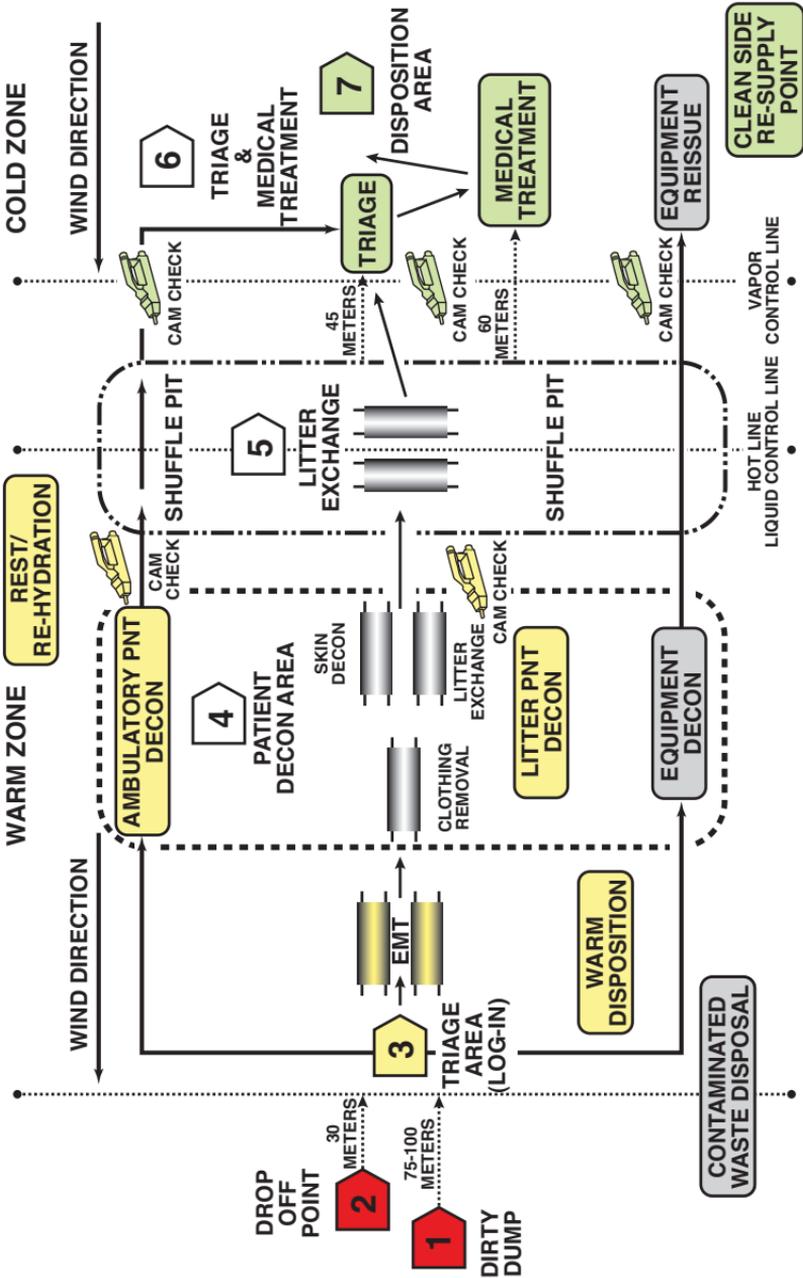


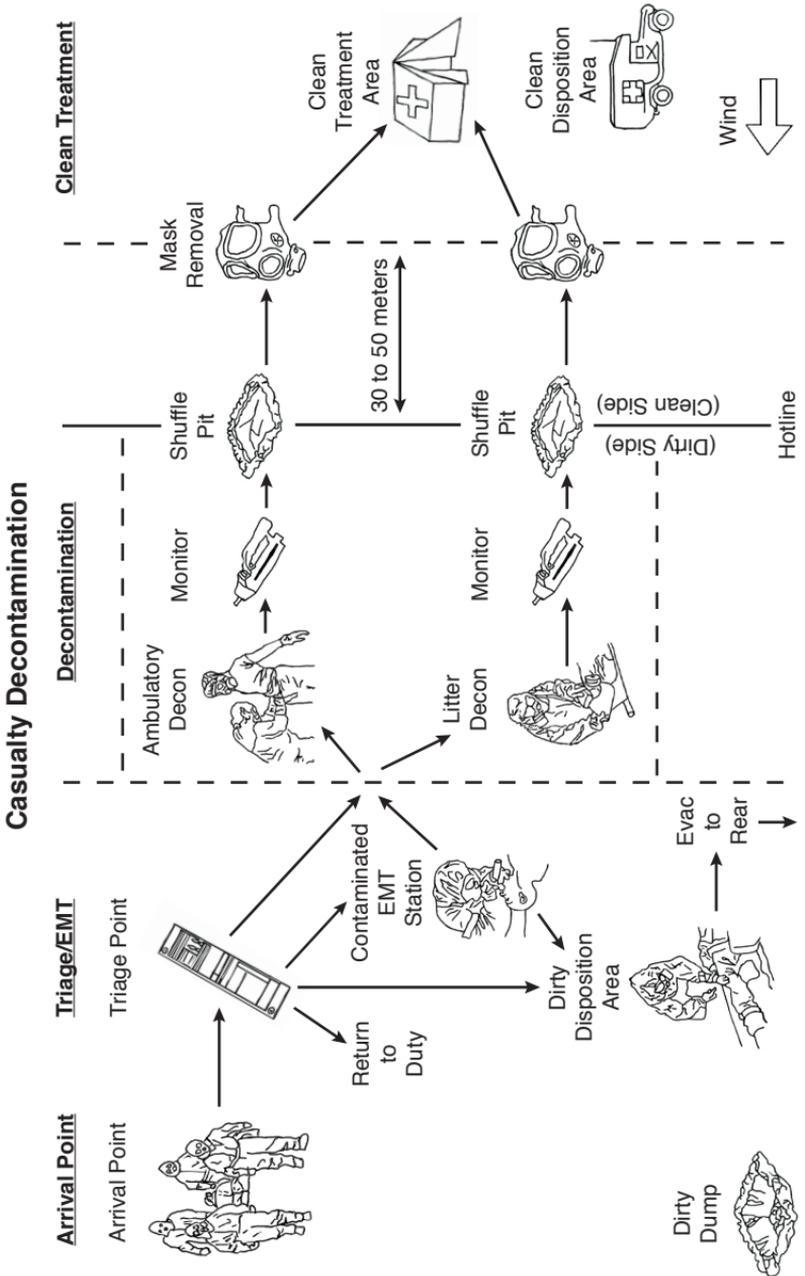
## Appendix A

# PATIENT DECONTAMINATION STATION DIAGRAMS

The following diagrams show set-up for casualty management in a contaminated environment. Chapter 8, on casualty management, describes the various areas. The actual set-up of this station may vary depending on circumstances and available assets.



**Diagram 1.** Patient decontamination site layout. CAM: Chemical Agent Monitor; decon: decontamination; EMT: emergency medical treatment; PNT: patient



**Diagram 2.** Casualty decontamination procedure. EMT: emergency medical treatment

## Appendix B

# PHYSIOCHEMICAL DATA

The following table provides physiochemical data on the agents discussed in this handbook.

| Agent                          | Molecular Weight | Vapor Density (Compared to Air) | Liquid Density (g/mL) |
|--------------------------------|------------------|---------------------------------|-----------------------|
| GA<br><i>Tabun</i>             | 162              | 5.63                            | 1.07 @ 25°C           |
| GB<br><i>Sarin</i>             | 140              | 4.86                            | 1.102 @ 20°C          |
| GF                             | 180              | 6.2                             | 1.17 @ 20°C           |
| GD<br><i>Soman</i>             | 182              | 6.33                            | 1.02 @ 25°C           |
| VX                             | 267              | 9.2                             | 1.01 @ 20°C           |
| HD<br><i>Distilled mustard</i> | 159              | 5.4                             | 1.27 @ 20°C           |
| L<br><i>Lewisite</i>           | 207              | 7.1                             | 1.89 @ 20°C           |
| CX<br><i>Phosgene oxime</i>    | 114              | 3.9                             | NA                    |
| AC<br><i>Hydrogen cyanide</i>  | 27               | 0.94                            | 0.94                  |
| CK<br><i>Cyanogen chloride</i> | 61.5             | 2.1                             | 1.18                  |
| CG<br><i>Phosgene</i>          | 99               | 3.4                             | 1.37                  |
| CN<br><i>Mace</i>              | 154.59           | 5.3                             | 1.32 (solid) @ 20°C   |
| CS                             | 189              | NA                              | 1.04 @ 20°C           |

\*HD decomposes before boiling at 218°C. HD as a liquid will still boil, but the agent decomposes (HD is demilitarized in a similar process).

NA: not available

| Freezing/<br>Melting<br>Point (°C) | Boiling Point<br>(°C @ 750<br>mm HG) | Vapor Pressure<br>(mm HG @<br>25°C) | Volatility (mg/m <sup>3</sup><br>@ 25°C) |
|------------------------------------|--------------------------------------|-------------------------------------|--|
| - 50                               | 247                                  | 0.07                                | 610                                      |
| - 56                               | 147                                  | 2.9                                 | 17,000                                   |
| - 30                               | 239 (@ 20°C)                         | 0.04 (@ 20°C)                       | 581                                      |
| - 42                               | 167                                  | 0.4                                 | 3,900                                    |
| - 39                               | 298                                  | 0.0007                              | 10                                       |
| 14.5                               | 227.8*                               | 0.07 @ 20°C                         | 600 @ 20°C                               |
| -1 8                               | 190                                  | 0.2239 @ 20°C                       | 4,480 @ 20°C                             |
| 35-40                              | 128                                  | 11.2 @ 25°C                         | 1,800 @ 20°C                             |
| - 13.3                             | 25.7                                 | 630 @ 20°C                          | 1,080,000 @ 25°C                         |
| - 6.9                              | 12.8                                 | 1,230 @ 25°C                        | 2,600,000 @ 12.8°C                       |
| -1 28                              | 7.6                                  | 1.17 @ 20°C                         | 4,300,000 @ 7.6°C                        |
| 58                                 | 248                                  | 0.0041 @ 20°C                       | 115 @ 20°C                               |
| - 94                               | 315                                  | 0.00034 @ 20°C                      | 0.71 @ 20°C                              |

## Appendix C

# CHEMICAL AGENT QUICK REFERENCE

The following table is intended to serve as a quick reference of chemical agents, their effects, first-aid measures, detection, and skin decontamination. Consult the appropriate chapter for further details.

| Type of Agent                             | Effects   | Onset   |
|---|---|---|
| Pulmonary<br>TICs: CG,<br>PFIB, HC        | Dyspnea, coughing   | Hours   |
| Cyanide: AC,<br>CK                        | Loss of consciousness,<br>convulsions, apnea  | Seconds   |
| Vesicants: H,<br>HD, L                    | Liquid: erythema, blisters;<br>irritation of eyes; cough,<br>dyspnea. Vapor: miosis,<br>rhinorrhea, dyspnea | Liquid: hours<br>(immediate pain<br>after L). Vapor:<br>seconds |
| Nerve agents:<br>GA, GB, GD,<br>GF, VX    | Liquid: sweating, vomiting.<br>Vapor: miosis, rhinorrhea,<br>dyspnea. Both: convulsions,<br>apnea           | Liquid: minutes<br>to hours. Vapor:<br>seconds                  |
| Incapacitating<br>agents: BZ,<br>Agent 15 | Mydriasis, increased body<br>temperature; dry mouth<br>and skin; confusion; visual<br>hallucinations        | Minutes to hours  |
| Riot-control<br>agents: CS, CN            | Burning, stinging of eyes, nose,<br>airways, skin   | Seconds   |

ACADA: Automatic Chemical Agent Detection Alarm  
ATNAA: Antidote Treatment Nerve Agent Autoinjector  
ICAM: Improved Chemical Agent Monitor  
JCAD: Joint Chemical Agent Detector  
PFIB: perfluoroisobutylene  
RSDL: Reactive Skin Decontamination Lotion  
TIC: toxic industrial chemical

| <b>First-aid</b>                                     | <b>Skin Decontamination</b>                      | <b>Field Detection</b>                                |
|--|--|---|
| None   | None usually needed                              | None  |
| None (nitrite and thiosulfate)                       | None usually needed                              | JCAD, M256A1, M18A2                                   |
| None   | RSDL, soap and water, 0.5% hypochlorite solution | JCAD, M256A1; M8 and M9 papers, ICAM, ACADA, FOX, M90 |
| ATNAA (1 to 3); diazepam                             | RSDL, soap and water, 0.5% hypochlorite solution | JCAD, M256A1, M8 and M9 papers, ICAM, M22 ACADA       |
| Prevent casualties from harming themselves or others | Remove outer clothing; water or soap and water   | None  |
| None   | Water  | None  |

## Appendix D

# NEMONICS

### The ABCDDs of Chemical Casualty Care

**A:** Airway management should be focused on establishing an airway and maintaining the airway. Death will occur if the airway is lost.

**B:** Breathing may require intubation and ventilation of casualties. Keep in mind that once a casualty has been intubated, someone must stay with the casualty to provide and monitor ventilations. This requirement may last until evacuation or return of spontaneous breathing, or until the patient expires.

**C:** Circulation: to maintain circulation in the absence of effective cardiac contractions, chest compressions may be required but will probably not be feasible in a mass-casualty event. Most casualties without a pulse will have to be triaged as expectant.

**D:** Decontamination: immediate, along with thorough patient decontamination and technical decontamination, constitutes one of the main types of personnel decontamination.

**D:** Drugs: refers to specific antidotal treatment for selected agents and also to ancillary supportive medications.

## Toxicology Acronyms

Acronyms are helpful for remembering the toxicologically important aspects of a poisoned casualty. Choose the one that you find easiest to remember and commit it to memory. The logical progression of each acronym from agent through environment and to host should aid memorization.

### **ASBESTOS**

**A:** Agent(s): type(s) and estimated doses

**S:** State(s): solid, liquid, vapor, gas, aerosol

**B:** Body sites: where exposed (routes of entry, exposure and absorption)

**E:** Effects: local vs systemic

**S:** Severity: of effects and exposure

**T:** Time course: past, present, and future (prognosis)

**O:** Other diagnoses: instead of (differential diagnosis) and in addition to (additional diagnoses)

**S:** Synergism: interaction among multiple coexisting diagnoses

### **TOXICANT**

**T:** Toxicant/toxidrome: does the agent fit with a specific toxidrome?

**O:** Outside the body: is its form solid, liquid, vapor, gas, or aerosol?

**X:** Xing into the body: where did the agent cross into the body (exposure and absorption)?

**I:** Inside the body: where did the agent go inside the body (distribution)?

**C:** Chronology: what is the time course of exposure (past, present, and future)?

**A:** Additional diagnoses: are there coexisting diagnoses?

**N:** Net effect of diagnoses: what is the effect of the interaction among all diagnoses, on the patient as a whole?

**T:** Triage: what is the patient's priority for treatment, decontamination, and transport?

## **POISON**

**P:** Poison(s): what are the type(s) and estimated doses?

**O:** Outside the body: is the agent solid, liquid, vapor, gas, or aerosol?

**I:** Into / inside the body: where did it get into the body and where did it go inside the body?

**S:** Sequence of events: what is the time course of effects (past, present, and future)?

**O:** Other diagnoses: are there other causes, instead of (differential diagnosis) and in addition to (additional diagnoses)?

**N:** Net effects of diagnoses: what results from the interaction among all diagnoses, for the patient as a whole?

Appendix E

## GLOSSARY OF TERMS AND ACRONYMS

- ABCs.** airway, breathing, circulation
- ABCDDs.** Airway, Breathing, Circulation, immediate Decontamination, and Drugs
- ACAA.** Automatic Chemical Agent Alarm
- ACADA.** Automatic Chemical Agent Detector Alarm; this area monitoring detector sounds a warning when it senses the vapors of blister and nerve agents
- Acid.** a substance with a pH less than 7
- ACU.** Army combat uniform
- AFS.** Alternative Footwear Solution
- Aerosol.** a gaseous suspension of fine solid or liquid particles
- Alkali.** a substance with a pH greater than 7
- Alveoli.** microscopic air sacs in the lungs where oxygen and carbon dioxide diffusion (movement) takes place through alveolar walls
- AMEDD.** Army Medical Department
- Asphyxiation.** unconsciousness or death caused by lack of oxygen
- ATNAA.** Antidote Treatment Nerve Agent Autoinjector
- BAL.** British anti-Lewisite
- Bronchi.** the finer, smaller divisions of the wind pipe as it enters the lungs
- BSA.** body surface area
- C2A1 filter canister.** the standard filter used on the military mask; protects against historical chemical warfare agents
- CAM.** Chemical Agent Monitor
- CANA.** Convulsive Antidote, Nerve Agent.
- Capillaries.** small blood vessels
- CARC.** Chemical Agent-Resistant Coating
- Central airway.** the airway segment that transports air from the nose and mouth to the lungs

- CNS.** central nervous system  
**Ct.** concentration-time product  
**CWC.** Chemical Warfare Convention  
**ECP.** entry control point  
**ED<sub>50</sub>.** effective dose  
**EEG.** electroencephalographic  
**EMT.** emergency medical treatment  
**FiO<sub>2</sub>.** fraction of inspired oxygen  
**FMC.** Field Medical Card  
**FR.** flame-resistant  
**nFR.** non-flame-resistant  
**GCSF.** granulocyte colony stimulating factor  
**GI.** gastrointestinal  
**HC smoke.** military tactical smoke  
**HEPA.** high-efficiency particulate air  
**HTH.** high test hypochlorite  
**ICAD.** Individual Chemical Agent Detector  
**ICAM.** Improved Chemical Agent Monitor  
**Intubation.** the process of enhancing respiration by providing an artificial airway  
**ICt<sub>50</sub>.** median incapacitating dose via vapor  
**ID<sub>50</sub>.** median incapacitating dose  
**IDLH.** immediately dangerous to life and health  
**IM.** intramuscular  
**IP.** intraperitoneal  
**IPE.** individual protective equipment  
**IV.** intravenous  
**JB2GU.** Joint Block 2 Glove Upgrade  
**JCAD.** Joint Chemical Agent Detector  
**JSGPM.** Joint Service General Purpose Mask  
**JSLIST.** Joint Service Lightweight Integrated Suit Technology  
**JSPDS.** Joint Service Personnel/Skin Decontamination System  
**L.** lewisite  
**Laryngospasm.** spasmodic closure of the larynx (voice box at the top of the trachea/wind pipe)  
**Larynx.** voicebox and vocal cords  
**LCL.** liquid control line  
**LCt<sub>50</sub>.** median lethal concentration  
**LD<sub>50</sub>.** median lethal dose

- LSD.** lysergic acid diethylamide
- MCBC.** Management of Chemical and Biological Casualties course
- MCW.** mass-casualty weapon
- MES.** medical equipment set
- MOPP.** mission-oriented protective posture
- MTF.** medical treatment facility
- Nasopharynx.** the area of the nose and upper airway
- NATO.** North Atlantic Treaty Organization
- NBC.** nuclear/biological/chemical
- NCO.** noncommissioned officer
- NCOIC.** noncommissioned officer-in-charge
- NOx.** oxides of nitrogen; toxic smoke that can cause pulmonary edema. Produced by exploding munitions, industrial smoke, and in grain silos as a product of grain fermentation
- OIC.** officer-in-charge
- Oropharynx.** the mouth and upper airway
- OSHA.** Occupational Safety and Health Agency
- PDS.** patient decontamination site
- PFIB.** toxic smoke produced by Teflon (DuPont, Wilmington, DE) burning at over 700°F
- PNS.** peripheral nervous system
- PO.** per os (by mouth)
- PPW.** Patient Protective Wrap
- Pulmonary edema.** fluid in the lungs, associated with an outpouring of fluids from the capillaries into the pulmonary spaces (air sacs or alveoli) producing severe shortness of breath. In later stages, produces expectoration of frothy, pink, fluid and blue lips (cyanosis)
- RDD.** radiological dispersal device
- RDIC.** Resuscitation Device, Individual Chemical
- RSCAAL.** Remote Sensing Chemical Agent Alarm
- RSDL.** Reactive Skin Decontamination Lotion
- TAP.** toxicological agent protective (eg, TAP apron)
- TIB.** toxic industrial biological
- TIC.** toxic industrial chemical; a chemical with a toxicity equal to or greater than ammonia that is produced more than 30 times a year by an industrial facility
- TIM.** toxic industrial material

**TIR.** toxic industrial radiological

**Trachea.** wind pipe

**USAMRICD.** US Army Medical Research Institute of Chemical Defense

**Vapor.** fumes given off by a liquid

**VCL.** vapor control line

**WBGT.** wet bulb globe thermometer

**WMDs.** weapons of mass destruction