New Jersey
Office of Homeland Security & Preparedness

NEW JERSEY FIRE INSPECTOR's
CBRNE INDICATORS COURSE

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The Following Information is Public Safety Sensitive.

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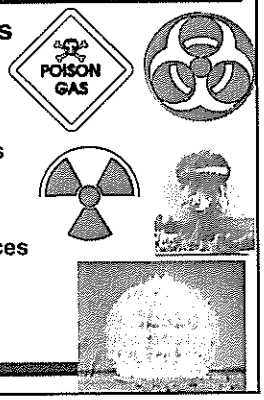
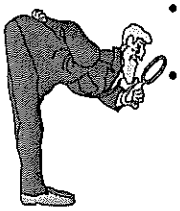
Focus



CBRNE Weapons

- Chemical agents/devices
- Biological agents/devices
- Radiological materials
- Nuclear material/devices
- Explosive materials/devices

Course Goals



- Describe the threat
- Describe the need for Inspection personnel to be familiar and able to recognize potential indicators-conditions during the course of their inspections.

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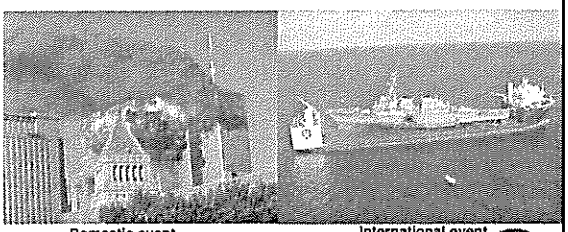
Terrorism takes on different forms and comes from different sources.



Domestic event International event

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Inspection Agencies

- Perform routine physical inspections of all buildings, structures and premises within their jurisdiction.
  - N.J.A.C. 5:70-2.1(b). (UFC-NJ)

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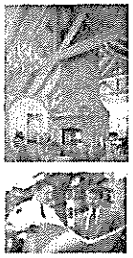
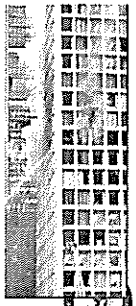
Inspection Agencies

- Through these routine inspections, inspection personnel become very aware of changes to property /building owners/operators,
- Levels of storage, type and arrangements.





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What items or actions do you inspect or approve ?

- List those items or actions you perform as a fire official / inspector

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Inspection Agencies

- Collect and approve evacuation plans.
- Perform drills with owner/operators.
- Develop preplans for future responses and code enforcement work.
- Collect building, operations (permits and processes) within, floor plans, contacts names, etc.

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- Like any business, marketing concern or process, we need to collect, analyze and disseminate information.
- Such information needs to be reliable, timely and appropriate.
- IE. If new tenant came to you and is starting a restaurant – what would you need tell them. ..... List items you would ask for.

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- If you are going to collect building and inspection data, what are you looking for.
- Student Activity

  What specific information would you or are you collecting.

  List 5-10 points

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Student Activity

- List 5 Buildings or High Potential Targets in your jurisdiction.
- List 5 locations in your jurisdiction where you believe that CBRNE materials could be acquired.

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- High School, Colleges & Universities
- Manufacturing facilities that utilize chemical processes and chemicals.
- Farms & farm type storage facilities
- Water treatment facilities
- Research & Development facilities that utilize chemical processes and chemicals.

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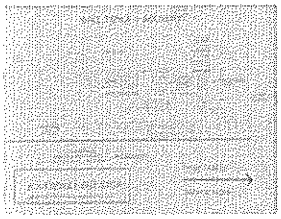
Indicators



School Floor Plans found in Baghdad 9-04

- Gathering of target intelligence
- Acquisition of materials necessary for an attack
- Preparation of weapons
- First steps of executing an attack (bomb delivery, gaining access to building, etc.)

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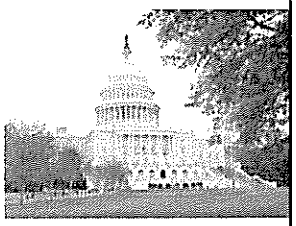
Factors of Threat

- Surprise (relative to time of attack)
- Means of attack
- Target of the attack
- Foreknowledge of the community response
- Significant dates



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Terrorism

- Definitions
  Causes
- Objectives
-

Tokyo Subway 2004

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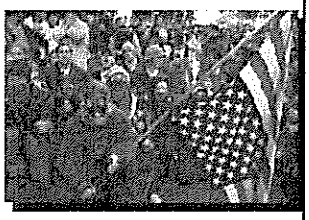
Definition of Terrorism

- Terrorism
  - Homeland Security Act of 2002
  - Pub Law, 107-295, 116 Stat. 2135 (2002)
- Weapons of Mass Destruction (WMD)
  - Title 18, U.S.C. 2332a



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Title 22 of the United States Code, Section 2656f(d)

Terrorism: premeditated, politically motivated violence perpetrated against noncombatant targets by sub-national groups or clandestine agents, usually intended to influence an audience

International terrorism: terrorism involving citizens or the territory of more than one country

Terrorist group: any group practicing, or that has significant subgroups that practice terrorism

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WEAPONS OF MASS DESTRUCTION DEFINED

Federal law [18 U.S.C. sec. 2332] defines any of the following as a weapon of mass destruction:

Any *"destructive device"* which means: any explosive, incendiary, or poison gas, bomb, grenade, rocket having a propellant charge of more than four ounces, missile having an explosive or incendiary charge of more than-quarter ounce, or mine.

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WEAPONS OF MASS DESTRUCTION DEFINED [Con't]

- Any weapon that is designed or intended to cause death or serious bodily injury through the release, dissemination or impact of toxic or poisonous chemicals.
- Any weapon involving a disease or organism.
- Any weapon that is designed to release radiation or radioactivity at a level dangerous to human life.

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- Causing or Risking Widespread Injury or Damage (N.J.S.A. 2C:17.2)
  - a. person who purposely or knowingly, unlawfully causes and explosion, flood, avalanche, collapse of a building, release or abandonment of poison gas, radioactive material or any other harmful or destructive substance, including, but not limited to hazardous waste .

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Concerns with Terms

- BASIC TERMS
- There are so many.
- They can carry different uses and meanings.
- We never had to know these as part of our job.

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Terms

- C Chemical
- B Biological
- R Radiological
- N Nuclear
- E Explosive

- BWA
- CWA
- TIC
- TIM
- Persistent
- Non Persistent

- LD_{50}
- LC_{50}
- ICt_{50}
- LCt_{50}
- LC_{100}
- LD_{100}

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B-NICE

Biological Nuclear Incendiary Chemical Explosives

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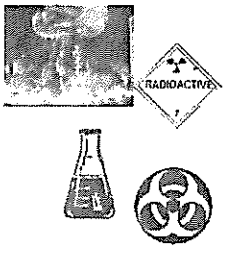
TRACEM-P

Thermal
Radiological
Asphyxiating
Chemical
Etiological
Mechanical
Psychological



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Basic Terms

- U/FOUO What is this ???

Term	Defined
U	Unclassified
FOUO	FOR OFFICIAL USE ONLY
LE Sensitive	LAW ENFORCEMENT
PS Sensitive	PUBLIC SAFETY
OPSEC	Operational Security

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Resource & Information

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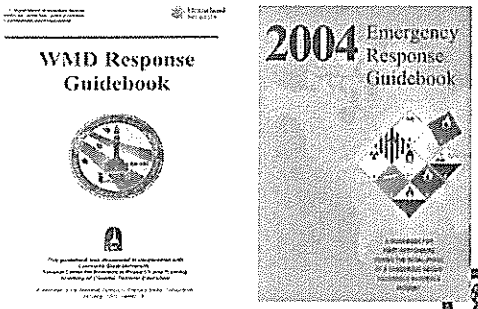
Emergency Response Guide



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Other Resources

- CAMEO
- NFA JOB-AID (version 1.1 and 2.0)
- DOJ- Bureau of Justice Programs
- WISER
- HAZ-CAT
- US Military and Civilian Sources
  - USAMRIID, US Military Chemical School,
  - DHS,
  - CDP, ODP,
  - Janes etc.
- *See handout section*.

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Resources

- See Hand-out Section

Public Officials

- Office of Homeland Security & Preparedness (OHS&P) (formerly Office of Counter-Terrorism OCT))
- Terrorism Hotline is 1-866-4 SAFENJ 1-866-472-3365.
- website www.njcounterterrorism.org.

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Typical HAZMAT Incident (HMI) vs. CBRNE Terrorism Incident (CBRNE-TI)

	HMI	CBRNE-TI
• Super toxic material		✓
• Hazard identification	x	✓
• Mass casualties		✓
• Many fatalities		✓
• Mass decontamination		✓
• Unusual risk to emergency responders and civilians		✓

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Typical HAZMAT Incident (HMI) vs. CBRNE Terrorism Incident (CBRNE-TI) (con't)

	HMI	CBRNE-TI
• Crime scene/evidence preservation		✓
• Major interaction/coordination with local, state, and federal agencies		✓
• Scene communication overload		✓
• Chaos, mass hysteria		✓
• Resources immediately overwhelmed		✓
• Secondary device designed to kill responders		✓
• Pre-incident indicators		✓

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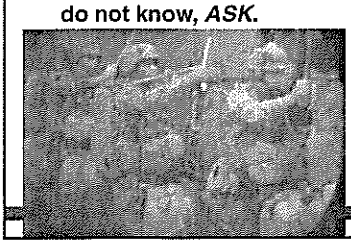
Administrative Notes

- Much of the material is military in nature.
- If there is a term you do not know, *ASK*.



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Chemical Agents

- Physical Rules that govern behavior
- Implication of Response Activities
- Properties of Military and Industrial agents
  - Effects of exposure
  - Signs and symptoms (initial indicators)

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Biological agents

- Various forms (Natural and man made)
- Effects of exposure
- Definitions
- Signs and symptoms

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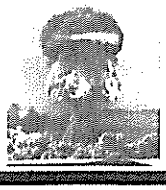
Nuclear-Radiological

- Types
- Effects
- Definitions



GAMMATORS

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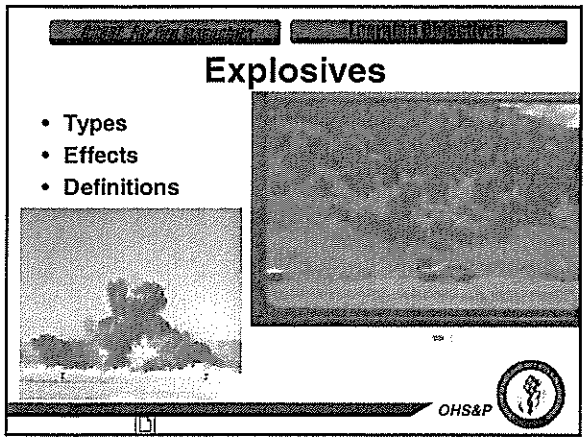
Explosives
• Types
• Effects
• Definitions
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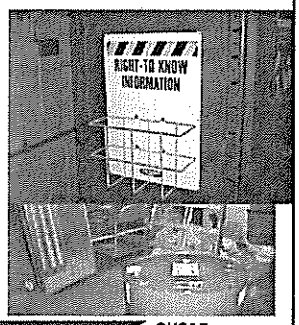
What we see and what we find !

- As an inspector, our main mission is to rapidly identify actual or potential fire and safety violations and seek corrective action.
- Sometimes these are obvious...



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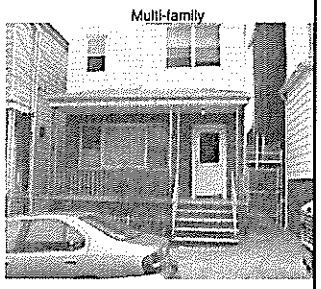
Some violations or concerns *are not so obvious.*

However, as trained observers, we need to rapidly size-up those conditions, be aware and recognize either events or situations that are occurring around us.



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Suspicious Persons

- Individuals:
  - In vehicles at odd times
  - Exiting secured locations
  - Located at non-public areas near transportation structures or stations, or typical target locations

- Wearing odd clothing
- Exhibiting odd or suspicious behavior

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Suspicious Vehicles

- Abandoned vehicles
- Possible mobile surveillance activity
- Unusual decals or altered signage
- Vehicle frame modifications

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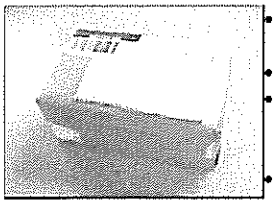
Suspicious Actions/Objects



- Suspicious packages or luggage
- Chemical fires, toxic odors
- Unusual test explosions
- Illicit access to blueprints or requests to see files and plans.
- Parcels or packages left unattended
- Heavy mailed packages with excessive postage

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Suspicious Actions/Objects

(continued)

- Unusual behavior
- Increase in anonymous telephone or e-mail threats to facilities in conjunction with suspected surveillance incidents
- Questioning personnel
- Any unusual activity or circumstance in your neighborhood, community, or workplace

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Critical Infrastructure (Potential Terrorist Targets)

- Telecommunications
- Electrical power
- Gas and oil production, storage, and delivery
- Banking and finance
- Transportation systems
- Water supply systems
- Emergency services
- Government operations

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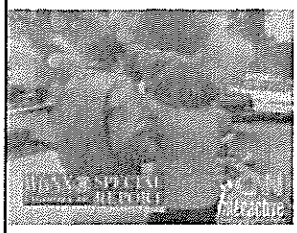
Tactics



- Mass casualties
- Secondary devices
- Multiple incidents
- Rapid escalation of the hazards

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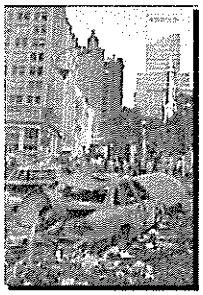
RAIN

- Recognize the hazard/threat
- Avoid the hazard/become contaminated/injured
- Isolate the hazard area
- Notify the appropriate support



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General Precautions

- Protective action
- Evacuation
- Isolation
- Shelter-in-place
- Sight
- Sound
- Odor
- Touching
- Tasting

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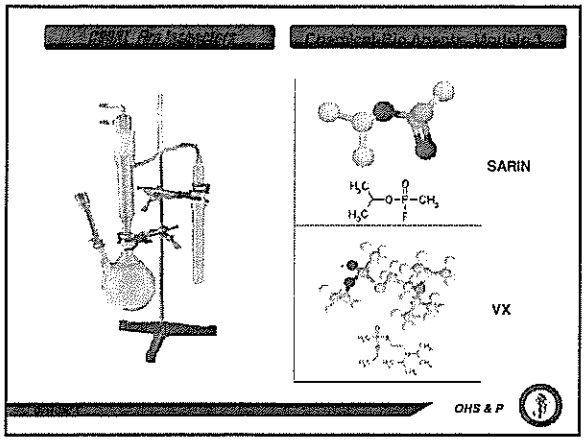

Objectives

- Demonstrate ability to recognize signs and symptoms of chemical agent exposure
- Describe how to protect oneself against chemical agents
- Demonstrate knowledge of terms, symbols, definitions and characteristics of chemical and biological materials.

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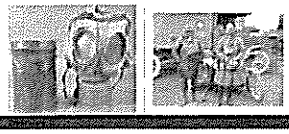
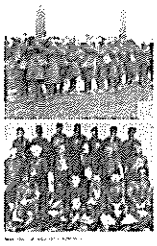
CHEMICAL AGENT DEFINED

A chemical substance which is intended for use in military operations to kill, seriously injure or incapacitate people.





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General Characteristics of Chemical Warfare Agents

- Generally liquid (when containerized)
- Normally disseminated as aerosols or gas
- Influenced by weather conditions
- Can be protected against

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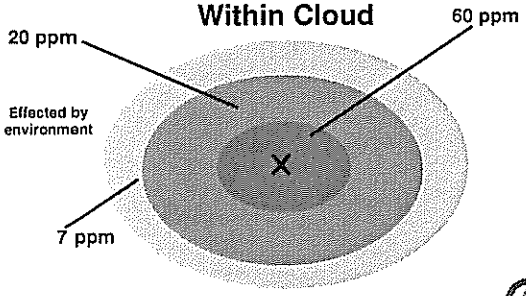
Concentration Will Vary Within Cloud



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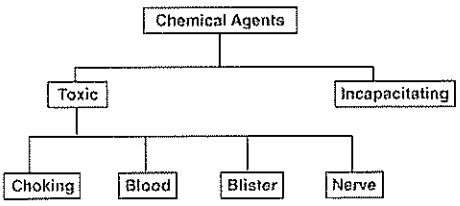
Classes of Chemical Agents



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Choking Agents

Common Name, Military Symbol	Phosgene (CG)	Chlorine (Cl)
Odor	Newly Mown Hay	Swimming Pool
Persistency	Minutes to hours	
Form	Gas, heavier than air	
Rate of Action	Immediate, symptoms will get worse with time	
Route of entry	Respiratory	
Symptoms	Coughing, choking, tightness of the chest	
Hazard	Respiratory	
Self aid	Leave contaminated area	
Decontamination	Aeration	

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Blood Agents

Common Name, Military Symbol	Hydrogen Cyanide (AC)	Cyanogen Chloride (CK)
Odor	Bitter Almonds	Bitter Almonds
Persistency	Minutes to hours	
Form	Gas, lighter than air	Gas, heavier than air
Rate of Action	Rapid (seconds)	
Route of entry	Respiratory	
Symptoms	Flush color, gasping for air, reddish lips (blue in dark-skinned), frothing	
Hazard	Respiratory	
Self aid	Leave contaminated area; Antidote available	
Decontamination	Aeration	

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Blister Agents

Common Name, Military Symbol	Mustard (H)	Lewisite (L)	Phosgene Oxime (CX)
Odor	Garlic	Geraniums	Irritating
Persistency	Hours to days		
Form	Liquid, Gas, heavier than air		Solid
Rate of Action	Rapid		
Route of entry	Skin, inhalation, eyes		
Symptoms	H, no immediate pain; L and CX immediate pain; burning eyes, coughing, skin blistering after 6-24 hrs.		
Hazard	Respiratory and skin		
Self aid	Immediate removal; flush with water; dilute bleach		
Decontamination	Removal; flush with water; dilute bleach		

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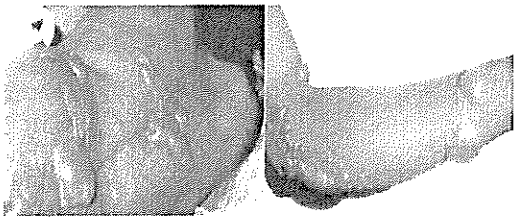
Blisters



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Nerve Agents

Common Name, Military Symbol	Tabun (GA)	Sarin (GB)	Soman (GD)	VX
Odor	None; fruity		None; camphor	None; sulfur
Persistency	Minutes to hours		Hours	Hours to days
Form	Liquid vapor; heavier than air			Liquid
Rate of Action	Inhalation rapid; skin seconds to minutes			
Route of entry	Skin, inhalation, eyes			
Symptoms	Pinpointing pupils; dimness of vision; runny nose; drooling; difficulty breathing; tightness in chest; muscle twitching			
Hazard	Respiratory and skin			
Self aid	Immediate removal; flush with water; dilute bleach			
Decontamination	Removal; flush with water; dilute bleach			

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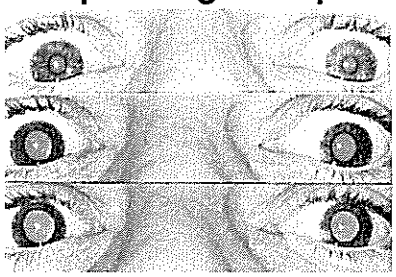
Pinpointing of Pupils



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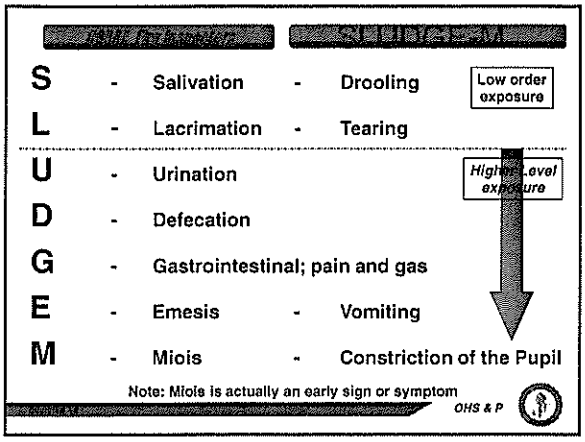
S - Salivation - Drooling
Low order exposure
L - Lacrimation - Tearing
U - Urination
Higher level exposure
D - Defecation
G - Gastrointestinal; pain and gas
E - Emesis - Vomiting
M - Miois - Constriction of the Pupil
Note: Miois is actually an early sign or symptom
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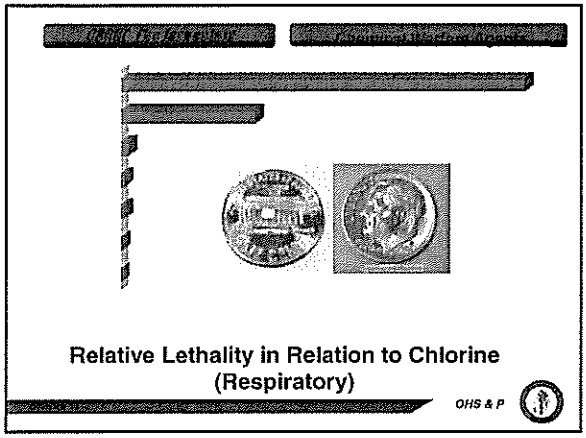
Relative Lethality in Relation to Chlorine
(Respiratory)
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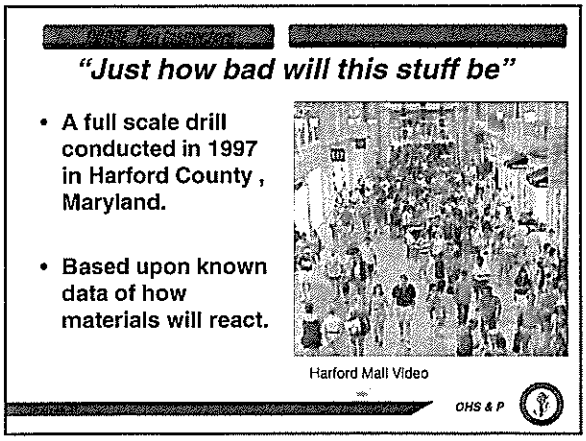
"Just how bad will this stuff be"
• A full scale drill conducted in 1997 in Harford County , Maryland.
• Based upon known data of how materials will react.
Harford Mall Video
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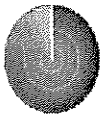
Key Points

- Terrorist groups have means, motive, opportunity
- NBC/CBRNE weapons have far-reaching effects
- Recognizing symptoms may be first clue
- Mass casualties may result
- New challenges to Responders



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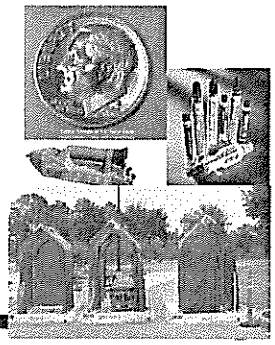
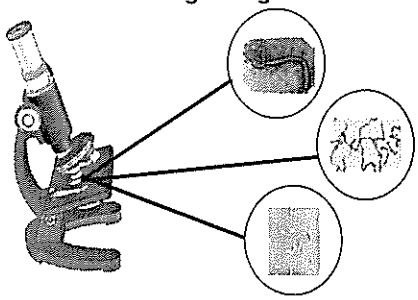
Key Points

- Chemical agents are supertoxic
- But:
  - They can be detected
  - You can protect yourself
  - There are first aid measures
  - They can be decontaminated



Biological Agents

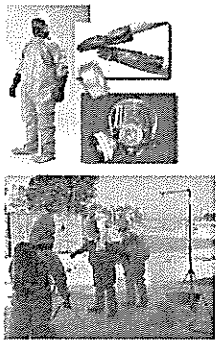


OHS & P

Biological Agents

Objectives

- Know how to protect yourself
- Universal Precautions/PPE
- Recognize the hazards and indicators of a biological incident



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Biological Warfare (BWA) Agent Defined

Living organisms or their derivatives that can be used in weapons to cause incapacitation or death.

Biological agents have the ability to reproduce themselves, thus they are less predictable then chemical agents.

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THREE COMPONENTS OF A BIO-WEAPONS ATTACK

THE AGENT: i.e., "The Payload" – a bacterial or viral organism.

THE DELIVERY SYSTEM: A delivery system for a biological agent can consist of about anything that can produce an aerosol, such as truck-mounted sprayer used to spray crops or crop-dusting aircraft.

METEOROLOGICAL CONDITIONS: If BW agents are to be employed on "open-air" targets, the meteorological conditions at the target become extremely important.

OHS & P

Biological Agent - Pathogens

Pathogens are infectious agents that cause disease in man, animals, or plants. Agents that constitute antipersonnel biological warfare (BW) threats *include bacteria, viruses, and rickettsias*. These are commonly referred to as germs. While many microorganisms are harmless or even helpful, there are approximately 100 naturally occurring pathogens that could be used as biological warfare (BW) agents.

Pathogens cause disease (infection) by entering the body through the lungs, digestive tract, through the skin and mucous membranes of body openings. Once they enter the body, pathogens multiply, overcoming the body's natural defenses and produce disease.

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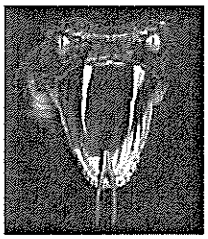
Toxins

- Poisonous substances produced as by-products of microorganisms, plants and animals
- Not living organisms
- Not CONTAGIOUS



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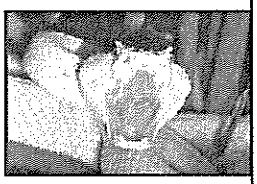
Example of Toxin Sources



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Biological Agents-Virus

Viruses constitute a large group of infectious organisms. Unlike bacteria, they must be inside a cell in order to multiply. Viruses multiply by taking over the cell, causing it to produce viruses instead of normal cell components.

After producing hundreds or even thousands of virus particles, the cell is often destroyed as these particles are released. Viruses are much smaller than bacteria, ranging from 0.02 - 0.2 microns in size. Their small size means that a relatively small amount of agent can infect a large number of personnel across a wide area.

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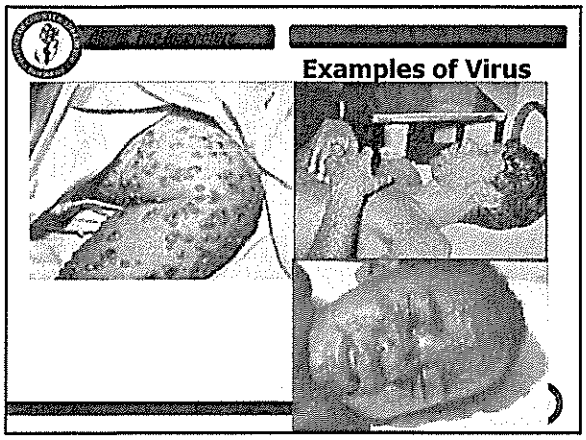
Examples of Virus



Biological Agents-Rickettsias

Rickettsiae are bacteria that are unable to multiply unless they are within a living cell. Most are spread from one person to another by means of an insect or tick that serves as a vector.

Rickettsia will be picked up by the vector from one infected person or animal, which then transmits the rickettsia when it bites its next victim.

Rickettsiae are smaller than most bacteria, but larger than viruses

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Biological Attack Indicators

- Unusual number of sick or dying people or animals
  Suspicious bombing incidents

  Unscheduled or unusual dissemination of sprayed material (e.g. Crop duster spraying over Coliseum)

  Abandoned spray or dispersion device

  Containers stolen/abandoned from laboratory or biological supply houses

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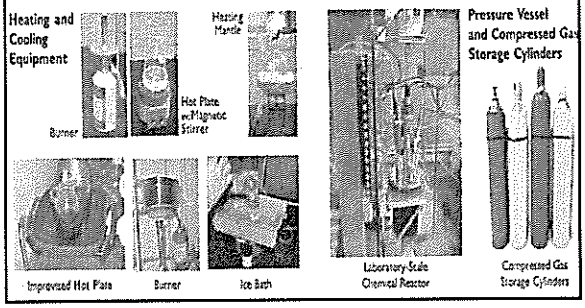
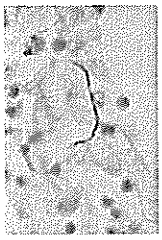
INDICATORS OF BW PRODUCTION



Characteristics

- Do not penetrate unbroken skin
- Non-volatile
- More toxic than chemicals by weight
- Undetectable by senses
- Limited field detection
- Disseminate as aerosols



Bacilli

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Biological Agents

Biological Characteristics (Continued)

- Range of effects
- Obtained from nature
- Relatively easy to produce
- Have delayed effects

Anthrax

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Potential Biological Agents

- Anthrax (bacteria)
- Plague (bacteria)
- Q fever, Lyme (rickettsia)
- Small pox (virus)
- Ebola (virus)
- Venezuelan Equine Encephalitis (VEE) (virus)
- Staphylococcal Enterotoxin B (toxin)
- Botulinum (toxin)
- Ricin (toxin)

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Biological Agents

Bacteria and Viruses

- Routes of entry
- Multiply and overcome body's immune system
- Some can cause epidemics

Tularemia

Anthrax Spore

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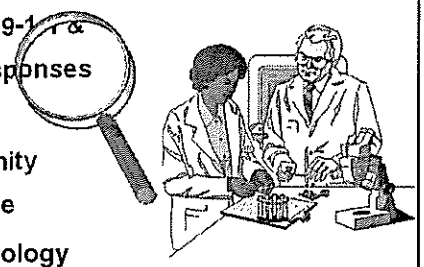
Detection of Biological Attacks

- Calls to 9-1-1 & EMS responses
- Medical community response
- Epidemiology



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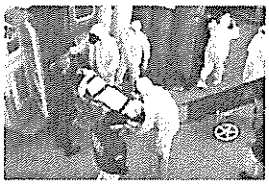
Protecting Yourself Against Biological Agents

- Mask
- Clothing
- Sanitation measures
- Decontamination
- Medical treatment
- Blood-borne pathogen *universal precautions*



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Decontamination

Chemical: Blot

Bio, Nuclear: Wet

Strip

Flush

Cover

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HEPA Filters

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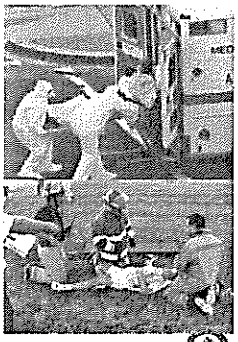
Key Points

- First indications may be 9-1-1 calls or patient "surge" on medical community.
- Protection
  - Protective mask/HEPA mask, properly fitted
  - Good sanitary procedures/universal precautions on site
  - Seek medical attention immediately
  - Treatment is available



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Additional Information

- Additional information on specific materials follows.

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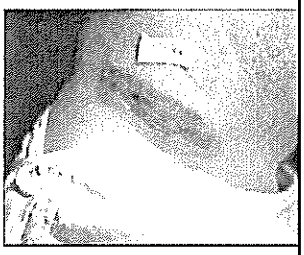
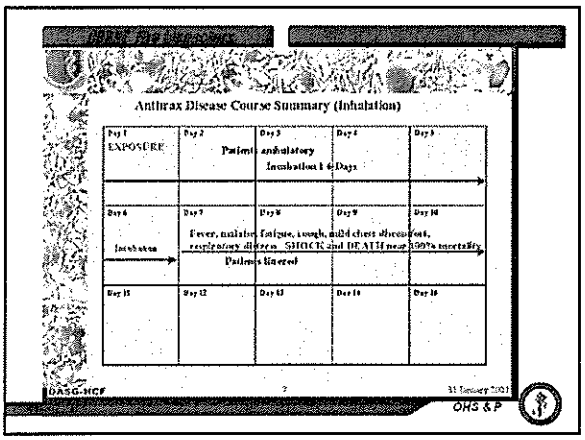
Route of entry:

- Respiratory, cuts in skin, Ingestion.
- Incubation period: 1-7 days
- Contagious: No
- Mortality: 80%-90% (respiratory)
- Symptoms:
  - Nausea
  - Fever, chills
  - Swelling of lymph nodes



OHS & P



Route of entry:

- Flea bites
- Incubation period: 2-3 days

Contagious: *Yes*

- Mortality: 90%-100% (respiratory)
- Symptoms:
  - Headache, shortness of breath
  - High fever, chills
  - Spitting up blood

OHS & P

Q Fever

Route of entry:

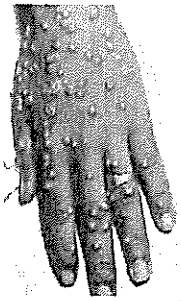
- Respiratory, digestive
- Incubation period: 2-10 days
- Contagious: *No*
- Mortality: Low (under 1%)
- Symptoms: Flu like

OHS & P

Small Pox

Route of entry:

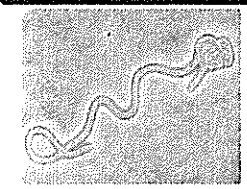
- Respiratory
- Incubation period: 10-12 days
- Contagious: Yes
- Mortality: 30%
- Symptoms:
  - Fever, rigors, vomiting
  - Headache, backache
  - Lesions (after 2-3 days)



OHS & P

Ebola

- Route of entry: Direct contact
- Incubation period: 3-21 days
- Contagious: *Yes*
- Mortality: 90%
- Symptoms:
  - Fever, vomiting, diarrhea
  - Blotches on skin
  - Bleeding



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Venezuelan Equine Encephalomyelitis

Route of entry:

- Mosquito bites, respiratory
- Incubation period: 1-5 days
- Contagious: No
- Mortality: 1%
- Symptoms:
  - Flu like

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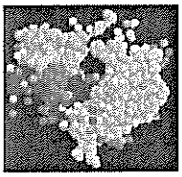
Staphyloccus Enterotoxin B



Route of entry:

- Digestive, respiratory
- Incubation period: 4-6 hours
- Contagious: No
- Mortality: Low
- Symptoms:
  - Vomiting, abdominal cramps, explosive watery diarrhea (ingestion)
  - High fever, cough chills, prostration (respiratory)

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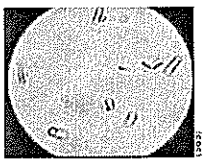
Botulinum



Route of entry:

- Digestive, respiratory
- Incubation period: 24-72 hours
- Contagious: *No*
- Mortality: 80%
- Symptoms:
  - Weakness, dizziness
  - Dry mouth and throat
  - Blurred vision

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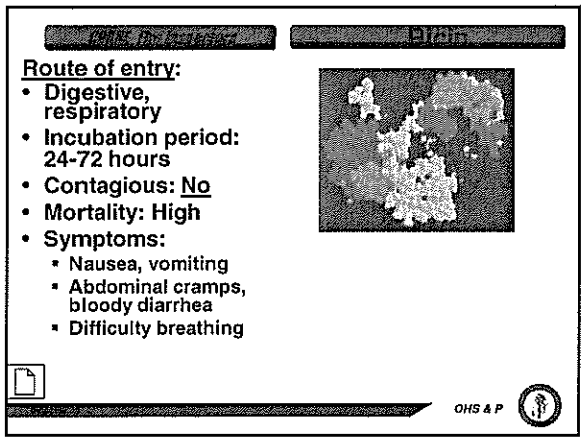
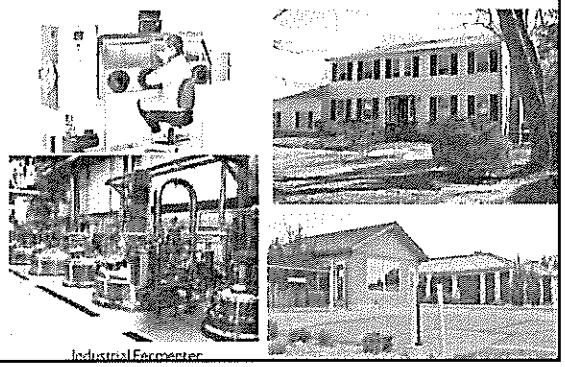

Route of entry:
• Digestive, respiratory
• Incubation period: 24-72 hours
• Contagious: No
• Mortality: High
• Symptoms:
▪ Nausea, vomiting
▪ Abdominal cramps, bloody diarrhea
▪ Difficulty breathing
OHS & P

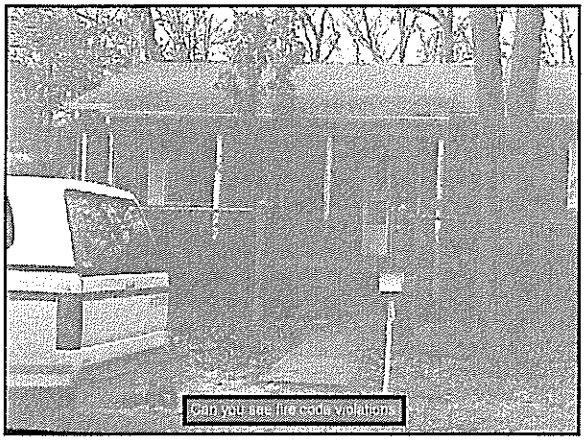
Makeshift Laboratory

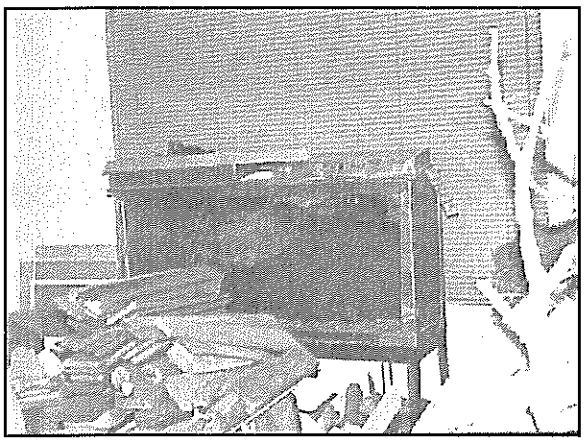
What does a lab look like ??

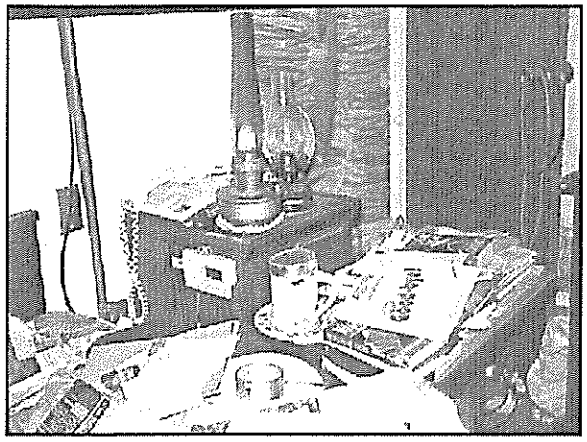


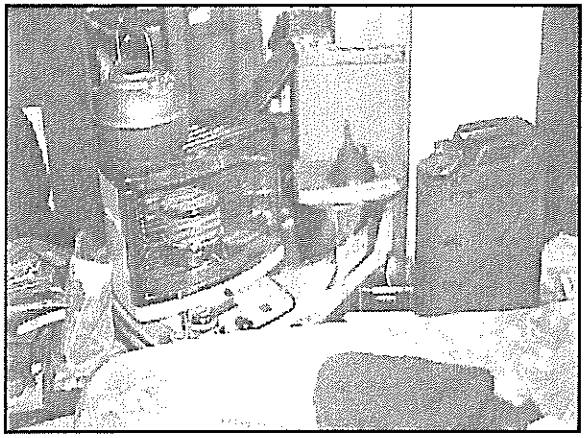
The Tale of two Haz Mats

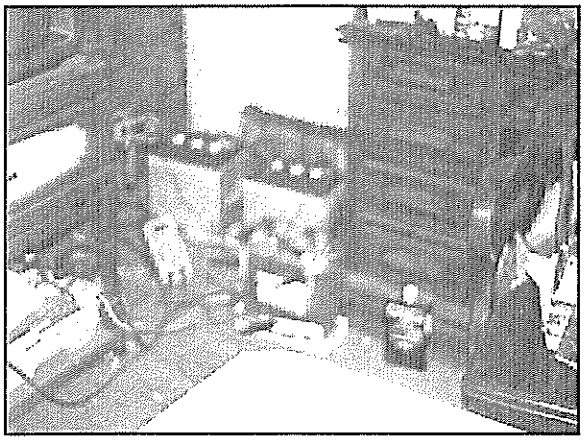
- Scene
  1. EMS Response to Welfare Check of Elderly Male.
  2. FD scheduled inspection of Multi-family dwell

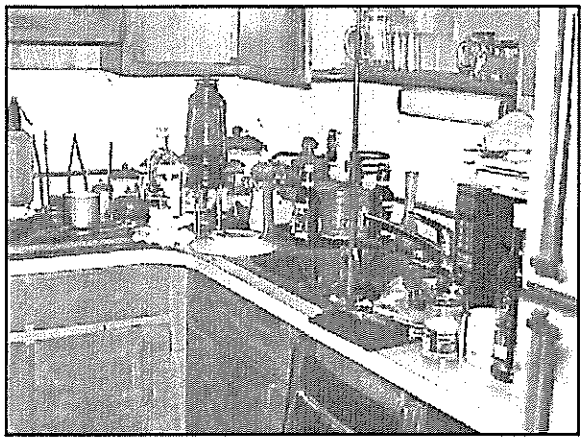

Can you see fire code violations

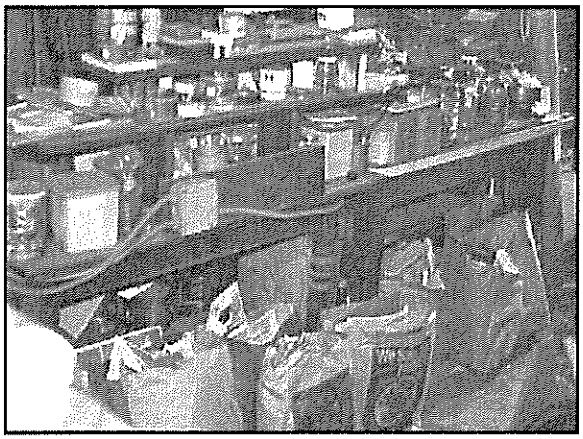


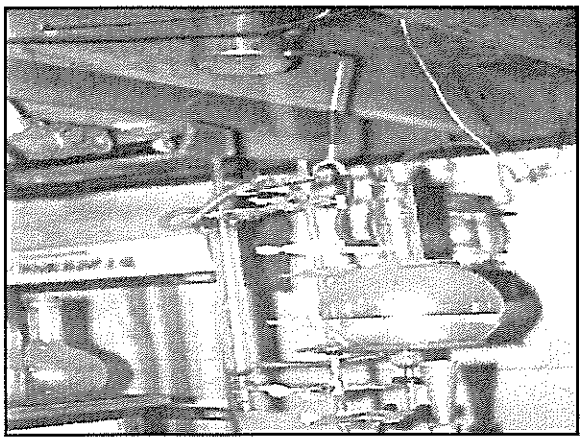


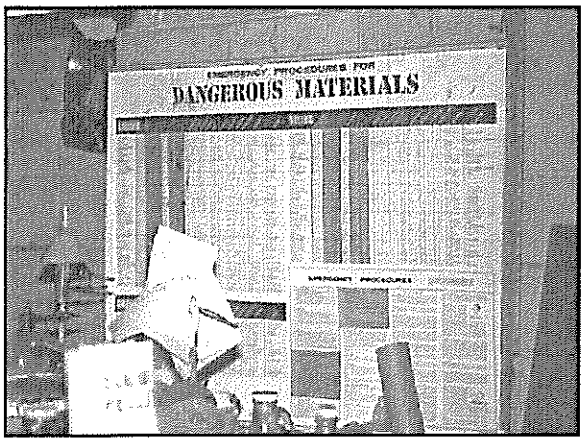


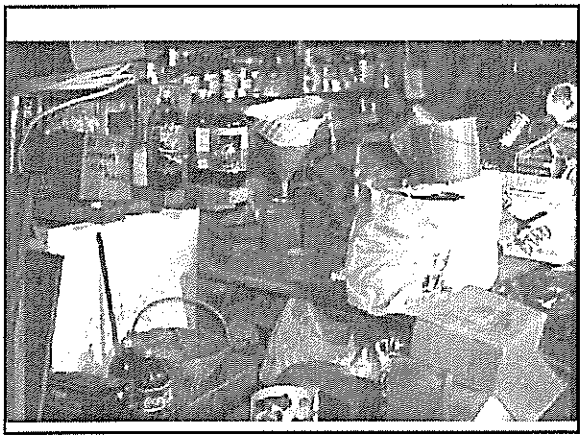


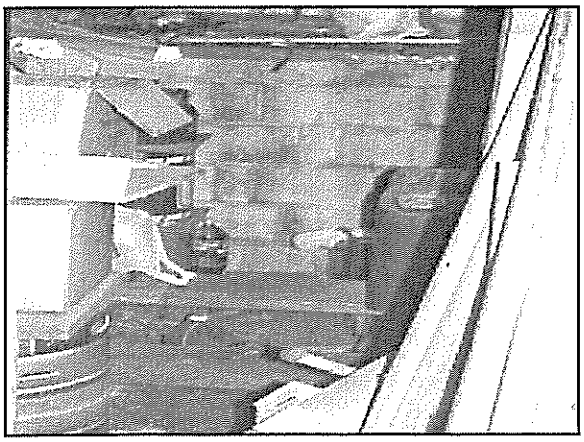


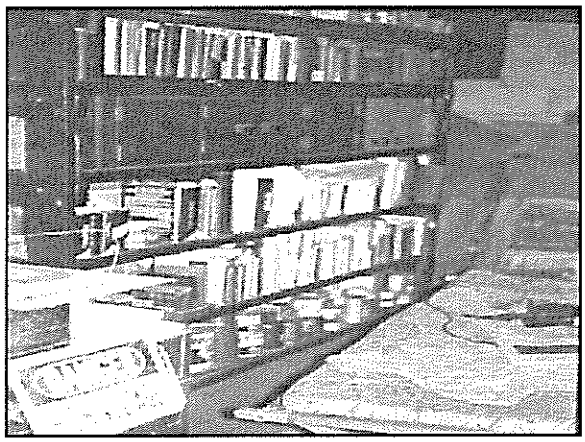


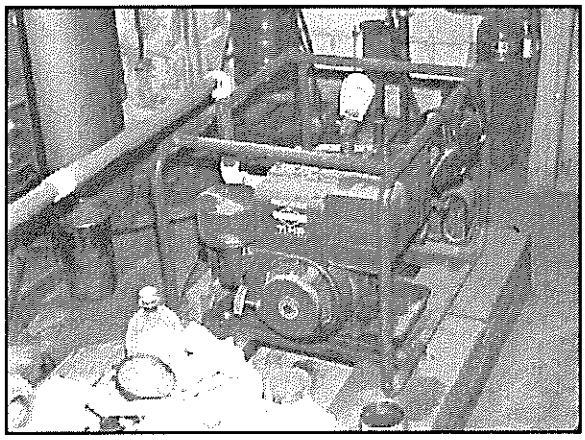


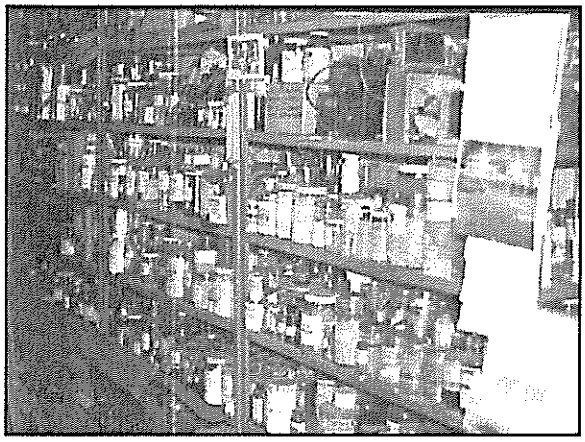

DANGEROUS MATERIALS

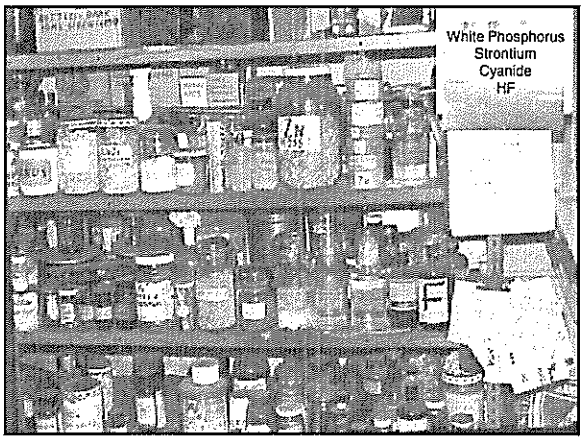


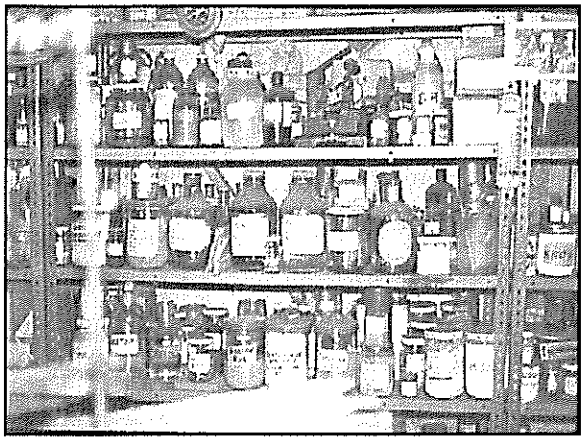


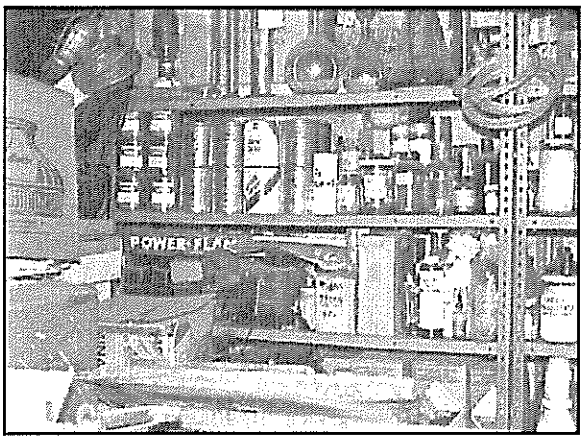




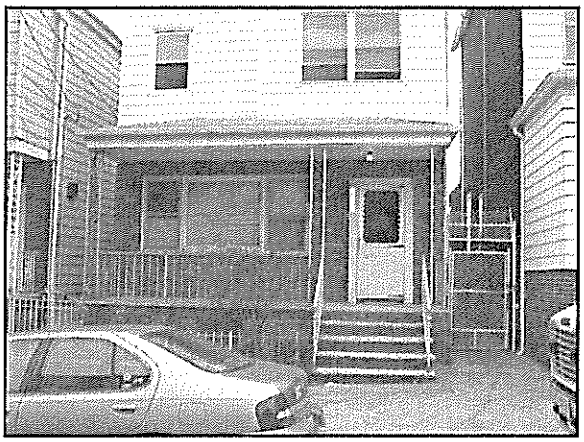


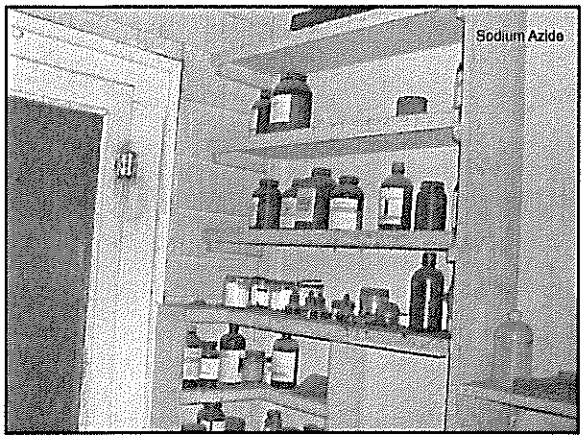

White Phosphorus
Strontium
Cyanide
HF

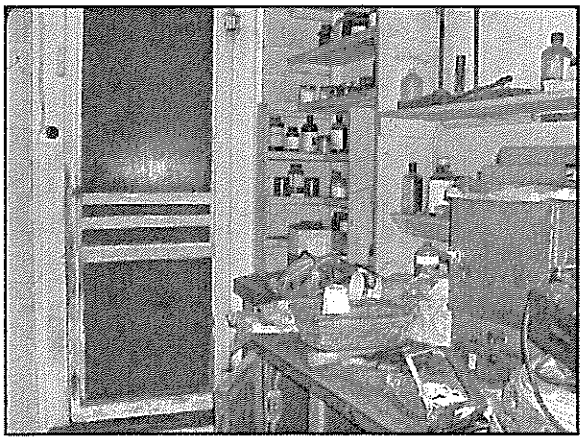


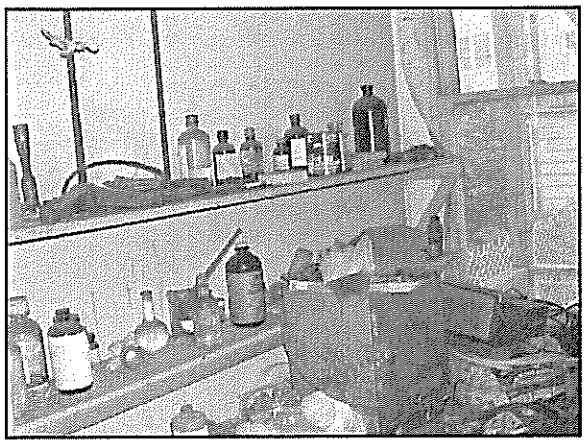


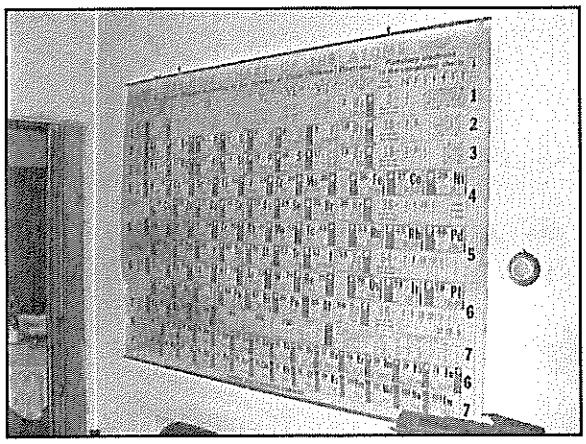
Scene 2

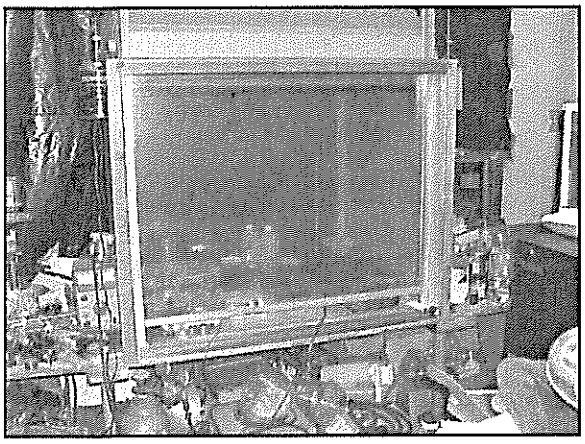


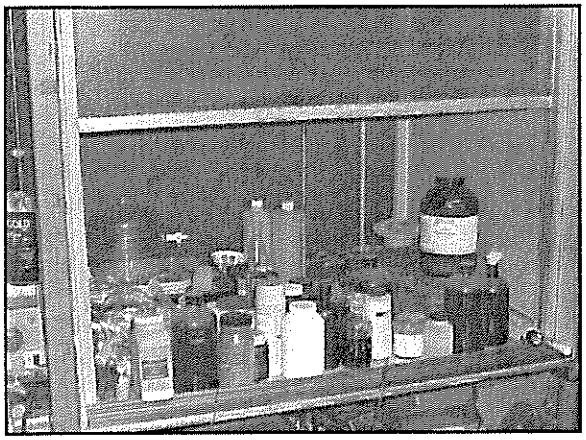

Sodium Azide

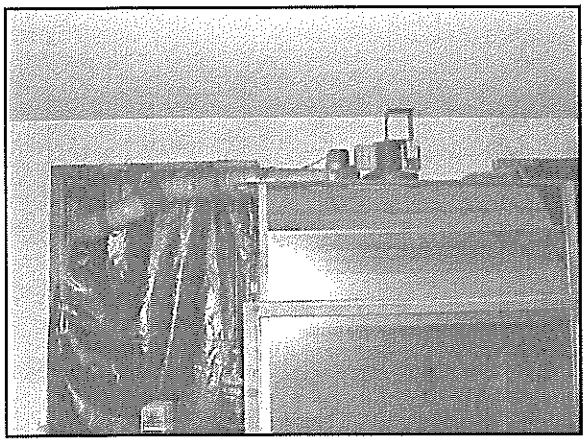


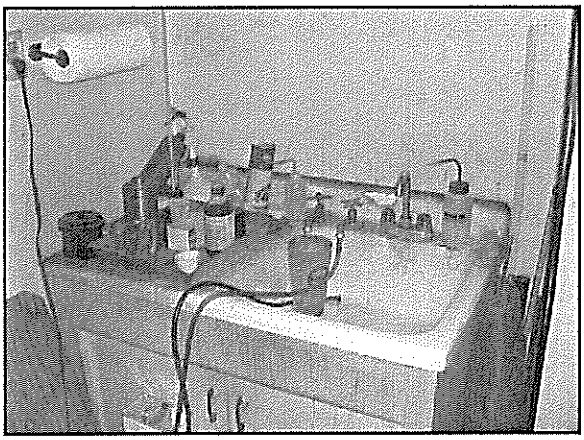


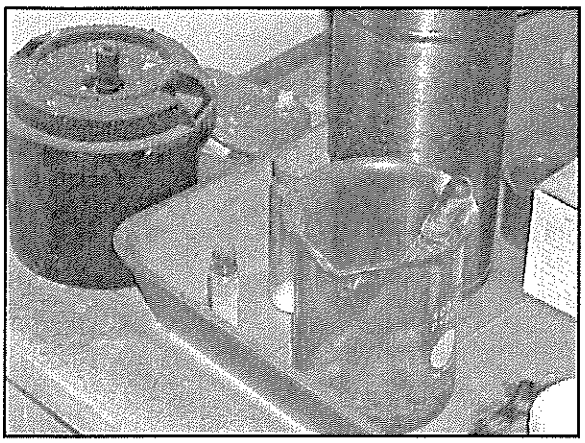


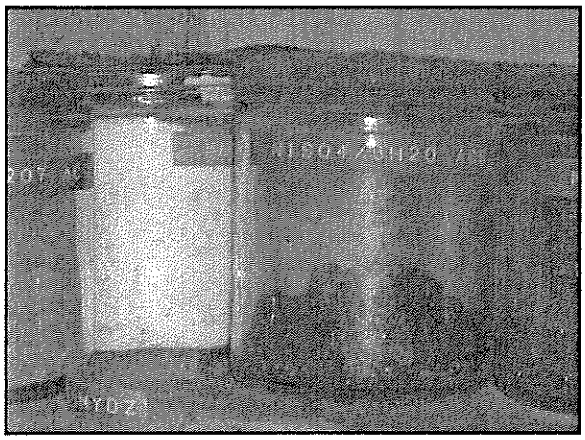


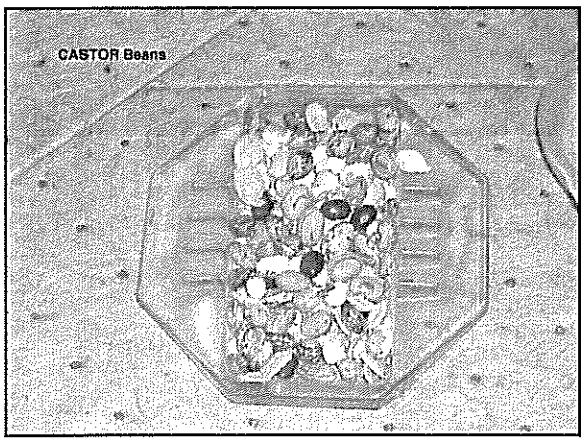








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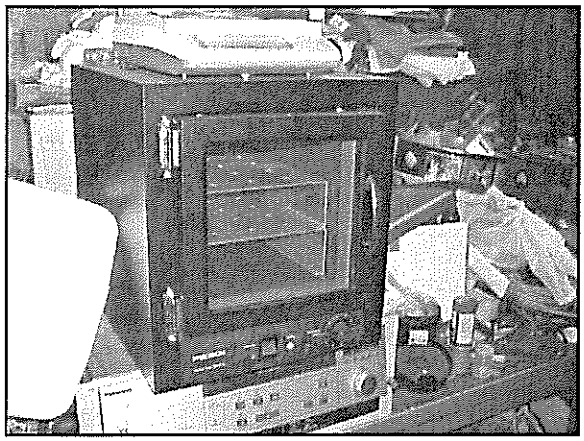
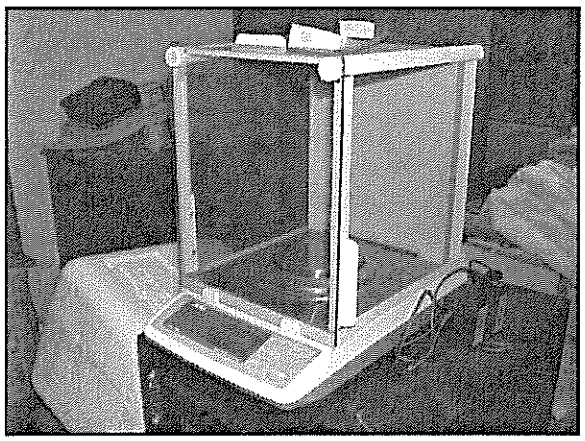
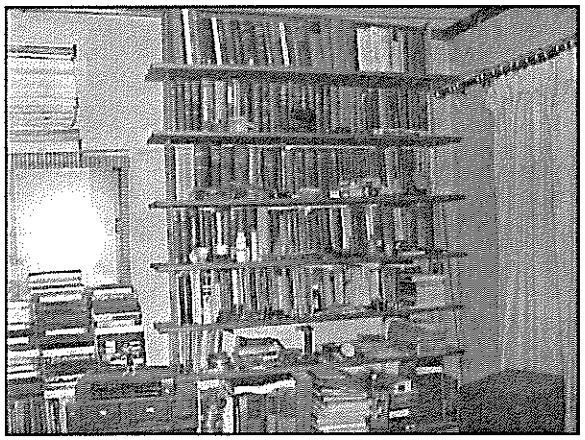
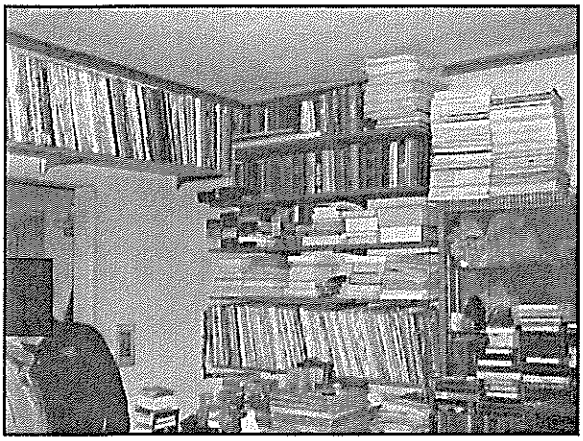
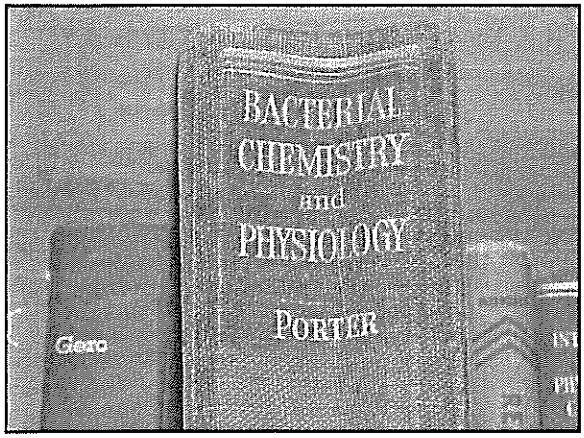
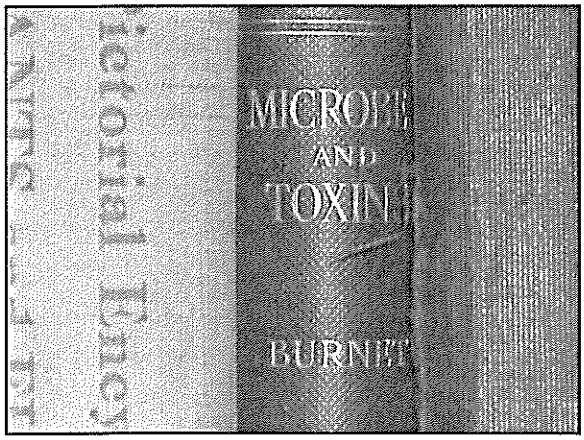


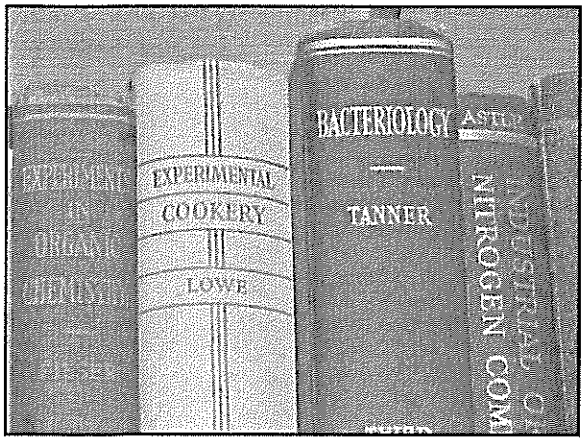


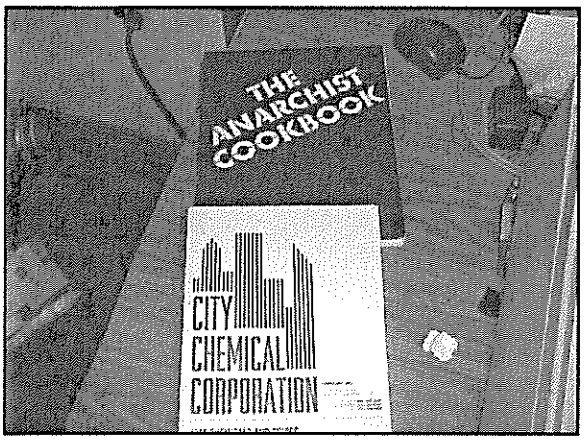


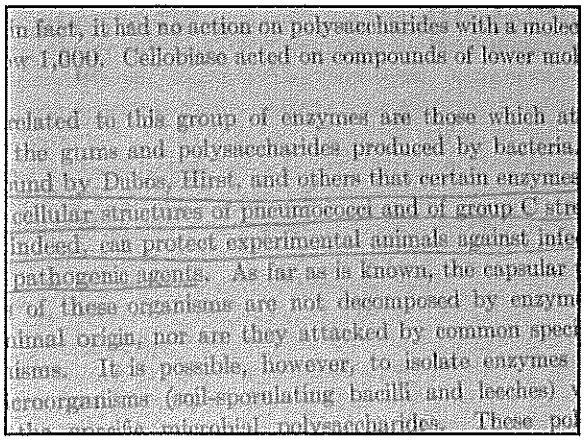


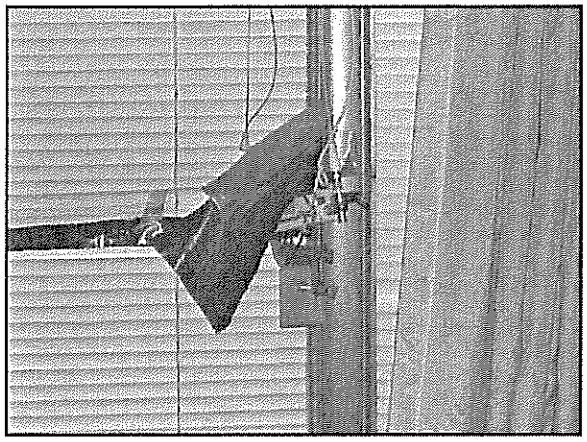

BACTERIAL
CHEMISTRY
and
PHYSIOLOGY
PORTER

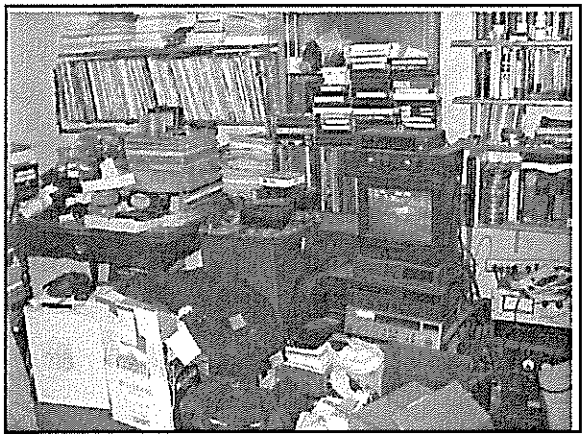

MICROBE
AND
TOXIN
BURNET


EXPERIMENTAL
COOKERY
LOWE
BACTERIOLOGY
TANNER
NITROGEN COM

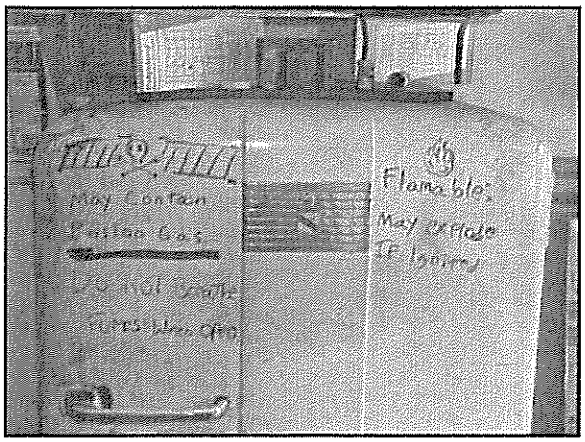

THE
ANARCHIST
COOKBOOK
CITY
CHEMICAL
CORPORATION

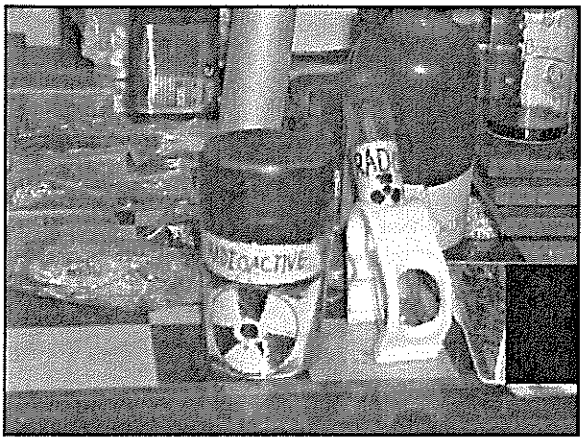


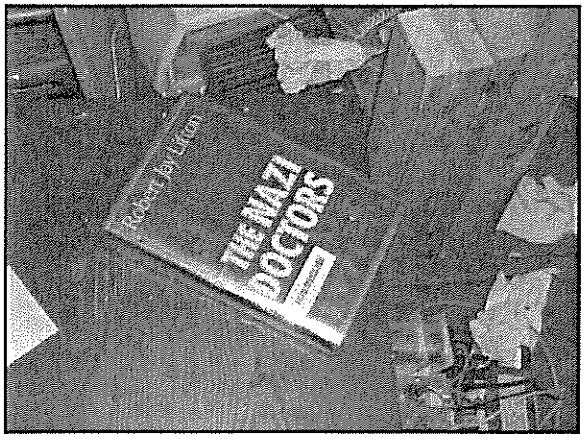


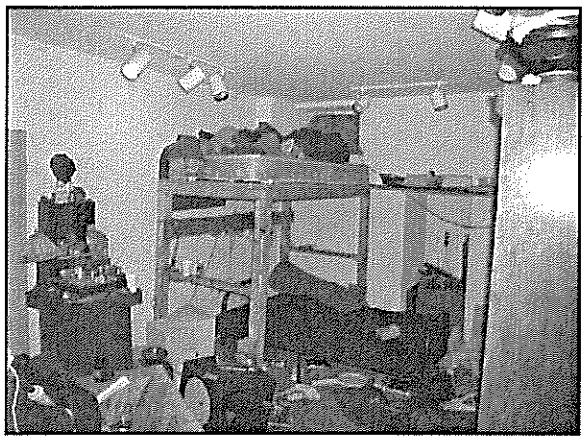


- Scene III

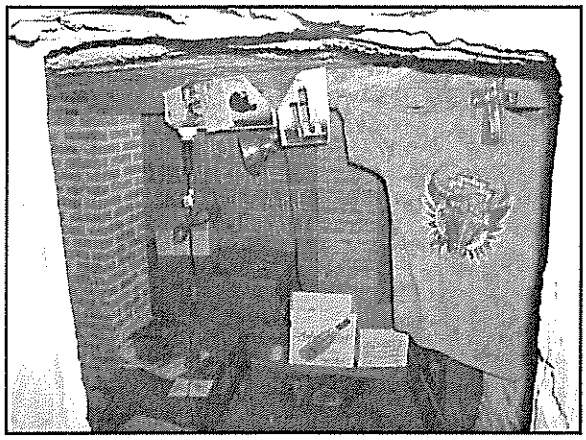

May Contain
Flamable
May explode

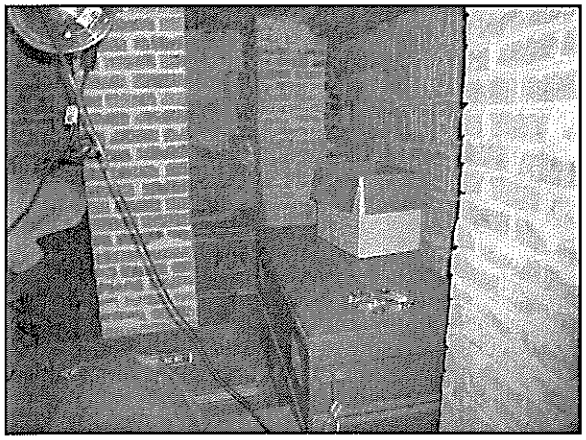

RADIOACTIVE

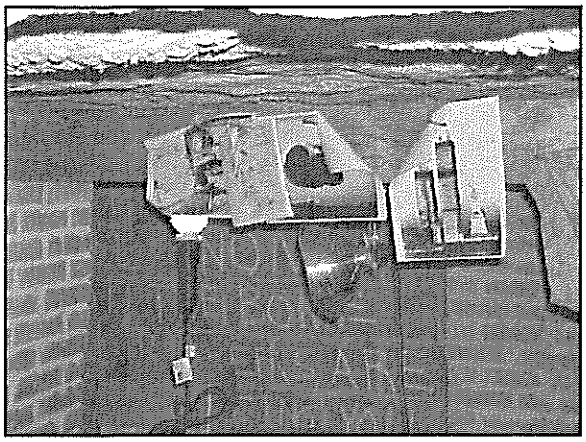

Robert Jay Lifton
THE NAZI DOCTORS

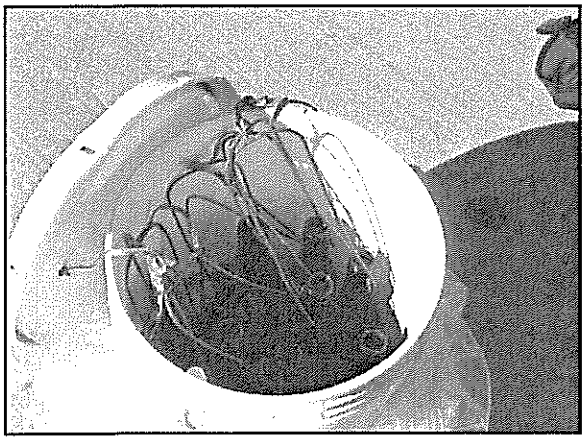


Scene 4



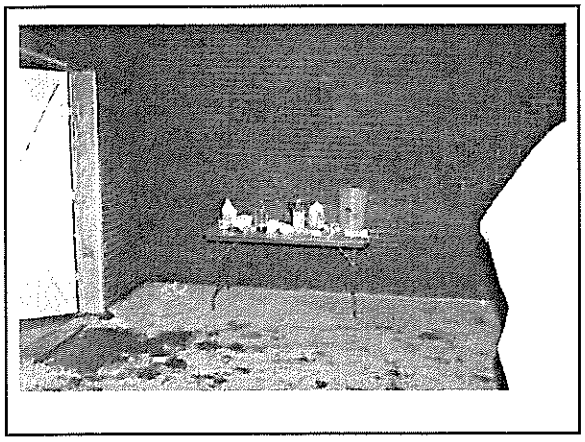


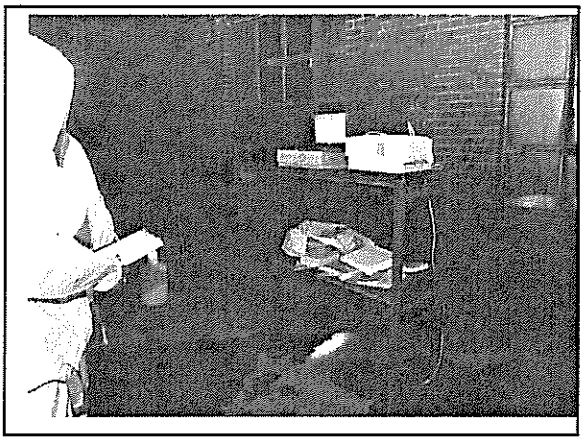




Lab #1

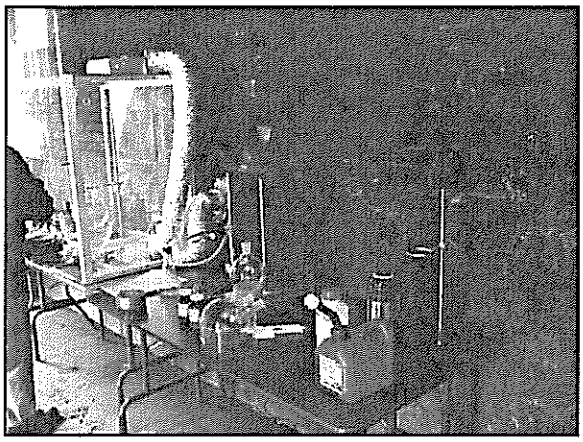
First floor

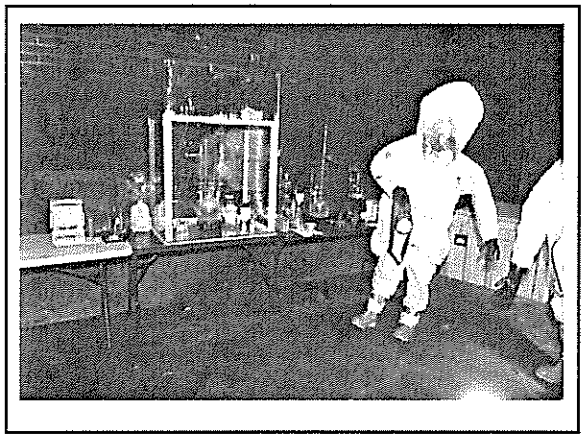


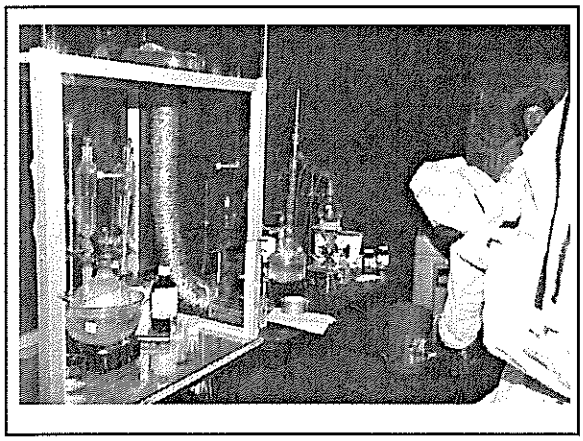


Lab # 2

Basement

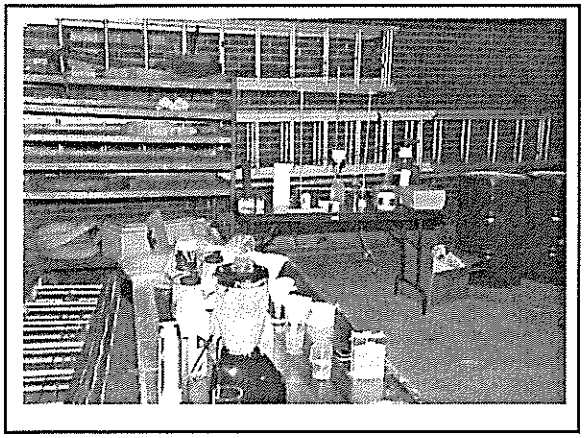


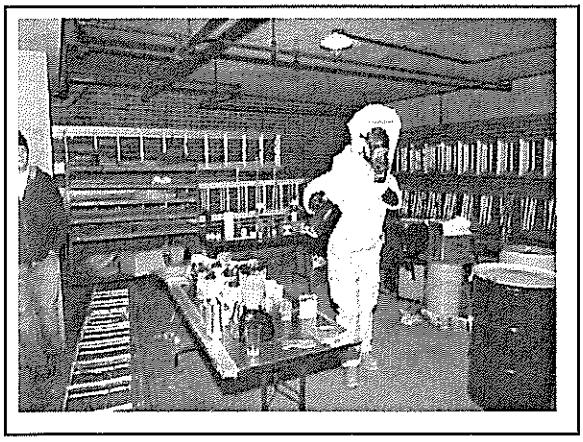


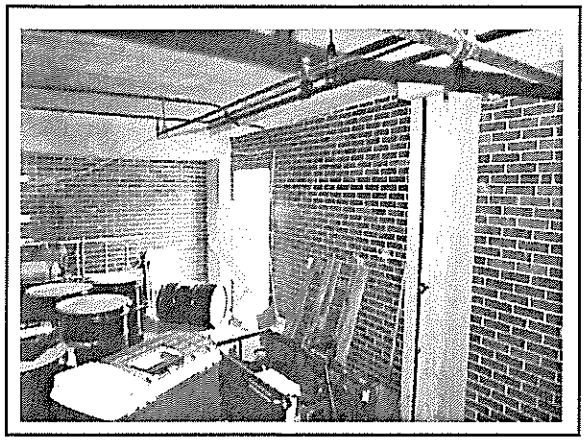


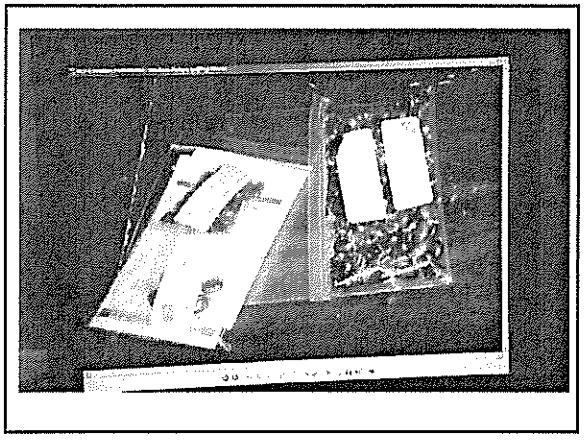
Lab # 3

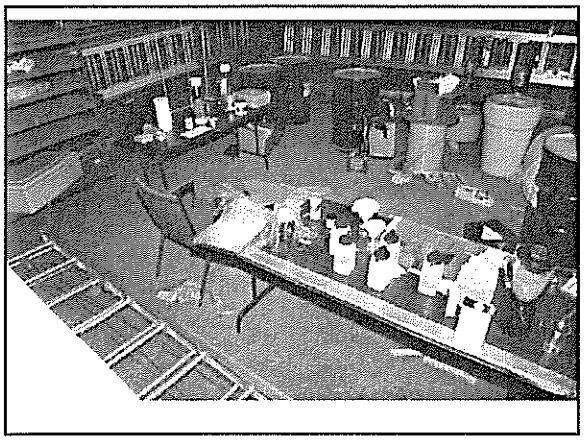
Warehouse

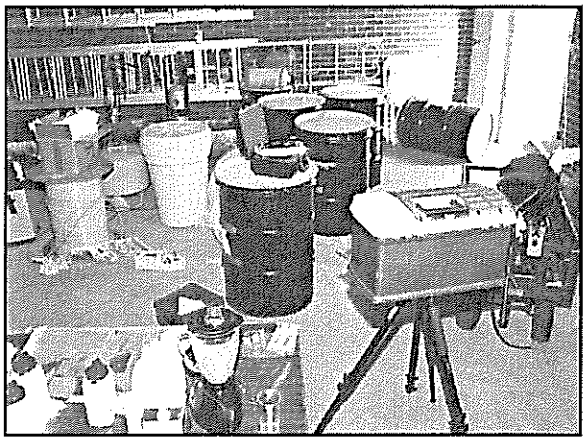






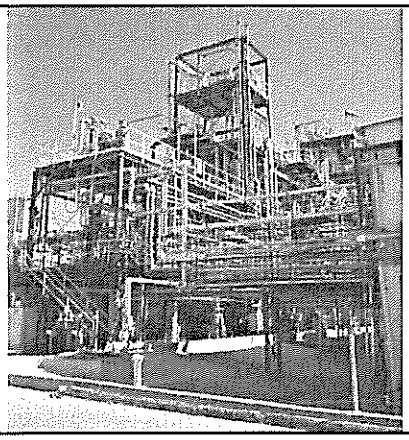






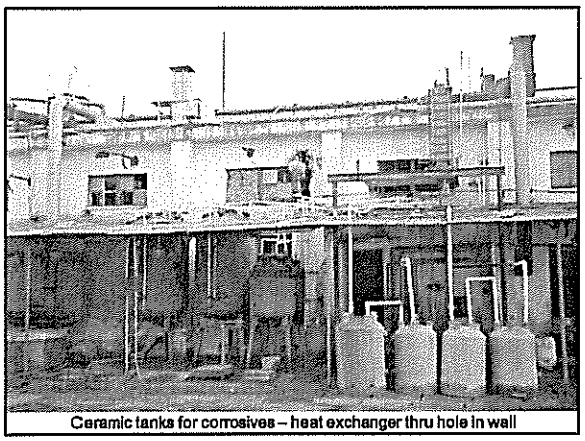
Facilities

- As code officials, we are aware of the facilities we have in our towns and jurisdictions.
- Part of our job is to insure that adequate and proper methods are employed to secure facilities that are no longer being used.

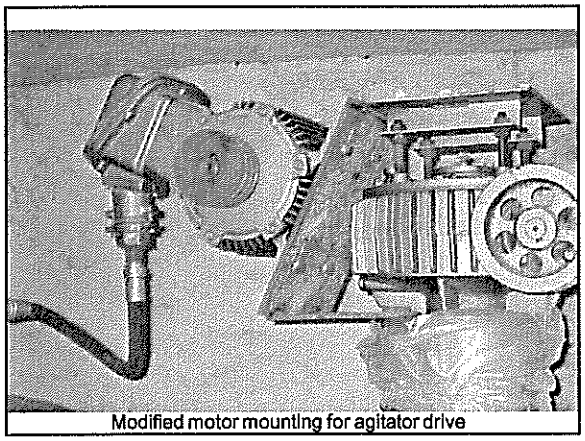


OVERVIEW COMMENTS

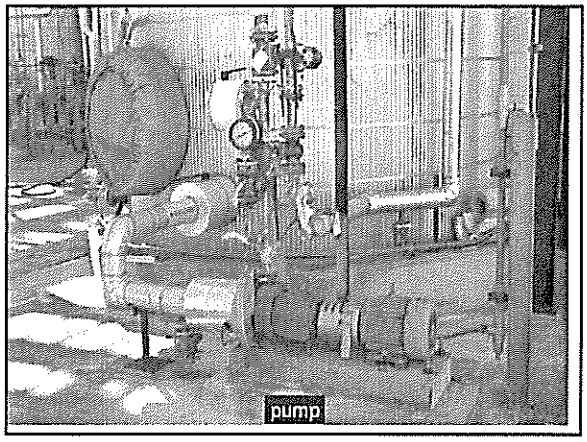
- For small scale operations, interest is simply in getting the job done
- Does not have regulatory requirements driving the design
- Does not have to worry about developing systems to handle large quantities
- If mistakes occur, they will be small in comparison



Ceramic tanks for corrosives – heat exchanger thru hole in wall

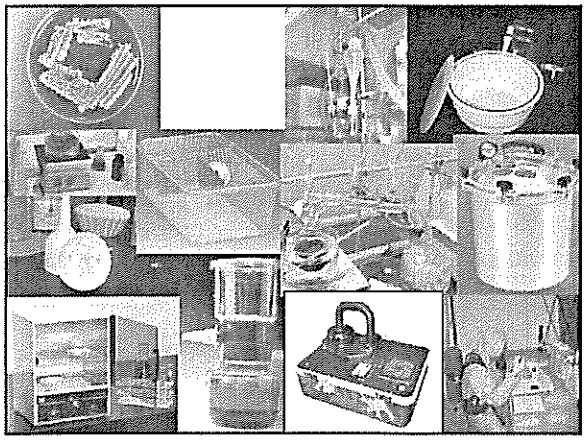


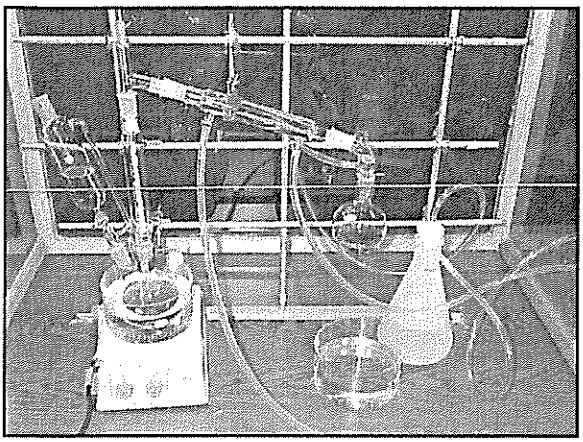
Modified motor mounting for agitator drive

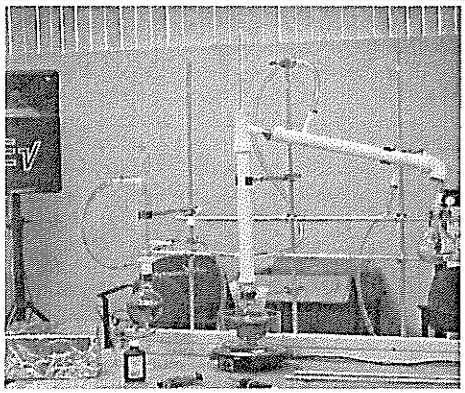


OVERVIEW COMMENTS

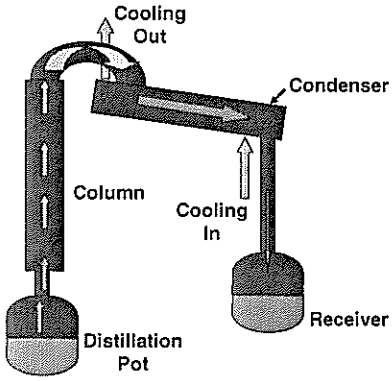
- Can use PPE rather than systems for protection – personnel hygiene becomes a significant issue
- Should have concern for shelf life of product – may not be as pure/stable and may take time to produce desired quantity
- But, will not be storing for years – just days or weeks

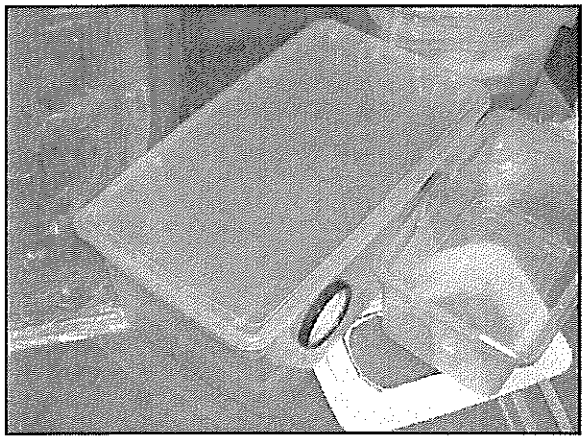


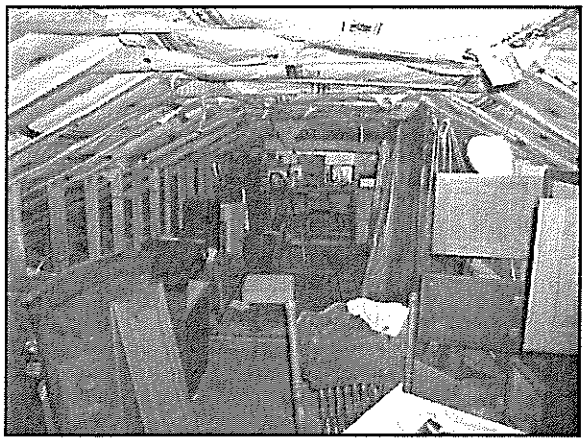


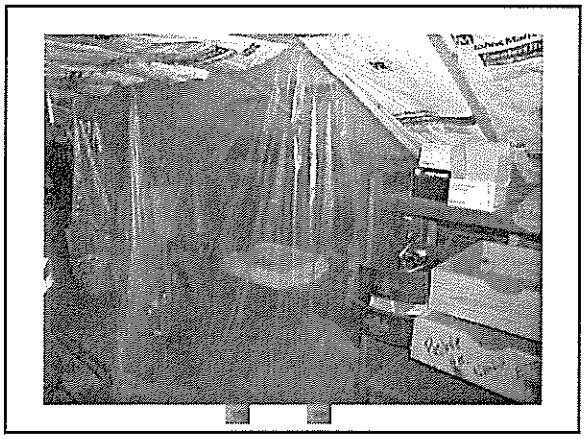


home made distillation and reflux systems

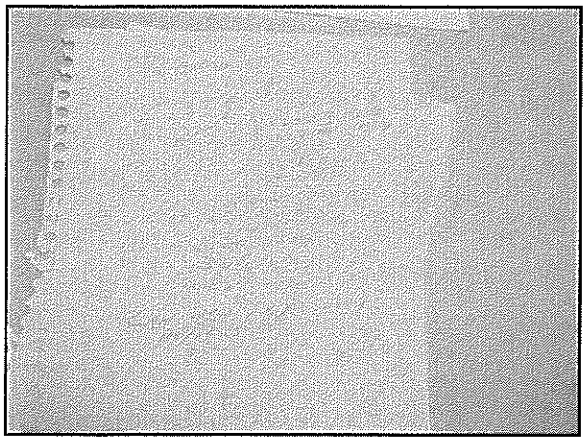


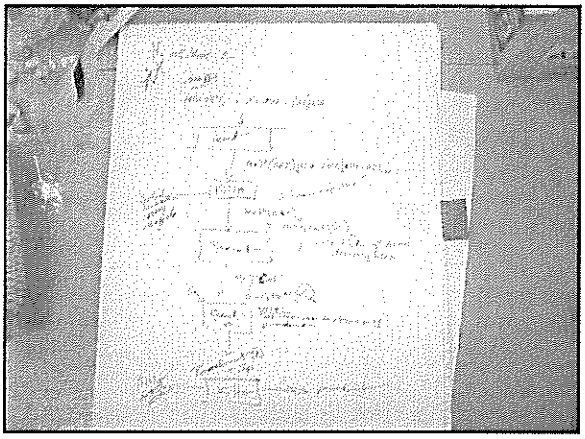


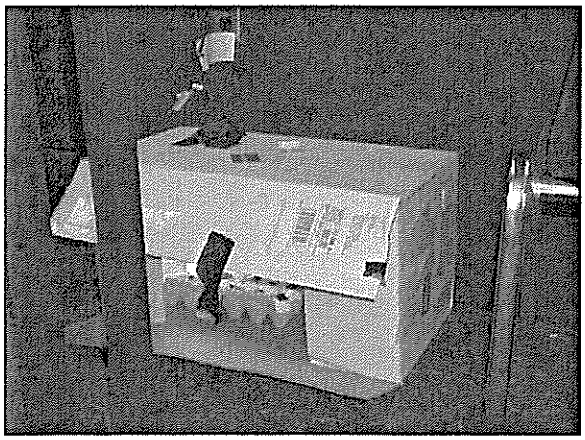


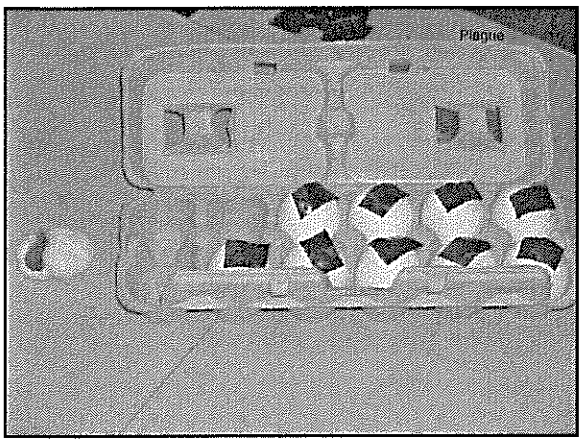


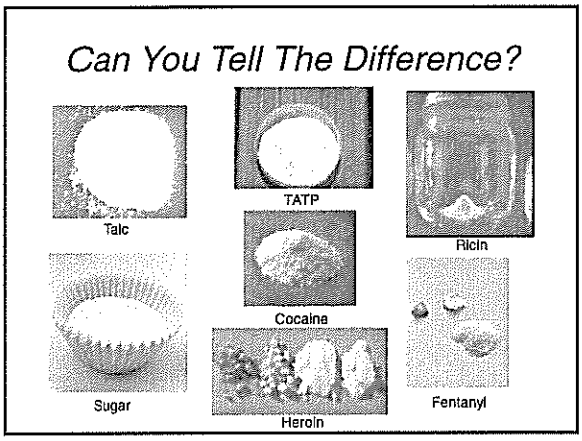
Prestone
Brake Fluid

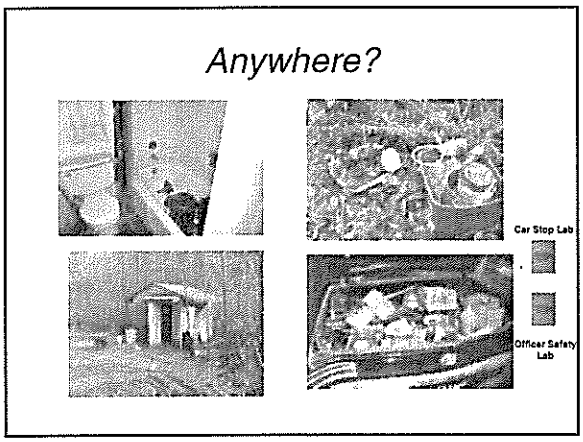






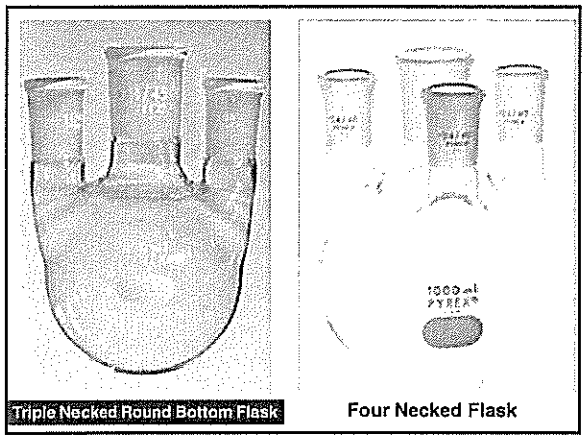

Plague


Can You Tell The Difference?
Talc
TATP
Ricin
Cocaine
Sugar
Heroin
Fentanyl


Anywhere?
Car Stop Lab
Officer Safety Lab

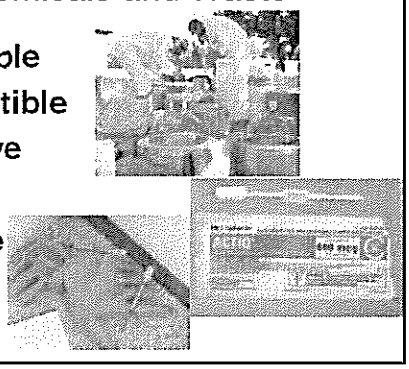
Lab Terminology

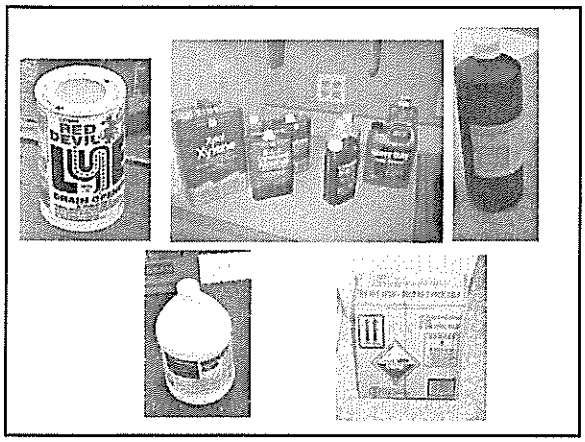
- a) **Precursor** - Primary chemical that is changed into the finished product, i.e., ephedrine or pseudo ephedrine to methamphetamine.
- b) **Reagent** - Chemical used in reactions to convert precursor into the finished product, but does not become part of the finished product.
- c) **Solvent** - Used to dissolve solid precursors or to separate chemicals in a reaction. Most solvents are highly flammable.
- d) **Catalyst** - Substance that initiates a chemical reaction, i.e., lithium metal.
- e) **Exothermic** - A chemical reaction producing its own heat.
- f) **pH Scale** - Measure of acidity or alkalinity.
  The pH range is 0 to 14 with 7 as neutral. <7 increases acidity, >7 increases alkalinity



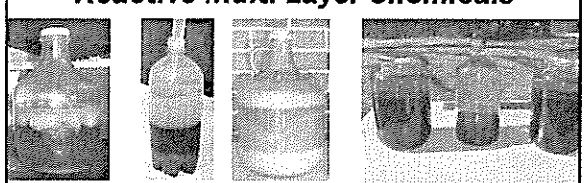
Chemicals and Waste

- **Flammable**
- **Combustible**
- **Corrosive**
- **Caustic**
- **Reactive**
- **Toxic**

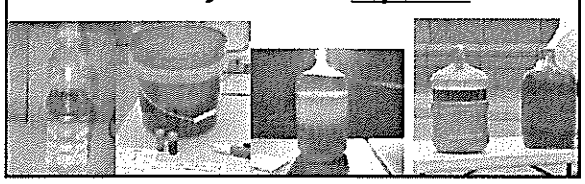




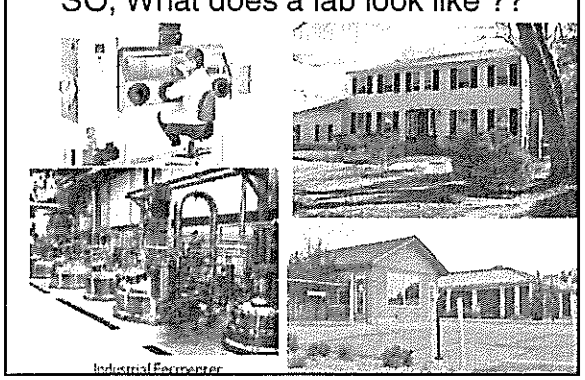
Reactive Multi-Layer Chemicals



"Binary Chemical Explosive"

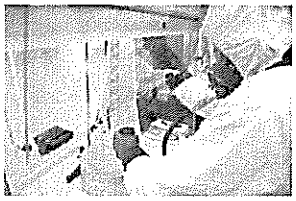


SO, What does a lab look like ??

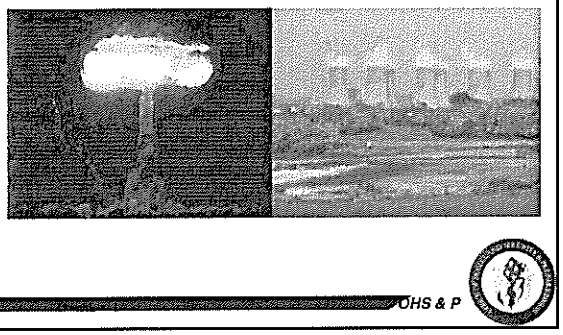


Remember!

- **If not trained - *DO NOT ENTER!***
- **If not equipped - *DO NOT ENTER!***
- **If alone - *DO NOT ENTER!***

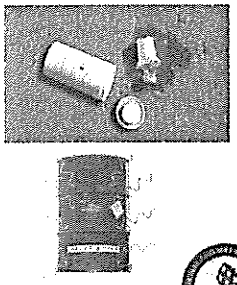


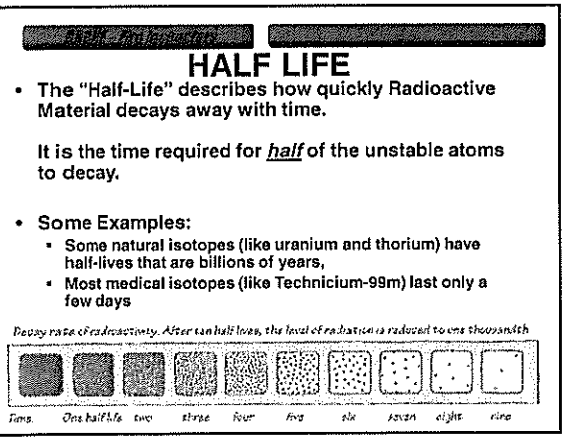
When in Doubt Call it In !



Objectives

- *demonstrate* a knowledge of self protection techniques
- *identify* types of radiation and their associated hazards
- *demonstrate* a knowledge of terminology





Some Isotopes & Their Half Lives

ISOTOPE	HALF-LIFE	APPLICATIONS
Uranium	billions of years	Natural uranium is comprised of several different isotopes. When enriched in the isotope of U-235, it's used to power nuclear reactor or nuclear weapons.
Carbon-14	5730 y	Found in nature from cosmic interactions, used to "carbon date" items and as radiolabel for detection of tumors.
Cesium-137	30.2 y	Blood irradiators, tumor treatment through external exposure. Also used for industrial radiography.
Hydrogen-3	12.3 y	Labeling biological tracers.
Irridium-192	74 d	Implants or "seeds" for treatment of cancer. Also used for industrial radiography.
Molybdenum-99	66 h	Parent for Tc-99m generator.
Technicium-99m	6 h	Brain, heart, liver (gastoenterology), lungs, bones, thyroid, and kidney imaging, regional cerebral blood flow, etc.

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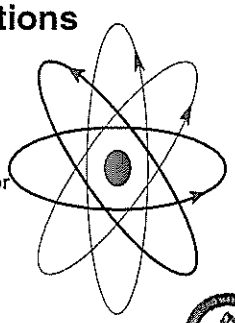
Definitions

- Radiation
  - Electromagnetic or particulate emission
- Radioactive material
  - Material giving off one or more forms of radiation



OHS & P

Radiation Language

rad

bequerel

rem

@#&!*$

Gy

Sv

curie

OHS & P

Radiation Language 2

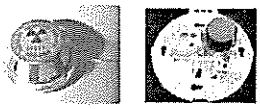
- Bequerel (Bq) / Curie (Ci) = Energy
- Rad / Gray (Gy) = absorbed dose
- Rem / Sievert (Sv) = biological effect
  - 1 Gy = 100 rad (1 cGy = 1 rad)
  - 1 Sv = 100 rem

See hand out card

OHS & P

Nuclear Materials Common Sources

Natural Sources
Soil (Radon)
Cosmic (sun and outer space)
Internal (Potassium 40)
Manmade Devices
Medical X-rays
Nuclear medicine
Consumer products
- Smoke Detectors
- Lantern Mantles
- Instruments



Smoke Detectors

OHS & P

Nuclear Radiation Indicators

- Specialized Packaging
- Placards or Labeling
- Written or verbal threats

Requires Detector

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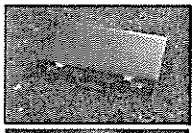
Release of Nuclear Material

Fission Device

Conventional Explosive at Facility

Radiological Dispersal Device or Radiological Destructive Device (RDD)

Improvised Nuclear Device (IND)



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Radiological Dispersion Device

RDD AKA "Dirty Bomb"
- Most like Nuclear Threat
- Conventional Explosive packed around Nuclear Materials

SIGNS & SYMPTOMS
- Acute Poisoning
- Radiation Burns

ROUTES OF ENTRY
- Inhalation
- Ingestion
- Skin Absorption
- Injection (Open Wounds or shrapnel

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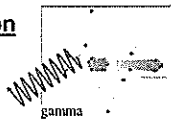
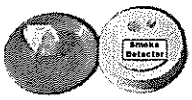
Types of Radiation

- Ionization
  - X-ray





- Non-Ionization
  - Micro wave
  - Radio Frequency

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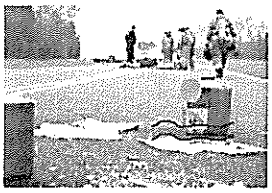
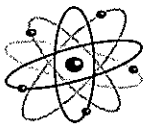
Ionizing Radiation

- Alpha particles
- Beta particles
- Gamma rays
- Neutrons





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Health Risks

- Risks depend on:
  - Amount
  - Rate
- Categorized as:
  - Acute
  - Chronic
  - Delayed

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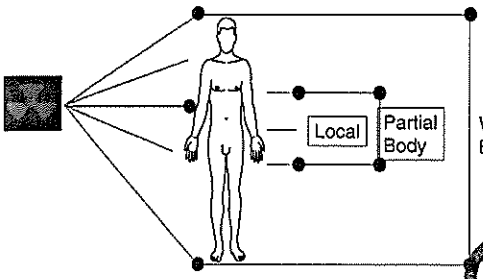
Irradiation



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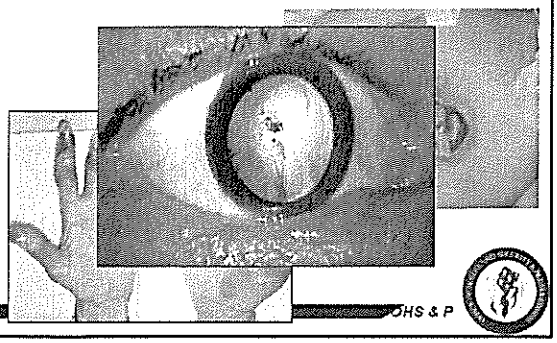
Local Injury



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Skin Changes - Local Exposure

Dose	Event	When
300 rad	Epilation	14 – 21 days
600 rad	Erythema	Transient initially then 14 – 21 days
1000 – 1500 rad	Dry Desquamation	2 – 3 weeks
2000 – 5000 rad	Wet Desquamation	2 – 3 weeks
> 5000 rad	Overt radionecrosis & ulceration	> 4 weeks

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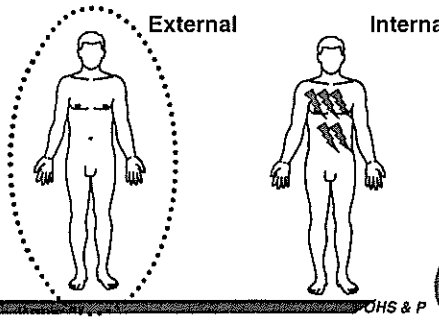
Contamination



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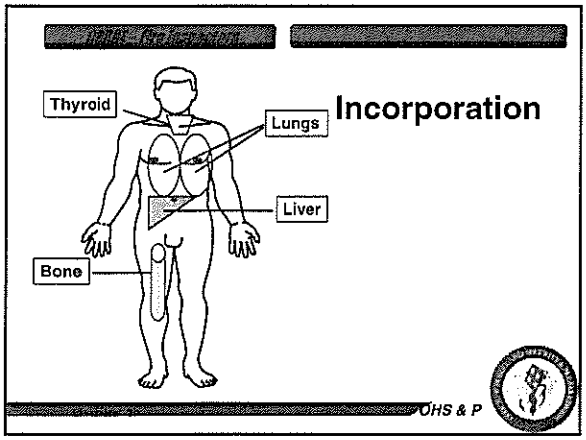

Combined Injury

- Radiation exposures/injuries are ***NOT*** medical emergencies
- Patients will die sooner from something else

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Acute Radiation Syndrome

- Group of signs and symptoms that develop after acute total body irradiation (> 100 rads)
- May occur from internal contamination
- Symptoms are predictable depending on the dose
- Severity related to how quickly symptoms develop

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Dose	Effect
15 – 50 rad	Possible chromosome aberrations & ↓ WBC's / platelets
100 rad	N/V ≈ 10% of patients within 48 hrs
200 rad	N/V ≈ 50% of patients within 24 hrs, ↓↓ WBC's / platelets
400 rad	N/V ≈ 90% within 12 hrs, Diarrhea ≈ 10% within 8 hrs 50% mortality w/o Tx
600 rad	100% mortality within 30 days due to bone marrow failure w/o Tx
1000 rad	Approximate survivable dose – BEST treatment
>1000 rad	N/V < 5 min, SEVERE GI damage Death likely in 2 – 3 wks w/o Tx
> 3000 rad	CV collapse & CNS damage, Death within 24 – 72 hrs

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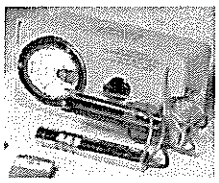

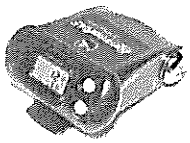

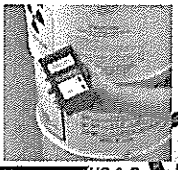

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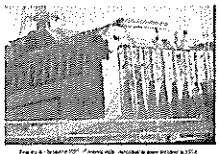
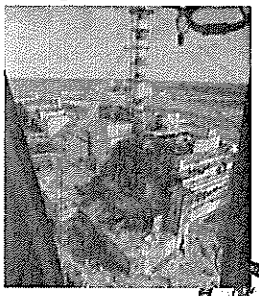
Health Hazards During an Incident

- **Exposure**
- **Ingestion**
- **External contamination**





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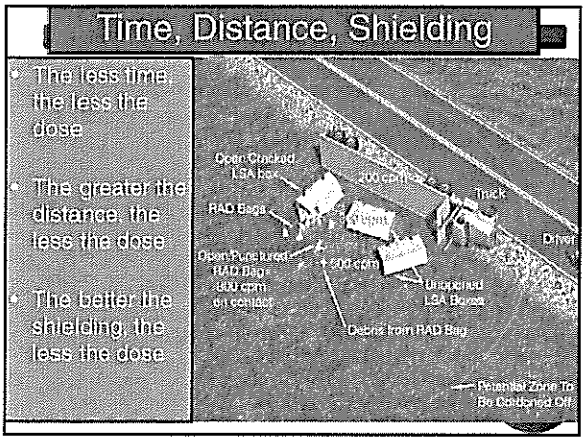
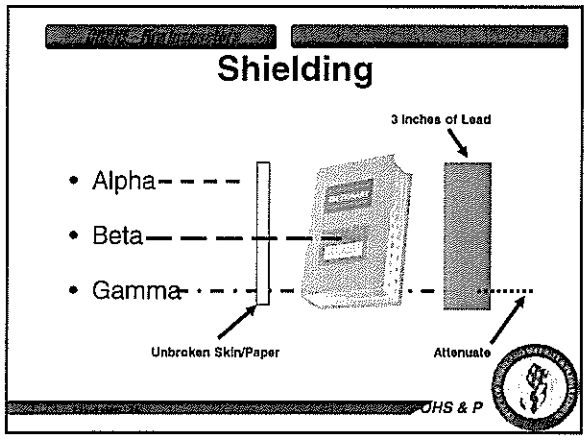
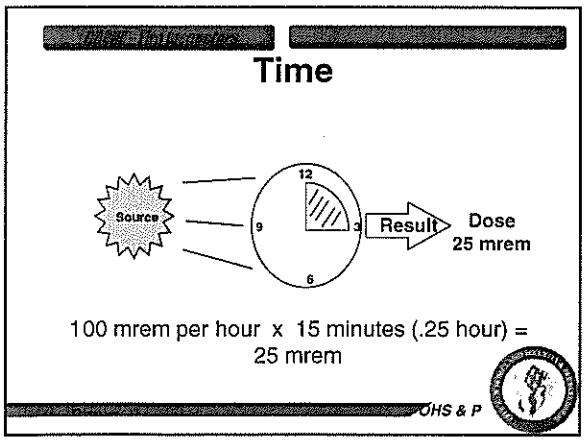
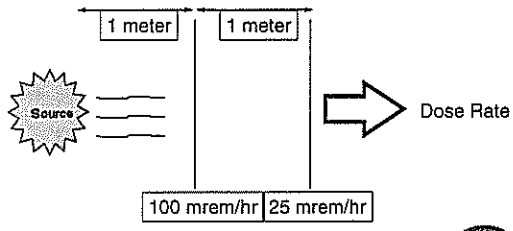

Time, Distance, Shielding
The less time, the less the dose
The greater the distance, the less the dose
The better the shielding, the less the dose
Open Cracked LSA box
RAD Bags
Open Punctured RAD Bags 800 cpm on contact
200 cpm
Truck
Driver
Unopened LSA Boxes
Debris from RAD Bag
Potential Zone To Be Cordoned Off


Shielding
3 Inches of Lead
Alpha
Beta
Gamma
Unbroken Skin/Paper
Attenuate
OHS & P


Time
Source
12
9
3
6
Result
Dose
25 mrem
100 mrem per hour x 15 minutes (.25 hour) =
25 mrem
OHS & P

Distance



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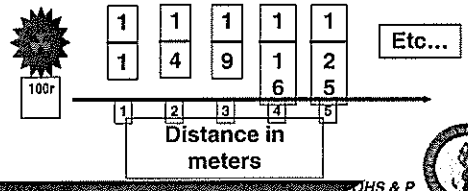
Inverse Square Rule

- Energy ***DECREASES*** by the inverse square ($1/x^2$) of the distance (x)



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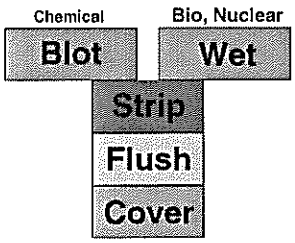
Decontamination



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Nuclear Weapons

Advantages
- Available
- Tie up resources
- Psychological Impact
- Difficult to Prepare For
- Next Level of Escalation

Disadvantages
- Heavy
- Delayed effects
- Deployment hazardous to Terrorist
- Requires Numerous Difficult steps
- Expensive

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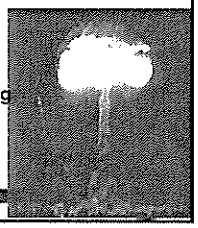
Nuclear Materials

- Natural Sources
- Radon (Soil) – 200mrem
- Cosmic (sun and outer space) – 28 mrem
- Terrestrial – 28 mrem
- Internal (Potassium 40) – 40 mrem
- Medical X-rays – 40 mrem
- Nuclear Medicine -14 mrem
- Consumer products – 10 mrem
- Other – 3 mrem
- Background level can vary depending upon location.



Common Radiation Exposures

Radiation Source	Relative Dose (millirem)
Gastrointestinal series (upper and lower)	1,400
Radon in average household in the United States	200 annually
Living in Denver	81 annually
X-rays and nuclear medicine	50 annually
Natural radioactivity in the body	39 annually
Living in Chicago	34 annually

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Common Radiation Exposures (cont'd)

Radiation Source	Relative Dose (millirem)
Cosmic Radiation	31 annually
Mammogram	30
Living at sea level	28 annually
Consumer products (such as drinking water)	11 annually
Chest X-ray	10
Living near a nuclear power station	< 1 annually

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Responder Exposure Limits

- Recommended limits established by the Environmental Protection Agency (EPA)
- Not considered safe limits because they still present some risk
- Recommended: *Maximum 25 rem total dose for any single life-threatening emergency.*
- *NJ Radiological Response Protocol*

OHS & P

Emergency Response Exposure Limits

Dose Limit (REM)	Activity	Condition
5	All	
10	Protecting valuable property	Lower dose not practical
25	Lifesaving or protection of large populations	Lower dose not practical
>25	Lifesaving or protection of large populations	Only on a voluntary basis to persons fully aware

Key Points

- Types of radiation
  - Alpha, Beta, Gamma & Neutron
- Protection
  - Time
  - Distance
  - Shielding
- *Once detected*
- *Establish the 2 mR line (NJ Rad protocol)*

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Summary

- Nuclear devices are extremely expensive lethal and difficult to deliver and handle.
- Nuclear devices effects are both instantaneous and long lasting
- Radiological devices are long lasting "Dirty Bombs"
- "Dirty Bombs" are most likely application of nuclear agents.

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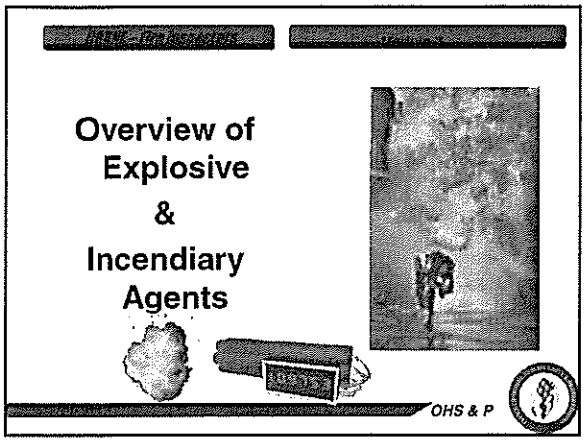
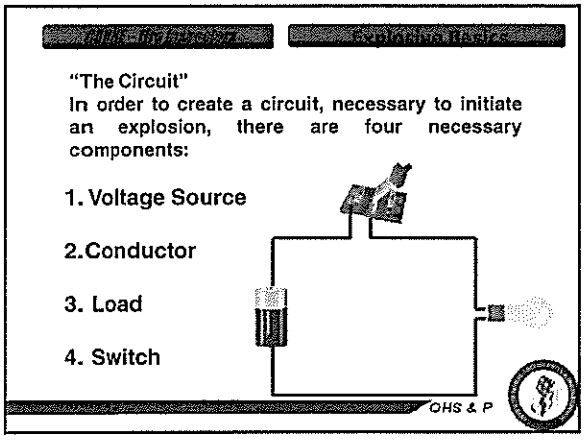
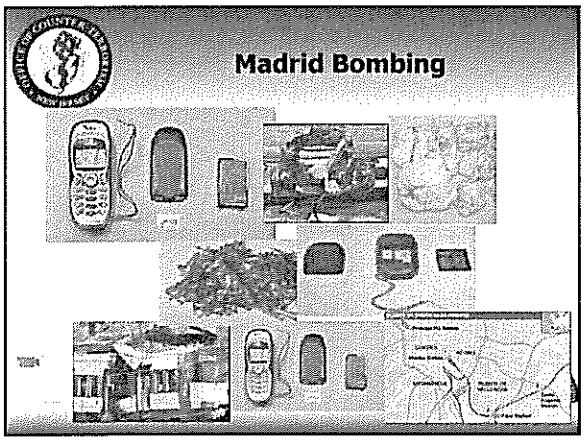
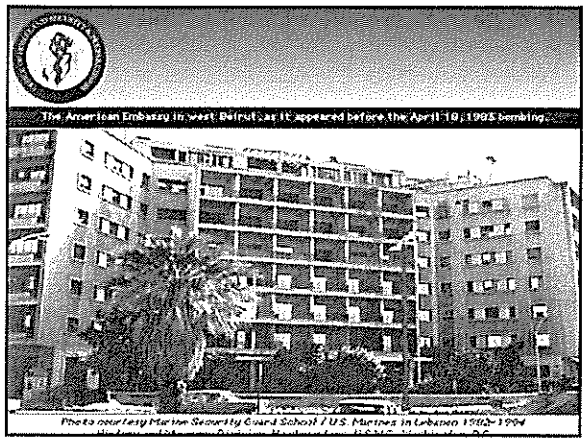

Overview of
Explosive
&
Incendiary
Agents
OHS & P


"The Circuit"
In order to create a circuit, necessary to initiate an explosion, there are four necessary components:
1. Voltage Source
2.Conductor
3. Load
4. Switch
OHS & P


Madrid Bombing

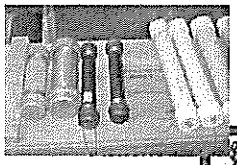

The American Embassy in west Beirut as it appeared before the April 18, 1983 bombing.

115

OKLAHOMA City, OK

Explosives

- Terrorist weapon of choice
- 70 percent of all terrorist incidents in the United States
- Can deliver death themselves or disperse an agent of death
- IED's
  - Vehicle bombs
  - Pipe bombs
  - Satchel devices



OHS & P

Incendiary Devices

- 20-25% of all Domestic Bombings
- Ignites 75% of Time
- Preceded by Threat Less Than 5% of incidents

OHS & P

Common Components

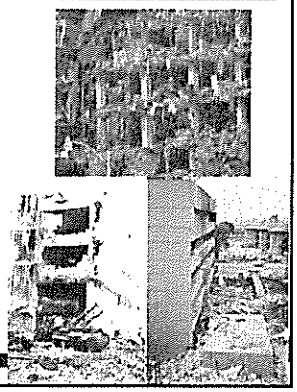
- Components
- Ignition Sources
- Combustible Filler
- Housing or Container

- Common Material Used
- Road Flares
- Gasoline/Motor Oil
- Light Bulbs
- Matches/Fireworks
- Electrical Components
- Propane Cylinders
- Plastic Pipes and Containers

OHS & P

Explosive Devices

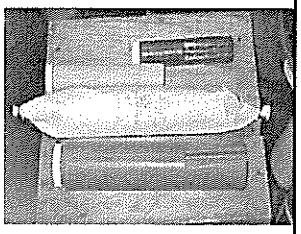
- >70% of Domestic Terrorist Incidents are Explosive
- Between 1990-1995 FBI Data Reveals 10,122 Actual Bombings Resulting in 355 Deaths and 3176 Injures.



Energetic Materials

Classified in three categories

1. Pyrotechnics
2. Propellants
3. Explosives

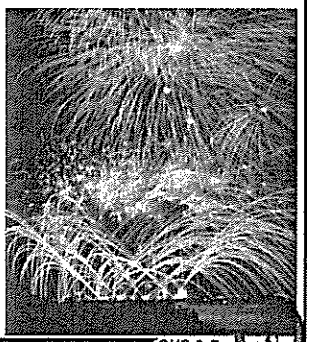


OHS & P

Pyrotechnics

PURPOSE
- Create smoke, light, heat and sound.

EXAMPLES:
- Display Fireworks
- Road Flares
- Smoke Grenades
- Thermites



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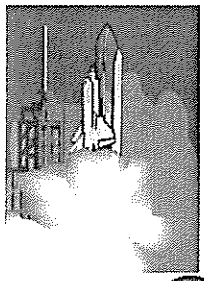
Propellants

- Designed to produce a controlled release of gases for the propulsion of objects.



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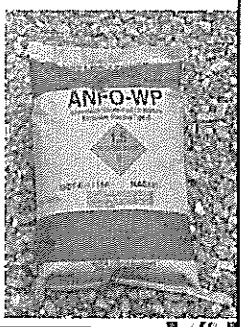
Explosives

- Designed to produce almost instantaneous production of super-heated gases which rapidly expand into a greater volume.



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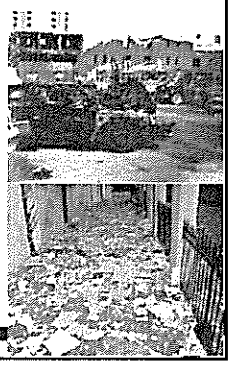
Explosives Terminology

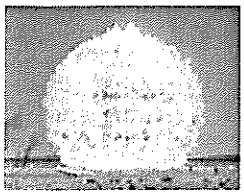
Explosives

- Low vs. High
- Explosives
- Blast Pressure
- Fragmentation
- Thermal Effects

Positive Blast Pressure + Negative Blast Pressure



Explosive Effects



- Bottle (Chemical)
- Car Bomber
- Hazards of being to Close
- Flash Powder Demo in Plastic Pipe

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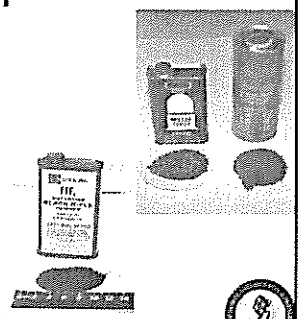
Low Explosives

- Better known as "propellants"
  - Gunpowder
  - Fuels
  - Designated to burn and produce output as gas.
  - Combustible materials containing both fuel and oxygen.



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Shock Wave
(Effectiveness)

- Explosives undergo rapid Chemical Reaction.
- Reaction pushes a shock wave
- The Speed of the shock wave is: *detonation velocity*.

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Explosive Basics

- "The Explosive Train"
- All explosives (civilian and military) require an initial high-impact and concentrated shock to cause detonation.
- A small explosive device called an initiator produces this initial shock. Initiators are a key step in a chain of events called the "Explosive Train".
- The most common type of initiator is a blasting cap.

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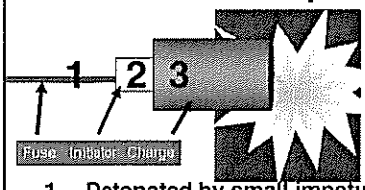
Initiation of Explosive Train



1. Detonated by small impetus (spark, flame, impact)
2. Large impetus that primary required to detonate
3. Requires huge impetus to detonate

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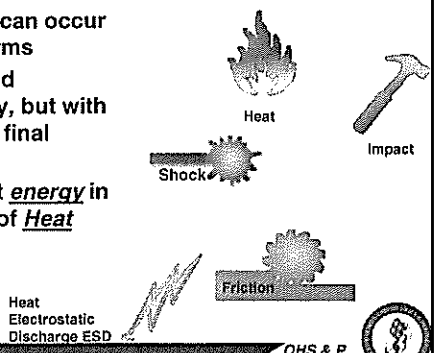
- Initiation can occur in five forms
- All created differently, but with the same final result.
- All impart *energy* in the form of *Heat*



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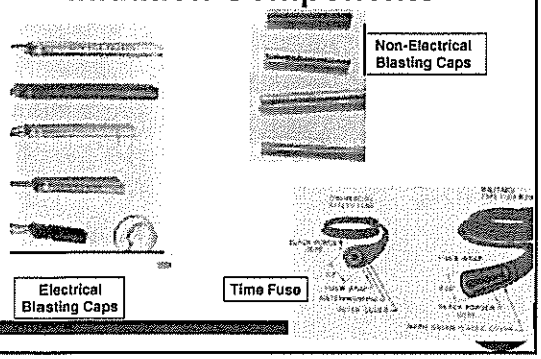
Initiation Components



Potential Oxidizers

Name	Oxidizer	Common Counter Ions
Perchlorates	ClO4	K, NH4, Na, Ba, & Ca
Chlorates	ClO3	K, Li, Na, & Ba
Hypochlorite	OCl	Ca (OCl)2
Nitrates	NO3	K, NH4, Na, Ba, Ag, & Sr
Chromates	CrO4	Pb, Ba, Ca, & K
Dichromate's	Cr2O7	K2Cr2O7
Iodates	IO3	K, Pb, & Ag
Permanganate	MnO4	KMnO4
Peroxides	O2 -2	Na, & Ba, also H2 O2

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Potential Fuels

- Energetic Hydrocarbons
- Nitrobenzene
- Nitrotoluenes
- Nitrocellulose
- Picric Acid

- Others
- Halogens (Cl, F, etc)
- Powdered Metals (Al, Mg, Sb)
- Carbon Disulfide (CS2)
- Phosphorus (P4)
- Sulfur (S8)
- Antimony Sulfide (Sb2S3)

Hydrocarbons
Petroleum
Turpentine
Naphtha
Castor Oil
Sugar
Wax, Paraffin
Vaseline
Dextrin
Shellac
Rosin
Saw dust
Glycerin

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Comparisons

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Relative Effectiveness Factor

Type of Explosive	Relative effectiveness Factor
TNT	1
Black Powder	0.55
Nitroglycerin	1.5
Composition 4	1.34
Composition B	1.1
Dynamite 40%	0.65
Dynamite 60%	0.83
Dynamite, Ammonia 40%	0.41
Dynamite, Ammonia 60%	0.53
Dynamite, Gelatin 40%	0.42
Dynamite, Gelatin 60%	0.76

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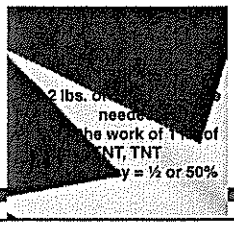
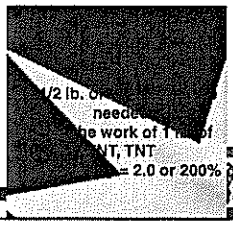
TNT Equivalency

- The mass of TNT needed to replicate the effects produced by a test explosion, divided by the mass of the explosive tested





Improvised Explosive Devices

- VBIED Vehicle Borne Improvised Explosive Devices

- Pipe Bombs

- Satchel Charges

- Suicide Bombers

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Types of Improvised Explosive Devices (I.E.D's.)

- I.E.D's. are generally simple and inexpensive to manufacture
- Many are made of fertilizer and sugar or T.A.T.P.
- Most have added fragmentation.
- The explosive is packed in PVC or light plastic tubing.
- Rarely weight more than 20 pounds.
- Compact enough to be strapped to a belt or worn in a vest, bra, shoes or jacket with built in pouches.

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Note

- High explosives are not required to make device.
- Traditional device – steel shell, filler
- Fireworks filler placed in a pipe is also common.

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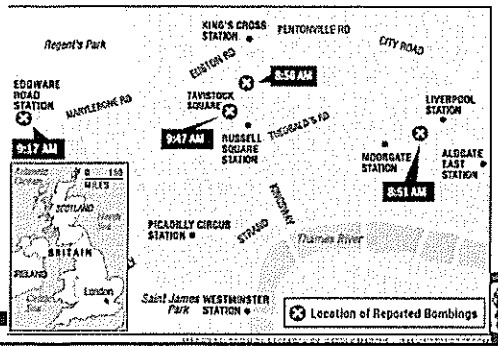
London Bombings July 2005



Summary

- The most common CBRNE agents in use are still *explosives* and incendiaries.
- A wide variety of substances can serve as oxidizer and fuel for an explosive device, even *common sugar*.
- It doesn't have to be a high (1) explosive to be deadly threat.

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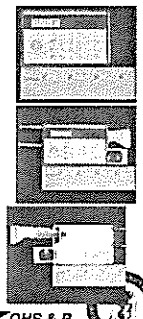
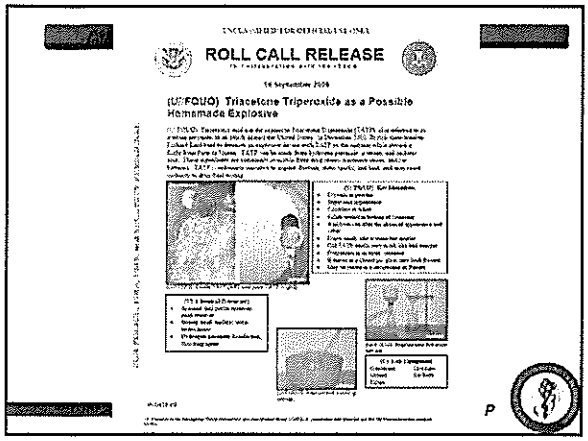
Improvised Devices



OHS & P


ROLL CALL RELEASE
(U//FOUO) Triacetone Triperoxide as a Possible Homemade Explosive

Responder Actions

Responder Actions

- Position equipment
- Isolate area
  - Hot zone
  - Warm zone
  - Cold zone
- Protect self (PPE as trained)

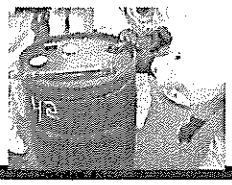
Emergency Self-Decontamination

Chemical	Bio, Nuclear
Blot	Wet
Strip	
Flush	
Cover	

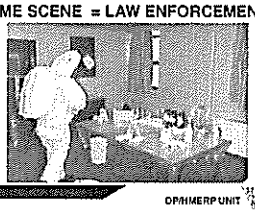
ACTS OF TERRORISM

HAZARDOUS MATERIALS RESPONSE ⟷ CRIME SCENE INVESTIGATION

CBRNE AGENTS = HAZMAT



CRIME SCENE = LAW ENFORCEMENT



OP/HMERP UNIT

Pre-Planning

- Fire Inspectors are in the better position as are career staff personnel to conduct fire preplanning activities.

1. Develop your Plan (Forms)
2. Make Site Visits
3. Transfer data to suppression
4. Up-date the data

SOP's and Protocols

- Establish, Know and Practice your regulations, SOP's and protocols:
- Establish working contacts with response agencies
- Protecting yourself and victims
- WORK MORE CLOSELY WITH LAW ENFORCEMENT AGENCIES
- Report the presence and location of potential evidence.

The Golden Rule of Crime Scenes

- Golden Rule:
  Leave it alone unless it is absolutely necessary for the performance of your duties, and law enforcement approves
- Second Rule:
  Do your job using the fewest personnel

Evidence Collection

- Your actions and observations are very important
- Everything is potential evidence
- Communicate observations of evidence to other responders and to Incident Command
- Record your observations and actions as soon as possible
- Victims can provide critical evidence
  - LISTEN TO THEM

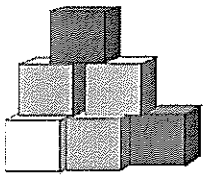
Responder Actions (continued)

- Defensive control
- Secondary devices
- Evidence preservation

The 4 Don'ts

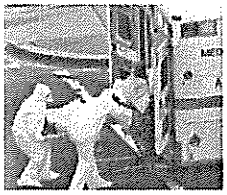
Don't become a victim	Don't Rush in
Don't TEST (Taste, Eat, Smell, Touch)	Don't assume anything

- **S**afety is First
- **A**ssess before Acting
- **F**ocus on avoiding the hazard
- **E**valuate the situation and report.



Triage

- Don't get contaminated yourself
- Use resources to treat those with the best chance for survival first



9-1-1

- Recognize signs, symptoms and indicators
- Know what to ask
- Recognize trends
- Know who to contact
- Notify responders
- Provide safety guidance

Key Points

RAIN

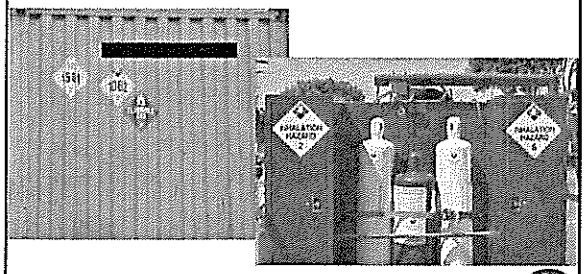
- Recognize
- Avoid
- Isolate
- Notify

QUESTIONS?

Terrorism Hotline is
1-866-4 SAFE
NJ/1-866-472-3365.

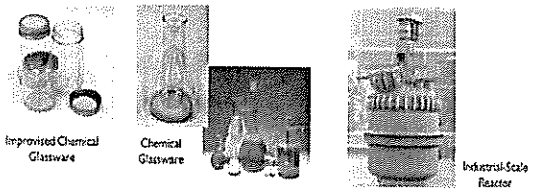
website is www.njcounterterrorism.org.

Indicators & Devices



OHS & P

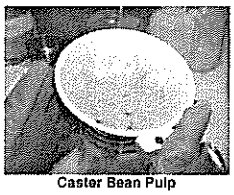
Chemical Agent Equipment



OHS & P

Chemical Attack Indicators

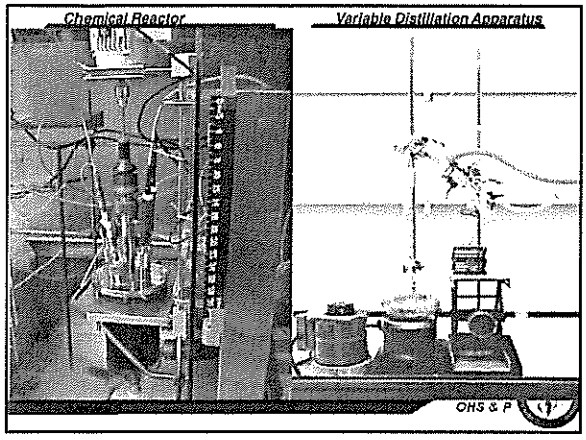
- Dead Animals
- Lack of Insect Life
- Unusual Liquid Droplets
- Discolored or Dead Plant Life
- Unexplained Odors
- Low lying Clouds
- Unusual Metal Debris
- Written or verbal threats
- Immediate Health Effects

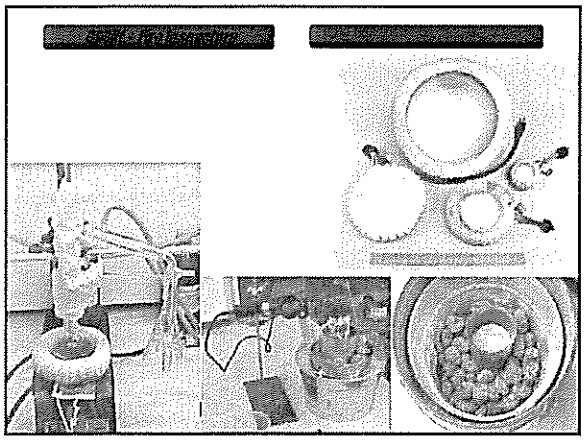


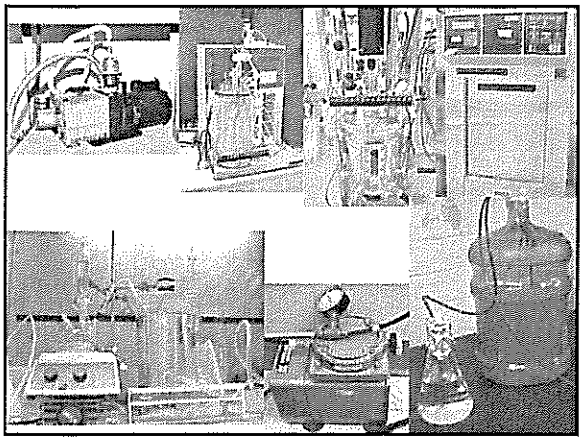
Caster Bean Pulp

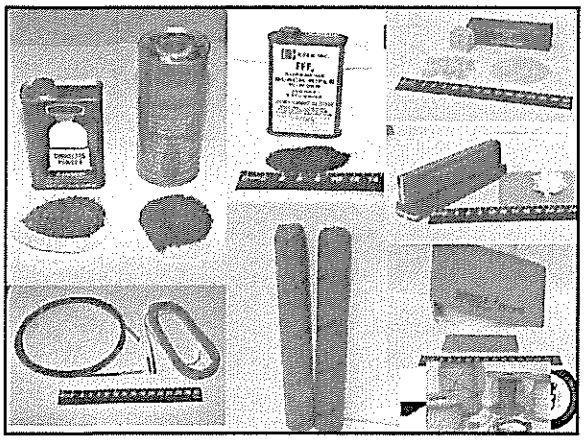
OHS & P

Manufacturing Equipment
High Tech
Low Tech
OHS & P


Chemical Reactor
Variable Distillation Apparatus
OHS & P







Simple Stuff

- Acetone
- Hydrogen Peroxide

Triacetone Triperoxide (TATP)

See article in Fire Engineering April 2006

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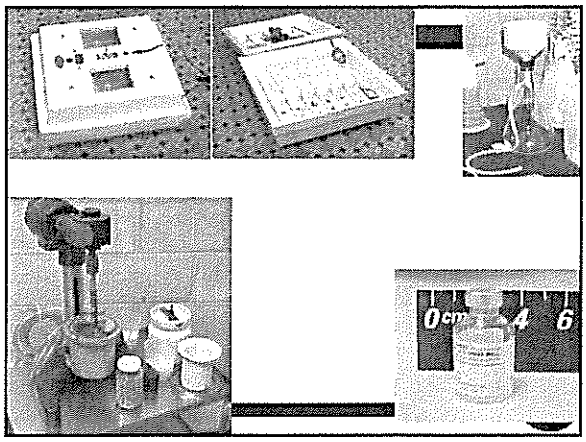
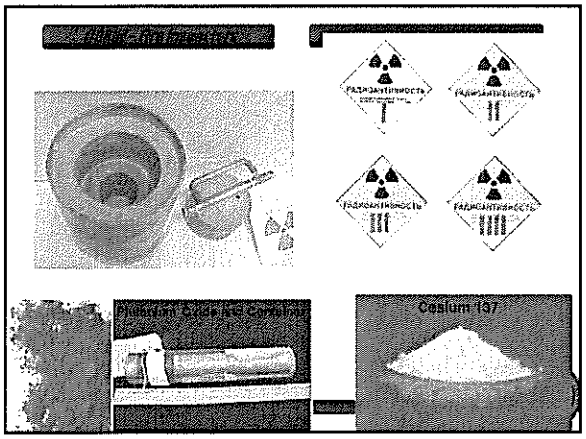
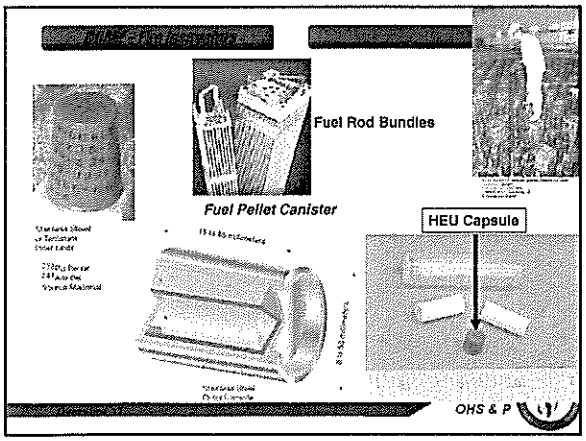
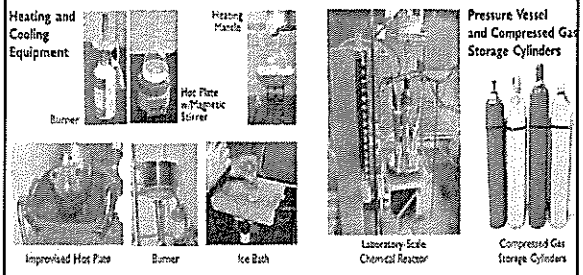



Cesium 137


Fuel Rod Bundles
Fuel Pellet Canister
HEU Capsule
OHS & P

INDICATORS OF BW PRODUCTION



OHS & P

Biological Attack Indicators

1. Unusual number of sick or dying people or animals.
2. Suspicious bombing incidents.
3. Unscheduled or unusual dissemination of sprayed material (e.g. Crop duster spraying over Coliseum)
4. Abandoned spray or dispersion device
5. Containers stolen/abandoned from laboratory or biological supply houses

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Home Made Devices

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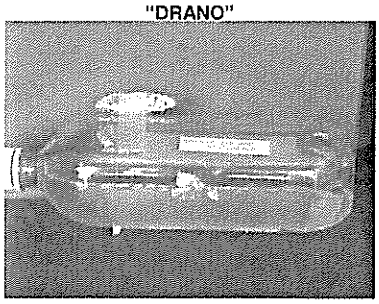
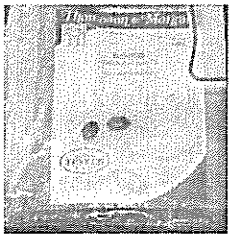
Acid Bomb

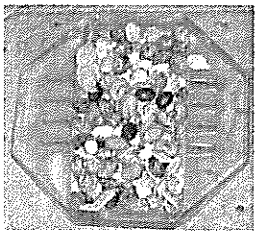
"DRANO"



OHS & P

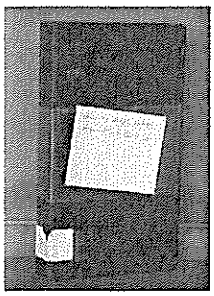
Castor Beans (Ricin source)

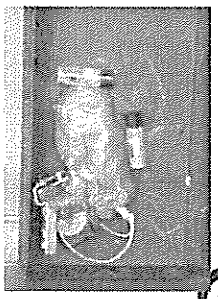




OHS & P

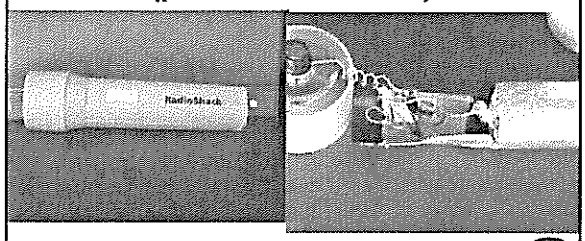
Bomb (snap switch activated)





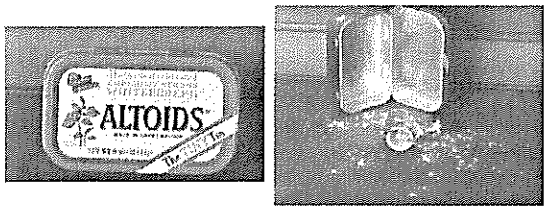
OHS & P

Bomb disguised as flashlight (pendulum switch)



OHS & P

Powder Disseminator (improvised mechanical device)

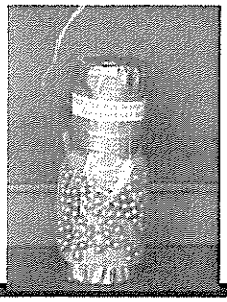


OHS & P

Organophosphate Fogger

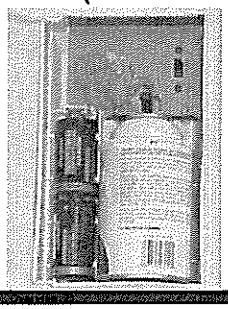
OHS & P

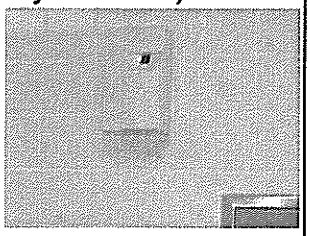
Dirty Bomb (Rad) with anti-personnel shrapnel



OHS & P

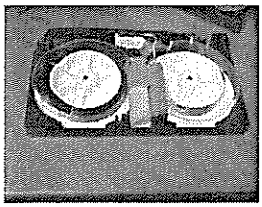
Chemical Disseminator (commercially available)

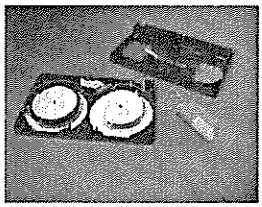




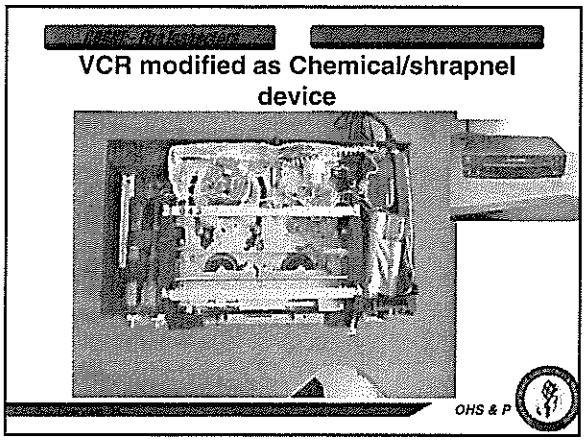
OHS & P

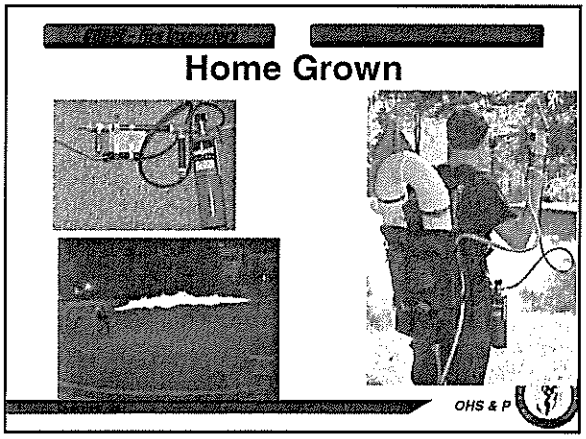
VHS Tape as anti-personnel device

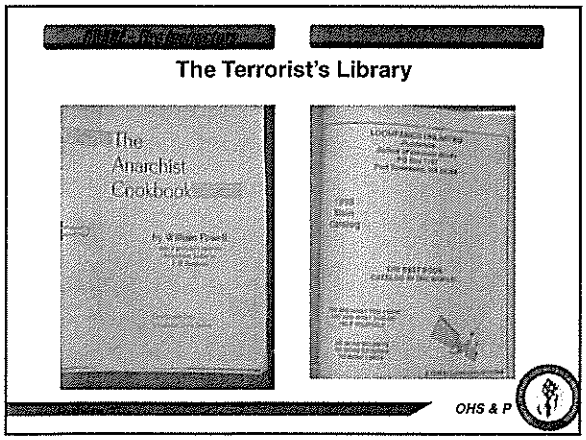


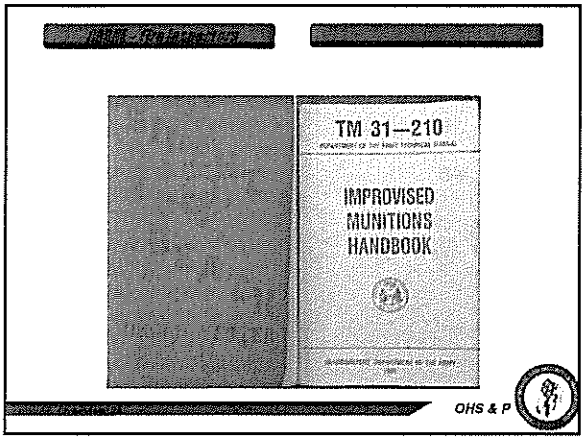


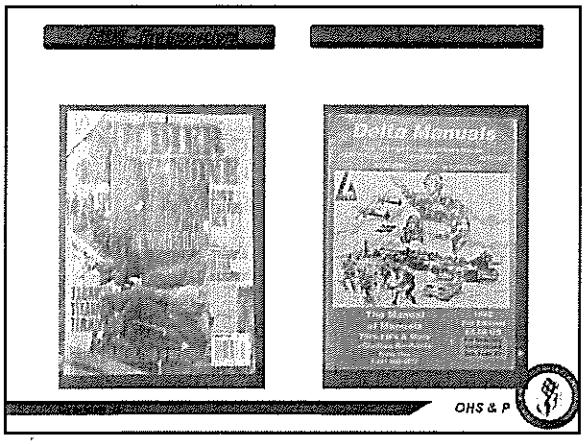
OHS & P

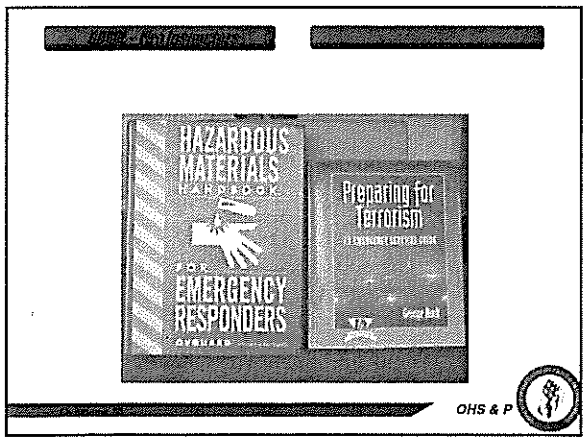

VCR modified as Chemical/shrapnel device
OHS & P


Home Grown
OHS & P


The Terrorist's Library
The Anarchist Cookbook
OHS & P


TM 31—210
IMPROVISED
MUNITIONS
HANDBOOK
OHS & P


Delta Manuals
OHS & P


HAZARDOUS
MATERIALS
HANDBOOK
FOR
EMERGENCY
RESPONDERS
Preparing for
Terrorism
OHS & P

Questions

- Now you should have a better understanding of things to look for.
- Their presence does not always constitute a crime.
- It does not indicate terrorist activity
  - BUT IT SHOULD MAKE YOU TAKE A LOOK AND OR REPORT IT.

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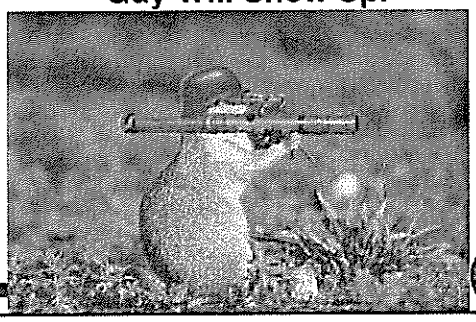
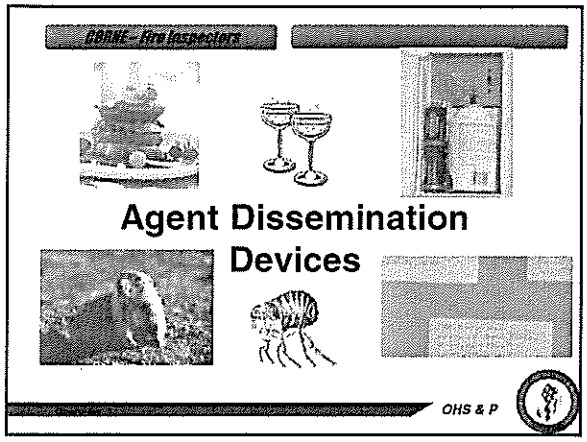
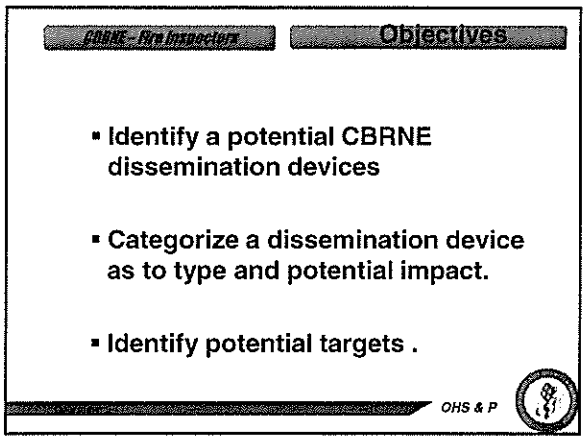
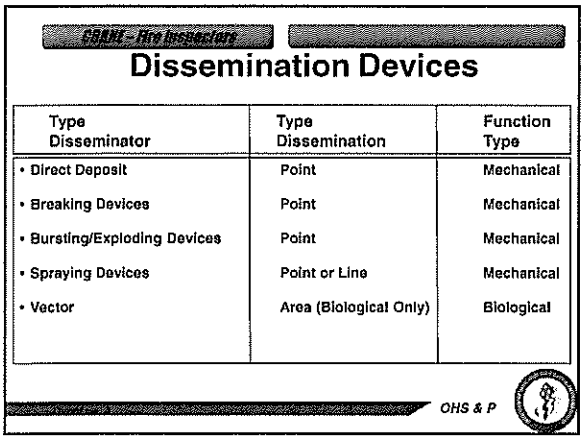
You Never Know When The Bad Guy Will Show Up.

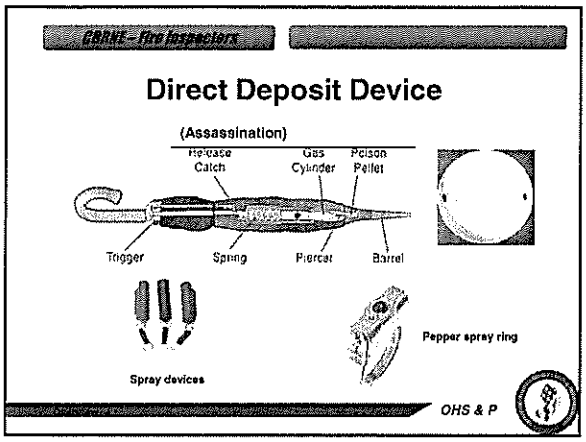


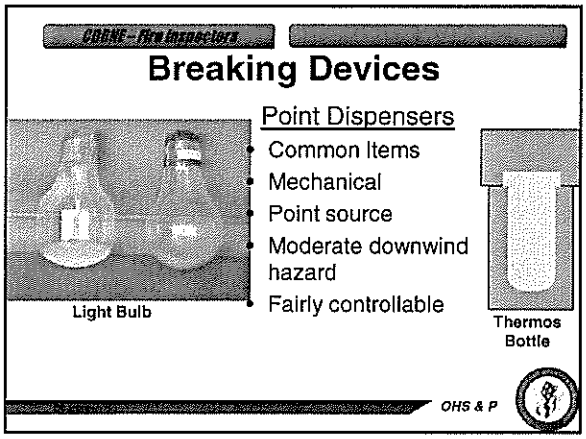


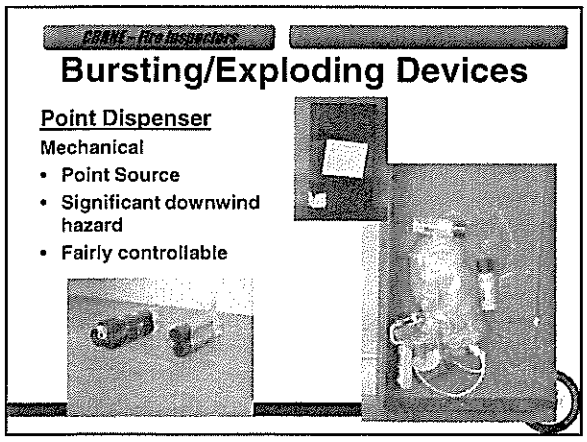


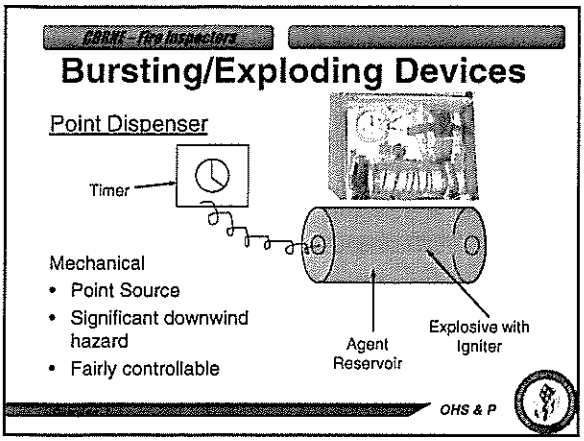


Type Disseminator	Type Dissemination	Function Type
• Direct Deposit	Point	Mechanical
• Breaking Devices	Point	Mechanical
• Bursting/Exploding Devices	Point	Mechanical
• Spraying Devices	Point or Line	Mechanical
• Vector	Area (Biological Only)	Biological


CBRNE - Fire Inspectors
Direct Deposit Device
(Assassination)
Release Catch
Gas Cylinder
Poison Pellet
Trigger
Spring
Piercer
Barrel
Spray devices
Pepper spray ring
OHS & P


CBRNE - Fire Inspectors
Breaking Devices
Point Dispensers
Common Items
Mechanical
Point source
Moderate downwind hazard
Fairly controllable
Light Bulb
Thermos Bottle
OHS & P


CBRNE - Fire Inspectors
Bursting/Exploding Devices
Point Dispenser
Mechanical
Point Source
Significant downwind hazard
Fairly controllable


CBRNE - Fire Inspectors
Bursting/Exploding Devices
Point Dispenser
Timer
Mechanical
• Point Source
• Significant downwind hazard
• Fairly controllable
Agent Reservoir
Explosive with Igniter
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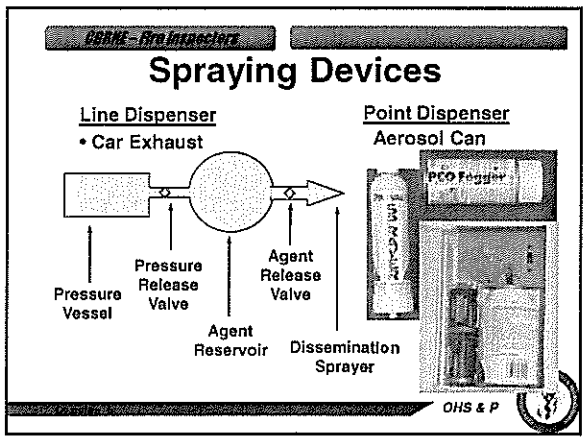
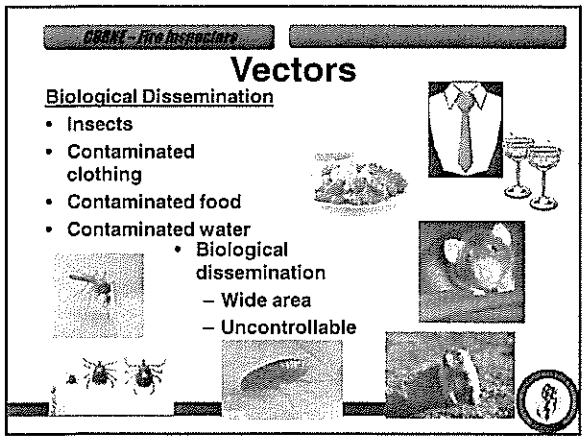
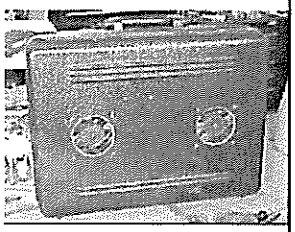

CBRNE - Fire Inspectors
Spraying Devices
Line Dispenser
• Car Exhaust
Point Dispenser
Aerosol Can
Pressure Vessel
Pressure Release Valve
Agent Reservoir
Agent Release Valve
Dissemination Sprayer
OHS & P


CBRNE - Fire Inspectors
Vectors
Biological Dissemination
• Insects
• Contaminated clothing
• Contaminated food
• Contaminated water
• Biological dissemination
– Wide area
– Uncontrollable

CBRNE - Fire Inspectors | Dissemination Devices

Briefcase

- □Contains fans for bio-agent dispersal or could house a spray device for chemical agents□
- Newer models have concealed fans□



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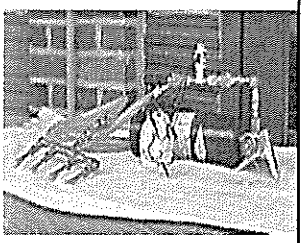
CBRNE - Fire Inspectors | Dissemination Devices

Fire Extinguisher

Fire extinguisher with a solenoid and four spray nozzles using a timer mechanism



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CBRNE - Fire Inspectors | Dissemination Devices

Chemical Weapons Dissemination Methods

- Aerosol--suspension or dispersion of small particles (solids or liquids) in a gas
  - Hand-held spray bottles
  - Backpack pesticide spray equipment

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CBRNE - Fire Inspectors | Dissemination Devices

Chemical Weapons Dissemination Methods (cont'd)

- Dissemination is difficult
  - Most scenarios have limited effectiveness
  - Military dissemination uses explosive detonated in air.
  - Most serious injury to those in physical contact with product.
  - Persons in immediate area most affected.
  - Difficult to produce building-wide or large-scale effects.

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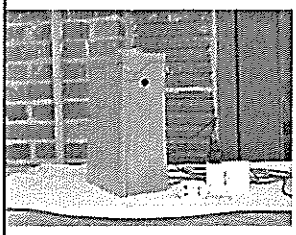
CBRNE - Fire Inspectors | Dissemination Devices

Electrical Box



Can be mounted on a wall. Box has a hole in the side and spray device mounted inside. Can be placed on a timer or remotely activated.

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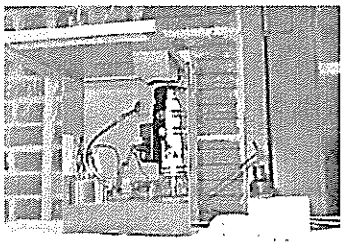
CBRNE - Fire Inspectors | Dissemination Devices

Electrical Box (cont'd)



- Inside the box:
- spray device
- container
- plunging mechanism
- battery
- remote activation system

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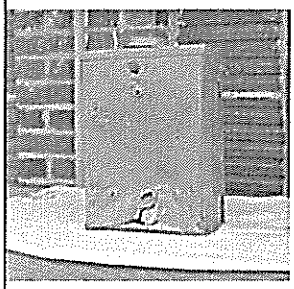
CBRNE - Fire Inspectors

Render Safe Considerations



Using a water cannon, explosive ordnance division (EOD) attempted to breach this device. It was not successful in opening the box, and broke the chemical container on the inside.

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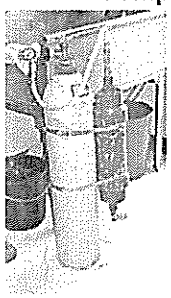
CBRNE - Fire Inspectors | Dissemination Devices

Compressed Gas Cylinder



Pressurized cylinder with a holding tank, which provides agent delivery through Venturi effect

Can be used with a timer or remote activator

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CBRNE - Fire Inspectors | Dissemination Devices

Spray Paint and Milk Carton

Spray paint delivery bottle (left)

Delivery device hidden in milk carton activated by remote control (right)

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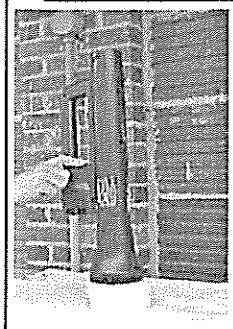
CBRNE - Fire Inspectors | Dissemination Devices



Leaf Blower

Container added to bottom, provides mechanism for biological distribution

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CBRNE - Fire Inspectors | Tyler, Texas

- It began with a mis-delivered envelope and developed into the most extensive domestic terrorism investigation since the Oklahoma City bombing.
- William Krar pleaded guilty to possession of a weapon of mass destruction. Inside his home and storage facilities, investigators found a sodium-cyanide bomb capable of killing thousands, more than a hundred explosives, half a million rounds of ammunition, dozens of illegal weapons, and a mound of white-supremacist and antigovernment literature.
- "Without question, it ranks at the very top of all domestic terrorist arrests in the past 20 years in terms of the lethality of the arsenal," says Daniel Levitas, author of "The Terrorist Next Door: The Militia Movement and the Radical Right."

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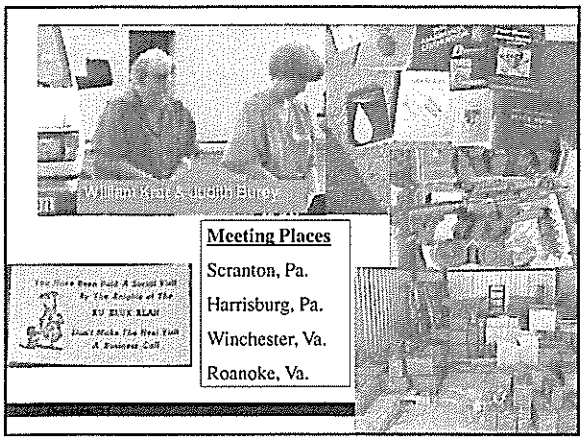

CBRNE - Fire Inspectors

States mentioned in the investigation:

Texas: Krar & Burey's business address – manufacturing and distributing firearm parts.
New York: False ID papers discovered when they are delivered to the wrong address.
New Jersey: False ID papers shipped to former NJ Militia member.
New Hampshire: Storage unit with some of Krar's material – he also had an arrest record there.
Vermont: Property rented by former NJ Militia member. Owned by another Militiaman.
Pennsylvania: Cities listed on documents as meeting sites.
North Dakota: Addresses given on false identification documents.
West Virginia: Addresses given on false identification documents.

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CBRNE - Fire Inspectors

Key Points

- Dissemination devices can take many forms
  - Sometimes difficult to recognize
- Potential targets
  - Enclosed spaces
  - Critical facilities
  - Facilities of interest to terrorists
- Responder actions
  - Don't touch, cover or move device
  - Make proper notification

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CBRNE - Fire Inspectors

Summary

- Chemical agents are lethal and effective...
- Relatively easy to obtain
- Next to incendiaries and explosives, they are the easiest WMD agent to employ
- Of the two categories of chemical agents, industrial agents are more easily accessible
- Any chemical agent event will generate large numbers of psychological casualties

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