1 Chapter 48, Part 4 Hazardous-Materials Incidents

2 A hazardous-materials emergency can involve ____________________________________ substances and occur in many situations. Warning placards on a truck should immediately alert you to the possible need of a “hazmat” team.

3 Hazardous Materials
   • A hazardous material is any substance that causes adverse ____________________________________ effects upon human exposure.
   • Generally, EMS personnel do not perform ____________________________________ and control functions at a hazmat response.

4 Hazmat Standards
   • ____________________________________ publication CFR 1910.120
   • ____________________________________ regulation 40 CFR 311
   • ____________________________________ standard 473

5 Levels of Training
   • ____________________________________ level
     □ Recognition
     • EMS Level I (____________________________________ level)
       □ Patient care in cold zone
     • EMS Level II (____________________________________ level)
       □ Patient care in warm zone

6 Incident Size-Up
   Priorities for a hazmat incident are the same as for any other major incident.
   • ____________________________________ safety
   • Incident stabilization
   • ____________________________________ conservation

7 Incident Awareness
   • Every city in the US has the ____________________________________ to be a hazmat incident
   • Every emergency ____________________________________ has the potential to be a hazmat incident.

8 Hazardous-Materials Areas
   • ____________________________________
     • Fixed facilities
     • ____________________________________

9 Do not rule out the presence of a hazardous material at an MVA just because you do not see a ____________________________________

10 Weapons of Mass Destruction
   • Chemical, ____________________________________, or nuclear devices used by
terrorists to strike at government or high-profile targets
• Designed to create a ____________________ number of casualties

11 • Potential Terrorist Targets
• ____________________ buildings
• Multinational headquarters
• ____________________ centers
• Workplaces
• Sites of ____________________

12 • At terrorist incidents, remember that a ____________________ device may exist!

13 • Ways to Recognize Haz-Mat
• ____________________
  - Placards
  - Material Safety Data Sheets (__________________________)
  - Shipping Papers
  - UN Number
  - ____________________ System

14 • Hazardous-Materials Recognition
  Two systems:
  • ____________________
  • ____________________ facilities

15 • Placards
  Many vehicles are required to carry placards, but the absence of one doesn’t mean there is not a ____________________ .

16 • Vehicles carrying hazardous materials are required to display placards indicating the ____________________ of their contents.

17 • Sample labels and placards required by the DOT for all packages, storage containers, and ____________________ containing hazardous materials.

18 • Hazard Classes and Placard Colors (1 of 2)

<table>
<thead>
<tr>
<th>Class</th>
<th>Type</th>
<th>Placard Color</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td></td>
<td>Orange</td>
</tr>
<tr>
<td>2</td>
<td>Gases</td>
<td>Red or Green</td>
</tr>
<tr>
<td>3</td>
<td>Liquids</td>
<td>Red</td>
</tr>
<tr>
<td>4</td>
<td>Oxidizers and organic peroxides</td>
<td>Red and White</td>
</tr>
</tbody>
</table>

19 • Hazard Classes and Placard Colors (2 of 2)

<table>
<thead>
<tr>
<th>Class</th>
<th>Type</th>
<th>Placard Color</th>
</tr>
</thead>
<tbody>
<tr>
<td>6</td>
<td>Poisons and etiological agents</td>
<td>White</td>
</tr>
</tbody>
</table>
• 7 Radioactive Material  Yellow and White
• 8 ____________________________________ Black and White
• 9 ____________________________________ Black and White

20 UN Number
• A specific ____________________________________ number given to a specific chemical
• Normally 4 digits

21 NFPA 704 System
• Identifies hazardous materials at a ____________________________________ site
• Uses diamond-shaped figures divided into four sections:
  □ Red—____________________________________
  □ Blue—____________________________________ hazard
  □ Yellow—____________________________________
  □ White—Specific information

22 NFPA 704 System

23 NFPA 704 System

24 Substance Identification
1 • North American Emergency ____________________________________ Guide
  • Shipping papers
  • ____________________________________ safety and data sheets (MSDS)
  • Databases
2 • Hazmat telephone lines (CHEMTREC, CHEMTEL, Inc.)
  • ____________________________________ control centers
  • ____________________________________
  • References

25 Emergency Response Guidebook
• Required to be on ALL ____________________________________ vehicles
• Updated Periodically
• Available in pdf format at:

26 Material Safety Data Sheet (MSDS).

27 Hazardous-Materials Zones
• It is important to setup zones around an incident to assure safety of yourself, your crew, other responders, and the public.
  • Hot (Contaminated Area) Zone: Only ____________________________________ team or expert entry
  • Warm (Controlled) Zone: For ____________________________________ and those supporting workers in hot zone
  • Cold (Safe) Zone: Associated ____________________________________ workers.
  – Area where normal EMS treatment occurs
Haz Mat Zones

Terminology (1 of 5)
• _________________ point: temperature at which a liquid becomes a gas
• Flammable/Explosive limits: range (upper and lower) of vapor concentration in the air at which an ignition will initiate ________________.
  – LEL: ____________________________________ explosive limit
  – UEL: ____________________________________ explosive limit

Terminology (2 of 5)
• _________________ Point: lowest temperature at which a liquid will give off enough vapors to ignite
• Ignition Temperature: lowest temperature at which a liquid will give off enough vapors to support ________________
• Specific Gravity: the weight of a volume of liquid compared with an equal volume of ____________________ (1.0)

Terminology (3 of 5)
• __________________ Density: the weight of vapor or gas compared with an equal volume of air (1.0)
• __________________ pressure: pressure of a vapor against the inside walls of a container
• Water solubility: ability of a chemical to ________________________ in water

Terminology (4 of 5)
• Threshold limit/time weighted average (TLV/TWA): maximum concentration of a substance that a person can be exposed to for 8 hours a day, 40 hours per week ________________ adverse effects.
• Threshold limit value/short-term exposure limit (TLV/STEL): maximum concentration of a substance that a person can be exposed to for ________________ minutes; not to exceed more than 4 times daily with 1 hour rests between exposures

Terminology (5 of 5)
• Threshold limit value/ceiling level (TLV-CL): maximum concentration of a substance that should never be ________________, even for one minute
• Lethal concentration/lethal doses (LCt/LD): concentration or dose that results in the death of ____________% of the test subjects
  – AKA: LD50 or LCt50
• Immediately dangerous to life and health (IDLH): level of concentration that can cause _______________________ threat to life.

Contamination and Toxicology Review

Types of Contamination
• __________________________ : Direct contact
• __________________________ : A contaminated person or object comes in contact with an uncontaminated person or object
Routes of Exposure
- Respiratory ____________________________
- Topical ________________________________
- ____________________________ injection (laceration, burn, puncture)
- Gastrointestinal ________________________

Effects of Poisons
- ____________________________ effects: occur rapidly
- ____________________________ effects: occur over time
- Local effects: involve area of exposure
- ____________________________ effects: involve body systems
- ____________________________ : chemical alteration of a substance within the body
- Synergism: 2 or more substances work together to produce an effect neither is capable on their own.

Treatment of Common Exposures

Corrosives (1 of 2)
- ____________________________ off dry particles.
- Flush liquid corrosives with large quantities of water.
- ____________________________ of green soap may help in decontamination.
- Irrigate eye injuries, possibly with proparacaine hydrochloride to assist.

Corrosives (2 of 2)
- If the corrosive has been ingested, do not induce ____________________________ .
- If the patient can swallow and is not drooling, give the person 5cc/kg water up to 200 cc.
- Support the ____________________________ .

Pulmonary Irritants
- Cannot be decontaminated.
- Remove patient’s clothing.
- Flush exposed skin with large quantities of ____________________________ .
- Irrigate eyes with water; proparacaine hydrochloride may assist.
- Treat pulmonary ____________________________ with furosemide and albuterol.
- Support the ABCs.

Pesticide Actions (1 of 2)
- Organophosphate substances act to block acetylcholinesterase (AChE)
- Produces SLUDGE:
  -S ____________________________
  -L ____________________________
  -U ____________________________
  -D ____________________________ (defecation)
  -G ____________________________ distress
Pesticide Actions (2 of 2)
• ________________________________ muscle contractions
• ________________________________ pupils
• These chemicals are readily absorbed through the
  ________________________________

Pesticide Treatment
• Remove all ________________________________ and jewelry.
• Maintain and support ABCs.
• Suction if needed.
• Administer ________________________________, 2 mg IV push until SLUDGE symptoms resolve.
• If an adult has seizures, administer 5–10 mg of diazepam.
• Another antidote is ________________________________ (2-Pam, Protopam)
• If the patient can swallow, give 5cc/kg up to 200cc of ________________________________.

Chemical Asphyxiants
The most common chemical asphyxiants include:
• Carbon ________________________________
  □ Has a high affinity for hemoglobin and displaces oxygen on the red blood cells
• ________________________________
  □ Inhibit cytochrome oxidase that enable oxygen to create adenosine triphosphate (ATP) required for muscle energy

General Treatment for Chemical Asphyxiants
• ________________________________ is usually not necessary.
• Remove from the toxic environment.
• Remove patient’s clothes to prevent ________________________________ gasses.
• Aggressive airway management

Treatment for CO Exposure
• ________________________________ patient.
• ________________________________ therapy is necessary in some cases.
• Use caution with pulse oximetry

Treatment for Cyanide
• Use a ________________________________ kit.
• Administer amyl nitrate.
• Administer sodium nitrite, 300 mg IV push over 5 minutes.
• Follow with an infusion of thiosulfate, 12.5 g IV push over 5 minutes.
• Repeat at half doses if necessary.
• If kit not available, ABC,s and ________________________________ transport

Hydrocarbon Solvents (1 of 2)
• ________________________________ based solvents
• Give off easily inhaled ____________________________________
• Immediate effects include ____________________________________ , pulmonary edema, and respiratory failure
• Delayed effects include CNS damage and renal system problems or failure

50 Hydrocarbon Solvents (2 of 2)
• Decontaminate the exposed area with warm water and tincture of green soap.
• If the patient has ___________________________ the solvent, do not induce vomiting.
• If the patient can swallow and is not drooling, administer 5 cc/kg up to 200cc of water.
• If the patient has seizures, give 5–10 mg diazepam.
• Support the ___________________________.

51 Methods of Decontamination

52 Dilution
• Application of large quantities of ___________________________ to the person.
• Water is the universal decontamination solution.
• Water may be aided by ___________________________.

53 Absorption
• Use of pads or towels to ___________________________ up the hazardous material
• Usually applied after ___________________________.
• More commonly used during environmental cleanup

54 Neutralization
• Almost never used by ___________________________ personnel
• A substance reduces or eliminates the ___________________________ of another substance

55 Isolation/Disposal
• Involves separating the patient or equipment from the hazardous substance.
• ___________________________ are established to prevent further contamination.

56 Field Decontamination
• When dealing with unknowns, do not attempt to ___________________________.
• Brush off dry chemicals.
• Apply large quantities of ___________________________ with green soap if available.

57 Two-Step Process
• Usually a ___________________________ method.
• Remove patient’s clothing and jewelry.
• Wash and rinse the patient ___________________________ times.

8

Eight-Step Decontamination Process
1. Rescuers enter the decontamination area at hot end of corridor and mechanically remove contaminants.
2. Rescuers drop equipment in a tool-drop area, and remove ___________________ gloves.
3. Decontamination personnel shower and scrub all victims and rescuers using gross decontamination. Victims can be moved to step 6 or step 7.
4. Rescuers remove and isolate their ____________________________ .

59

Eight-Step Decontamination Process
5. Rescuers remove all protective clothing. Victims who are still clothed have their clothes removed.
6. Rescuers remove all personal clothing.
7. Rescuers and victims receive a ____________________________ washing.
8. Patients receive ____________________________ assessment and stabilization before transport.

60

Decontamination

61

Hazmat Protection Equipment
Level _________:
• ____________________________ respiratory and splash protection
• Fully encapsulating
Level _________:
• Full respiratory protection
• Non-encapsulating, but ____________________________ resistant

62

Hazmat Protection Equipment
Level _________:
• Uses an air-purifying respirator
• Nonpermeable suit, boots, and eye and hand protection
Level _________:
• Structural fire-fighting gear

63

Level A Haz-Mat Suit
64

Level B Haz-Mat Suit
65

Level C Haz-Mat Suit

66

The level of protection needed depends on the ____________________________ or substance involved.

67

Medical Monitoring and Rehabilitation

68

Entry Readiness
Hazmat team members are assessed for readiness and the following checked and documented:
• BP, ________________________________, Respiratory rate
• Temperature
• Body ________________________________
  • ________________________________
• Mental/ Neurological status

69 [ ] After-Exit “Rehab”
• The team completes decontamination and reports to rehab.
• Measure and document the same ________________________________ as during entry readiness.
• ________________________________ the members of the team.
• Team members are not allowed to reenter the hot zone until their parameters are within ________________________________ limits.

70 [ ] Heat Stress Factors
Take into account:
• Temperature and ________________________________
• Prior hydration status
• Duration and degree of ________________________________
• Level of protective suit used

71 [ ] Importance of Practice
Take into account:
• ________________________________ the skills you can expect to use at a hazmat incident in most EMS systems.
• You should work closely with your local ________________________________ team to practice these skills on a regular basis.

72 [ ] Summary
• EMS personnel are normally ________________________________ in charge of a Haz-Mat incident
• Do not allow anyone to convince you to do anything that you are not ________________________________ to do
• Haz-Mat is NOT something that you want to take lightly
• The effects of Haz-Mat exposure may not be noticed for weeks or ________________________________ to come
• Use the “Rule of ________________________________”