3. Provide 02 by mask.

4. Monitor cardiac rhythm; obtain l2-lead EKG.

5. Laboratory Tests: Perform urine dipstick for occult blood and hemoglobin. Send for CBC, plasma free hemoglobin PFHgb), urine hemoglobin, platelets, electrolytes, BUN and/or creatinine, bilirubin, blood type and screen, and other laboratory tests as appropriate. Urinary arsenic levels may be elevated for a few weeks after exposure.

6. If there is evidence of acute hemolysis, alkalinize urine with sodium bicarbonate, 50-100 mEq added to 1 (one) liter of 5% dextrose administered IV at a rate to maintain urine output at 2-3 cc/kg/hr. Consider furosemide or mannitol. Follow electrolytes. Follow BUN, creatinine and fluid status closely because renal failure may result in acute fluid overload.

7. If PFHgb exceeds *1.5* gm/dl, there has been a significant rapid drop in hematocrit (e.g., from40 to 30 without other explanation) or there are other indications of intravascular hemolysis (severe abdominal pain, jaundice, shock), consider exchange transfusion after consultation with a medical toxicologist. Prepare for dialysis in the event of renal failure. Shock may occur and should be treated appropriately.

NOTE: BAL and other chelating agents are not effective for arsine exposure. Arsine does not produce the classical symptoms of arsenic poisoning.

FOR ADVICE ON CLINICAL MANAGEMENT, CALL YOUR
REGIONAL POISON CONTROL CENTER AT:
(___) ___-____

Date Revised: 3/13/89

ASBESTOS

FORMS:

Dust and Microscopic fibers.

BACKGROUND:

Asbestos is the name for a group of naturally occurring silicate fibers used in a variety of products such as heat resistant materials, construction materials, insulation, and brake pad linings. Inhalation of asbestos does not produce acute illness, but chronic exposure may lead to chronic lung disease, lung cancer, and other cancers, especially in smokers. The fibers that cause lung disease are microscopic. The most common hazmat circumstances resulting in asbestos exposure in fire fighters is during "overhaul" after a structural fire. A single exposure to a small amount of airborne asbestos is not likely to result in acute or chronic disease. As with any dust, asbestos may cause transient airway irritation which may require medical evaluation. The asymptomatic patient does not require emergency department evaluation.

POTENTIAL FOR SECONDARY CONTAMINATION:

The potential for secondary contamination depends on the circumstances. If the material is wetted down by flushing with water, and grossly contaminated clothing is removed, there is very little risk of secondary contamination. Even wetting down dusted clothing without removing it limits the air dispersion of asbestos fibers.

PATIENT MANAGEMENT IN THE HOT ZONE/ DECON AREA:

1. Rescuers should don agent-specific protective clothing, gloves, and mask.

2. Quickly evaluate and support ABCs. Stabilize the spine (if trauma suspected), establish airway and breathing, and consider high flow supplemental oxygen by bag valve mask with reservoir device or manually triggered oxygen powered breathing device, if possible and practical.

3. Flush the victim with water spray if visible contamination has occurred. Remove contact lenses and irrigate exposed eyes if symptomatic.

PREHOSPITAL MANAGEMENT AFTER INITIAL DECONTAMINATION:

1. If victim is NOT decontaminated and responder is properly trained, don appropriate agent-specific protective equipment and mask. Activate basic decontamination protocol (see Section Iv, p.20).

If these requirements cannot be met, request assistance from the local hazmat team or your Regional Poison Control Center.

If victim is decontaminated, don appropriate protective equipment consistent with risk of secondary contamination (Section III, p.18, and Table 5, p.23).

2. Evaluate and support ABCs (airway, breathing and circulation). As with any other dust, asbestos may irritate the airways. If so, re-evaluate the airway and need for assisted ventilation. Administer supplemental oxygen.

3. Aerosolized bronchodilators (such as metaproterenol) may be helpful for victims with wheezing.

4. Continue to flush affected skin and eyes with copious water or saline. Remove contact lenses and irrigate eyes with saline via plain Iv tubing, for at least 10-15 minutes or until symptoms of pain or irritation have resolved.

5. Victims who are asymptomatic do not require further evaluation. However, those with persistent cough or wheezing should receive medical attention.

MANAGEMENT IN THE HOSPITAL:

1. If victim is NOT decontaminated and responder is properly trained, don appropriate agent-specific protective equipment and mask. Activate basic decontamination protocol (see Section Iv, p.20). If these requirements cannot be met, request assistance from the local hazmat team or your Regional Poison Control Center.

   If victim is decontaminated, don appropriate protective equipment consistent with risk of secondary contamination (Section III, and Table 7, p.32).

2. Evaluate and support ABCs (airway, breathing, and circulation).

3. In patients with persistent wheezing, administer aerosolized bronchodilators (such as metaproterenol). Obtain arterial blood gases and chest x-ray.

FOR ADVICE ON CLINICAL MANAGEMENT, CALL YOUR
REGIONAL POISON CONTROL CENTER AT:
(___) ___-____

Date Revised: 7/31/90

CARBON MONOXIDE

FORMS:

Gas.

BACKGROUND:

Carbon monoxide (CO) is a colorless, odorless gas. It is a common product of combustion of any organic material and is a major toxic component in cases of smoke inhalation. Carbon monoxide causes poisoning by interfering with the binding of oxygen to hemoglobin in the blood, myoglobin in heart and muscle tissue, and possibly by interfering with oxygen utilization in the cell. Symptoms of progressively worse exposure include, in order, headache, dizziness, giddiness, tinnitus, nausea, muscle weakness, chest pain, dyspnea, syncope, seizures, and coma. Cherry-red skin coloration is not commonly seen (except post-mortem) and should not be relied upon for diagnosis. The half-life of CO in the blood is from 5 to 9 hours when the victim is breathing room air, compared to 60-90 minutes when breathing 100% oxygen.

POTENTIAL FOR SECONDARY CONTAMINATION:

Very small amounts of CO can be trapped in a victim's clothing after an overwhelming exposure, but are not sufficient to create a hazard for health care personnel away from the scene. Decontamination is not required.

PATIENT MANAGEMENT IN THE HOT ZONE/ DECON AREA:

1. Rescuers should don agent-specific protective clothing and gloves, and self-contained breathing apparatus. Skin protection is not necessary. If only CO poisoning is involved, no decontamination is required.

2. Quickly evaluate ABCs, spine stabilization (if trauma suspected), establish airway and breathing, and administer 100% oxygen by tight-fitting mask, preferably with oxygen reservoir (non-rebreather).

PREHOSPITAL MANAGEMENT AFTER INITIAL DECONTAMINATION:

1. If victim is NOT decontaminated and responder is properly trained, don appropriate agent-specific protective equipment and self-contained breathing apparatus. Activate basic decontamination protocol (see Section IV, p.20). If these requirements cannot be met, request assistance from the local hazmat team or your Regional Poison Control Center.

If victim is decontaminated, don appropriate protective equipment consistent with risk of secondary contamination (Section III, p.18, and Table 5, p.23).

2. Evaluate and support ABCs (airway, breathing and circulation). Re-evaluate airway, intubate the trachea if victim is unconscious or has developed severe respiratory distress. Administer 100% oxygen by tight-fitting mask. Attach cardiac monitor.

3. Support BP, if needed, with IV crystalloid solutions and/or dopamine.

4. Continue to flush affected skin and eyes with copious water or saline. Remove contact lenses and irrigate eyes with saline via plain IV tubing, for at least 10-15 minutes or until symptoms of pain or irritation have resolved.

MANAGEMENT IN THE HOSPITAL:

1. If victim is NOT decontaminated and responder is properly trained, don appropriate agent-specific protective equipment and self-contained breathing apparatus. Activate basic decontamination protocol (see Section IV, p.20). If these requirements cannot be met, request assistance from the local hazmat team or your Regional Poison Control Center.

   If victim is decontaminated, don appropriate protective equipment consistent with risk of secondary contamination (Section m, and Table 7, p.32).

2. Evaluate and support ABCs (airway, breathing, and circulation).

3. Provide 100% 0_2 by a tight-fitting mask or endotracheal tube, preferably with oxygen reservoir.

4. Monitor cardiac rhythm, and obtain l2-lead EKG. Watch for is chemic changes.

5. Laboratory tests - Send for carboxyhemoglobin level (COHb), arterial blood gases, Hct, electrolytes, and other tests as appropriate. Pulse oximetry is not reliable and may indicate falsely normal oxygen saturation.

6. Treat cerebral edema with fluid restriction, hyperventilation, and/or mannitol.

7. Admit to the hospital if any of the following are present:

   a. Mental status changes are present or were present.

   b. COHb > 25%.

C. COHb > 15% in a patient with coronary disease, or current symptoms suggestive of coronary disease.

d. Any EKG change thought to be acute, particularly ST segment depression, regardless of COHb level.

e. Metabolic acidosis or disordered thermoregulation.

f. Patient is pregnant and symptomatic or has COHb > 10%.

NOTE: Cherry red color is usually a post-mortem finding and should not be relied on for diagnosis.

8. A hyperbaric chamber may be helpful if the CO.Hb level is > 40%, the patient has an altered level of consciousness, or the patient does not rapidly respond to 100% 0_2. Consultation with a medical toxicologist is advised. Speed in instituting therapy is very important, and anticipation of hyperbaric oxygen treatment should not delay intubation and the delivery of 100% 02. The use of HBO is controversial and the risk of complications during transport may outweigh the benefits if the chamber is not near by.

FOR ADVICE ON CLINICAL MANAGEMENT, CALL YOUR
REGIONAL POISON CONTROL CENTER AT:
(___) ___-____

Date Revised: 7/31/90

CHLORINE GAS

FORMS:

Gas (anhydrous) or liquid (aqueous chlorine usually in the form of hypochlorite, variable concentrations). The liquid hypochlorite solutions are very unstable and react with acids to release chlorine gas.

NOTE: Liquified compressed gas may produce cryogenic (freezing) hazard as it is released into the atmosphere.

BACKGROUND:

Chlorine is a highly irritating gas which rapidly forms hydrochloric acid after contact with moist mucous membranes in the upper airway and in the lungs. Symptoms occur rapidly and provide good warning properties for exposure. Low concentrations produce eye, nose and throat irritation. Higher concentrations produce cough, wheezing, choking, chemical pneumonitis, or pulmonary edema. Ingestion of concentrated hypochlorite solutions can cause serious corrosive esophageal or stomach injury.

POTENTIAL FOR SECONDARY CONTAMINATION:

Small amounts of chlorine gas can be trapped in clothing after an overwhelming exposure but are not usually sufficient to create a hazard for health care personnel away from the scene. However, clothing which has become soaked with concentrated hypochlorite solution may be corrosive to rescuers and may off-gas chlorine. Once the victim has been stripped and flushed with water, there is no significant risk of secondary contamination. Decontamination is not necessary after simple inhalation exposure.

PATIENT MANAGEMENT IN THE HOT ZONE/ DECON AREA:

1. Rescuers should don agent-specific protective clothing and gloves, and self-contained breathing apparatus.

   Ambulatory patients should be instructed to remove themselves from the hot zone and to decontaminate themselves under the direction of the decontamination supervisor.

2. Quickly evaluate and support ABCs. Stabilize the spine (if trauma suspected), establish airway and breathing, and consider high flow supplemental oxygen by bag valve mask with reservoir, if possible and practical.

3 If clothing has been soaked by hypochlorite solution, remove and double-bag. Flush skin with water spray for 1 - 2 minutes. Remove contact lenses and irrigate exposed eyes if symptomatic.

PREHOSPITAL MANAGEMENT AFTER INITIAL DECONTAMINATION:

1. If victim is NOT decontaminated and responder is properly trained, don appropriate agent-specific protective equipment and self-contained breathing apparatus. Activate basic decontamination protocol (see Section IV, p.20). If these requirements cannot be met, request assistance from the local hazmat team or your Regional Poison Control Center.

   If victim is decontaminated, don appropriate protective equipment consistent with risk of secondary contamination (Section III, p. 18, and Table 5, p.23).

2. Evaluate and support ABCs (airway, breathing, and circulation). Re-evaluate airway, intubating the trachea if victim has developed severe respiratory distress due to upper airway swelling or pulmonary edema. Continue to provide high-flow oxygen by mask. Attach cardiac monitor.

3. Aerosolized bronchodilators (e.g., metaproterenol) may be helpful for victims with wheezing.

4. Continue to flush affected skin and eyes with copious water or saline. Remove contact lenses and irrigate eyes with saline via plain IV tubing, for at least 10-30 minutes or until symptoms of pain or irrigation have resolved.

5. Victims with minimal or quickly resolving symptoms probably do not require immediate evaluation in the emergency department. Those with persistent cough, wheezing, or altered mental status should receive urgent medical evaluation.

6. Ingestion: DO NOT induce vomiting. Immediately dilute with I glass of water or milk.

MANAGEMENT IN THE HOSPITAL:

1. If victim is **NOT** decontaminated and responder is properly trained. don appropriate agent-specific protective equipment and self-contained breathing apparatus. Activate basic decontamination protocol (see Section IV, p.20). If these requirements cannot be met, request assistance from the local hazmat team or your Regional Poison Control Center.

   If victim is decontaminated, don appropriate protective equipment consistent with risk of secondary contamination (Section III, and Table 7, p.32).

2. Evaluate and support ABCs (airway, breathing, and circulation).

3. Provide 0_2 by mask. Intubation may be required for severe respiratory distress.

4. If the patient complains of eye irritation, check for the presence of contact lenses and remove, then irrigate eyes copiously with saline via plain Iv tubing for at least 10-15 minutes, or until symptoms of pain or irritation have resolved. Consider fluorescein or slit-lamp examination to rule out corneal injury.

5. Monitor cardiac rhythm if clinically indicated.

6. Obtain chest x-ray, arterial blood gases. Obtain other laboratory tests as appropriate.

7. Observe 6-12 hours for delayed onset pulmonary edema for symptomatic patients.

8. Advise that full recovery is generally expected, but may take several months. Cases of chronic airways disease have been reported following severe exposure.

FOR ADVICE ON CLINICAL MANAGEMENT, CALL YOUR
REGIONAL POISON CONTROL CENTER AT:
(___) ___-____

Date Revised: 7/31/90

CYANIDE

FORMS:

Gas (hydrogen cyanide), liquid (solutions of cyanide salts), and solid (cyanide salts). Hydrogen cyanide gas may be formed when acid is added to a cyanide salt or a nitrile.

BACKGROUND:

Cyanide (CN) is an extremely toxic compound which is widely used in industry in a variety of forms (gas, liquid, solid). CN gas (HCN) is a major toxic component in cases of smoke inhalation. CN produces toxicity by interfering with cellular oxygen utilization. Symptoms and signs include headache, dizziness, vomiting, tachypnea, tachycardia, and coma. There may be a distinctive odor ("bitter almonds") on the victim's clothing or breath. Death can occur within minutes of exposure. If exposure is by inhalation of CN gas, peak toxic effects are seen within minutes, but after ingestion of a CN salt, effects may be delayed until the CN is absorbed from the stomach.

POTENTIAL FOR SECONDARY CONTAMINATION:

If the exposure was by inhalation of HCN gas, even though there may be small amounts of gas trapped in clothing after an overwhelming exposure, this is not usually sufficient to create a hazard for health care personnel away from the scene. The risk of secondary contamination to rescuers is greater if there are large amounts of liquid or solid material on the victim's clothing or skin.

PATIENT MANAGEMENT IN THE HOT ZONE/ DECON AREA:

1. Rescuers should don agent-specific protective clothing and gloves, and self-contained breathing apparatus.

   Ambulatory patients should be instructed to remove themselves from the hot zone and to decontaminate themselves under the direction of the decontamination supervisor.

2. Quickly evaluate and support ABCs. Stabilize the spine (if trauma suspected), establish airway and breathing, and consider high flow supplemental oxygen by bag valve mask with reservoir, if possible and practical.

3. If clothing has been soaked by solid or liquid CN-containing material, remove and double-bag clothing. Flush skin with water spray for 1-2 minutes. Remove contact lenses and irrigate exposed eyes if symptomatic.

CYANIDE

PREHOSPITAL MANAGEMENT AFTER INITIAL DECONTAMINATION:

1. If victim is NOT decontaminated and responder is properly trained, don appropriate agent-specific protective equipment and self-contained breathing apparatus. Activate basic decontamination protocol (see Section Iv, p.20). If these requirements cannot be met, request assistance from the local hazmat team or your Regional Poison Control Center.

   If victim is decontaminated, don appropriate protective equipment consistent with risk of secondary contamination (Section III, p.18, and Table 5, p.23).

2. Evaluate and support ABCs (airway, breathing, and circulation). Re-evaluate airway, intubating the trachea if victim is unconscious or has developed severe respiratory distress. Continue to provide high-flow oxygen by mask. Attach cardiac monitor.

3. Consider use of sodium thiosulfate IV. *This is not within current California EMT-II or EMT-P scope of practice.*

4. Ingestion: If available, administer activated charcoal 60-100 gm orally. Immediate induction of emesis with ipecac is probably not as effective.

5. Continue to flush affected skin and eyes with copious water or saline. Remove contact lenses and irrigate eyes with saline via plain IV tubing, for at least 10-15 minutes or until symptoms of pain or irrigation have resolved.

MANAGEMENT IN THE HOSPITAL:

1. If victim is NOT decontaminated and responder is properly trained, don appropriate agent-specific protective equipment and self-contained breathing apparatus. Of note, liquid chlorine bleach will decontaminate contaminated equipment and should be used when laundering contaminated clothing. Activate basic decontamination protocol (see Section IV, p.20). If these requirements cannot be met, request assistance from the local hazmat team or your Regional Poison Control Center.

   If victim is decontaminated, don appropriate protective equipment consistent with risk of secondary contamination (Section III, and Table 7, p.32).

2. Evaluate and support ABCs (airway, breathing, and circulation).

3. Administer 0_2 by mask or endotracheal tube. Reducing the potential for chemical exposure from any form of mouth-to-mouth resuscitation, including use of pocket one-way valve mouth-to-mouth resuscitation, should be carefully considered.

4. Monitor cardiac rhythm, and obtain l2-lead EKG.

5. Laboratory Tests: Serum thiocyanate, blood cyanide, CBC, electrolytes, arterial blood gases, lactate, and other laboratory tests as appropriate. **Appropriate treatment should not be delayed in test results.**

6. Respiratory Exposure: If the patient arrives asymptomatic, probably no treatment will be needed. If the patient is ill, begin (7) below.

Ingestion or Skin Contact: ER staff should be ready to initiate therapy immediately, regardless of the presence of symptoms on arrival. Be prepared to intubate quickly.

7. In the symptomatic patient with a significant exposure, administer treatment in the following order (use Cyanide Antidote Kit):

a. Amyl nitrite-break pearls into gauze sponge and hold under patient's nose or Ambu intake valve for 15 to 30 seconds/minute, until sodium nitrite solution is ready.

b. Sodium nitrite ($NaNO_2$) 3% IV solution:

Adults: 10 ml at 2.5 to 5 ml/minute, or 0.35 ml/kg.

Children: 0.2 ml/kg, not to exceed 10 ml.

c. Through the same IV line in (13) above, give sodium thiosulfate ($Na_2S_2O_3$),25%.

Adults: 12.5 gm *(50* cc of *25%* solution).

Children: 1.6 to 1.8 ml/kg of a 25% solution, up to 50 cc.

d. Repeat antidote at 50% of initial dose if symptoms persist after 20 minutes. If symptoms worsen after treatment, consider nitrite toxicity causing methemoglobinemia greater than 25%, up to 50 cc.

WARNING: Methemoglobinemia may be particularly dangerous in children. Also, be extremely cautious in treating with nitrite if there has also been carbon monoxide exposure. The same dose of nitrites can cause excessive methemoglobinemia. Normal therapeutic amounts of methemoglobinemia in the face of carbon monoxide poisoning can be a problem and should be closely watched.

8. If ingestion is suspected, perform gastric lavage and administer activated charcoal.

9. Admit and observe 2448 hours. Watch for metabolic acidosis; treat with sodium bicarbonate if needed. Watch for hypotension; treat with fluid and pressors if needed. Hyperbaric oxygen may be helpful in displacing cyanide ion from cellular enzymes.

10. Hyperbaric oxygen may be indicated for victims of smoke inhalation who have had both cyanide and carbon monoxide exposures and who do not respond to treatment.

FOR ADVICE ON CLINICAL MANAGEMENT, CALL YOUR
REGIONAL POISON CONTROL CENTER AT:
(___) ___-____

Date Revised: 7/31/90

ETHYLENE OXIDE (ETO, EO)

FORMS:

Liquid and gas. Used to produce ethylene glycol for anti-freeze products; sterilize food; fumigate books, dental, pharmaceutical, medical and scientific equipment and supplies; and, in health care facilities, to gas sterilize equipment.

ETO in its pure form is extremely flammable, explosive and toxic. Inhalation or direct contact by dermal exposure should be avoided. ETO is a colorless gas with an ether-like (sweetish) odor that is readily detected at first; however, continued exposure results in olfactory fatigue.

BACKGROUND:

ETO in a gaseous form can enter the body through the lungs, skin or eyes. Short-term exposure can cause irritation to eyes, nose, throat and lungs. Even brief skin contact with liquid ETO can cause edema and erythema with progression to blister formation in 6-12 hours.

Acute exposure to several hundred ppm can lead to nausea, vomiting, olfactory fatigue, nervous system injury and respiratory distress. Prolonged breathing of these high concentrations can cause dizziness, weakness, chest pain and pulmonary edema. Symptoms after mild exposure usually clear within a few hours. However, onset of pulmonary edema may be delayed up to 24 hours. Symptoms usually clear without residual within hours after termination of exposure. The material is a known sensitizer and has produced allergic and anaphylactic reactions. Peripheral neuropathy has been infrequently observed.

Cancer and adverse reproductive effects, including spontaneous abortions among female hospital workers, have been reported in various studies but long-term effects are not completely known.

POTENTIAL FOR SECONDARY CONTAMINATION:

Following inhalation exposure to ETO gas **ONLY**, the potential for secondary contamination is low and decontamination is not required. Liquid formulations of ETO may be absorbed by clothing, shoes, and boots from which it can off-gas. Remove and air out grossly contaminated clothing, shoes and boots.

PATIENT MANAGEMENT IN THE HOT ZONE/ DECON AREA:

1. Rescuers should don agent-specific protective clothing and gloves, and self-contained breathing apparatus.

   Ambulatory patients should be instructed to remove themselves from the hot zone and to decontaminate themselves under the direction of the decontamination supervisor.

2. Quickly evaluate and support ABCs. Stabilize the spine (if trauma suspected), establish airway and breathing, and consider high flow supplemental oxygen by bag valve mask with reservoir, if possible and practical.

3. Remove exposed individual from source of contamination. Remove grossly contaminated clothing, shoes and boots and air out. Flush the skin with water spray vigorously for at least 15 minutes. Remove contact lenses and irrigate exposed eyes if symptomatic.

PREHOSPITAL MANAGEMENT AFTER INITIAL DECONTAMINATION:

1. If victim is NOT decontaminated and responder is properly trained, don appropriate agent-specific protective equipment and self-contained breathing apparatus. Activate basic decontamination protocol (see Section Iv, p.20). If these requirements cannot be met, request assistance from the local hazmat team or your Regional Poison Control Center.

   If victim is decontaminated, don appropriate protective equipment consistent with risk of secondary contamination (Section III, p.18, and Table 5, p.23).

2. Evaluate and support ABCs (airway, breathing, and circulation). Quickly establish airway, and stabilize C-spine if trauma if suspected. Administer supplemental oxygen as soon as it is practical.

3. Give bronchodilators if significant wheezing is present.

4. Continue to flush affected skin and eyes with copious water or saline. Remove contact lenses and irrigate eyes with saline via plain Iv tubing, for at least 10-15 minutes or until symptoms of pain or irrigation have resolved.

5. Victims with minimal or quickly evolving symptoms may not require hospital emergency department evaluation.

MANAGEMENT IN THE HOSPITAL:

1. If victim is NOT decontaminated and responder is properly trained, don appropriate agent-specific protective equipment and self-contained breathing apparatus. Activate basic decontamination protocol (see Section IV, p.20). If these requirements cannot be met, request assistance from the local hazmat team or your Regional Poison Control Center.

   If victim is decontaminated, don appropriate protective equipment consistent with risk of secondary contamination (Section III, and Table 7, p.32).

2. Evaluate and support ABCs. Provide supplemental oxygen as needed. Administer aerosolized bronchodilators for wheezing.

3. Arterial blood gases, chest x-ray, and pulmonary function studies may be helpful to assess patient's pulmonary status.

4. If the patient complains of eye irritation, check for the presence of contact lenses and remove, then irrigate eyes copiously with saline via plain IV tubing for at least 10-15 minutes, or until symptoms of pain or irritation have resolved. Consider fluorescein or slit-lamp examination to rule out corneal injury.

5. Clinical decisions about period of observation should be guided by exposure history and presenting signs and symptoms. Experience has shown that most victims with exposure to 12% ETO in Freon (a common mixture for gas sterilization equipment) do not develop pulmonary problems. If after 4-6 hours the patient remains a symptomatic and baseline pulmonary studies are normal, the likelihood of sudden pulmonary edema is very low. On the other hand, victims with significant exposure who ar symptomatic should be admitted and observed for pulmonary edema which may have a delayed onset of up to 24 hours.

FOR ADVICE ON CLINICAL MANAGEMENT, CALL YOUR
REGIONAL POISON CONTROL CENTER AT:
(___) ___-____

Date Revised 7/31/90

FORMALDEHYDE

FORMS:

Formaldehyde is a gas. Formalin is an aqueous solution, usually about 35% formaldehyde, that may also contain 5-15% methanol.

BACKGROUND:

Formaldehyde is a gas with a pungent odor used widely in paper processing, wood products, urea-form insulation, carpeting, furniture, and fabrics. It is a highly water soluble gas with toxicity beginning at very low levels of exposure. Inhalation of high concentrations can cause severe coughing, wheezing, and non-cardiogenic pulmonary edema. Skin and eye irritation may occur, and direct contact with concentrated aqueous solutions can cause burns.

Ingestion of formalin may cause corrosive injury of the esophagus and stomach, and absorption of the formaldehyde and methanol can cause metabolic acidosis and blindness due to metabolism to formic acid.

Formaldehyde is a known animal and suspected human carcinogen.

POTENTIAL FOR SECONDARY CONTAMINATION:

Victims who have inhaled formaldehyde gas are not contaminating to others and do not require decontamination. Victims whose clothing or skin is soaked with formalin solution may off-gas formalin and methanol, but once the clothing has been removed and the skin flushed with water, there is no significant risk of secondary contamination of rescuers outside of the hot zone, even if the characteristic residual odor of formaldehyde is still detectable.

PATIENT MANAGEMENT IN THE HOT ZONE/ DECON AREA:

1. Rescuers should don agent-specific protective clothing and gloves, and self-contained breathing apparatus.

   Ambulatory patients should be instructed to remove themselves from the hot zone and to decontaminate themselves under the direction of the decontamination supervisor.

2. Quickly evaluate and support ABCs. Stabilize the spine (if trauma suspected), establish airway and breathing, and consider high flow supplemental oxygen by bag valve mask with reservoir, if possible and practical.

3. If the victim has been soaked by formalin solution, remove and double bag clothing and flush skin for 1-2 minutes. Remove contact lenses and irrigate exposed eyes if symptomatic.

PREHOSPITAL MANAGEMENT AFTER INITIAL DECONTAMINATION:

1. If victim is NOT decontaminated and responder is properly trained, don appropriate agent-specific protective equipment and self-contained breathing apparatus. Activate basic decontamination protocol (see Section IV, p.20). If these requirements cannot be met, request assistance from the local hazmat team or your Regional Poison Control Center.

   If victim is decontaminated, don appropriate protective equipment consistent with risk of secondary contamination (Section III, p.18, and Table 5, p.23).

2. Evaluate and support ABCs (airway, breathing, and circulation). Reevaluate the airway, intubating the trachea if victim has developed severe respiratory distress due to upper airway swelling or pulmonary edema. Continue to provide supplemental oxygen. Attach cardiac monitor.

3. Aerosolized bronchodilators (e.g., metaproterenol) may be helpful for victims with wheezing.

4. Continue to flush affected skin and eyes with copious water or saline. Remove contact lenses and irrigate eyes with saline via plain IV tubing, for at least 10-15 minutes or until symptoms of pain or irrigation have resolved.

5. Victims with minimal or quickly resolving symptoms of eye and throat irritation do not require immediate evaluation in the emergency department. Those with persistent cough, wheezing, or altered mental status should receive urgent medical evaluation.

6. Ingestion: DO NOT induce vomiting. Immediately dilute with 1 glass of water or milk.

MANAGEMENT IN THE HOSPITAL:

1. If victim is NOT decontaminated and responder is properly trained, don appropriate agent-specific protective equipment and self-contained breathing apparatus. Activate basic decontamination protocol (see Section IV, p.20). If these requirements cannot be met, request assistance from the local hazmat team or your Regional Poison Control Center.

   If victim is decontaminated, don appropriate protective equipment consistent with risk of secondary contamination (Section III, and Table 7, p.32).

2. Evaluate and support ABCs (airway, breathing, and circulation).

3. Obtain arterial blood gases, chest x-ray, and electrocardiogram in seriously symptomatic patients.

4. Provide supplemental oxygen. Intubation and assisted ventilation may be required for severe pulmonary edema or if the patient is comatose or convulsing. Pulmonary edema may be delayed for up to 6-12 hours, so patients with serious exposures should have prolonged observation.

5. Skin and eye exposures: Irrigate exposed skin if not already performed. If the patient complains of eye irritation, check for the presence of contact lenses and remove, then irrigate eyes copiously with saline via plain IV tubing for at least 10-15 minutes, or until symptoms of pain or irritation have resolved. Consider fluorescein or slit-lamp examination to rule out corneal injury.

6. Formalin ingestion: Dilute with oral water or milk. Perform cautious gastric lavage using a small flexible gastric tube. If corrosive injury to GI tract is suspected, obtain consultation with gastroenterologist or surgeon for possible endoscopy. Also, obtain serum methanol, osmolar gap, and (if available) formate levels to evaluate possible systemic poisoning. Consult with a poison control center.

FOR ADVICE ON CLINICAL MANAGEMENT, CALL YOUR
REGIONAL POISON CONTROL CENTER AT:
(___) ___-____

Date Revised: 07/31/90

HALOGENATED HYDROCARBON SOLVENTS, INCLUDING CHLORINATED SOLVENTS, DEGREASERS, PAINT STRIPPERS, AND CHLOROFLUOROCARBONS

FORMS:

Most halogenated hydrocarbon solvents are liquid at room temperature. Gas (vapor) can be released from open containers or spilled material, and especially from solvents that have a high vapor pressure.

Halogenated hydrocarbon solvents are widely used in industry because, for the most part, they present a reduced risk of fire or explosion when compared to other commonly available solvents. However, when exposed to heat or fire, they can break down into irritant gases, including hydrochloric acid, hydrofluoric acid, or phosgene.

BACKGROUND:

These substances are commonly used in industry for cleaning and degreasing electronic parts or metal or other surfaces, for dry cleaning, and for refrigeration. Among the halogenated hydrocarbon solvents are trichloroethylene, perchloroethylene ("perc"), methylene chloride (dichloromethane), 1,1,1-trichloromethane (methyl chloroform), Freons, Halons and other chlorofluorocarbons. Methylene chloride deserves special attention because it is metabolized to carbon monoxide and is corrosive to skin and mucous membranes. Odor varies by compound and in general is not a good warning property.

These solvents are well absorbed through skin or the lungs. They tend to be excreted rapidly, largely through exhalation, usually within a period of 15 minutes to a few hours. Acute high level exposures can produce slight to moderate skin or mucous membrane irritation, and narcosis (a sensation of giddiness or disorientation which, if extremely pronounced, may lead to unconsciousness and/or respiratory depression). Sensitization of the myocardium following high-level exposures may result in cardiac arrhythmias. Liver and kidney injury may also occur. Lower levels of exposure are not typically very dangerous but may cause headache, nausea, and dizziness. A significant concern for many of these agents is their high vapor pressure which, in confined or poorly ventilated spaces, can displace oxygen resulting in life threatening hypoxemia.

Solvents may be absorbed by ingestion with symptoms similar to those associated with inhalation. Aspiration into the lungs may cause severe chemical pneumonitis. These patients usually have coughing, tachypnea and other symptoms of respiratory distress.

Exposures limited to brief skin contact do not produce a significant acute health risk although most of these agents can cause a defatting effect on the skin and some (e.g., methylene chloride) can cause severe dermatitis. Some of the chlorinated solvents are known or suspected carcinogens.

HALOGENATED HYDROCARBON SOLVENTS, INCLUDING CHLORINATED SOLVENTS, DEGREASERS, PAINT STRIPPERS, AND CHLOROFLUOROCARB ONS

POTENTIAL FOR SECONDARY CONTAMINATION:

If the victim was exposed only to solvent vapors, there is no risk of secondary contamination and decontamination is not necessary. On the other hand, if the victim's clothing, skin or hair is soaked with solvent, rescuers can be contaminated by direct contact or, more importantly, by inhalation of off-gassing vapors. Rescuers should avoid skin contact with these solvents or respiratory exposure in a poorly ventilated area. Decontaminated victims exhaling these products through the lungs could produce transient minor symptoms in transporting personnel.

PATIENT MANAGEMENT IN THE HOT ZONE/ DECON AREA:

1. Rescuers should carefully evaluate risks. If appropriate, rescuers should don agent-specific protective clothing and gloves, and self-contained breathing apparatus.

   Ambulatory patients should be instructed to remove themselves from the hot zone and to decontaminate themselves under the direction of the decontamination supervisor.

2. Quickly evaluate and support ABCs. Stabilize the spine (if trauma suspected), establish airway and breathing, and consider high flow supplemental oxygen by bag valve mask with reservoir if possible and practical.

   Note: Solvent exposure alone is rarely the cause of loss of consciousness, except in cases of cardiac arrythmia or in cases of overwhelming exposure in a confined space.

3. If the victim's skin is grossly contaminated with liquid material, remove and double-bag soaked clothing and flush skin with water spray for 1 - 2 minutes. Remove contact lenses and irrigate exposed eyes if symptomatic.

PREHOSPITAL MANAGEMENT AFTER INITIAL DECONTAMINATION:

1. If victim is **NOT** decontaminated and if liquid contaminant is present, responder is properly trained, don appropriate agent-specific protective equipment and self-contained breathing apparatus. Activate basic decontamination protocol (see Section IV, p. 20). If these requirements cannot be met, request assistance from the local hazmat team or your Regional Poison Control Center.

   If victim is decontaminated, don appropriate protective equipment consistent with risk of secondary contamination (Section III, p.18, and Table 5, p.23).

2. Evaluate and support ABCs (airway, breathing, and circulation). Reevaluate and manage airway. Continue to provide high-flow oxygen until respiratory distress and/or altered consciousness subside. Monitor cardiac rhythm. Be alert for cardiac arrhythmias.

   Note: Solvent exposure alone is rarely the cause of loss of consciousness, except in cases of cardiac arrythmia or in cases of overwhelming exposure in a confined space.

3. Provide high flow oxygen. Avoid epinephrine, bronchodilators, terbutaline, and other betaadrenergic agents, if possible, because they may induce fatal arrhythmias in the myocardium sensitized by halogenated hydrocarbons.

4. If the patient complains of eye irritation, check for the presence of contact lenses and remove, then irrigate eyes copiously with saline via plain IV tubing for at least 10-15 minutes, or until symptoms of pain or irritation have resolved. Consider fluorescein or slit-lamp examination to rule out corneal injury.

   If the patient complains of skin irritation, flush affected skin areas with copious amounts of water or saline for 15 minutes. Washing with soap and water may help to remove residual solvent.

5. Victims with minimal or quickly resolving symptoms probably do not require immediate evaluation in the emergency department.

6. **Ingestion: DO NOT induce vomiting.** Immediately dilute with 1 glass of water and give activated charcoal if available.

MANAGEMENT IN THE HOSPITAL:

The principal risks for severely exposed patients are coma and cardiac arrhythmias (following inhalation or ingestion), and chemical pneumonitis due to solvent aspiration following ingestion. Arrhythmias may be delayed for up to 12 to 24 hours after exposure. However, these risks are appreciable only if the inhalation victim has initially displayed significant symptoms of dizziness, disorientation, or respiratory distress. Patients with significant methylene chloride exposure may develop carbon monoxide toxicity in addition to the other effects of the solvent.

1. If victim is NOT decontaminated and if liquid contaminant is present, and responder is properly trained, don appropriate agent-specific protective equipment and self-contained breathing apparatus. Activate basic decontamination protocol (see Section IV, p. 20). If these requirements cannot be met, request assistance from the local hazmat team or your Regional Poison Control Center.

If victim is decontaminated, don appropriate protective equipment consistent with risk of secondary contamination (Section III, p.18 and Table 7, p.32).

Some solvents may cause latex gloves to disintegrate. Chemically specific protective gloves should be worn. At a minimum, health care personnel should double glove and repeatedly check and change them, and wear goggles and gowns or other protective clothing until decontamination is completed.

2. Evaluate and support ABCs.

3. Administer oxygen by mask and maintain patient airway. Intubate and assist ventilation if necessary. Obtain arterial blood gases and chest x-ray if respiratory distress is present.

4. For patients with significant methylene chloride exposure and altered consciousness or severe respiratory distress, obtain a carboxyhemoglobin level. Administer 100% oxygen and refer to treatment protocol for carbon monoxide (see p. C. 1.1).

5. Monitor cardiac rhythm, obtain 12-lead EKG, watch for cardiac arrhythmias which may occur in the first 24 hours after significant exposure. Avoid epinephrine, bronchodilators, and other beta-adrenergic agents if possible, because of the risk of inducing arrhythmias.

6. Remove contact lenses and irrigate the eyes copiously with saline or water for at least 15 to 20 minutes if eye irritation is present. Examine eyes using a slit-lamp and/or fluorescein strips, if corneal injury is suspected.

7. If ingestion is suspected, particularly in the presence of altered consciousness perform gastric lavage after protecting the airway, and administer activated charcoal. Observe for at least 6 hours for onset of symptoms of pulmonary aspiration chemical pneumonia. If suspected, obtain chest x-ray and arterial blood gases.

8. Obtain routine laboratory baseline tests to include hepatic transaminase and kidney function tests.

9. If corrosive injury to the GI tract is suspected, obtain consultation with a gastroenterologist or surgeon for possible endoscopy.

HALOGENATED HYDROCARBON SOLVENTS, INCLUDING CHLORINATED SOLVENTS, DEGREASERS, PAINT STRIPPERS, AND CHLOROFLUOROCARBONS

10. Victims who have lost consciousness, or who may have ingested a quantity of solvent or who have an infiltrate on initial chest x-ray should be observed for at least 12 to 24 hours for aspiration pneumonia, and monitored for 24 hours for cardiac arrhythmias.

FOR ADVICE ON CLINICAL MANAGEMENT, CALL YOUR
REGIONAL POISON CONTROL CENTER AT:
(___) ___-____

Date Revised: 7/31/90

HYDROFLUORIC ACID

FORMS:

Gas, liquid (variable concentrations), and fluoride salts in the presence of acids may generate toxic quantities of hydrogen fluoride.

BACKGROUND;

Hydrofluoric acid (HF) produces toxicity quite distinct from other mineral acids. The “acid” moiety (hydrogen ion) is relatively unimportant, producing little burning sensation on initial contact. In contrast, the highly toxic fluoride ion has the ability to penetrate tissue and produce indolent ulceration or bony destruction. Solutions of greater than 10-20% are particularly destructive. Solutions of greater than 60% concentration can cause significant respiratory exposures. as well. Inhalation may cause eye, nose and~throat irritation, cough, tracheobronchitis, and delayed onset pulmonary edema. Ingestion may produce severe corrosive burns of the esophagus and stomach. Systemic absorption of fluoride (i.e., from a burn or after ingestion) may result in severe hypocalcemia, hypomagnesemia, and hyperkalemia, resulting in tetany and cardiac arrest.

POTENTIAL FOR SECONDARY CONTAMINATION:

Until the soaked clothing has been removed and the affected body part has been flushed, there is some hazard to treating health care personnel, depending on the concentration. Following basic decontamination, there is usually no significant risk of secondary contamination.

PATIENT MANAGEMENT IN THE HOT ZONE I DECON AREA:

1. Rescuers should don agent-specific protective clothing and gloves, and self-contained breathing apparatus.

   Ambulatory patients should be instructed to remove themselves from the hot zone and to decontaminate themselves under the direction of the decontamination supervisor.

2. Quickly evaluate and support ABCs. Stabilize the spine (if trauma suspected), establish airway and breathing, and consider high flow supplemental oxygen by bag valve mask with reservoir, if possible and practical.

3. Remove and double-hag clothing. Flush skin with water spray for I - 2 minutes with water spray. Remove contact lenses and irrigate exposed eyes if symptomatic.

HYDROFLUORIC ACID

PREHOSPITAL MANAGEMENT AFTER INITIAL DECONTAMINATION:

1. If victim is NOT decontaminated and responder is properly trained, don appropriate agent-specific protective equipment and self-contained breathing apparatus. Activate basic decontamination protocol (see Section IV, p.20). If these requirements cannot be met, request assistance from the local hazmat team or your Regional Poison Control Center.

   If victim is decontaminated, don appropriate protective equipment consistent with risk of secondary contamination (Section III, p.18, and Table 5, p.23).

   If available, magnesium sulfate solution (Epsom salt) or lime water (calcium hydroxide) are effective irrigating solutions. Also, magnesium-containing antacids such a Maalox (R) or Mylanta(R) can be applied topically.

2. Evaluate and support ABCs (airway, breathing, and circulation). Re-evaluate airway, intubating the trachea if victim is unconscious or has developed severe respiratory distress due to upper airway swelling or pulmonary edema. Continue to provide high-flow oxygen by mask. Attach cardiac monitor.

3. Provide continuous cardiac monitoring to look for QT interval prolongation which is an early sign of hypocalcemia.

   a. Treat tetany or cardiac arrest with IV 5 cc calcium chloride 10% (or 10 cc calcium gluconate 10%). *(Calcium gluconate is not within current California EMT-II or EMT-P scope of practice.)*

   b. Consider prophylactic calcium for victims with high concentration (10-20%) exposure to greater than 3-5% body surface area.

4. **Ingestion: DO NOT induce vomiting.** Immediately dilute with 1 glass of water or milk. If available, give magnesium or calcium-containing antacid (both will bind fluoride).

5. Continue to flush affected skin and eyes with copious water or saline. Remove contact lenses and irrigate eyes with saline via plain IV tubing, for at least 10-15 minutes or until symptoms of pain or irrigation have resolved.

MANAGEMENT IN THE HOSPITAL:

1. If victim is **NOT** decontaminated and responder is properly trained, don appropriate agent-specific protective equipment and self-contained breathing apparatus. Activate basic decontamination protocol (see Section IV, p.20). If these requirements cannot be met, request assistance from the local hazmat team or your Regional Poison Control Center.

HYDROFLUORIC ACID

If victim is decontaminated, don appropriate protective equipment consistent with risk of secondary contamination (Section m, p.18 and Table 7, p.32).

If not decontaminated before arrival, remove and double bag clothing; wash skin with soap and water. Continue to irrigate copiously. HF will continue to leach from exposed skin and tissues for at least 15 minutes.

2. Evaluate and support ABCs (airway, breathing, and circulation).

DILUTION IS BETTER THAN NEUTRALIZATION IN THE FIRST CRITICAL MINUTES!!

3. Evaluate the extent of skin exposure and following irrigation, administer additional treatment:

a. If the HF concentration was > 20% or is unknown or exposure was prolonged:

(1) Infiltrate affected area with 10% calcium gluconate, using a 25-30 gauge needle and multiple injections of *0.5* mi per square centimeter, taking care to prevent damaging underlying structures. Pain should resolve with the injection.

DO NOT USE calcium chloride, which is extremely painful and may further injure tissues.

(a) Repeat after several hours if pain recurs.

(b) Avoid local anesthetics, which may mask~clinical findings.

(c) Limit injection to 0.5 mi per phalanx.

(2) Remove blisters and debride underlying tissues, as these may contain HF.

(3) Remove nails if evidence of periungual or ungual tissue involvement. Use a regional anesthesia proximal to the site of injury.

b. If the HF concentration was < 20% and the duration of exposure was brief (less than a few minutes), administer calcium gluconate gel (2.5%) or 30% - 50% magnesium sulfate solution by massage or soaks to affected area for at least 30 minutes. This treatment binds HF as the insoluble CaF_2 or MgF_2 salts. If pain persists, go to step 3A. If more than an hour or two has elapsed since the time of initial decontamination topical soaks are not as effective.

c. For extremity burns where topical agents are ineffective in relieving pain or as alternative modality to fingernail removal, an intraarterial injection of calcium gluconate may be effective. Obtain consultation with a medical toxicologist.

4. Ingestion - treat as severely corrosive agent. Consider endoscopy to evaluate extent of damage. Consider lavage with calcium containing solution.

5. Additional steps for all patients:

   a. Admit to burn unit or intensive care unit if the total extent of the burn is greater than 2% - 3% BSA, or if there is significant respiratory distress.

   b. Observe for hypocalcemia, hypercalcemia, and other system effects if HF concentration was greater than 20% or if there was prolonged contact with a significant percent of BSA (2% to 3% or more).

   c. Provide continuous cardiac monitoring to look for QT prolongation which may be early sign of hypocalcemia. Consider giving IV calcium prophylactically for high concentration exposures to greater than 5% BSA or for dilute exposures to larger surface areas.

   d. If the patient complains of eye irritation, check for the presence of contact lenses and remove, then irrigate eyes copiously with saline via plain IV tubing for at least 10-15 minutes, or until symptoms of pain or irritation have resolved. Consider fluorescein or slit-lamp examination to rule out corneal injury. Administer 1 gram (10 ml) 10% calcium gluconate IV if immediate serum calcium levels are not available and exposure was extensive-greater than 5% BSA**.**

6. Establish baseline and serial electrolytes, Ca, Mg. Follow blood gases in the event of respiratory exposure.

7. Obtain 12-lead EKG; monitor cardiac rhythm.

FOR ADVICE ON CLINICAL MANAGEMENT, CALL YOUR
REGIONAL POISON CONTROL CENTER AT:
(___) ___-____

Date Revised: 7/31/90

HYDROGEN SULFIDE, SULFIDES & MERCAPTANS

FORMS:

Gas (hydrogen sulfide, methyl & short-chain alkyl mercaptans) and liquid (other mercaptans).

BACKGROUND:

Hydrogen sulfide (H_2S) is a highly toxic gas with an odor of rotten eggs at low concentrations. At higher concentrations olfactory fatigue rapidly occurs, making odor a poor warning symptom of danger. Mercaptans are sulfur-containing, highly odorous compounds. All of these compounds are direct irritants, but their major toxicity is due to interference with cellular oxygen utilization. Low-level exposures produce irritation of the eyes, nose and throat, cough, headache, nausea, and dizziness. Higher exposures can cause syncope, seizures, coma, tracheobronchitis, and pulmonary edema (which may occur up to 48-72 hours later). Death may occur within minutes of acute massive exposure.

POTENTIAL FOR SECONDARY CONTAMINATION:

Small amounts of H_2S gas can be trapped in clothing after an overwhelming exposure but are not usually sufficient to create a hazard for health care personnel away from the scene. However, clothing which has become soaked with concentrated liquid sulfide solutions or mercaptans may pose a risk to rescuers. Once the victim has been stripped and flushed with water, there is no significant risk of secondary contamination.

PATIENT MANAGEMENT IN THE HOT ZONE/ DECON AREA:

1. Rescuers should don agent-specific protective clothing and gloves, and self-contained breathing apparatus.

   Ambulatory patients should be instructed to remove themselves from the hot zone and to decontaminate themselves tinder the direction of the decontamination supervisor.

2. Quickly evaluate and support ABCs. Stabilize the spine (if trauma suspected), establish airway and breathing. and consider high flow supplemental oxygen by bag valve mask with reservoir, if possible and practical.

3. If clothing has been soaked by liquid sulfide or mercaptan-containing material, remove and double-bag clothing and flush skin for with water spray 1 - 2 minutes. Remove contact lenses and irrigate exposed eyes if symptomatic.

HYDROGEN SULFIDE, SULFIDES & MERCAPTANS

PREHOSPITAL MANAGEMENT AFTER INITIAL DECONTAMINATION:

1. If victim is **NOT** decontaminated and responder is properly trained, don appropriate agent-specific protective equipment and self-contained breathing apparatus. Activate basic decontamination protocol (see Section IV, p.20). If these requirements cannot be met, request assistance from the local hazmat team or your Regional Poison Control Center.

   If victim is decontaminated, don appropriate protective equipment consistent with risk of secondary contamination (Section III, p.18, and Table 5, p.23).

2. Evaluate and support ABCs (airway, breathing, and circulation). Re-evaluate airway, intubating the trachea if victim is unconscious or has developed severe respiratory distress due to upper airway swelling or pulmonary edema. Continue to provide high-flow oxygen by mask. Attach cardiac monitor.

3. Ingestion of liquid sulfides: **DO NOT INDUCE EMESIS**. If available, administer activated charcoal 60-100 gm orally.

4. Continue to flush affected skin and eyes with copious water or saline. Remove contact lenses and irrigate eyes with saline via plain IV tubing, for at least 10-15 minutes or until symptoms of pain or irrigation have resolved.

5. Victims with minimal or quickly resolving symptoms probably do not require immediate emergency department evaluation.

MANAGEMENT IN THE HOSPITAL:

1. If victim is NOT decontaminated and responder is properly trained, don appropriate agent-specific protective equipment and self-contained breathing apparatus. Activate basic decontamination protocol (see Section IV, p.20). If these requirements cannot be met, request assistance from the local hazmat team or your Regional Poison Control Center. Odor will provide a warning about the need for decontamination. *A WELL-VENTILATED AREA WILL BE VERY HELPFUL.*

   If victim is decontaminated, don appropriate protective equipment consistent with risk of secondary contamination (Section III, p.18, and Table 7, p.32).

2. Evaluate and support ABCs (airway, breathing, and circulation).

3. Provide 0_2 by mask, if the victim has respiratory distress or altered mental status.

4. Irrigate the eyes with saline or water if there is eye irritation. If the patient is severely affected with coma or cardiovascular collapse, administer treatment in the following order, using the nitrite portion of the Cyanide Antidote Kit:

   a. Amyl nitrite: Break pearls into gauze sponge and hold under patient's nose or Ambu intake valve for 15 to 30 seconds/minute, until sodium nitrite solution is ready.

   b. Sodium nitrite ($NaNO_2$) 3% IV solution:

      Adults: 10 mi at 2.5 to 5 mi/minute, or 0.35 mi/kg.

      Children: 0.2 mi/kg, not to exceed 10 mi.

   c. Sodium thiosulfate is *not* effective for H_2S exposure.

   d. Repeat antidote at 50% of initial dose if symptoms persist after 20 minutes. If symptoms worsen after treatment, consider the possibility of nitrite toxicity causing methemoglobinemia greater than 25%.

   e. Continue 0_2 for at least 2 hours afterward.

5. Monitor cardiac rhythm and obtain l2-lead EKG. Tachyarrhythmias may occur.

6. Laboratory tests: CBC, electrolytes, creatinine and/or BUN, blood gases, liver function studies, urinalysis, and other laboratory tests as appropriate.

7. If symptoms are mild, including eye and throat irritation, headache, nausea, or dizziness, supportive care will suffice.

8. In severe cases, observe for delayed onset pulmonary edema and liver toxicity.

9. Hyperbaric oxygen may be helpful, although the medical literature on this point is controversial.

FOR ADVICE ON CLINICAL MANAGEMENT, CALL YOUR
REGIONAL POISON CONTROL CENTER AT:
(___) ___-____

Date Revised: 7/31/90

METHYL BROMIDE

FORMS:

Methyl bromide is an odorless and colorless gas with poor warning properties. At low temperatures it may liquefy. When used as a fumigant, methyl bromide is usually mixed with a warning agent, such as chloropicrin, or tear gas.

BACKGROUND:

Methyl bromide is widely used in chemical synthesis and as an insecticidal fumigant both in agriculture and for termite eradication in homes and other buildings; it has also been used in refrigeration and in fire extinguishers. When used in fumigation, it is typically applied under a tarp which is draped over the building or plot of land. In such cases, the methyl bromide tends to disperse more rapidly than the warning agent. When first "shot" during fumigation, methyl bromide may liquefy, running down the applicator's skin, clothing and shoes resulting in severe burns if not promptly removed.

Exposure to high concentrations of methyl bromide can produce irritation of the eyes, nose, throat and respiratory tract. Delayed pulmonary edema can occur. Because of the poor warning properties of methyl bromide, significant exposure can occur before the onset of symptoms. Systemic toxicity includes malaise, nausea, vomiting, tremor, seizures, and coma. Chronic neurologic sequelae such as dementia and psychosis have been described. There is very little medical information about chronic health risks associated with low level exposure (i.e., up to 100 ppm in air). Methyl bromide is a suspected carcinogen.

Methyl bromide easily penetrates clothing and some protective gear. Retention of the gas or liquid in clothing or rubber or leather boots can be a source of prolonged percutaneous exposure.

POTENTIAL FOR SECONDARY CONTAMINATION:

Patients exposed only to gaseous methyl bromide are not contaminating to others and do not require decontamination. For victims exposed to liquid methyl bromide, once the clothing has been removed and the skin has been flushed with water there is no significant risk of secondary contamination of rescuers outside of the hot zone. Leather clothing and boots contaminated with liquid methyl bromide should not be reworn; they should be decontaminated or discarded.

METHYL BROMIDE

PATIENT MANAGEMENT IN THE HOT ZONE/ DECON AREA:

1. Rescuers should don agent-specific protective clothing and gloves, and self-contained breathing apparatus.

   Ambulatory patients should be instructed to remove themselves from the hot zone and to decontaminate themselves under the direction of the decontamination supervisor.

2. Quickly evaluate and support ABCs. Stabilize the spine (if trauma suspected), establish airway and breathing, and consider high flow supplemental oxygen by bag valve mask with reservoir, if possible and practical.

3. Remove and double bag clothing and flush skin with water spray for 1 - 2 minutes. Remove contact lenses and irrigate exposed eyes if symptomatic.

PREHOSPITAL MANAGEMENT AFTER INITIAL DECONTAMINATION:

1. If liquid-soaked victim is NOT decontaminated, and responder is properly trained, don appropriate agent-specific protective equipment and self-contained breathing apparatus. Activate basic decontamination protocol (see Section IV, p.20). If these requirements cannot be met, request assistance from the local hazmat team or your Regional Poison Control Center.

   If victim is decontaminated, don appropriate protective equipment consistent with risk of secondary contamination (Section III, p. 18, and Table 5, p.23).

2. Evaluate and support ABCs (airway, breathing, and circulation). If necessary, establish a patient airway, and provide supplemental oxygen.

3. Treat seizures with diazepam (Valium):

   5-10 mg IV for an adult; and,
   1-2 mg IV for children.

4. Continue to flush affected skin and eyes with copious water or saline. Remove contact lenses and irrigate eyes with saline via plain IV tubing, for at least 10-15 minutes or until symptoms of pain or irrigation have resolved.

METHYL BROMIDE

MANAGEMENT IN THE HOSPITAL:

1. If victim is **NOT** decontaminated and responder is properly trained, don appropriate agent-specific protective equipment and self-contained breathing apparatus. Activate basic decontamination protocol (see Section Iv, p.20). If these requirements cannot be met, request assistance from the local hazmat team or your Regional Poison Control Center.

   If victim is decontaminated, don appropriate protective equipment consistent with risk of secondary contamination (Section III, p.18, and Table 7, p.32).

2. Evaluate and support ABCs. Provide supplemental oxygen. Intubation and assisted ventilation maybe required for severe pulmonary edema or if the patient is comatose or convulsing.

3. Obtain arterial blood gases, chest x-ray, and electrocardiogram in seriously symptomatic patients.

4. Although in serious exposures most symptoms begin in 4 to 6 hours, a delay of up to 24 hours may occur. Observation for 24 hours should be considered.

5. Treat seizures with diazepam (Valium):

   5-10 mg Iv for adults;
   1-2 mg for children;

   or with Lorazepam:

   24 mg Iv for adults;
   0.1 mg/kg Iv for children;

   and/or other anticonvulsants.

6. Flush the skin with large amounts of water or eye exposures with copious irrigation. If the patient complains of eye irritation, check for the presence of contact lenses and remove, then irrigate eyes copiously with saline via plain Iv tubing for at least 10-15 minutes, or until symptoms of pain or irritation have resolved. Consider fluorescein or slit-lamp examination to rule out corneal injury.

7. Serum bromide levels may be elevated after serious methyl bromide exposure but do not correlate with severity of illness. However, serum bromide levels greater than 5 mg/dl is an indicator of significant exposure to methyl bromide.

8. Antidotes: There are no proven antidotes, although some toxicologists have suggested use of dimercaprol (BAL) or acetylcysteine (Mucomyst).

9. After serious exposures, delayed onset of pulmonary and neurologic manifestations may occur.

FOR ADVICE ON CLINICAL MANAGEMENT, CALL YOUR
REGIONAL POISON CONTROL CENTER AT:
(___) ___-____

Date Revised: 07/31/90

NITROGEN-CONTAINING COMPOUNDS AND OTHER CHEMICALS CAUSING METHEMOGLOBINEMIA

FORMS:

Gas, liquid and solid. Substances tend to be brown or yellow in color, especially when impure.

BACKGROUND:

A wide variety of nitrogen-containing compounds, including anilines, nitrates and nitrites, aryl amines, and aromatic nitrogen compounds, are potent oxidizing agents which can produce methemoglobinemia. However, not all nitrogen containing compounds produce methemoglobinemia. Methemoglobin is unable to transport oxygen. Patients with methemoglobinemia greater than 15% will appear grey or cyanotic, and their blood will appear chocolate brown. With higher levels signs and symptoms of hypoxia are present, including headache, dizziness, nausea, dyspnea, syncope, seizures, and coma. These methemoglobin-forming compounds may also produce direct systemic effects such as skin or respiratory irritation, vasodilation, hypotension, headache, nausea and CNS depression. Many of the liquid compounds are highly volatile and may be inhaled, and many are well-absorbed through the skin.

POTENTIAL FOR SECONDARY CONTAMINATION:

Depending on the individual compound, these agents may pose a significant health hazard for rescuers and health care personnel. Many are well-absorbed through intact skin. Simple water washing may be insufficient to remove oily compounds.

PATIENT MANAGEMENT IN THE HOT ZONE/ DECON AREA:

1. Rescuers should don agent-specific protective clothing and gloves, and self-contained breath mg apparatus.

   Ambulatory patients should be instructed to remove themselves from the hot zone and to decontaminate themselves under the direction of the decontamination supervisor.

2. Quickly evaluate and support ABCs. Stabilize the spine (if trauma suspected), establish airway and breathing, and consider high flow supplemental oxygen by bag valve mask with reservoir, if possible and practical.

3. Remove and double-bag clothing. Flush skin with water spray for 1 - 2 minutes. Remove contact lenses and irrigate exposed eyes if symptomatic.

NITROGEN-CONTAINING COMPOUNDS AND OTHER CHEMICALS CAUSING METHEMOGLOBINEMIA

PREHOSPITAL MANAGEMENT AFTER INITIAL DEC ONTAMINATION:

1. If victim is **NOT** decontaminated and responder is properly trained, don appropriate agent-specific protective equipment and self-contained breathing apparatus. Activate basic decontamination protocol (see Section Iv, p.20). If these requirements cannot be met, request assistance from the local hazmat team or your Regional Poison Control Center.

   If victim is decontaminated, don appropriate protective equipment consistent with risk of secondary contamination (Section III, p.18, and Table 5, p.23).

2. Evaluate and support ABCs (airway, breathing, and circulation). Re-evaluate airway, intubating the trachea if victim is unconscious or has developed severe respiratory distress. Continue to provide high-flow oxygen by mask. Attach cardiac monitor.

3. If victim has not been stripped and flushed, activate basic decontamination protocol (see Section IV above). In addition, wash oily contaminated areas with soap and/or shampoo.

4. Ingestion: If available, administer activated charcoal 60-100 gm orally.

5. Continue to flush affected skin and eyes with copious water or saline. Remove contact lenses and irrigate eyes with saline via plain IV tubing, for at least 10-15 minutes or until symptoms of pain or irrigation have resolved.

MANAGEMENT IN THE HOSPITAL:

1. If victim is **NOT** decontaminated and responder is properly trained, don appropriate agent-specific protective equipment and self-contained breathing apparatus. Activate basic decontamination protocol (see Section IV, p.20). If these requirements cannot be met, request assistance from the local hazmat team or your Regional Poison Control Center.

   If victim is decontaminated, don appropriate protective equipment consistent with risk of secondary contamination (Section III, and Table 7, p.32).

   Health care personnel should don neoprene gloves *(do not use canvas, cotton, rubber, or latex gloves)* and protective clothing. If the victim's clothing is wet, or dusty material is present, respiratory protection is appropriate. Consult with a knowledgeable authority about appropriate protective clothing.

2. Evaluate and support ABCs (airway, breathing, and circulation).

3. If not decontaminated before arrival, remove and double bag contaminated clothing, and wash skin with soap and water.

4. 0_2 by mask.

5. Monitor cardiac rhythm; obtain 12-lead EKG.

6. The following laboratory tests should be performed: Send methemoglobin (MetHb) level STAT *(MUST be done within 1 hour to be accurate and helpful)*. **Note that waiting for this result may jeopardize the patient.** Chocolate brown blood suggests that significant methemoglobinemia is present.

7. Additional laboratory tests: CBC, electrolytes, BUN and/or creatinine. Obtain other laboratory tests as appropriate.

8. Administer methylene blue if MetHb > 40% or if MetHb is between 25% and 40% AND the patient is symptomatic. Worrisome symptoms include severe headache, disorientation, tachypnea, tachycardia, or other indications of cardiovascular decompensation.

    a. Give methylene blue, 1 % solution (10 mg/ml), 1 to 2 mg/kg Iv over 10 minutes (equivalent to 0.1 to 0.2 mi/kg, or total of about 5 to 20 ml). Observe for elevated BP, nausea, disorientation.

    b. Repeat in 1 hour if cyanosis or severe symptoms persist.

    c. The total dose of methylene blue should not exceed 7 mg/kg.

    d. Continue Oxygen for at least 2 hours following methylene blue administration.

    WARNING:Methylene blue is itself toxic, and may produce disorientation, elevated BP, nausea, diarrhea, and delayed hemolytic anemia.

9. Once the patient is stable, rule out other causes for methemoglobinemia (drug use, G6-PD deficiency, hemoglobinopathies).

10. If the patient complains of eye irritation, check for the presence of contact lenses and remove, then irrigate eyes copiously with saline via plain IV tubing for at least 10-15 minutes, or until symptoms of pain or irritation have resolved. Consider fluorescein or slit-lamp examination to rule out corneal injury.

FOR ADVICE ON CLINICAL MANAGEMENT, CALL YOUR
REGIONAL POISON CONTROL CENTER AT:
(___) ___-____

Date Revised: 07/31/90

PENTACHLOROPHENOL

FORMS:

Pentachiorophenol is a solid (1)locks, flakes, or pellets), and is often found in liquid solution (5-30% in accompanying organic solvents). Technical grades are dark gray to brown in color. Solid forms are not flammable, but organic solvents maybe flammable. When heated, pentachiorophenol can produce chlorinated dibenzodioxin and dibenzofurans.

Solid pentachlorophenol has a low vapor pressure. At 20' C, the saturated air concentration is *2.5* mg/m^3. This means that the potential for acute poisoning by inhalation alone is very low. Dusts or mists of pentachiorophenol increase the inhalation hazard. The presence of volatile organic solvents, especially in confined or poorly ventilated spaces may also increase the risk of inhalation. Fires may produce smoke laden with pentachlorophenol and its decomposition products.

BACKGROUND:

Pentachlorophenol is a wood preservative with a characteristic and pungent odor. It is a strong irritant; prolonged contact may cause burns to the eyes or skin, and vapors are irritating to the eyes and respiratory tract. Eye and nose irritation are good warning properties of an acute exposure. It is well absorbed by skin contact, inhalation, or ingestion.

Pentachlorophenol intoxication causes uncoupling of oxidative phosphorylation in the cell resulting in increased tissue oxygen demand and generation of excessive heat. Acute poisoning is characterized by profuse sweating and fever in addition. to headache, nausea, vomiting, weakness, metabolic acidosis, restlessness, tachypnea, and tachycardia. Seizures and coma may occur.

In animals, pentachlorophenol causes cancer and adverse effects on fetal development. There is little information about the chemical effects on humans.

POTENTIAL FOR SECONDARY CONTAMINATION:

Pentachlorophenol is well absorbed through the skin, and until contaminated clothing has been removed and all affected areas have been thoroughly washed with soap and water, there is a potential risk of secondary contamination.

PENTACHLOROPHENOL

PATIENT MANAGEMENT IN THE HOT ZONE/ DECON AREA:

1. Rescuers should don agent-specific protective clothing and gloves, and self-contained breathing apparatus.

   Ambulatory patients should be instructed to remove themselves from the hot zone and to decontaminate themselves under the direction of the decontamination supervisor.

2. Quickly evaluate and support ABCs. Stabilize the spine (if trauma suspected), establish airway and breathing, and administer high flow supplemental oxygen by bag valve mask with reservoir, as soon as practical.

3 Remove and double bag clothing, activate decontamination protocol (Section IV, p.20) and flush affected skin for several minutes. Remove contact lenses and irrigate exposed eyes if symptomatic. Follow with thorough soap and shampoo wash of exposed skin areas.

PREHOSPITAL MANAGEMENT AFTER INITIAL DECONTAMINATION:

1. If victim is **NOT** decontaminated and responder is properly trained, don appropriate agent-specific protective equipment and self-contained breathing apparatus. Activate basic decontamination protocol (see Section IV, p.20). If these requirements cannot be met, request assistance from the local hazmat team or your Regional Poison Control Center.

   If victim is decontaminated, don appropriate protective equipment consistent with risk of secondary contamination (Section III, p.18, and Table 5, p.23).

   A second soap or shampoo wash may be indicated for victim with heavy contamination; this may be performed by EMS personnel using plain latex gloves. Remove contact lenses and irrigate exposed eyes with water or saline if symptomatic.

2. Evaluate and support ABCs (airway, breathing, and circulation). Re-evaluate the ABCs. Continue to provide supplemental oxygen. Aerosolized bronchodilators (e.g., metaproterenol) may be helpful for victim with wheezing.

3. Treat seizures with diazepam (Valium):

   5-10 mg IV for an adult; and,
   1-2 mg IV for children.

4. Perform external cooling for patients with obvious hyperthermia, using water spray and fanning.

5. Continue to flush affected skin and eyes with copious water or saline. Remove contact lenses and irrigate eyes with saline via plain Iv tubing, for at least 10-15 minutes or until symptoms of pain or irrigation have resolved.

MANAGEMENT IN THE HOSPITAL:

1. If victim is NOT decontaminated and responder is properly trained, don appropriate agent-specific protective equipment and self-contained breathing apparatus. Activate basic decontamination protocol (see Section IV, p.20). If these requirements cannot be met, request assistance from the local hazmat team or your Regional Poison Control Center.

   If victim is decontaminated, don appropriate protective equipment consistent with risk of secondary contamination (Section III, p.18, and Table 7, p.23).

2. Evaluate and support ABCs (airway, breathing and circulation). Provide supplemental oxygen. Aerosolized bronchodilators (e.g., metaproterenol) may be helpful for victims with wheezing. Intubation and assisted ventilation may be required for severe respiratory distress or if the patient is comatose or convulsing.

3. Obtain arterial blood gases, chest x-ray, and electrocardiogram in seriously symptomatic patients.

4. Treat seizures with diazepam (Valium):

   5-10 mg Iv adult;
   1-2 mg IV for children;

   or Lorazepam:

   2-4 mg Iv for adults;
   0.1mg/kg IV for children;

   and/or other anticonvulsants.

5. Perform aggressive cooling for patients with hyperthermia, using tepid water spray with fanning, ice water gastric or peritoneal lavage, and/or neuromuscular paralysis. **DO NOT give aspirin.**

6. If the patient complaints of eye irritation, check for presence of contact lenses and remove, then irrigate eyes copiously with saline via plain IV tubing for at least 10-15 minutes, or until symptoms of pain or irritation have resolved. Consider fluorescein or slit-lamp to rule out corneal injury.

FOR ADVICE ON CLINICAL MANAGEMENT, CALL YOUR
REGIONAL POISON CONTROL CENTER AT:
(___) ___-____

Date Revised: 07/31/90

PESTICIDES - CARBAMATES

FORMS:

Liquid (usually in solution with xylene or other organic solvent), solid (wettable powder). May be inhaled in an aerosol form or as a component of smoke.

BACKGROUND:

Carbamate pesticides are widely used in home gardening and commercial agriculture. Like organophosphates, they inhibit the enzyme cholinesterase, resulting in buildup of excessive acetyl choline. Unlike organophosphates, the inhibition of cholinesterase is transient and self-limited. Symptoms and signs include hypersalivation, sweating, bronchospasm, abdominal cramps, diarrhea, muscle weakness, small pupils, bradycardia, twitching and seizures. Death is due to respiratory muscle paralysis. Nonspecific symptoms such as upper airway irritation, dizziness, nausea and headache after inhalation exposure may be due to the solvent vehicle (e.g., xylene) and not due to cholinesterase inhibition. Potential toxicity of the solvent vehicle should always be considered.

POTENTIAL FOR SECONDARY CONTAMINATION:

Many carbainates are well absorbed through intact skin, and thus may pose a serious hazard to rescuers or health care personnel. Simple water washing may be insufficient to remove oily compounds.

PATIENT MANAGEMENT IN THE HOT ZONE/ DECON AREA:

I. Rescuers should don agent-specific protective clothing and gloves, and self-contained breathing apparatus.

   Ambulatory patients should be instructed to remove themselves from the hot zone and to decontaminate themselves tinder the direction of the decontamination supervisor.

2. Quickly evaluate and support ABCs. Stabilize the spine (if trauma suspected), establish airway and breathing, and consider high flow supplemental oxygen by bag valve mask with reservoir, if possible and practical.

3. Remove and double-bag clothing. Flush skin with water spray for I - 2 minutes. Remove contact lenses and irrigate exposed eyes if symptomatic.

PESTICIDES - CARBAMATES

PREHOSPITAL MANAGEMENT AFTER INITIAL DECONTAMINATION:

1. If victim is NOT decontaminated and responder is properly trained, don appropriate agent-specific protective equipment and self-contained breathing apparatus. Activate basic decontamination protocol (see Section IV, p.20). If these requirements cannot be met, request assistance from the local hazmat team or your Regional Poison Control Center.

   If victim is decontaminated, don appropriate protective equipment consistent with risk of secondary contamination (Section III, p.18, and Table 5, p.23).

   In addition, wash oily contaminated areas with soap and/or shampoo.

2. Evaluate and support ABCs (airway, breathing, and circulation). Re~valuate airway, intubating the trachea if victim is unconscious or has developed severe respiratory distress. Continue to provide high-flow oxygen by mask. Attach cardiac monitor.

3. If the victim is symptomatic (e.g., excessive salivation, abdominal cramps, diarrhea, wheezing, sweating, bradycardia), administer atropine 0.5-1.0 mg initially, followed by repeated 1-2 mg doses every 3-5 minutes as needed for severe poisoning (severe bronchospasm or bradycardia).

4. Ingestion: If available, administer activated charcoal 60-100 gm orally.

   DO NOT induce emesis.

5. Continue to flush affected skin and eyes with copious water or saline. Remove contact lenses and irrigate eyes with saline via plain IV tubing, for at least 10-15 minutes or until symptoms of pain or irrigation have resolved.

MANAGEMENT IN THE HOSPITAL:

1. If victim is NOT decontaminated and responder is properly trained, don appropriate agent-specific protective equipment and self-contained breathing apparatus. Activate basic decontamination protocol (see Section Iv, p.20). If these requirements cannot be met, request assistance from the local hazmat team or your Regional Poison Control Center.

   If victim is decontaminated, don appropriate protective equipment consistent with risk of secondary contamination (Section III, and Table 7, p.32).

   Shampoo hair and scalp, clean under nails, and in ears.

2. Evaluate and support ABCs (airway, breathing, and circulation). Intubation is occasionally required.

3. Provide 0_2 by mask or endotracheal tube. Obtain and follow blood gases if respiratory distress is present.

4. Monitor cardiac rhythm; watch for either bradycardia or tachycardia.

5. Laboratory Tests: RBC and plasma cholinesterase. Other laboratory tests should be performed.

6. Treat with atropine when appropriate.

(DO NOT TREAT IF ASYMPTOMATIC!)

a. In general, atropine is needed only if at least one or more of the following are present:

! Alteration in mental status; confusion; seizures.
! Nausea, vomiting, diarrhea, or abdominal cramps.
! Pupillary constriction.
! Salivation.
! Diaphoresis.
! Respiratory distress, wheezing, pulmonary edema.
! Significant arrhythmia (particularly bradycardia).

b. Atropine treatment:

(1) Adults: Give atropine sulfate 0.5 to 1.0 mg initially, followed by 2 to 4 mg repeat 2 to 4 mg every 3-10 minutes as needed until signs of parasympathetic (muscarinic) toxicity are controlled, the mouth is dry, and airway is clear. At this point, the pupils will generally be dilated, although not invariably, and the skin will be warm and dry.

(2) Children: Atropine sulfate, 1 mg or 0.05 mg/kg, as above.

C. Pralidoxime (2-PAM) is not recommended for carbamate poisoning.

8. If ingestion is suspected, initiate gastric lavage and administer activated charcoal.

9. Other general treatment guidelines:

a. Watch for signs of atropine toxicity. Note that disorientation, uncooperative behavior, hallucinations, blurred vision, tachycardia, fever, and convulsions may be due to atropine itself.

b. Respiratory depression, due in part to respiratory muscle paralysis, is the usual cause of death, and it not completely prevented by atropine.

c. Remove pulmonary secretions by suctions if necessary.

d. If seizures are not responsive to atropine, treat with diazepam, 5 to 10 mg by slow IV push or lorazepam 2-4 mg IV. Phenobarbital, or phenytoin, may be used.

10. Significant poisoning does not occur unless cholinesterase levels are depressed at least 30% below individual's baseline levels, although this level may be within the laboratory range for normal values. In severe poisoning, levels are depressed 90% or more. It may be necessary to recheck cholinesterase levels in a few days to determine the individual's normal baseline cholinesterase levels. Cholinesterase levels are helpful in documenting exposure to carbamate pesticides, although they may be less helpful for emergency management.

11. If the patient complains of eye irritation, check for presence of contact lenses and remove, then irrigate eyes copiously with saline via plain IV tubing for at least 10-15 minutes, or until symptoms of pain or irritation have resolved. Consider fluorescein or slit-lamp examination to rule out corneal injury.

FOR ADVICE ON CLINICAL MANAGEMENT, CALL YOUR
REGIONAL POISON CONTROL CENTER AT:
(___) ___-____

Date Revised: 07/31/90

PESTICIDES - ORGANOPHOSPHATES

FORMS:

Liquid (usually solution with xylene or other organic solvent), solid (wettable powder). May be inhaled in an aerosol form or as a component of smoke.

BACKGROUND:

Organophosphate pesticides are widely used in home gardening and commercial agriculture. A variety of products are available, with widely varying potencies. Organophosphate pesticides inhibit the enzyme cholinesterase, resulting in buildup of excessive acetyicholine. Symptoms and signs include hypersalivation, sweating, bronchospasm, abdominal cramps, diarrhea, muscle weakness, small pupils, twitching and seizures. Death is due to respiratory muscle paralysis. For certain orgdnophosphates, if victim survives the acute poisoning, they may develop delayed onset peripheral netiropathy. Nonspecific symptoms such as upper respiratory irritation, dizziness, nausea and headache after inhalation exposure may be due to the solvent vehicle (e.g., xylene) and not due to cholinesterase inhibition. Potential toxicity of the solvent vehicle should always be considered.

POTENTIAL FOR SECONDARY CONTAMINATION:

Many organophosphates are well-absorbed through intact skin, and thus may pose a serious hazard to rescuers or health care personnel. Simple water washing may be insufficient to remove oily compounds.

PATIENT MANAGEMENT IN THE HOT ZONE/ DECON AREA:

1. Rescuers should don agent-specific protective clothing and gloves, and self-contained breathing apparatus.

   Ambulatory patients should be instructed to remove themselves from the hot zone and to decontaminate themselves under the direction of the decontamination supervisor.

2. Quickly evaluate and support ABCs. Stabilize the spine (if trauma suspected), establish airway and breathing and consider high tiow supplemental oxygen by bag valve mask with reservoir, if possible and practical.

3. Remove and double-bag clothing. Flush skin with water spray for 1 - 2 minutes. Remove contact lenses and irrigate exposed eyes if symptomatic.

PESTICIDES - ORGANOPHOSPHATES

PREHOSPITAL MANAGEMENT AFTER INITIAL DECONTAMINATION:

1. If victim is **NOT** decontaminated and responder is properly trained, don appropriate agent-specific protective equipment and self-contained breathing apparatus. Activate basic decontamination protocol (see Section IV, p.20). If these requirements cannot be met, request assistance from the local hazmat team or your Regional Poison Control Center.

   If victim is decontaminated, don appropriate protective equipment consistent with risk of secondary contamination (Section III, p.18, and Table 5, p.23). In addition, wash oily contaminated areas with soap and/or shampoo.

2. Evaluate and support ABCs (airway, breathing, and circulation). Re-evaluate airway, intubating the trachea if victim is unconscious or has developed severe respiratory distress. Continue to provide high-flow oxygen by mask. Attach cardiac monitor.

3. If the victim is symptomatic (e.g., excessive salivation, abdominal cramps, diarrhea, wheezing, sweating, bradycardia) administer atropine 0.5-1.0 mg initially, followed by repeated 1-2 mg doses every 3-5 minutes as needed for severe poisoning (severe bronchospasm or bradycardia).

4. Ingestion: If available, administer activated charcoal 60-100 gm orally.

   DO NOT induce emesis.

5. Continue to flush affected skin and eyes with copious water or saline. Remove contact lenses and irrigate eyes with saline via plain IV tubing, for at least 10-15 minutes or until symptoms of pain or irrigation have resolved.

MANAGEMENT IN THE HOSPITAL:

1. If victim is **NOT** decontaminated and responder is properly trained, don appropriate agent-specific protective equipment and self-contained breathing apparatus. Activate basic decontamination protocol (see Section IV, p.20). If these requirements cannot be met, request assistance from the local hazmat team or your Regional Poison Control Center.

   If victim is decontaminated, don appropriate protective equipment consistent with risk of secondary contamination (Section III, p.18, and Table 7, p.32).

   In addition, wash oily contaminated areas with soap and/or shampoo. Mucous membranes may require vigorous lavage. Wash ear canals and under finger nails.

2. Evaluate and support ABCs (airway, breathing, and circulation).

3. Administer 0_2 by mask or endotracheal tube.

4. Monitor cardiac rhythm; watch for either bradycardia or tachycardia, or for ventricular ectopy.

5. Laboratory Tests: RBC and plasma cholinesterase. Follow arterial blood gases if the patient has respiratory distress or altered mental status. Other laboratory tests should be done as clinically indicated.

6. Treat with atropine when appropriate.

   (DO NOT TREAT IF ASYMPTOMATIC!)

   a. In general, atropine is needed if one or more of the following are present:

      ! Altered mental status or seizures.
      ! Nausea, vomiting, diarrhea, or abdominal cramps.
      ! Pupillary constriction.
      ! Excess salivation.
      ! Respiratory distress, wheezing, pulmonary edema.
      ! Significant dysrhythmia (particularly bradycardia).
      ! Other medical conditions may cause these symptoms and should be ruled out.

   b. Atropine treatment:

      (1) Adults: Atropine sulfate, 0.5 to 1.0 mg initially, followed by 2 to 4 mg IV; repeat 2 to 4 mg every 3-10 minutes as needed until signs of parasympathetic (muscarinic) toxicity are controlled, the mouth is dry, and airway is clear. At this point, the pupils will generally be dilated, although not invariably, and the skin will be warm and dry.

      (2) Children: Atropine sulfate, 0.05 mg/kg, or 1 mg as above.

   c. Pralidoxime chloride (2-PAM, or Protopam) is best given early (but may be of value in the first few days) and will reactivate some cholinesterase activity. Treatment with pralidoxime is most helpful for control of nicotinic symptoms, particularly generalized muscle weakness or fasciculation which may contribute to respiratory paralysis. Dose is 1 gm for adults and 25-50 mg/kg for children, given IV over 5-10 minutes. In severe cases this may be repeated in 1 hour. Repeat treatment may be needed (can give 1-3 gm IV every 6 to S hours), especially for agents with prolonged effects like fenthion.

8. If symptoms have not appeared and ingestion is suspected, initiate gastric lavage and administer activated charcoal.

9. Other general treatment guidelines:

    a. Watch for signs of atropine toxicity. Note that disorientation, uncooperative behavior, hallucinations, blurred vision, tachycardia, fever, and convulsions may be due to atropine itself.

    b. Respiratory depression, due in part to respiratory muscle paralysis, is the usual cause of death, and is not completely prevented by atropine.

    c. Remove pulmonary secretions by suction if necessary.

    d. If seizures are not responsive to atropine, treat with diazempam, 5 to 10 mg by slow IV push or Lorazepam 2-4 mg IV. Phenobarbital may also be used.

10. Significant poisoning does not occur unless cholinesterase levels are depressed at least 30% below the individual's baseline levels, although this level may be within the laboratory range for normal values. In severe poisoning, levels are depressed 90% or more. It may be necessary to recheck cholinesterase levels in 3 to 6 weeks to determine the individual's normal baseline cholinesterase levels. Note that some other conditions, including chronic cocaine use, can depress cholinesterase levels. Cholinesterase levels are helpful in documenting exposure to organophoshate pesticides, although they may be less helpful for emergency management.

11. If the patient complaints of eye irritation, check for the presence of contact lenses and remove, then irrigate eyes copiously with saline via plain IV tubing for at least 10-15 minutes, or until symptoms of pain or irritation have resolved. Consider fluorescein or slit-lamp examination to rule out corneal injury.

FOR ADVICE ON CLINICAL MANAGEMENT, CALL YOUR
REGIONAL POISON CONTROL CENTER AT:
(___) ___-____

Date Revised: 07/31/90

PETROLEUM DISTILLATES (COMMONLY USED) AND RELATED HYDROCARBON PRODUCTS
(Including Gasoline, Kerosene, Naphtha, and Mineral Spirits)

FORMS:

This group includes a wide variety of commonly used liquid hydrocarbon mixtures (see Table below), many of which are highly flammable or combustible.

BACKGROUND:

The term "petroleum distillates" refers to a variety of liquid hydrocarbon mixtures derived by fractional distillation or by catalytic cracking of crude oil. Terpenes are included in this group; they are plant-derived products such as citrus, pine, and eucalyptus oils.

The health effects and medical management of these substances are similar. Inhalation of vapors may produce headache, dizziness, nausea, and weakness. Intense exposure in an enclosed space may result in loss of consciousness, coma or convulsions mainly because of oxygen displacement. Exposure to vapors may also produce eye, nose and throat irritation.

Ingestion may cause nausea, vomiting, and abdominal cramps. Although aliphatic hydrocarbons are less well absorbed and usually produce no systemic symptoms, benzene, xylene, toluene and related aromatics are well-absorbed and may cause seizures, CNS depression, and cardiac sensitization.

Aspiration into the lungs may occur during ingestion. Pulmonary aspiration of even small amounts can result in severe chemical pneumonia. Patients with aspiration usually have immediate onset of coughing. Potential kidney damage, long-term neurological problems, benzene related cancer, defatting of skin, and skin burns may occur in some cases.

POTENTIAL FOR SECONDARY CONTAMINATION:

If the victim was exposed only to vapors, there is no risk of secondary contamination. Vapors off-gassing from heavily soaked clothing may produce nausea, eye and throat irritation, and other nuisance symptoms, especially in an enclosed area. Even after decontamination, rescuers may notice a slight nuisance odor, particularly in cases of ingestion. However, once the clothing has been removed and the victim flushed with water, there is no significant risk of secondary contamination of rescuers outside of the hot zone.

PETROLEUM DISTILLATES (COMMONLY USED) AND RELATED HYDROCARBON PRODUCTS (Including Gasoline, Kerosene, Naphtha, and Mineral Spirits)

PATIENT MANAGEMENT IN THE HOT ZONE/ DECON AREA:

1. Rescuers should don agent-specific protective clothing and gloves, and self-contained breathing apparatus.

   Ambulatory patients should be instructed to remove themselves from the hot zone and to decontaminate themselves under the direction of the decontamination supervisor.

2. Quickly evaluate and support ABCs. Stabilize the spine (if trauma suspected), establish airway and breathing, and consider high flow supplemental oxygen by bag valve mask with reservoir, if possible and practical.

3. Remove and double-bag soaked clothing, and flush exposed skin with water spray for 1-2 minutes. Use soap or shampoo for heavy contamination of skin or hair. Remove contact lenses and irrigate exposed eyes if symptomatic.

PREHOSPITAL MANAGEMENT AFTER INITIAL DECONTAMINATION:

1. If victim is NOT decontaminated and responder is properly trained, don appropriate agent-specific protective equipment and self-contained breathing apparatus. Activate basic decontamination protocol (see Section IV, p.20). If these requirements cannot be met, request assistance from the local hazmat team or your Regional Poison Control Center.

   If victim is decontaminated, don appropriate protective equipment consistent with risk of secondary contamination (Section III, p.18, and Table 5, p.23).

2. Evaluate and support ABCs (airway, breathing, and circulation). Re-evaluate the airway and need for assisted ventilation. Endotracheal intubation may be necessary if the victim is unconscious or has developed severe respiratory distress. Administer supplemental oxygen.

3. Aerosolized bronchodilators (such as metaproterenol) may be helpful for victims with wheezing.

4. Continue to flush affected skin and eyes with copious water or saline. Remove contact lenses and irrigate eyes with saline via plain IV tubing, for at least 10-15 minutes or until symptoms of pain or irrigation have resolved.

5 Ingestion: **DO NOT induce emesis.** Consider giving activated charcoal.

6. Victims with minimal exposure and those who are asymptomatic do not require immediate evaluation in the emergency department. Those with persistent cough, wheezing, or altered consciousness or skin burns should receive an immediate medical evaluation.

MANAGEMENT IN THE HOSPITAL:

1. If victim is NOT decontaminated and responder is properly trained, don appropriate agent-specific protective equipment and self-contained breathing apparatus. Activate basic decontamination protocol (see Section IV, p.20). If these requirements cannot be met, request assistance from the local hazmat team or your Regional Poison Control Center.

   If victim is decontaminated, don appropriate protective equipment consistent with risk of secondary contamination (Section III, p.18, and Table 7, p.32)

2. Re-evaluate and support ABCs, administer supplemental oxygen, and monitor cardiac rhythm.

3. In patients with wheezing, administer aerosolized bronchodilator.

4. In patients with persistent cough or respiratory distress, obtain arterial blood gases and chest xray. Intubate if patient manifests severe respiratory distress. Obtain arterial blood gases and chest x-ray if respiratory distress is present. Intubation and assisted ventilation may be needed in severe cases of aspiration-induced chemical pneumonia to maintain adequate oxygenation.

5. If this patient complains of eye irritation, check for the presence of contact lenses and remove, then irrigate eyes copiously with saline via plain IV tubing for at least 10-15 minutes, or until symptoms of pain or irritation have resolved. Consider fluorescein or slit-lamp examination to rule out corneal injury.

PETROLEUM DISTILLATES (COMMONLY USED) AND RELATED HYDROCARBON PRODUCTS (Including Gasoline, Kerosene, Naphtha, and Mineral Spirits)

6. Ingestion: DO NOT induce emesis. If a large quantity (e.g., greater than 1 mg/Kg) of a product containing a high percentage of benzene-related aromatics or other toxic ingredients has been ingested, contact the regional poison control center for advice. Gastric lavage and activated charcoal may be advised depending on the circumstances.

FOR ADVICE ON CLINICAL MANAGEMENT, CALL YOUR REGIONAL POISON CONTROL CENTER AT:
(___) ___-____

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PETROLEUM DISTILLATES (COMMONLY USED)
AND RELATED HYDROCARBON PRODUCTS
(Including Gasoline, Kerosene, Naphtha, and Mineral Spirits)

Table: Commonly Used Petroleum Distillates

Product	Boiling Point	Constituents*
Petroleum Spirits	86-146 F	100% aliphatics
Gasoline**	104-400 F	95% aliphatics up to 5% aromatics including benzene
Rubber Solvent	113-257 F	95% aliphatics 5% aromatics
Painters' Naphtha	203-320 F	85% aliphatics 15% aromatics
Mineral Spirits	302-392 F	80% aliphatics 20% aromatics
Stoddard Solvent	320-410 F	85% aliphatics 15% aromatics
Diesel fuel, jet fuel, kerosene	350-600 F	100% aliphatics

* Aromatics include benzene and benzene derivatives.

** Gasoline may also contain toxic additives such as benzene and alkyl lead.

PHOSPHINE

FORMS:

Gas. Extremely flammable, may ignite spontaneously in air or explode on contact with flame. Phosphine gas is released when solid fumigants such as aluminum phosphide and zinc phosphide come into contact with moisture.

BACKGROUND:

Phosphine (PH_3) is an extremely toxic gas with a nauseating odor, used in the electronics industry, as an insect fumigant, and occasionally occurring as a by-product in manufacturing. Its toxicology is not well understood, but it appears to affect the central nervous system, the heart, lungs, and liver. Symptoms following low to moderate exposure include nausea, vomiting, headache, cough, dizziness, diarrhea, myalgias, fever, and chills. Severe exposure may produce syncope, stupor, coma, pulmonary edema, local myocardial necrosis, and death. Unlike arsine, phosphine does not produce hemolysis.

POTENTIAL FOR SECONDARY CONTAMINATION:

Very small amounts of phosphine can be trapped in a victim's clothing after an overwhelming exposure, but are not sufficient to create a hazard for health care personnel away from the scene.

PATIENT MANAGEMENT IN THE HOT ZONE I DECON AREA:

1. Rescuers should don agent-specific protective clothing and gloves, and self-contained breathing apparatus.

   Ambulatory patients should be instructed to remove themselves fr~)m the hot zone and to decontaminate themselves under the direction of the decontamination supervisor.

2. Quickly evaluate and support ABCs. Stabilize the spine (if trauma suspected), establish airway and breathing, and consider high flow supplemental oxygen by bag valve mask with reservoir, if possible and practical.

3. If gas is likely to be trapped in clothing (i.e., significant exposure in an enclosed area), remove and double-bag clothing. Flush skin with water spray for I - 2 minutes.

PHOSPHINE

PREHOSPITAL MANAGEMENT AFTER INITIAL DECONTAMINATION:

1. If victim is **NOT** decontaminated and responder is properly trained, don appropriate agent-specific protective equipment and self-contained breathing apparatus. Activate basic decontamination protocol (see Section IV, p.20). If these requirements cannot be met, request assistance from the local hazmat team or your Regional Poison Control Center.

   If victim is decontaminated, don appropriate protective equipment consistent with risk of secondary contamination (Section III, p.18, and Table 5, p.23).

2. Evaluate and support ABCs (airway, breathing, and circulation). Re-evaluate airway, intubate the trachea if victim has developed severe respiratory distress. Administer supplemental high-flow oxygen by mask. Attach cardiac monitor.

MANAGEMENT IN THE HOSPITAL:

1. If victim is **NOT** decontaminated and responder is properly trained, don appropriate agent-specific protective equipment and self-contained breathing apparatus. Activate basic decontamination protocol (see Section IV, p.20). If these requirements cannot be met, request assistance from the local hazmat team or your Regional Poison Control Center.

   If victim is decontaminated, don appropriate protective equipment consistent with risk of secondary contamination (Section III, and Table 7, p.32).

2. Evaluate and support ABCs (airway, breathing, and circulation).

3. Administer 0_2 by mask, if the patient has respiratory distress.

4. Monitor cardiac rhythm; obtain 12-lead EKG. Following severe exposures, follow serial cardiac enzymes to rule out myocardial infarction.

5. Laboratory Test: Hct, electrolytes, BUN and/or creatinine, liver enzymes, Ca, Mg, and blood gases. Other laboratory tests should be requested.

6. Treat pulmonary edema. Symptoms may not develop for 72 hours.

7. Liver damage may become evident 2-3 days later.

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POLYCHLORINATED BIPHENYLS (PCB's)

FORMS:

PCBs occur as oily liquids. They are found in transformers, electrical generators, and capacitors. PCBs constitute a large class of chemicals with many isomers having varying toxicity; the term "PCB" is therefore broad and non-specific in determining the t6xic hazard.

BACKGROUND:

There are no recognized acute toxic effects of PCBs. For this reason, immediate medical attention is NOT necessary for exposure to this material alone. However, exposed victims should be decontaminated to prevent possible long-term effects. If acute distress occurs, especially after a fire or mixture with other chemicals, toxics other than PCB should be suspected. For example, PCBs may sometimes be encountered as mixtures with chlorobenzenes and chlorinated phenols which may increase their irritancy and tendency to form more toxic compounds when heated. For some individuals, PCBs are mild respiratory irritants.

In general, PCBs are absorbed through the skin, with minor contributions from the lungs and gastrointestinal tract. PCBs have an extremely low vapor pressure and do not present an inhalation hazard unless some physical process causes them to become airborne. Agent specific gloves should be worn. During emergency spills or leaks, respiratory protection may be advisable due to aerosolized oil particles containing PCBs, such as high-tension electrical fires in overhead devices.

As noted, PCBs are not acutely toxic. Adverse effects from short-term exposures as might occur in chemical spill scenarios are unlikely. However, PCBs are persistent in the environment and are stored in body fat. Long-term exposure to PCBs may cause chloracne or injure the liver. There is little evidence for other, more subtle effects of PCBs on health. The long-term effects in man are not well known and mostly based on animal and epidemiological studies which are not completely relevant to chemical spills.

High temperature fires or electrical shorts (over several hundred degrees Celsius) may produce higher concentrations of the more toxic substances (chlorinated dibenzofurans, dibenzofuran compounds, and dioxins) depending on oxygen availability and temperature. These agents can also accumulate in the body after long-term exposures to cause harm. The short-term exposures which might occur in a chemical spill scenario involving PCB fires are not likely to cause injury. The possibility of other more subtle adverse effects on health has been raised, but is not proven.

PCBs are weak carcinogens in animal studies. The animal and human evidence indicates that short-term exposures do not pose a significant risk of cancer.

POLYCHLORINATED BIPHENYLS (PCB's)

POTENTIAL FOR SECONDARY CONTAMINATION:

While acute exposure to these materials is unlikely to produce adverse health effects, it is good policy to minimize exposure to potential human carcinogens. This will help decrease the risk of delayed or long-term health effects from cumulative exposures during the course of employment.

PCBs are oily and have a high potential for sticking to clothing and skin, facilities and the environment in the hot zone may be contaminated. Secondary contamination of personnel, transport vehicles and hospitals is possible if rescue personnel or victims are not decontaminated.

PATIENT MANAGEMENT IN THE HOT ZONE/ DECON AREA:

1. Rescuers should don agent-specific protective clothing and gloves, and self-contained breathing apparatus.

   Ambulatory patients should be instructed to remove themselves from the hot zone and to decontaminate themselves under the direction of the decontamination supervisor.

2. Quickly evaluate and support ABCs. Stabilize the spine (if trauma suspected), establish airway and breathing, and consider high flow supplemental oxygen by bag valve mask with reservoir if possible and practical.

3. Follow decontamination protocols (Section IV, p.20 above). Remove and double-bag clothing. Flush skin with water spray for I - 2 minutes. Remove contact lenses and irrigate exposed eyes if symptomatic.

PREHOSPITAL MANAGEMENT AFTER INITIAL DECONTAMINATION:

1. If the victim is not decontaminated, evaluate risks and wear appropriate protective clothing and self-contained breathing apparatus, if required, and activate basic decontamination protocol (see Section IV above).

   If victim is NOT decontaminated and responder is properly trained, don appropriate agent-specific protective equipment and self-contained breathing apparatus. Activate basic decontamination protocol (see Section IV, p; 20). If these requirements cannot be met, request assistance from the local hazmat team or your Regional Poison Control Center.

   If victim is decontaminated, don appropriate protective equipment consistent with risk of secondary contamination (Section III, p. 18, and Table 5, p.23).

2. Quickly evaluate ABCs, spine stabilization (if trauma suspected), establish airway and breathing, and administer supplemental oxygen.

3 Evaluate and support ABCs (airway, breathing, and circulation). Reevaluate airway, intubate the trachea if victim has developed sever respiratory distress. Administer supplemental high-flow oxygen by mask. Attach cardiac monitor.

4. Continue to flush affected skin and eyes with copious water or saline. Remove contact lenses and irrigate eyes with saline via plain IV tubing, for at least 10-15 minutes or until symptoms of pain or irrigation have resolved.

5. Victims with immediate or quickly resolving symptoms or whose only exposure is dermal do not require immediate medical attention.

6. Ingestion: Give activated charcoal.

MANAGEMENT IN THE HOSPITAL:

1. If the patient has not been previously decontaminated, evaluate risks and wear appropriate protective clothing and self-contained breathing apparatus, if required, activate decontamination protocols (Section IV, p.20).

   If victim is **NOT** decontaminated and responder is properly trained, don appropriate agent-specific protective equipment and self-contained breathing apparatus. Activate basic decontamination protocol (see Section IV, p.20). If these requirements cannot be met, request assistance from the local hazmat team or contact your Regional Poison Control Center.

   If victim is decontaminated, don appropriate protective equipment consistent with risk of secondary contamination (Section III, and Table 7, p.32).

2. Evaluate and support ABCs.

3. It is not anticipated that single PCB exposures would lead to transaminase elevations. However, in the event of large body surface area contaminations with PCB oils (such as saturation of an entire extremity), baseline hepatic transaminase and liver function studies may be obtained. This is clearly not an emergency procedure, but if deemed desirable, should be done within 24 hours. The purpose of the baseline is to determine any unrecognized, pre-existing liver enzyme elevations from other causes. A follow-up evaluation in 4-7 days with repeat studies may be conducted at the physician's discretion. Serum PCB levels do not correlate well with health risk or with the degree of exposure in an acute setting.

4. If the patient complains of eye irritation, check for the presence of contact lenses and remove, then irrigate eyes copiously with saline via plain IV tubing for at least 10-15 minutes, or until symptoms of pain or irritation have resolved. Consider fluorescein or slit-lamp examination to rule out corneal injury.

5. Ingestion of PCB oils: Give activated charcoal and consider gastric lavage.

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SMOKE INHALATION

FORMS:

Smoke is a complex combination of various toxic gases, vapors, entrained liquids, aerosolized dusts, carbonized particles, and super heated steam resulting from burning a variety of substances. Common toxic substances include carbon monoxide, hydrogen cyanide, irritant gases such as acrolein, ammonia, hydrogen chloride, phosgene, nitrogen oxides, metal fumes, and carbonaceous particulates. The proportion of each component depends on the substances and conditions of combustion. Fires involving stored chemicals may produce smoke with very high concentrations of the specific toxins such as pesticides.

BACKGROUND:

Smoke inhalation injury results from the combined effects of the various inhaled toxic substances as well as direct thermal injury to the airway. Stridor, wheezing, tracheobronchitis, and acute upper airway obstruction may occur from irritant gases and thermal effects. Acute non-cardiogenic pulmonary edema and chemical pneumonia may occur shortly after exposure or may be delayed up to several hours, especially after exposure to nitrogen oxides.

In any victim with altered mental status, suspect inhalation of a systemic toxin such a carbon monoxide (see protocol), hydrogen cyanide (see protocol), agents producing methemoglobinemia (see protocol), or smoke laden with a stored chemical such as pesticides (see protocol) or those found in drug laboratory chemicals.

POTENTIAL FOR SECONDARY CONTAMINATION:

Although small quantities of acid, amine, or ammonia mists may be absorbed onto clothing from smoke, they pose no significant risk of secondary contamination of rescuers outside of the hot zone, even though odor and carbon deposits may be a nuisance. If the victim has been exposed to heavy concentrations of liquid or vapor from a warehoused chemical, then removal of clothing and flushing with water is appropriate.

PATIENT MANAGEMENT IN THE HOT ZONE/ DECON AREA:

1. Rescuers should don agent-specific protective clothing and gloves, and self-contained breathing apparatus.

   Ambulatory patients should be instructed to remove themselves from the hot zone and to decontaminate themselves under the direction of the decontamination supervisor.

2. Quickly evaluate and support ABCs. Stabilize the spine (if trauma suspected), establish airway and breathing, and consider high flow supplemental oxygen by bag valve mask with reservoir, if possible and practical. Flush exposed skin for 1 - 2 minutes.

3. Remove contaminated clothing. Treat exposed clothing appropriately, according to agent involved. Remove contact lenses and irrigate exposed eyes if symptomatic.

PREHOSPITAL MANAGEMENT AFTER INITIAL DECONTAMINATION:

1. If victim is **NOT** decontaminated and responder is properly trained, don appropriate agent-specific protective equipment and self-contained breathing apparatus. Activate basic decontamination protocol (see Section IV, p.20) consistent with specific agents involved in the fire. If these requirements cannot be met, request assistance from the local hazmat team or your Regional Poison Control Center.

   If victim is decontaminated, don appropriate protective equipment consistent with risk of secondary contamination (Section III, p.18, and Table 5, p.23).

2. Evaluate and support ABCs (airway, breathing, and circulation). Reevaluate the airway, observing the nose and mouth for soot deposits and singed hair which suggests that thermal injury to the airway may have occurred. Evaluate and manage airway. Provide high-flow oxygen by non-rebreather mask. If airway is becoming compromised, intubation is preferable. Monitor cardiac rhythm and establish IV TKO.

3. Significant bronchospasm can result from smoke exposure. For asthmatics and, based on good clinical judgement, for other exposures, wheezing or other signs of airway constriction should be treated with a cardio-selective agent such as aerosolized albuterol.

   Some components of smoke can sensitize the myocardium, and epinephrine and theophylline should be **AVOIDED**.

4. Victim with minimal or quickly resolving symptoms of eye and throat irritation do not require immediate evaluation in the emergency department. Those with persistent cough, wheezing, dyspnea, chest pain or altered mental status should receive immediate medical evaluation.

5. These protocols do not supersede existing burn protocols.

6. Continue to flush affected skin and eyes with copious water or saline. Remove contact lenses and irrigate eyes with saline via plain IV tubing, for at least 10-15 minutes or until symptoms of pain or irrigation have resolved.

SMOKE INHALATION

MANAGEMENT IN THE HOSPITAL:

1. If victim is NOT decontaminated and responder is properly trained, don appropriate agent-specific protective equipment and self-contained breathing apparatus. Activate basic decontamination protocol (see Section IV, p.20). If these requirements cannot be met, request assistance from the local hazmat team or your Regional Poison Control Center.

   If victim is decontaminated, don appropriate protective equipment consistent with risk of secondary contamination (Section III, p.18, and Table 7, p.32).

2. Reevaluate and support ABCs. If the victim is contaminated, activate basic decontamination protocol (see Section IV above).

3. Provide high-flow humidified supplemental oxygen by tight fitting mask with oxygen reservoir. Intubation and assisted ventilation may be required for victims with airway obstruction, severe pulmonary edema, coma, or convulsions. Patients at risk for airway obstruction often have facial burns, singed nasal hairs, or carbonaceous sputum in addition to cough and stridor. Pulmonary edema may be delayed for up to 12-24 hours.

4. If the patient complains of eye irritation, check for the presence of contact lenses and remove, then irrigate eyes copiously with saline via plain IV tubing for at least 10-15 minutes, or until symptoms of pain or irritation have resolved. Consider fluorescein or slit-lamp examination to rule out corneal injury.

5. For symptomatic patients, obtain arterial blood gases, carboxyhemoglobin level, methemoglobin level, cyanide level (result will not usually be available stat), base line pulmonary function and diffusing' capacity if available, chest x-ray, and 12-lead electrocardiogram. Severe methemoglobinemia will turn the blood brown. Cherry red skin color suggests carbon monoxide poisoning but is not reliably present.

6. Monitor cardiac rhythm.

7. If carbon monoxide poisoning is suspected, provide the highest possible oxygen concentration readily available. This may include hyperbaric oxygen if the victim can be placed in the chamber within 3040 minutes of arrival.

8. Cyanide poisoning should be suspected in any patient with altered mental status; it commonly accompanies and mimics carbon monoxide poisoning. Unfortunately, there is no rapid confirmatory test for cyanide; in severe cases, the venous oxygen saturation may exceed 90% because oxygen is not being utilized by tissues. If cyanide poisoning is suspected, administer the thiosulfate portion of the antidote kit (sodium thiosulfate 25%, 50 mi IV [children 1.6-1.8 mi/kg IV]).

DO NOT give the nitrite portion of the antidote kit because of the danger of inducing or worsening methemoglobinemia under these circumstance.

9. In most cases of minor smoke inhalation, asymptomatic patients can be monitored and discharged from the emergency department after 4-6 hours with appropriate discharge instructions.

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(___) ___-____

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