

Chemical Terrorism: Assessing Current Threats

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Objectives

- Cite historical uses of chemical agents
- Discuss barriers to defining the current threat of chemical terrorism
- Recognize shifting paradigms in probable "scale" of attack
- Discuss ranking systems for high threat chemicals
- Recognize syndromes suggestive of chemical terrorism or emergencies

Chemical Terrorism

- The intentional use of chemicals as weapons for the purpose of causing significant social and economic disruption as well as damage to human health and to the environment.

*MDCH Chemical Terrorism Website 2005

Terrorism

- Previously, clear political or social objectives & constituency
- Today, extremists motivated by ideology
 - Diffuse or unstated political or social agenda

Probability of Chemical Terrorism?

- Less likely than conventional weapon (explosive)
 - Greater access
 - Ease of use
 - Cheaper
 - Proven attack method (predictable)
 - Visible acts of destruction
 - Taboo against use of C/B agents

Chemical vs. Conventional?

- Greater access & ease of use?
 - Dual use technology
- Proven attack method (predictable) desired?
 - Combination with explosives attractive
 - Prepared to die in attack
- Similar "signature" as explosives
 - Added value given psychological impact
 - Less taboo against use

What is Likely vs. Possible?

- Prior vulnerability analyses based on a few historical incidents
 - Military framework
 - Worst-case scenarios

Chemical Weapons

“...the effect is so deadly to the unprepared that we can never afford to neglect the question.”



General Pershing

Military Use of Chemical Agents

- 1000 BC: Chinese arsenical smokes
- Boer War: Picric acid
- 1915: WWI
 - chlorine
 - phosgene
 - cyanogen chloride
 - hydrogen cyanide
 - mustard
- 1940: US Chemical Weapons Program



Textbook of Military Medicine

Other Use of Chemical Agents

- 1963: Egypt vs. Yemen
- 1988: 4,000-12,000 Kurds killed in Halabja
- Desert Storm: Iraqi chemical arsenal
- 2000 Moscow Hostage Crisis



Textbook of Military Medicine

Military Chemical Threat Framework

- **Large scale attack involving**
 - Nerve agents
 - Blister/vesicants
 - Blood (cyanide)
 - Choking/Lung
 - Incapacitating

Terrorist Use

- 1993: CN WTC bombing
- June 1994: Matsumoto
 - 550 casualties
 - 7 fatalities
- March 1995: Tokyo
 - 5500 sought care
 - 12 fatalities



Terrorism WMD Chronology

- 126 chemical terrorism events 1975-2000
- 2002: increase in chemical events (20)
 - Uses
 - Attempted acquisitions
 - Plots
 - Possessions
 - No chemical hoaxes
- Agents: cyanide (8), unknown (4), arsenic (2), sodium hydroxide, pesticide, mercury, sodium azide, tetranium

Monterey Institute, CNS 2003

Terrorism WMD Chronology

- Chemicals were agents of choice for "users"
 - Biologicals preferred for hoaxes
- Chemicals employed were common household, industrial or unknown
 - All used low-end agents and delivery systems lacked potential to inflict mass casualties

Monterey Institute, CNS 2003

What is Likely vs. Possible?

- Small scale, targeted attacks more likely
 - Building, subway, enclosed space
 - Dozens to hundreds of victims
- Agent used?
 - Readily available chemical

Al-Qa'ida's Recent Chemical Chronology

- 11th volume of Encyclopedia of Jihad devoted to how to construct CBW
- 2000 Plot to poison US Embassy water in Rome CN
- 2002 CN purchases
- 2002 3 operatives arrested for CN plot on London subway
- 2003 production plans CBW captured (CN included)
- 2003 plot to poison US troops via ricin in food
- 2004 Zarquawi weapons lab in Iraq: CN & ricin
- 2004 9/11 commission reports operatives in Afghanistan plotted to use mustard, CN via air conditioning systems
- 2004 British thwarted plot to use explosives with OsO4
- 2004 Jordanian seizure of 6 trucks wired with explosives and 20 tons of unknown chemicals, Zarqawi plot

Monterey Institute, CNS 2005

Comparing Chemical Threats

- | | |
|---------------------------------|---------------------------------|
| ■ Military | ■ Industrial |
| – Higher toxicity | – Greater availability |
| – Lack of accessibility | – volume offsets lower toxicity |
| – Tight security | – Accessible |
| – Known threat | – Much less secure |
| – Designed to create casualties | – Inexpensive |
| – Primarily acute effects | – Legitimate uses |
| | – Difficult to detect |
| | – Acute & chronic effects |

Scope of Accessible Chemical Terrorism Threats

- 627,000 toxic chemicals in PoisIndex™
- 600 new chemicals each year
- 1.5 billion tons hazardous shipments annually (500,000 shipments/day)

NATO ITF-25: High Hazard*

- Tissue Irritants
 - Ammonia
 - Boron trichloride
 - Fluorine
 - Formaldehyde
 - Hydrogen bromide
 - Hydrogen chloride
 - Phosgene
 - Phosphorus trichloride
 - Nitric acid
 - Sulfur dioxide
 - Sulfuric acid
- Systemic Poisons
 - Arsine
 - Boron trifluoride
 - Carbon disulfide
 - Cyanide
 - Diborane
 - Ethylene oxide
 - Hydrogen fluoride
 - Hydrogen sulfide
 - Tungsten hexafluoride

* >30 tons produced, LCT50 <100,000 mg/min/m³, vapor pressure at 20 °C

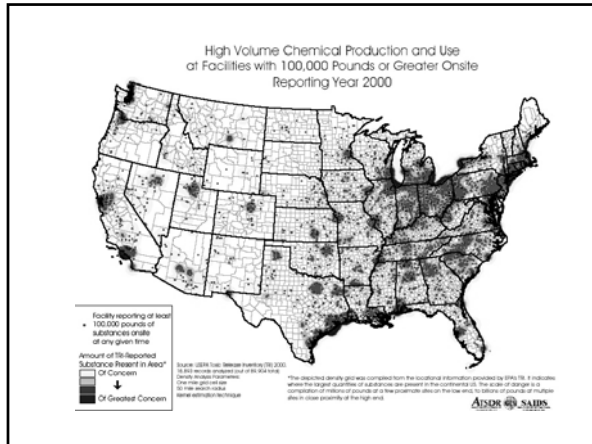
EPA

- Worst-case scenario plans and information
- Catastrophic toxic releases
- Chemical plants adjacent to communities

Yosemite.epa.gov/oswer/CEppoWeb.nsf/content/index.html

EPA

- ~ 850,000 U.S. businesses use, produce, or store TICs
- 123 chemical plants across US have enough toxic chemicals to kill/injure 1 million people in terrorist attack
- 750 other plants have enough chemicals to kill/injure at least 100,000 people in an attack



HSEES

- 24,359 hazmat incidents over 5 yrs.
- 80% fixed facilities
 - Chemical manufacture (agricultural)
 - Petroleum-refining
 - Electric light or power
 - Milling (pulp/paper)
- 20% transportation-related
- 10% hospitals/schools

HSEES "Most Hazardous"

■ Chlorine	■ Others:
■ Ammonia	- Petroleum products
■ Nitrogen fertilizers	- Pesticides
■ Hydrochloric acid	- Corrosives
	- Metals
	- Volatile organics

CDC's Chemical Threat List

Nerve agents Pesticides
Blister agents Corrosives
Blood agents Volatile toxins
Choking agents Heavy metals
Incapacitating agents
Explosive nitro compounds & oxidizers

www.bt.cdc.gov/agent/agentlistchem.asp

Other Chemical Lists

- CWC
 - www.opcw.org/html/db/cwc/eng/cev_ann_ex_on_chemicals.html
- US DOJ EFR NIJ Guide 103
 - www.ncjrs.org/pdffiles1/nij/189724/pdf

Newer Ranking Strategy

- Small Scale Attacks:
 - Ease of acquisition
 - Public Health Impact
 - Resistance to Medical Treatment
 - Ease of Dissemination
- Congressional Research Service, May 2004.

Addressing the Threat

- Regulation
- Intelligence
- Bolster surveillance & response systems
- Advance research in prophylaxis and treatment
- New approaches to education

Current Regulation

- "No First-Use" Agreements
 - Hague International Peace Conferences
 - Geneva Protocols
- Chemical weapons convention 1993
- Australia group participation
- Comprehensive Homeland Security Act 2003
 - Chemical facilities counterterrorism measures
- DOJ Chemical facility vulnerability assessment project to determine security risk of industrial sites (2003)
- Export controls for dual-use technology

Current Regulation

- Domestic regulation is lacking
- Balance security vs. economy

Bolstering Community Chemical Preparedness

- Identify local hazards
- Educate
 - Recognize event
 - Protect personnel
 - Decontaminate
 - Triage
 - Stabilize
 - Treat



Protect the Community

Bolstering Community Chemical Preparedness

- 1984 Bhopal incident 2500 deaths
- EPCRA (SARA III)
- Established SERCs
 - Oversees appointed Local Emergency Planning Committees (LEPCs)
 - Oversee accidental release notification
 - Oversee non-emergency release emission for certain agents
 - Develop response plans for 302 sites (extremely hazardous chemicals)
- Public availability of information

LEPCs + Other Chemical Planning Partners

- MSP Emergency Management Division HazMat Planning Unit
- Michigan Dept. Community Health Epidemiology Division
- MDCH Office of Public Health Preparedness
- State Professional Organizations: MPA, MIDS, MCEP

- Local Emergency Management
- Local Health Departments
- Universities: UMCPPH, WSU
- Michigan Poison System

- Hazardous Materials Response Teams
- Hospitals

Poison Centers

- Preparedness
 - Antidotes
- Surveillance
- Response

1-800-222-1222

Poison Centers

- Identify Agent
- Dose
- Provide Toxicity Data
- Treatment Advice

Addressing the Threat: Education

- Clues to Covert Chemical Attack
 - Unusual increase in # patients seeking care for chemical-related illness
 - Unexplained deaths among young, healthy people or plants/animals
 - Cluster of illness in patients with common characteristics such as common water source
 - Rapid onset of sx's. after exposure to a potentially contaminated medium
 - Presence of a particular clinical pattern or toxidrome

MMWR October 3, 2003.

Chemical Terrorism Syndromes

- Inhalational syndrome
- Neurologic syndrome
- Metabolic syndrome
- Dermatologic syndrome
- Myocardial syndrome
- Hematologic syndrome
- Delayed syndromes

Inhalational Syndrome

■ Military

Choking Agents

- Phosgene
- Chlorine
- Ammonia
- Obscurants

■ Industrial

- Phosgene
- Chlorine
- Ammonia
- Hydrogen chloride
- Acrolein
- Isocyanates
- Sulfur dioxide
- Formaldehyde

Neurologic Syndromes

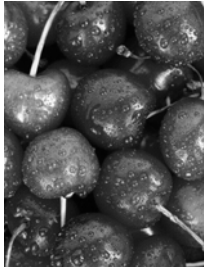
- Acute Solvent: xylene, toluene, benzene, methyl bromide, methylene chloride, aliphatic hydrocarbons
- Simple Asphyxiant Toxidrome: nitrogen, natural gas (methane, propane, butane), carbon dioxide, argon
- Cholinergic toxidrome: organophosphates, carbamates, nerve agents, nicotine

Metabolic Syndrome

- Cyanide, hydrogen sulfide, azides, phosphine, carbon monoxide, SMFA

Cyanide

- Industrial sources:
300,000 tons annually
- Cyanide salts
 - Hydrogen cyanide gas
 - Halogenated cyanogens: military agents
 - Organic cyanogens: nitriles
 - Smoke Inhalation



Borron S, Baud FJ. Arh Hig Rada Toksikol 1996;47:307

Dermatologic Syndrome



Textbook of Military Medicine

- Acid/alkaline corrosives, hydrofluoric acid, phenol, hydrocarbons, compressed gases, vesicants

Myocardial Syndrome

- Halogenated & aromatic hydrocarbons, hydrofluoric acid, carbon monoxide

Hematologic Syndrome

- Oxidants:
 - Aniline, nitrogen oxides, nitrites, chlorates, dinitrophenol, paratoluidine, acetanilid, arsine

Delayed Syndromes

Acrylonitrile	Cyanide toxicity
Aniline	Methemoglobinemia
Arsine	Hemolysis
Benzene	Bone marrow effect
Chlorine	Pulmonary edema
Ethylene oxide	P.E., neurotoxicity
Halogenated solvents	Hepatorenal toxicity

Delayed Syndromes

Summary: Chemical Terrorism

- Planning for chemical terrorism has been based on mass casualty, military frameworks and scant historical cases
- Paradigm shift to small scale incidents using readily available industrial chemicals

Summary: Chemical Terrorism

- Addressing the threat may require:
 - Changes to regulation, intelligence
 - Bolstering existing systems
 - public health, poison centers
 - Establishing new research priorities
 - Adopting new educational approaches
