LESSON 13 - CONTROLLING TOXIC INDUSTRIAL MATERIALS (TIMS) (NON-NBC)

Terminal Learning Objective

- Given classroom instruction, FM 21-10 and FM 4-25.12, and FM 100-14, recommend actions to reduce your units exposure to toxic industrial materials (TIMs) IAW FM 21-10, FM 4-25.12 and FM 100-14.

Enabling Learning Objectives (1-4)

- Classify TIMs according to their physical states.
- Identify the routes of entry of TIMs into the body.
- Identify the biological effects of TIMs.
- Identify the TIMs threat and their sources.

Enabling Learning Objectives (5-8)

- Identify the harmful effects of carbon monoxide, hydrogen chloride, bore/gun gases, solvents, greases and oils.
- Describe the risk management process as it pertains to TIMs.
- Describe the PMMs necessary to protect personnel from exposure to TIMs.
- Describe the IPMMs necessary to protect personnel from exposure to TIMs.

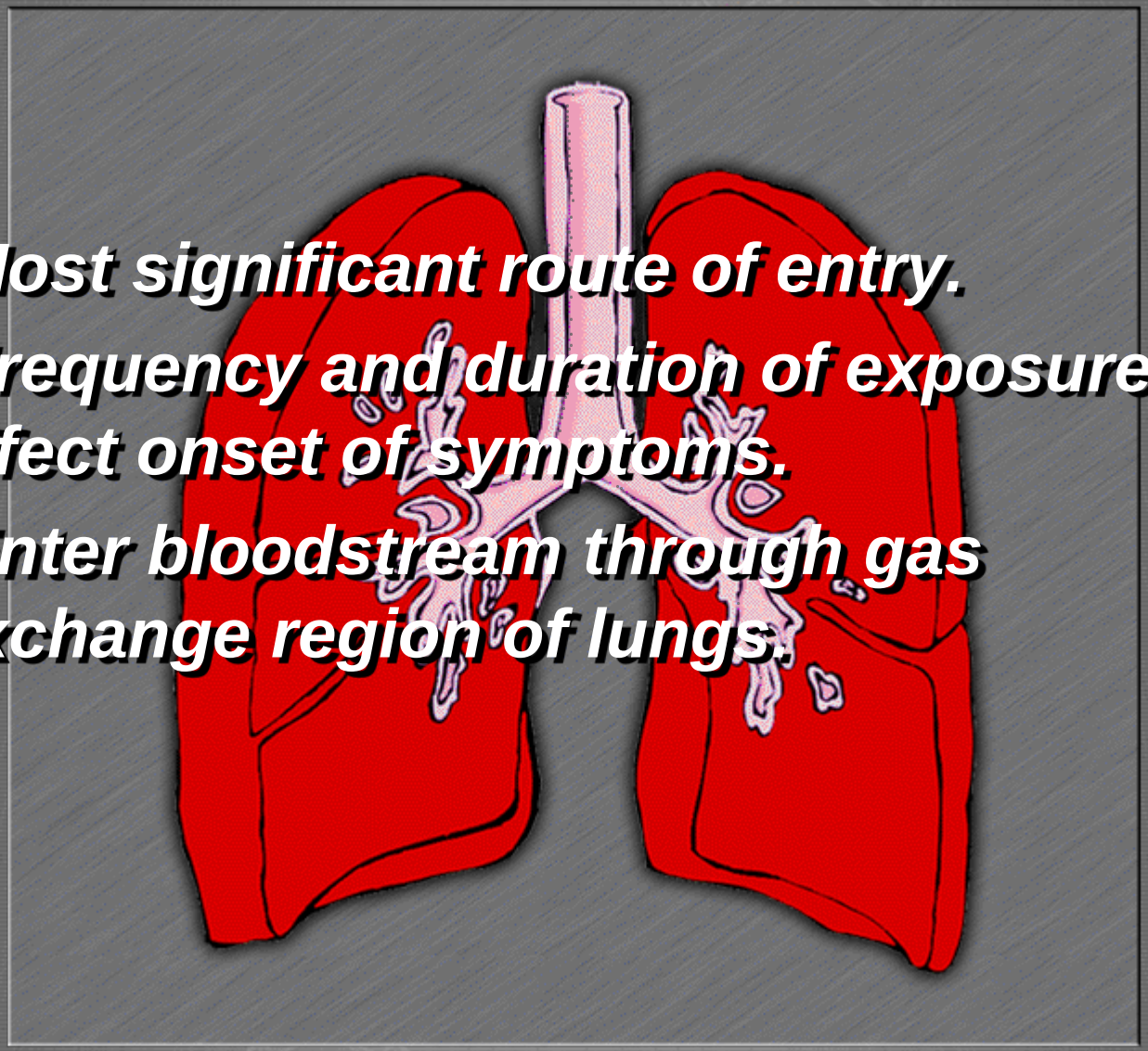
PHYSICAL STATE OF TOXIC CHEMICAL SUBSTANCES

- Gas
- Liquid
  - Vapor
  - Mist
- Solids
  - Fume
  - Dust

Toxic Chemical Four Routes of Entry

- Inhalation
- Absorption
- Ingestion
- Injection

Routes of Entry - Inhalation (1)



- Most significant route of entry.
- Frequency and duration of exposure effect onset of symptoms.
- Enter bloodstream through gas exchange region of lungs.

Routes of Entry - Inhalation (2)

- Symptoms
  - Instant
    - Cough
    - Burning in throat or chest
  - Delayed
    - Asbestosis
    - Chronic lung disorders

Routes of Entry - Absorption

- Local effects
  - Dermatitis - reddening of the skin or raised, blister like lesions
- Systemic effects
  - Systemic poisoning - cancer

Routes of Entry - Ingestion

- Eating or smoking with contaminated hands or utensils.
- May occur if TIMs are stored with food or beverages.

Routes of Entry - Injection

- Normally accidental
  - Rupture of high-pressure gas or liquid line
  - May enter through traumatic injury
    - Puncture wound
    - Laceration

Five Biological Effects

- Irritants
- Asphyxiants
- Anesthetics
- Systemic Poisons
- Carcinogens

Biological Effects - Irritation

- Caused by irritants
  - Sulfur dioxide, acetic acid, formaldehyde, others
- Effects
  - Inflammation of the mouth, nose and lung tissue

Biological Effects - Asphyxiation

- Caused by asphyxiants
  - Nitrogen, hydrogen, carbon monoxide, others
- Effects
  - Displace oxygen or cause the body to become incapable of using oxygen

Biological Effects - Anesthesia

- Caused by exposure to solvents
  - Acetone, trichloroethylene
- Effects
  - Depressant effect on the brain and central nervous system (CNS)

Biological Effects - Systemic poisoning

- Caused by exposure to organic solvents
  - Methylene chloride, carbon tetrachloride
- Effects
  - Damage to internal organs

Biological Effects - Cancer

- Caused by exposure to carcinogens
  - Chemicals suspected of causing cancer based on animal studies

Medical Threat - Carbon monoxide

- Sources
  - Internal combustion engines
  - Space heaters
  - Explosives
- Hazard
  - Presence is difficult to detect
  - May be too overcome to evacuate area

Medical Threat - Hydrogen chloride

- Sources
  - Exhaust from rocket systems
- Hazard
  - Produces hydrochloric acid when combined with water

Medical Threat - Bore/Gun Gases

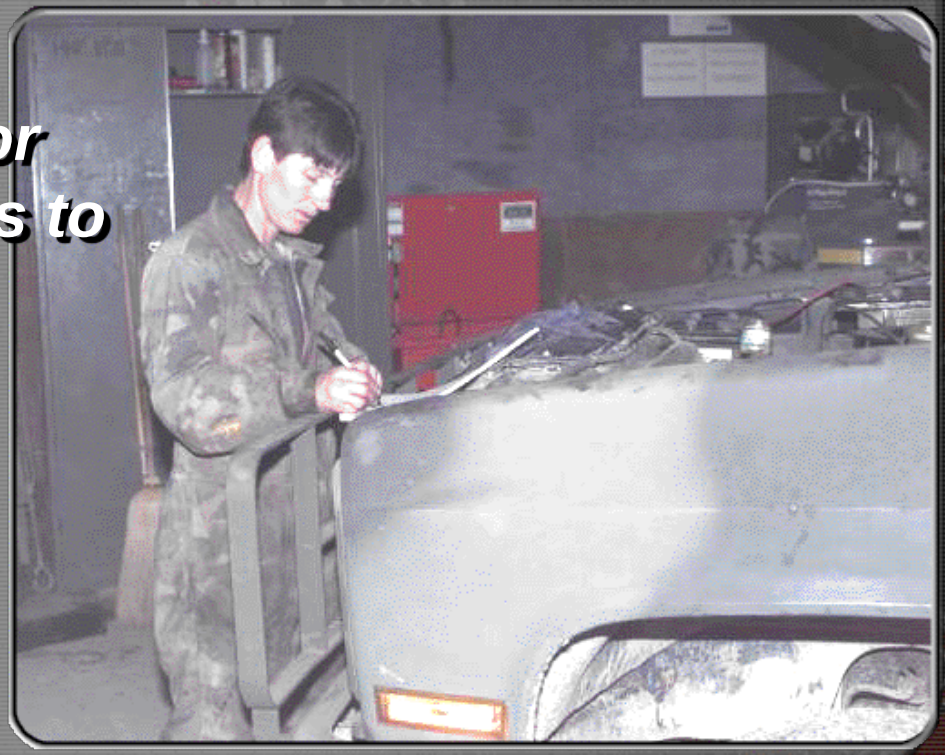
- Sources
  - Tank guns
  - Artillery cannons
- Hazards
  - Carbon monoxide
  - Oxides of nitrogen

Medical Threat – Liquid Chemicals (1)

- Sources
  - Solvents
    - Carbon tetrachloride
    - Trichloroethylene
    - Weapons cleaning solvents
  - Fuels
    - Gasoline (MOGAS)
    - Diesel fuel
  - Lubricants
    - Oil
    - Grease

Medical Threat – Liquid Chemicals (2)

- Hazard
  - Widespread use in day-to-day operations
  - Exposure is often unexpected
  - May cause cancer or other harmful effects to body



Medical Threat - A true story

Harmful Effects - Carbon monoxide

- Carbon monoxide poisoning
  - Headache
  - Sleepiness
  - Coma
  - Death

Harmful Effects - Hydrogen chloride

- Hydrogen chloride exposure
  - Irritation of eyes, throat & lungs
  - Cough
  - Acid burn
  - Flu-like symptoms

Harmful Effects - Bore/gun gases

- Bore/gun gas exposure
  - Symptoms of carbon monoxide poisoning
  - Lung irritation

Harmful Effects - Solvents, greases & oils

- Solvent, grease and oil exposure
  - Skin irritation
    - Rash
    - Burns
    - Abnormally dry skin
    - Infection
  - Organ damage
    - Liver
    - Brain

Risk Management

- Identify the sources of TIMs in your unit
  - Maintain an up to date list
- Maintain Material Safety Data Sheets (MSDS) for all TIMs
  - Health information
  - Hazardous properties
  - Control methods

MATERIAL SAFETY DATA SHEET
GC-764

Section I. CHEMICAL PRODUCT AND COMPANY IDENTIFICATION

PRODUCT: GC-764
SUPPLIER:
PHONE:

EMERGENCY 24 HOUR

CHEMICAL MANUFACTURER INC.
Rt. 1 Box 21
Hereweare, OK 74056
(918) 749-9118

1 - 800 - 424 - 7459

Section II. COMPOSITION/INFORMATION ON INGREDIENTS

HAZARDOUS COMPONENTS/ CAS NUMBER	EXPOSURE LIMITS		CONCENTRATION (%)
FORMALDEHYDE (50-00-0)	OSHA: .75 ppm (TWA) ACGIH: .75 ppm (TWA) ACGIH: 2 ppm STEL		37% Action level 0.5 ppm
METHYL ALCOHOL (67-56-1)	OSHA: 200 ppm PEL(TWA) ACGIH: 200 ppm (TLV SKIN)(TWA) ACGIH: 250 ppm STEL		7-12%

Section III. HAZARDS IDENTIFICATION

ACUTE EXPOSURE: Corrosive to skin, eyes, and mucous membranes.
CHRONIC EXPOSURE: Can cause damage to the eyes, liver, heart, kidneys, and gastrointestinal disturbances. Prolonged contact may cause hardening or tanning of the skin. Formaldehyde is listed as a carcinogen.

Potential Health Effects

EYE: Liquid, vapor or mist causes tearing, severe irritation or burns. High concentration may cause irreversible damage. Methanol ingestion may cause blindness.

SKIN: Causes irritation or drying of the skin.

Risk Management Process

- Incorporate risk management into all operations
- Risk management process
  - Identify hazards
  - Assess hazards to determine risks
  - Develop controls and make risk decisions
  - Implement controls
  - Supervise and evaluate



PMM for Carbon Monoxide

- Prevent accumulation of exhaust
  - Run engines outside
  - Use tailpipe extensions
- Provide ventilation of work/sleep areas

PMM for Hydrogen Chloride

- Position soldiers upwind
- Provide respirators

PMM for Bore/Gun Gases

- Ensure use of on-board ventilation systems
- Ensure proper maintenance of bore evacuator systems

PMM for Solvents, Greases & Oils

- Environmental controls
  - Minimize exposure
  - Provide Stoddard solvents
- Personal protective controls
  - Gloves
  - Goggles
  - Respirators
- Medical controls
  - Periodic exams
  - Medical surveillance

PLAN FOR TOXIC CHEMICAL PROTECTION

- Identify sources of toxic chemicals in your unit

PLAN FOR TOXIC CHEMICAL PROTECTION

- Identify sources of toxic chemicals in your unit
- Develop protective action plan to reduce sickness or injury

ENFORCE INDIVIDUAL PREVENTIVE MEDICINE MEASURES

- Tune engines outside

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- Ventilate sleeping quarters

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- Don't use engine for heat
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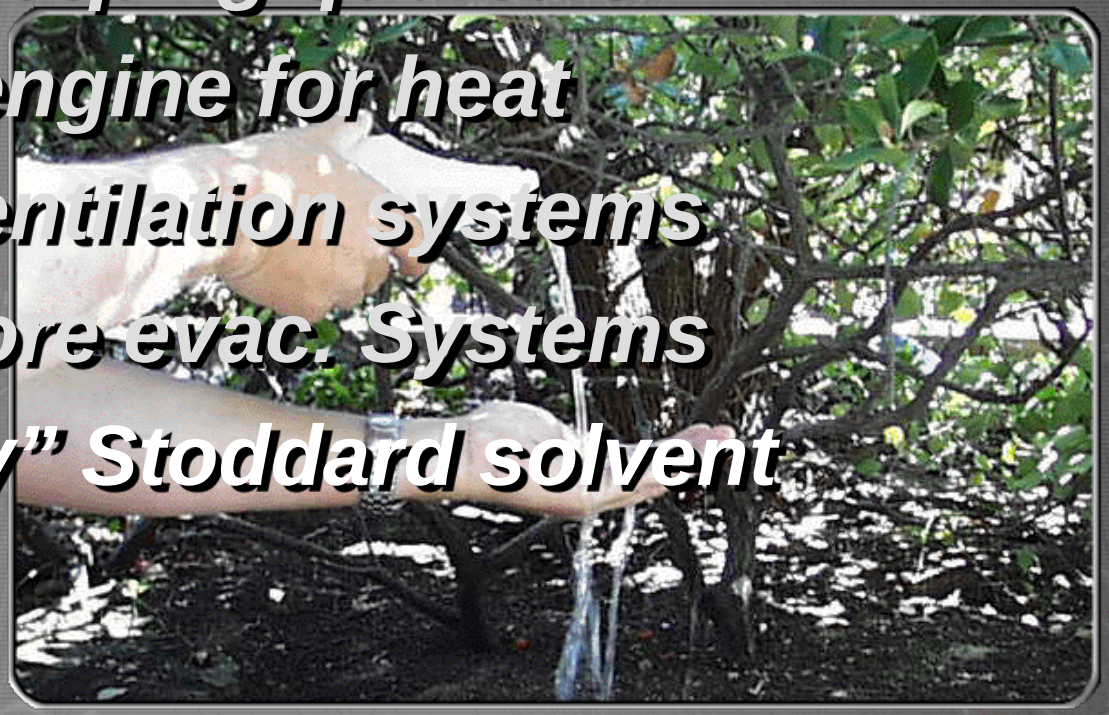
- Maintain bore evac. Systems
- Use "safety" Stoddard solvent



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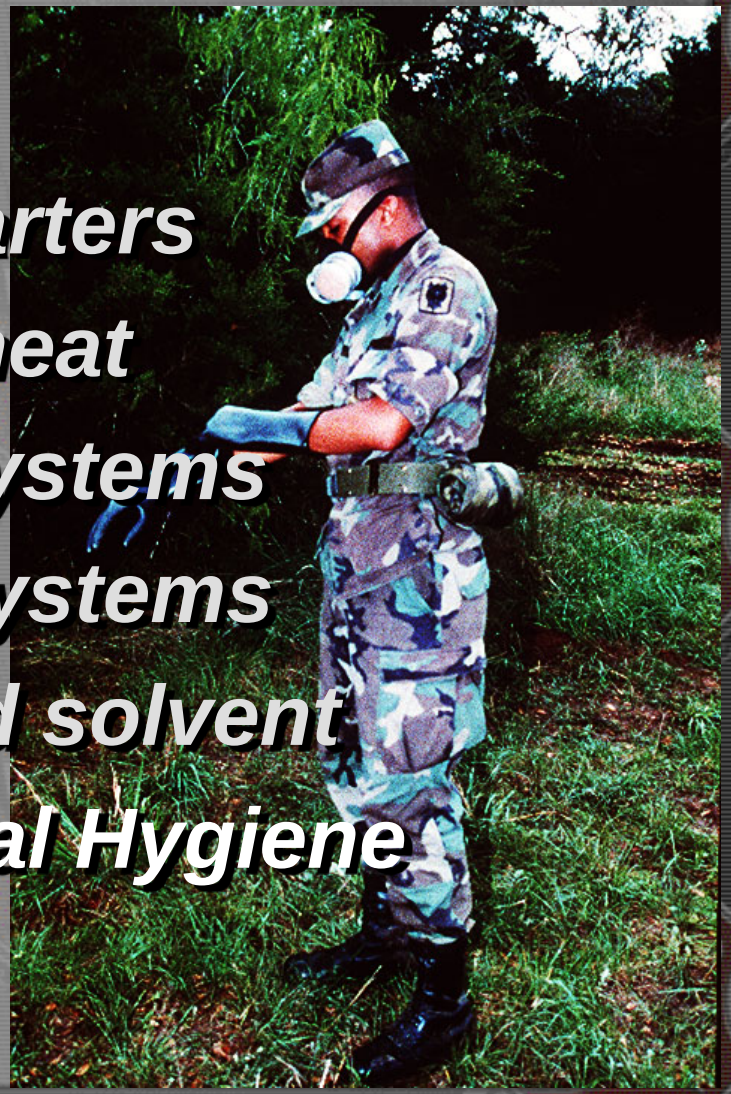
- Ventilate sleeping quarters
- Don't use engine for heat
- Maintain ventilation systems
- Maintain bore evac. Systems
- Use "safety" Stoddard solvent
- Use PPE (gloves and goggles)

ENFORCE INDIVIDUAL PREVENTIVE MEDICINE MEASURES

- Tune engines outside
- Ventilate sleeping quarters
- Don't use engine for heat
- Maintain ventilation systems
- Maintain bore evac. Systems
- Use "safety" Stoddard solvent
- Practice good personal Hygiene



SUMMARY