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 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.

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

*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
<table>
<thead>
<tr>
<th>Freezing/Melting Point (°C)</th>
<th>Boiling Point (°C @ 750 mm HG)</th>
<th>Vapor Pressure (mm HG @ 25°C)</th>
<th>Volatility (mg/m³ @ 25°C)</th>
</tr>
</thead>
<tbody>
<tr>
<td>-50</td>
<td>247</td>
<td>0.07</td>
<td>610</td>
</tr>
<tr>
<td>-56</td>
<td>147</td>
<td>2.9</td>
<td>17,000</td>
</tr>
<tr>
<td>-30</td>
<td>239 (@ 20°C)</td>
<td>0.04 (@ 20°C)</td>
<td>581</td>
</tr>
<tr>
<td>-42</td>
<td>167</td>
<td>0.4</td>
<td>3,900</td>
</tr>
<tr>
<td>-39</td>
<td>298</td>
<td>0.0007</td>
<td>10</td>
</tr>
<tr>
<td>14.5</td>
<td>227.8*</td>
<td>0.07 @ 20°C</td>
<td>600 @ 20°C</td>
</tr>
<tr>
<td>-1.8</td>
<td>190</td>
<td>0.2239 @ 20°C</td>
<td>4,480 @ 20°C</td>
</tr>
<tr>
<td>35–40</td>
<td>128</td>
<td>11.2 @ 25°C</td>
<td>1,800 @ 20°C</td>
</tr>
<tr>
<td>-13.3</td>
<td>25.7</td>
<td>630 @ 20°C</td>
<td>1,080,000 @ 25°C</td>
</tr>
<tr>
<td>-6.9</td>
<td>12.8</td>
<td>1,230 @ 2 5°C</td>
<td>2,600,000 @ 12.8°C</td>
</tr>
<tr>
<td>-128</td>
<td>7.6</td>
<td>1.17 @ 20°C</td>
<td>4,300,000 @ 7.6°C</td>
</tr>
<tr>
<td>58</td>
<td>248</td>
<td>0.0041 @ 20°C</td>
<td>115 @ 20°C</td>
</tr>
<tr>
<td>-94</td>
<td>315</td>
<td>0.00034 @ 20°C</td>
<td>0.71 @ 20°C</td>
</tr>
</tbody>
</table>
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.

<table>
<thead>
<tr>
<th>Type of Agent</th>
<th>Effects</th>
<th>Onset</th>
</tr>
</thead>
<tbody>
<tr>
<td>Pulmonary TICs: CG, PFIB, HC</td>
<td>Dyspnea, coughing</td>
<td>Hours</td>
</tr>
<tr>
<td>Cyanide: AC, CK</td>
<td>Loss of consciousness, convulsions, apnea</td>
<td>Seconds</td>
</tr>
<tr>
<td>Incapacitating agents: BZ, Agent 15</td>
<td>Mydriasis, increased body temperature; dry mouth and skin; confusion; visual hallucinations</td>
<td>Minutes to hours</td>
</tr>
<tr>
<td>Riot-control agents: CS, CN</td>
<td>Burning, stinging of eyes, nose, airways, skin</td>
<td>Seconds</td>
</tr>
</tbody>
</table>

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
<table>
<thead>
<tr>
<th>First-aid</th>
<th>Skin Decontamination</th>
<th>Field Detection</th>
</tr>
</thead>
<tbody>
<tr>
<td>None</td>
<td>None usually needed</td>
<td>None</td>
</tr>
<tr>
<td>None (nitrite and thiosulfate)</td>
<td>None usually needed</td>
<td>JCAD, M256A1, M18A2</td>
</tr>
<tr>
<td>None</td>
<td>RSDL, soap and water, 0.5% hypochlorite solution</td>
<td>JCAD, M256A1; M8 and M9 papers, ICAM, ACADA, FOX, M90</td>
</tr>
<tr>
<td>ATNAA (1 to 3); diazepam</td>
<td>RSDL, soap and water, 0.5% hypochlorite solution</td>
<td>JCAD, M256A1, M8 and M9 papers, ICAM, M22 ACADA</td>
</tr>
<tr>
<td>Prevent casualties from harming themselves or others</td>
<td>Remove outer clothing; water or soap and water</td>
<td>None</td>
</tr>
<tr>
<td>None</td>
<td>Water</td>
<td>None</td>
</tr>
</tbody>
</table>
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
c. concentration-time product
CWC. Chemical Warfare Convention
ECP. entry control point
ED_{50}. effective dose
EEG. electroencephalographic
EMT. emergency medical treatment
FiO_2. 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_{50}. median incapacitating dose via vapor
ID_{50}. 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_{50}. median lethal concentration
LD_{50}. 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