Aspects of Chemical Security
Dual-use Chemicals

Indonesia
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Topics to be discussed

- What are dual use chemicals?
- Areas of focus for this talk
- Examples of each area:
  - Explosive / Chemical Weapons / Precursors (drug and weapons)
- International chemical controls

Chemical dual-use awareness

Dual use chemicals: Chemicals that can be used for both legal and illegal purposes.

Areas of focus

Four Mains areas of focus:

1. Drug precursors
2. Chemical weapons
3. Explosives
4. Chemical weapon precursors

Dual-use chemicals: Pseudoephedrine

- Pseudoephedrine is a common ingredient in cold medicines
- Precursor to crystal methamphetamine
- Recipes for conversion available on web

Illicit Methamphetamine Laboratory

US DEA

Clandestine meth labs in US during 2002

- Caused 194 fires, 117 explosions, and 22 deaths
- Cost $23.8 million for cleanup
- Dumped chemicals led to
  - deaths of livestock
  - contaminated streams
  - large areas of dead trees and vegetation

End product of dual-use chemicals: Methamphetamine

Late 2005: Indonesian authorities raided a very large Meth Lab in Cikande, Indonesia 60km West of Jakarta.

- 75 kg of crystalline style Meth per batch
- 250,000 tablets of MDMA (Ecstasy) every 8hrs

MDMA = (3,4-methylenedioxymethamphetamine)

Meth reactor ~ 75kg "Ice"

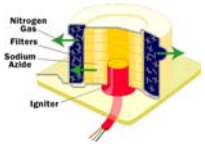
MDMA reactors ~ 8kg Ecstasy

http://www.justice.gov/dea/programs/forensicsci/microgram/mg1106/mg1106.html

Dual-use chemicals: Sodium azide

- Industrial Uses
  - Propellant in automobile airbags
    - ~ 50g Driver side
    - ~ 200g Passenger side
  - Biocide in hospitals and laboratories
  - Anticorrosion solutions
- Illegal Uses
  - Gas more deadly than Hydrogen Cyanide when reacted with an aqueous oxidizer
  - Toxic by ingestion
  - Detonator for powerful explosives

Air Bag Inflation Device



http://auto.howstuffworks.com/car-driving-safety/safety-regulatory-devices/airbag1.htm

Dual-use chemicals: Cyanide

Therence Koh/AFP/Getty Images

* "Tylenol Crisis of 1982."

- Industrial Use
  - Cyanide consumption globally
    - 13% - mineral processing of gold, copper, zinc, silver
    - 87% - plastics, adhesives, and pesticides
- Illegal Use:
  - Product tampering*
    - Tylenol capsules
      - laced with KCN
      - 7 deaths, fall 1982, Chicago, Illinois, USA
      - Led to tamper-proof product packaging
  - Popular with criminals and terrorists because it is relatively easy to obtain
  - K/NaCN is an Australian Group CW agent

http://en.wikipedia.org/w/index.php?title=Tylenol_Crisis_of_1982&oldid=173056508>.

Dual-use chemicals: Chlorine

www.longwarjournal.org/archives/2007/03/al_qaedas_chlorine_w.php

- Industrial Use
  - Manufacture of chlorine compounds
    - 63% - organic chlorine compounds
      - Examples: $C_2H_4Cl_2$ and C_2H_3Cl – (PVC)
    - 18% - inorganic chlorine compounds
      - Examples: HCl, HOCl, $AlCl_3$, $SiCl_4$, PCl_3
    - 19% - bleaches and disinfection products
- Illegal Use:
  - Incidents in which chlorine gas cylinders are blown up with explosives
    - Chlorine likely stolen/diverted from water purification plants or oil industry
    - Civilians and non-combatants injured
  - Chlorine first used in WWI as a chemical weapon

Dual-use chemicals: Precursors

- Dimethyl methyl phosphonate (DMMP)
  - Flame retardant for:
    building materials, furnishings, transportation equipment, electrical industry, upholstery
  - **Nerve agent precursor**

- Thiodiglycol
  - Dye carrier, ink solvent, lubricant, cosmetics, anti-arthritic drugs, plastics, stabilizers, antioxidants, photographic, copying, antistatic agent, epoxides, coatings, metal plating
  - **Mustard gas precursor**

- Arsenic Trichloride
  - Catalyst in CFC manufacture, semiconductor precursor, intermediate for pharmaceuticals, insecticides
  - **Lewisite (Agent L, Schedule 1 CWC) precursor**

From: Chemical Weapons Convention: Implementation Assistance Programme Manual (on CD)

End product of dual-use chemicals: TATP

- Triacetone triperoxide (TATP) or Acetone Peroxide
- Nicknamed “Mother of Satan” because of its deadly nature
- Made using acetone, hydrogen peroxide, and a strong acid (i.e. HCl, H_2SO_4)
- Invisible to detectors looking for N-based explosives
- Used as Primary High Explosive
  - Sept 2009 arrest of N. Zazi, NY and Denver
  - July 2005 London suicide bombs
  - 2001 Richard Reid “shoe bomber”
  - 1997 New York subway suicide bomb plot

CAS 17088-37-8

Wikipedia downloaded Oct 2009
http://en.wikipedia.org/wiki/Acetone_peroxide

Dual-use Chemicals: Explosives

- Theft of conventional explosives
  - Chemical suppliers
  - Users such as mines or construction sites
- Diversion of industrial or laboratory chemicals
  - Chemical suppliers
  - Chemical factories
  - Academic teaching or research laboratories
  - Disposal sites

Diversion of industrial / laboratory chemicals: Oklahoma bombing

Photo: US DOD

- Bomb was made of:
  - 108 – 22.5kg bags of Ammonium nitrate fertilizer
  - 3 – 210L drums of liquid nitromethane
  - Several crates of Tovex
    - Water-gel mixture composed of ammonium nitrate and methyl-ammounium nitrate
  - 17 bags of ANFO – 94% ammonium nitrate / 4% fuel oil
  - 60L of diesel fuel
  - Cannon fuse
- How were the chemicals obtained?

Diversion of industrial / laboratory chemicals: Bali bombing

- Van bomb was made of:
  - Potassium chlorate
  - Aluminum powder
  - Sulfur mixed with TNT (trinitrotoluene)
  - 150 meters of PETN (pentaerythritol tetranitrate) filled detonating cord
  - 94 RDX (cyclotrimethylenetrinitramine) electric detonators
- How where the chemicals obtained?

Photo: www.zgeek.com

International Chemical Controls

International chemical control groups

Two Main Groups:

Organisation for the Prohibition of Chemical Weapons

- **Implementing body of the Chemical Weapons Convention**

The Australia Group

- **Export controls**

Organization for the Prohibition of Chemical Weapons (OPCW)

- International group headquartered in The Hague, Netherlands
  - https://www.opcw.org/index.html
- Chemical weapons convention (CWC)
  - International treaty which bans the development, production, stockpiling, transfer and use of chemical weapons
- Promotes international cooperation in peaceful uses of chemistry
- Provide assistance and protection to fellow member states

OPCW: Promotes international cooperation in peaceful uses of chemistry

- Associates program
- Analytical skills development course
- Conference support program
- Research projects program
- Internship Support Program
- Laboratory Assistance Program
- Equipment Exchange Program

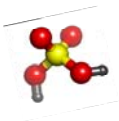
OPCW: Provide assistance and protection to fellow member states

- Each member state can request assistance from other member states in the event of a threat or attack, including chemical terrorism
- This can take the form of expertise, training, materials, and/or equipment

OPCW's – Chemical Weapons Convention

Designated 3 class of controlled substances:

- Schedule 1 – chemicals have few or no uses outside of chemical weapons
- Schedule 2 – chemicals have legitimate small-scale applications
- Schedule 3 – chemicals have large scale uses apart form chemical weapons



OPCW's – Schedule 1 Chemicals

Chemicals

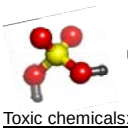
Nerve Agents
1. Sarin
2. Soman
3. Tabun
4. VX - persistent

Blistering Agents
5. Sulfur mustards
6. Nitrogen mustards
7. Lewisites

8. Saxitoxin – marine organisms
9. Ricin – plant toxin

Precursors

1. DF - Methylphosphonyl difluoride
   - React with IPA and IPAmine to make Sarin
2. QL - Isopropyl aminoethylmethyl phosphonite
   - React with Sulfur to make VX
3. Chlorosarin - isopropyl methylphosphonochloridate
   - Used to make Sarin
4. Chlorosoman – pinocoyl methylphosphonochloridate
   - Used to make Soman



OPCW's – Schedule 2 Chemicals

Toxic chemicals:

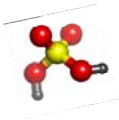
1. Amiton (78-53-5)
   - V-series nerve agent
2. PFIB (382-21-8)
   - perfluoroisobutene
3. BZ (6581-06-2)
   - Benzeneacetic acid

Precursors:

4. Chemicals, except for those listed in Schedule 1, containing a phosphorus atom to which is bonded one methyl, ethyl or propyl group but not further carbon atoms,
   e.g. Methylphosphonyl dichloride (676-97-1)
   Dimethyl methylphosphonate (756-79-6)
   Exemption: O-Ethyl S-phenyl ethylphosphonothiolothionate (944-22-9)

5. N,N-Dialkyl phosphoramidic dihalides
6. Dialkyl N,N-dialkyl-phosphoramidates
7. Arsenic trichloride (7784-34-1)
8. 2,2-Diphenyl-2-hydroxyacetic acid (76-93-7)
9. Quinuclidin-3-ol (1619-34-7)
10. N,N-Dialkyl aminoethyl-2-chlorides
11. N,N-Dialkyl aminoethane-2-ols
    Exemptions: N,N-Dimethylaminoethanol (108-01-0)
    N,N-Diethylaminoethanol (100-37-8)

12. N,N-Dialkyl aminoethane-2-thiols
13. Thiodiglycol: Bis(2-hydroxyethyl)sulfide (111-48-8)
14. Pinacolyl alcohol: 3,3-Dimethylbutan-2-ol (464-07-3)



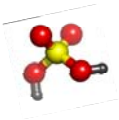
OPCW's – Schedule 3 Chemicals

Toxic chemicals:

1. Phosgene: Carbonyl dichloride (75-44-5)
2. Cyanogen chloride (506-77-4)
3. Hydrogen cyanide (74-90-8)
4. Chloropicrin: Trichloronitromethane (76-06-2)

Precursors:

1. Phosphorus oxychloride (10025-87-3)
2. Phosphorus trichloride (7719-12-2)
3. Phosphorus pentachloride (10026-13-8)
4. Trimethyl phosphite (121-45-9)
5. Triethyl phosphite (122-52-1)
6. Dimethyl phosphite (868-85-9)
7. Diethyl phosphite (762-04-9)
8. Sulfur monochloride (10025-67-9)
9. Sulfur dichloride (10545-99-0)
10. Thionyl chloride (7719-09-7)
11. Ethyldiethanolamine (139-87-7)
12. Methyldiethanolamine (105-59-9)
13. Triethanolamine (102-71-6)



Australia Group

- An informal arrangement to minimize the risk of assisting chemical and biological weapon (C&BW) proliferation.
  - Harmonizing participating countries' national export licensing measures
  - Started in 1985 when Iraq CW program was found to have diverted chemicals and equipment from legitimate trade
- 40 nations plus European Commission participate

Australia Group: Export Controls

- Controls exports of:
  - 63+ Chemical weapon agent precursor chemicals
  - Dual-use chemical manufacturing facilities and equipment and related technology
  - Dual-use biological equipment and related technology
  - Biological agents
  - Plant and animal pathogens
- Includes no-undercut policy
  - Countries will not approve an export that another member country denied

Dual-use summary

- Defined dual use chemicals
- Discussed examples in each area of focus:
  - Explosive / Chemical Weapons / Precursors (drugs and weapons)
- Discussed International chemical control groups
  - OPCW – schedule 1, 2, & 3
  - Australia group