



# HAZMAT TRAINING FOR THE FIRST RECEIVER (OSHA)

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Finger Lakes Regional Training Center  
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# Instructor

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- Thomas Fletcher, PA (URMC/DOD)

# Lecture Agenda

- General Principles
- Chemical
- BREAK
- Biological
- Radiological
- Decon Operations



# General Principles of Decon

- Training Requirements
- Recognition and Response
- Chemical Identification

# Awareness Level Training

- WHO: Everyone
- WHAT:
  - How to know if someone...
  - How to keep safe
  - How to alert

# Operations Level Training

- WHO: Decon Team Members
- WHAT:
  - Didactic and Practical
    - Recognition of chemicals
    - PPE
    - Recognition of symptoms
    - Clean up
- When:
  - Must be completed annually along with a respiratory questionnaire

# Decontamination

- Who: Anyone that is contaminated
  - Victims
  - Responders
- What: Anything that is necessary for your hospital to function
  - Equipment
  - Structures

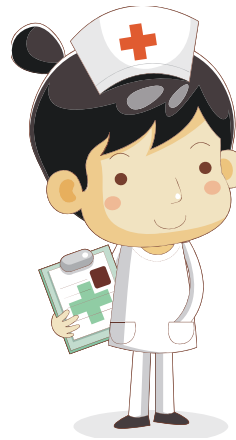


# Decontamination

- Where
  - Uphill, Upwind when possible
  - Designated external sites
- When: Anytime you suspect contamination
  - Victim complains of pain, odor, ect.
  - Victims near release site
  - Visible material

# Decontamination

- Why: Prevent worsening of problem
  - Remove toxic agent
  - Prevent staff/facility contamination



Problem

Solution

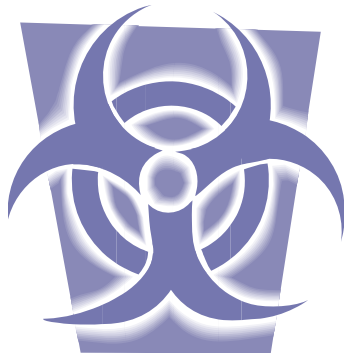


# RECOGNITION & RESPONSE

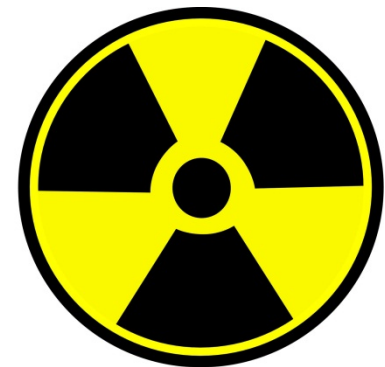
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# Hazardous Substance

- Is any substance to which exposure may result in adverse effects on the health or safety of employees. (OSHA)
- Includes:
  - Substances defined by CERCLA
  - Biological agents with disease causing potential
  - US DOT substance listed as hazardous
  - Substances classified as hazardous waste



[www.Primabell.com](http://www.Primabell.com)



# Chemical Hazards

- 69% occur at fixed sites (ATSDR,2007-2008)
- 91% involve one substance(ATSDR2007-2008)
- Most are liquid (40%) or vapors (41%)
  - Corrosives
  - Pesticides
  - Gases
  - Paints and dyes
  - Volatile organic hydrocarbons
  - Other inorganic chemicals

<http://www.atsdr.cdc.gov/HS/HSEES/annual2008.html#substances>

# Contamination Event

- VERY common
- Patients go to CLOSEST\* hospital
- Risk to hospital
  - Contamination of staff and facilities
  - Need emergency plan
  - Need decontamination facility and team

# Emergency Response Plan

- Train everyone to AWARENESS level- patients presenting to ED with contamination
- Decon Team Policies and Procedures
- Notification Procedure
- ASSUME all are contaminated

# Notification System

- Notifies all in ED/Hospital
  - Specific responsibilities for all
- Activates Decon team
- Access Control/Lockdown



# Activation/Response

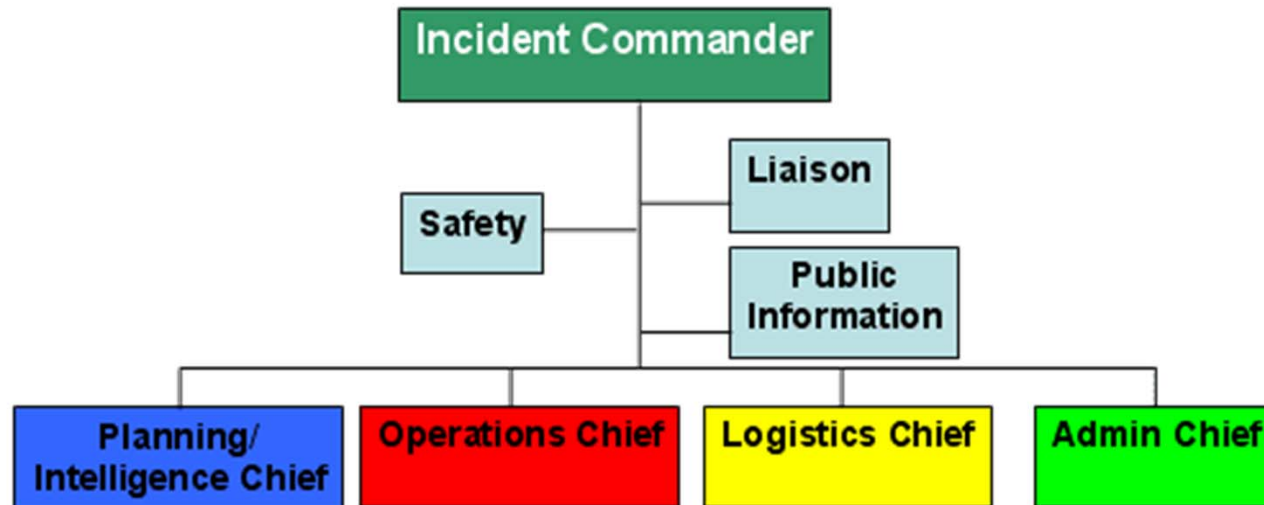
- Decon Team Leader
  - Interviews patient from safe distance and OUTSIDE
  - Determines response based on scope of incident

# Activation/Response

- Decon Team members and support staff
  - Gets decon room ready
  - Gets partially dressed, except respirator
  - Finalizes PPE and decontaminates victim(s) upon final say of Decon Team Leader

# Incident Command System

- ICS should be followed at ALL levels
- Hospital
  - Departmental
    - Specific team (ie, Decontamination)
- At each level, designated person to communicate with.



# ICS – Decon Team

- **COMMAND** (Decon Team Leader)
- **SAFETY OFFICER**
- **OPERATIONS** (Decon team members)
- **LOGISTICS** (Decon team suit/equipment support)
- **LIAISON** (Decon Team Leader or designee)



# AGENT IDENTIFICATION

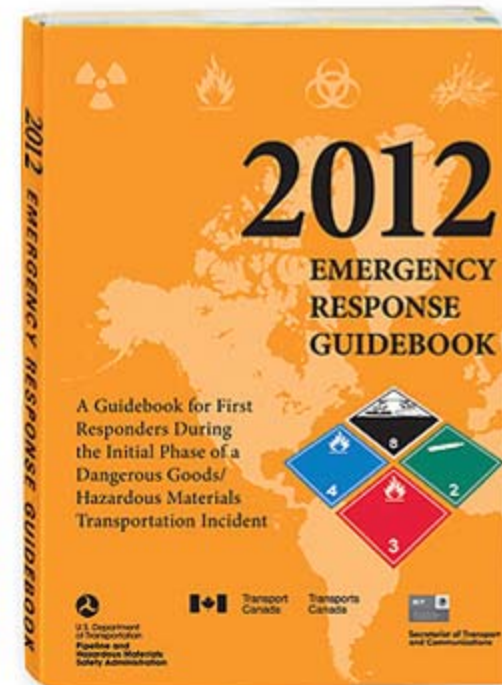
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# Labels/warnings...

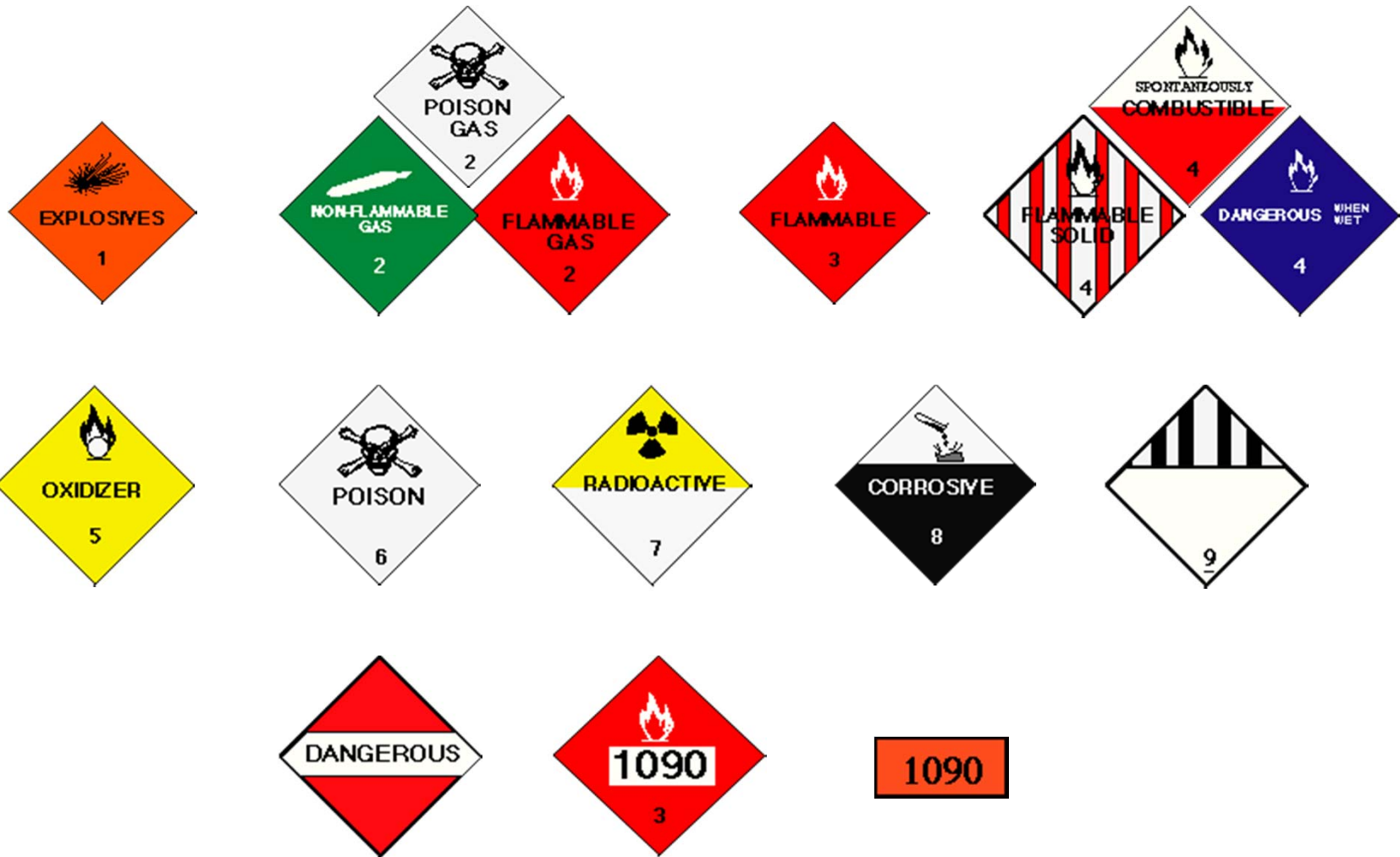
- CAS numbers  
(Chemical Abstract Service #)
- Shipping manifesto/label
- Container label
- DOT placards
- Name of product on container

# Initial ID/precautions

- Emergency Response Guidebook
- Quick guide
  - General ID
  - Occasional specific ID
  - General guidance for class of chemical



# Placards and Labels





# Other patient's warning...

- It smelled like...
- It is used for...
- You **HAVE TO USE A RESPIRATOR** to...
- It tasted like...
- There's a <color> warning/placard on it...

# Poison Center will...

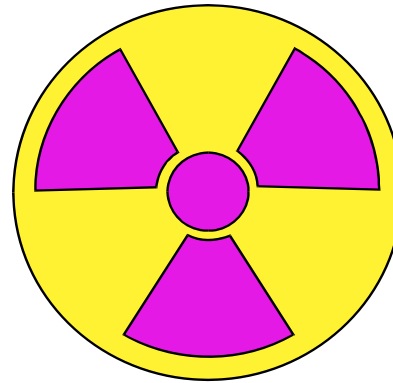
- ID chemical
  - Based on placard information you find
  - Based on signs and symptoms displayed
- Healthcare information
  - Signs and symptoms to watch out for
  - Treatments that may be needed
- **1-800-222-1222**

# WHY???

- Types of PPE
- Types of hazards to providers
- Type of Decon
  - Dry- removal of clothing
  - Wet- removal of clothing and shower

# CBRNE

- Define
  - WMD
  - NBC
  - CBRNE
- Nuclear Devices
- Biological Weapons
- Chemical Weapons





# NBC/CBRNE Agent Sources

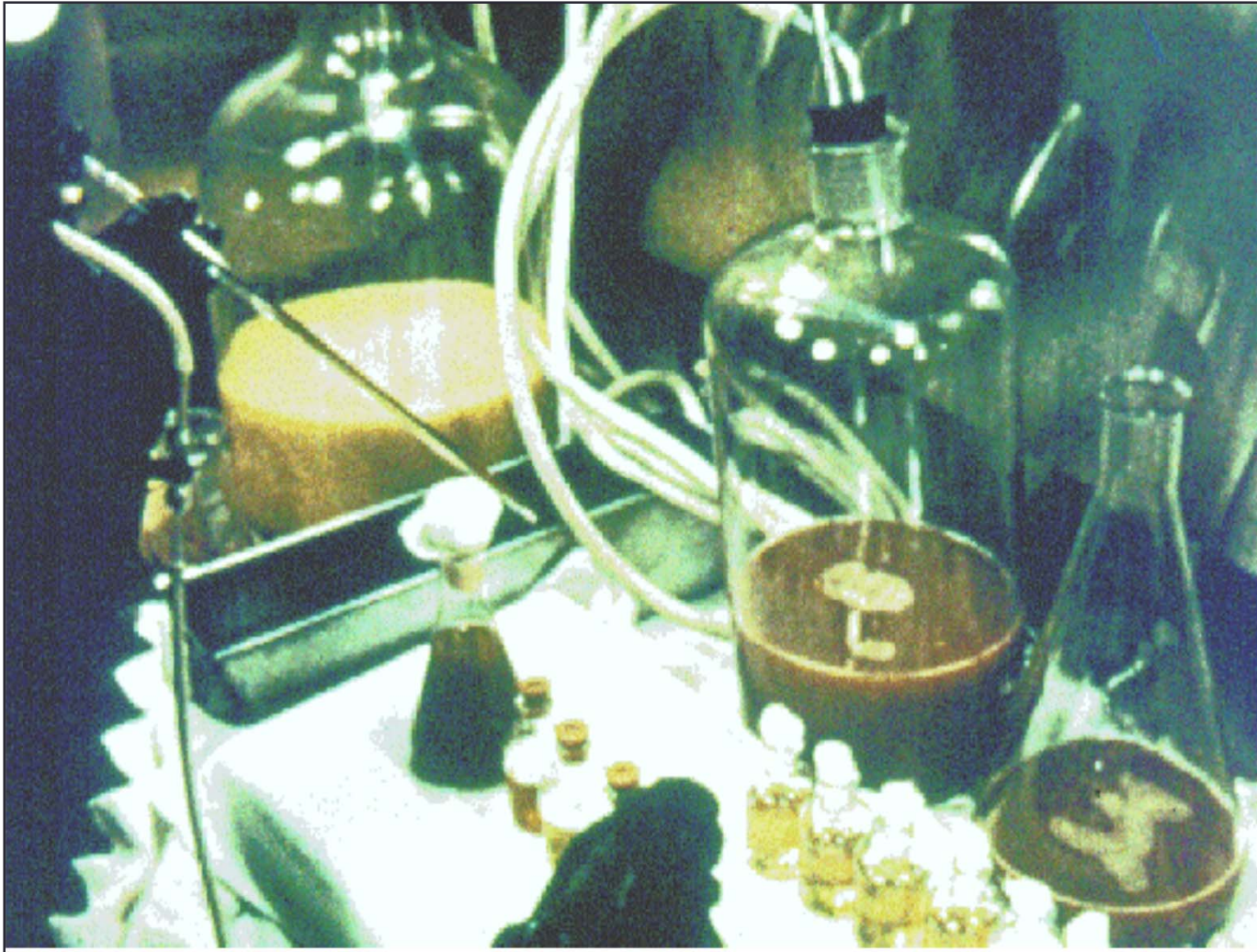
- Home production
- Laboratory / commercial production
- Industrial facilities
- Military sources
- Medical / university research facilities



# The Fallacies

- It can't happen to us
- NBC agents are so deadly the victims will all die anyway
- There is nothing we can do

# Chemical Agents





# Chemical Agents

- General Information
- Pulmonary Agents
- “Blood” Agents
- Blister Agents
- Nerve Agents



# Tokyo Sarin Attack

- Numbers seeking medical care:
  - 5,510 total at 278 health-care facilities
    - Mild: 984
    - Moderate: 37
    - Severe: 17
    - Deaths: 12
    - Status unknown: >300
- No secondary contamination of health-care workers, but 2 vapor-exposed physicians



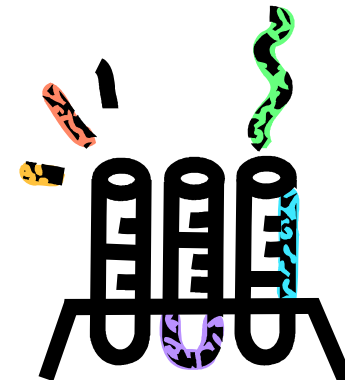
# Real Life

- Most will not wait for EMS to arrive
- Most will go to hospitals without decontamination

About 80 % of victims arrive without decontamination

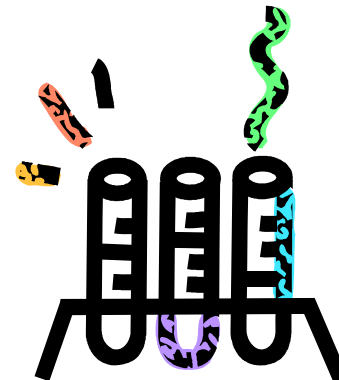
# Characteristics and Behavior

- Generally liquid (when containerized)
- Normally disseminated as aerosol or gas
- Present both a respiratory and skin contact hazard
- May be detectable by the senses (especially smell)
- Influenced by weather conditions



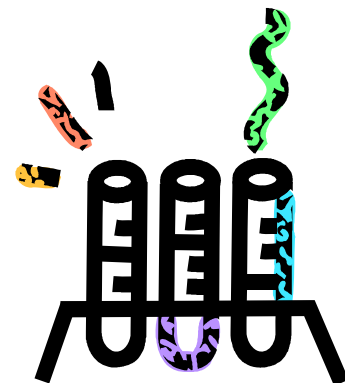
# Characteristics and Behavior

- Irritant/Corrosive vs. Drug-Like Effects
- Physical States
  - Vapor/Gases act quickly
  - Liquids act slower
  - Solids
- Normally disseminated as aerosol or gas



# Characteristics and Behavior

- Present both a respiratory and skin contact hazard
- May be detected by the senses (especially smell)
- All forms of chemicals may cause contamination
- Personnel must wear protective equipment during decontamination and immediate patient care



# Chemical Agent Clues

- Rapid onset of symptoms
- Similar signs and symptoms
- Absence of traumatic injury
- Emergency responders may be affected
- Animal or insect die-off
- Report of cloud or vapor release

# Routes of Entry

- INHALATION - vapor or aerosol
- SKIN (percutaneous) - liquid or vapor  
(vapor if prolonged contact with skin)
- INGESTION - liquid or solid
- INJECTION - intravenous or intramuscular

# Volatility

- Tendency of a liquid agent to form vapor
- Volatility proportional to vapor pressure
- Affected especially by
  - Temperature
  - Wind
  - Method of delivery



# Persistence

- Tendency of a liquid agent to remain on terrain, other surfaces, material, clothing, skin
- Affected especially by
  - Temperature
  - Surface material
- Persistence is inversely proportional to volatility

# Examples

- Non-persistent agents (less than 24 hours)  
tabun, sarin, soman, cyanide, phosgene
- Persistent agents (greater than 24 hours)  
mustard, VX

# CHOKING (PULMONARY) AGENTS

- Disrupts pulmonary function
  - Non cardiogenic pulmonary edema
  - ARDS (Adult Respiratory Distress Syndrome)
- Treatment: Supportive



# CHLORINE CYLINDERS



Ypres, Belgium, April 1915

# CHLORINE - Civilian Uses

- Chlorinated lime (bleaching powder)
- Water purification
- Disinfection
- Synthesis of other compounds
  - synthetic rubber
  - plastics
  - chlorinated hydrocarbons



# CHOKING (PULMONARY) AGENTS

## Phosgene

- Odor: Newly cut hay
- Symptoms: Coughing, choking, vomiting

## Chlorine

- Odor: Swimming pool
- Symptoms: Coughing, choking, vomiting

# PHOSGENE

- 42 y/o female
- 2 hrs post exposure
- rapidly inc. dyspnea
- PaO<sub>2</sub> 40 torr (room air)
- CXR: infiltrates -
  - perihilar
  - fluffy
  - diffuse interstitial



# PHOSGENE - Uses/Sources

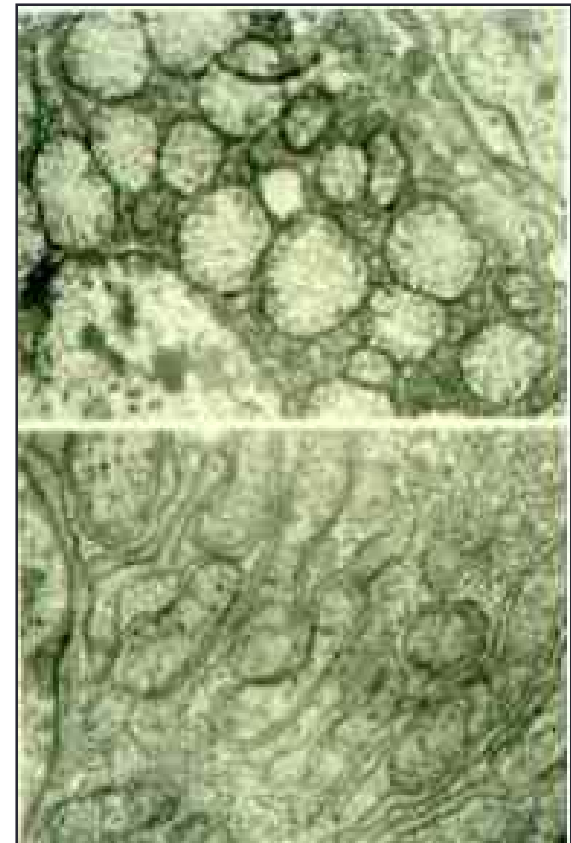
- **Chemical industry**
  - foam plastics (isocyanates)
  - herbicides, pesticides
  - dyes
- **Burning of:**
  - plastics
  - carbon tetrachloride
  - methylene chloride (paint stripper)
  - degreasers





# “BLOOD” AGENTS (CYANIDE)

- Hydrogen Cyanide (AC)
- Cyanogen Chloride (CK)



# Blood Agents

- Cyanide Gas
- Odor: Bitter almonds/musty
- Symptom Onset: Rapid
- Symptoms: Normal skin color, gasping for air, shock, seizure

# CYANIDE (BLOOD AGENTS)

- Hydrogen Cyanide (AC), Cyanogen Chloride (CK)
- Gas at STP, lighter than air
- Mechanism: blocks cell utilization of oxygen
- Old treatment: amyl/sodium nitrite and sodium thiosulfate
- New treatment: hydroxocobalamin

# Cyanide Treatment

Nitrites + Hemoglobin → MetHemoglobin

metHgb + CN → cyanomethemoglobin

CNmetHgb + thiosulfate → Hgb + thiocyanate

Thiocyanate eliminated renally!

# Cyanide Treatment

CN + hydroxocobalamin →  
cyanocobalamin (vit. B12)

Expensive

Easier to use

Less toxic

Eliminated renally

But interferes with some blood tests x 24 hours!

# BLISTER AGENTS (VESICANTS)

- Sulfur Mustard (H,HD)
- Nitrogen Mustard (HN1, HN2, HN3)
- Lewisite = chlorovinylidichloroarsine (L)
- Mustard / Lewisite mixtures (HL,HT,TL)
- Phosgene oxime (CX)



# VESICANTS: SULFUR MUSTARD

- Sulfur Mustard, Nitrogen Mustard
- Oily liquid, heavier than air and water, persistent
- Garlic Odor
- Mechanism: alkylating agent, DNA and proteins most sensitive targets
- Symptom onset delayed
- Symptom: Tearing, eye irritation, cough, blisters, and runny nose
- Treatment: Treat similarly to burn patients

# BLIND LEADING THE BLIND



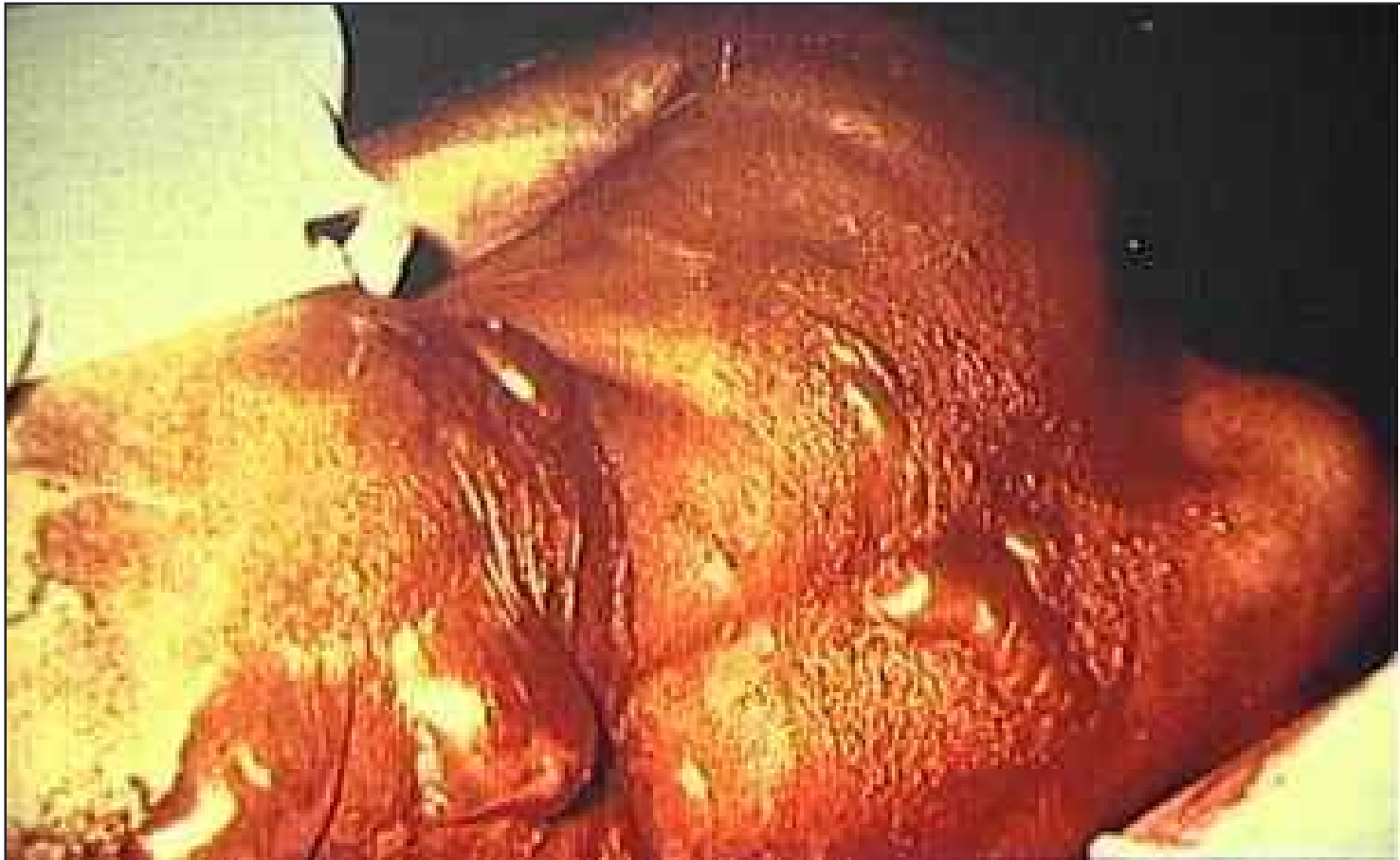
Convalescence 2wks-6months



# MUSTARD: EYE



# VESICANT EFFECTS



Iran/Iraq War: 90-95% burns, pulmonary injury, bone marrow suppression, sepsis, and eventually died.

# NERVE AGENTS (ANTICHOLINESTERASES)

- Tabun (GA)
- Sarin (GB)
- Soman (GD)
- GF
- VX



Represents three lethal doses of VX

# NERVE AGENTS

- Sarin (GB), VX (persistent)
- All liquids initially at STP
- Mechanism: inhibits acetylcholinesterase, causes massive cholinergic crisis
- Treatment: atropine, oxime, diazepam

# Nerve Agents

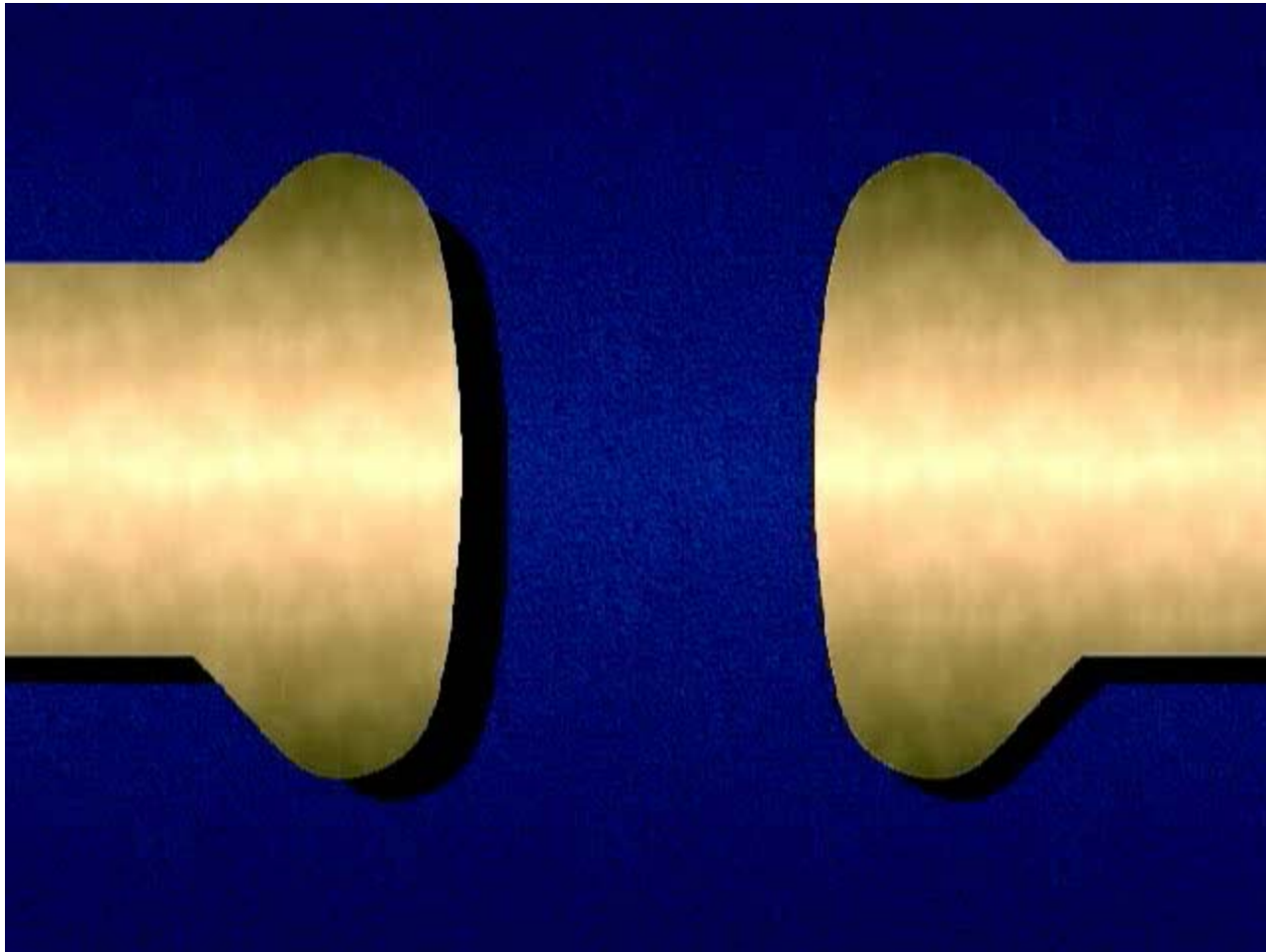
## Odor

- Tabun, Sarin: Non or fruity
- Soman: None
- VX: None/Sulfur

## Properties

- Volatile
- Volatile
- Persistent

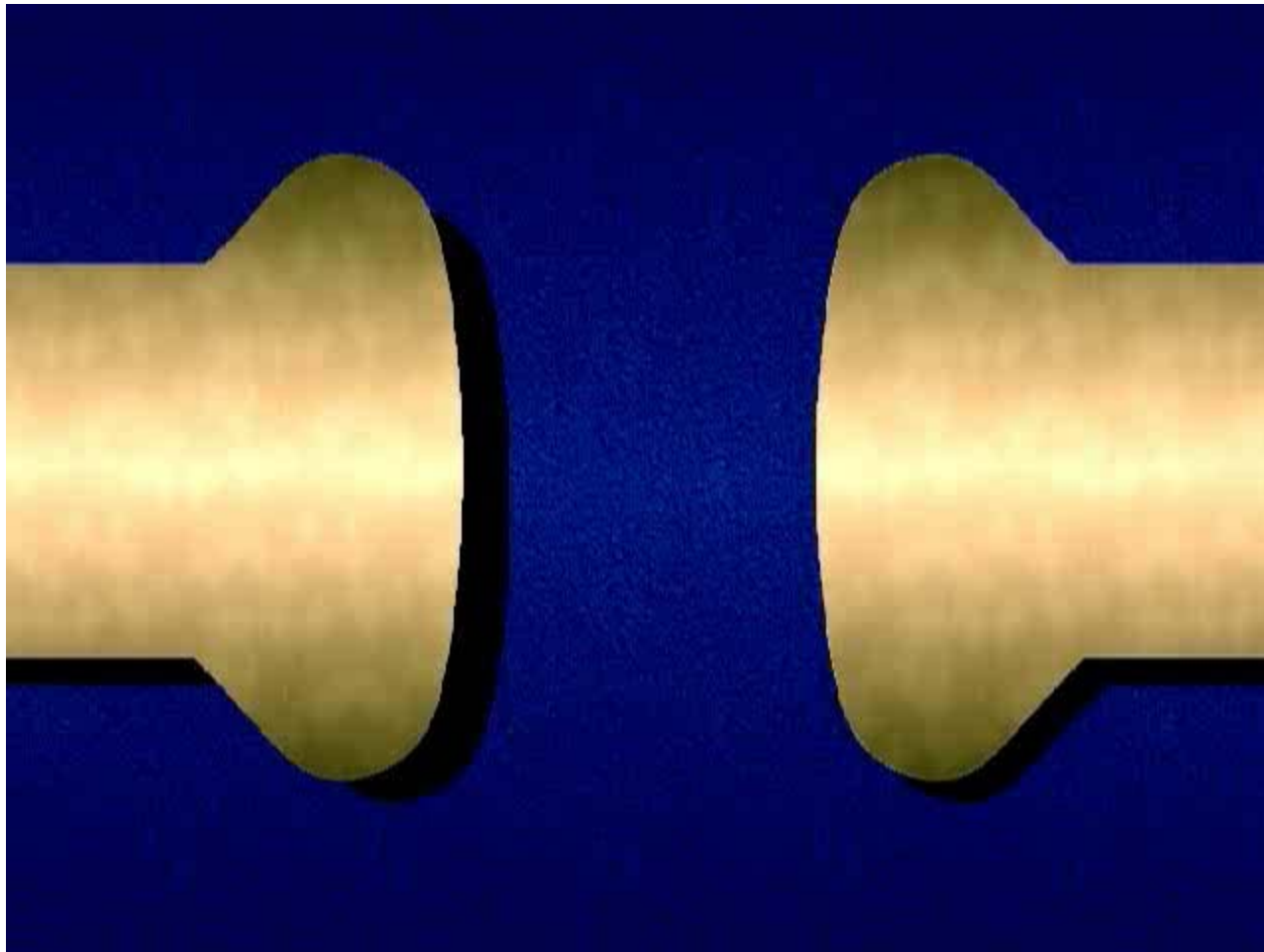
# Normal (cholinergic) synapse



But why does the acetylcholine disappear?

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...because of acetylcholinesterase!



# Signs and Symptoms of NA Exposure

- D iarrhea
- U rination
- M iosis
- B radycardia
- B ronchospasm
- B rhochorrhea
- E mesis
- L acrimation
- S alivation

and:

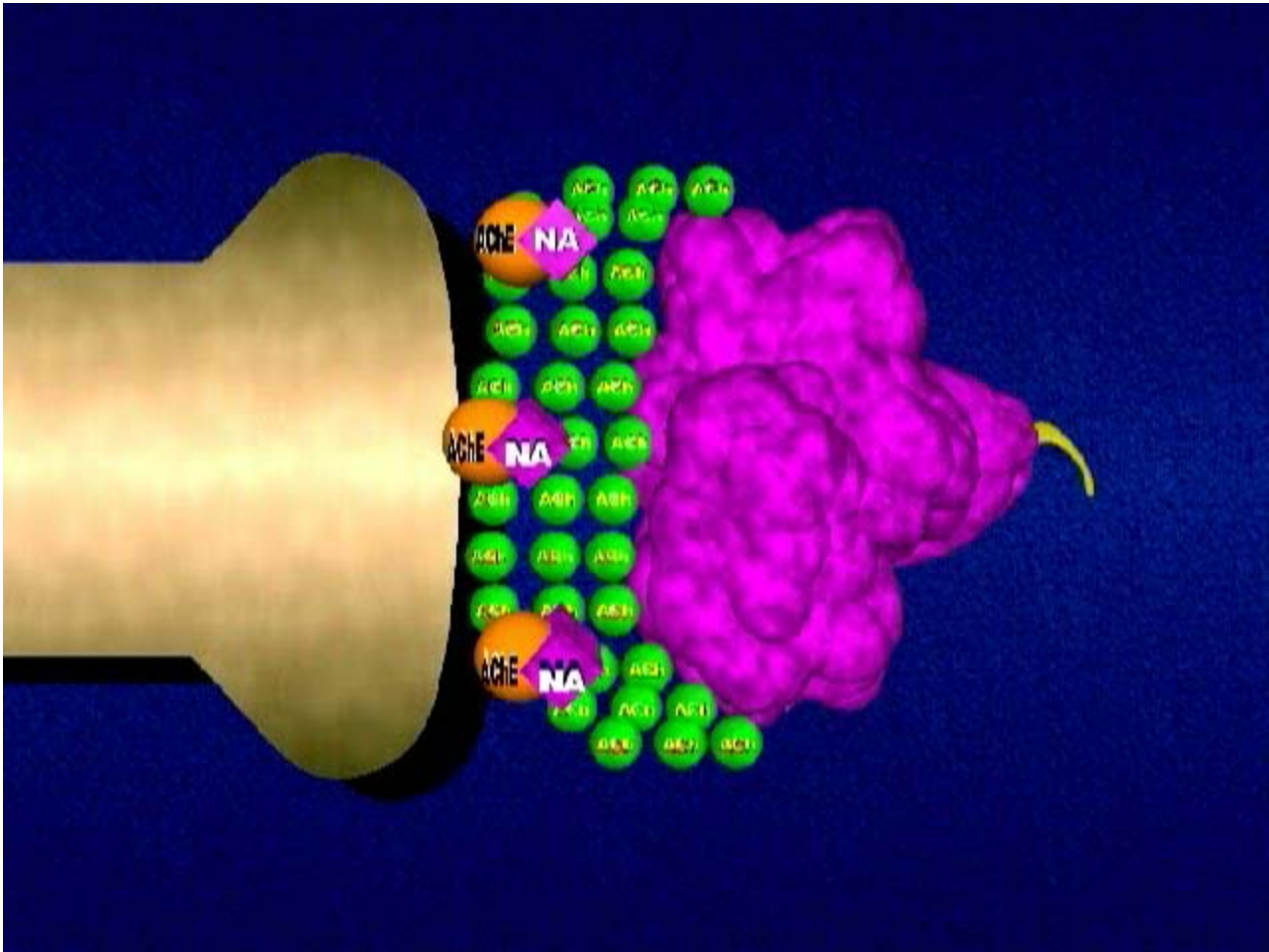
**Seizures**

**Coma**

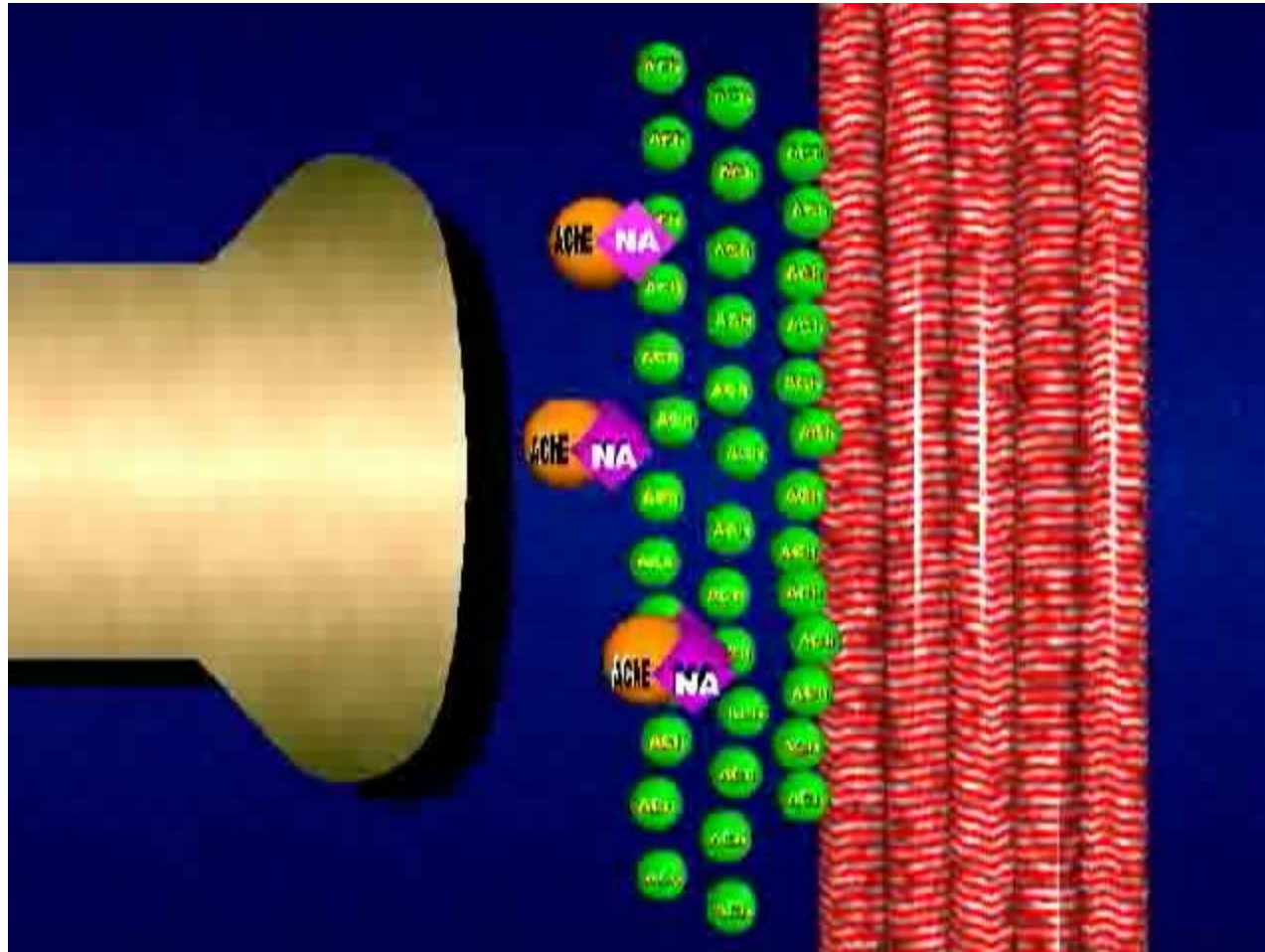
**Death**



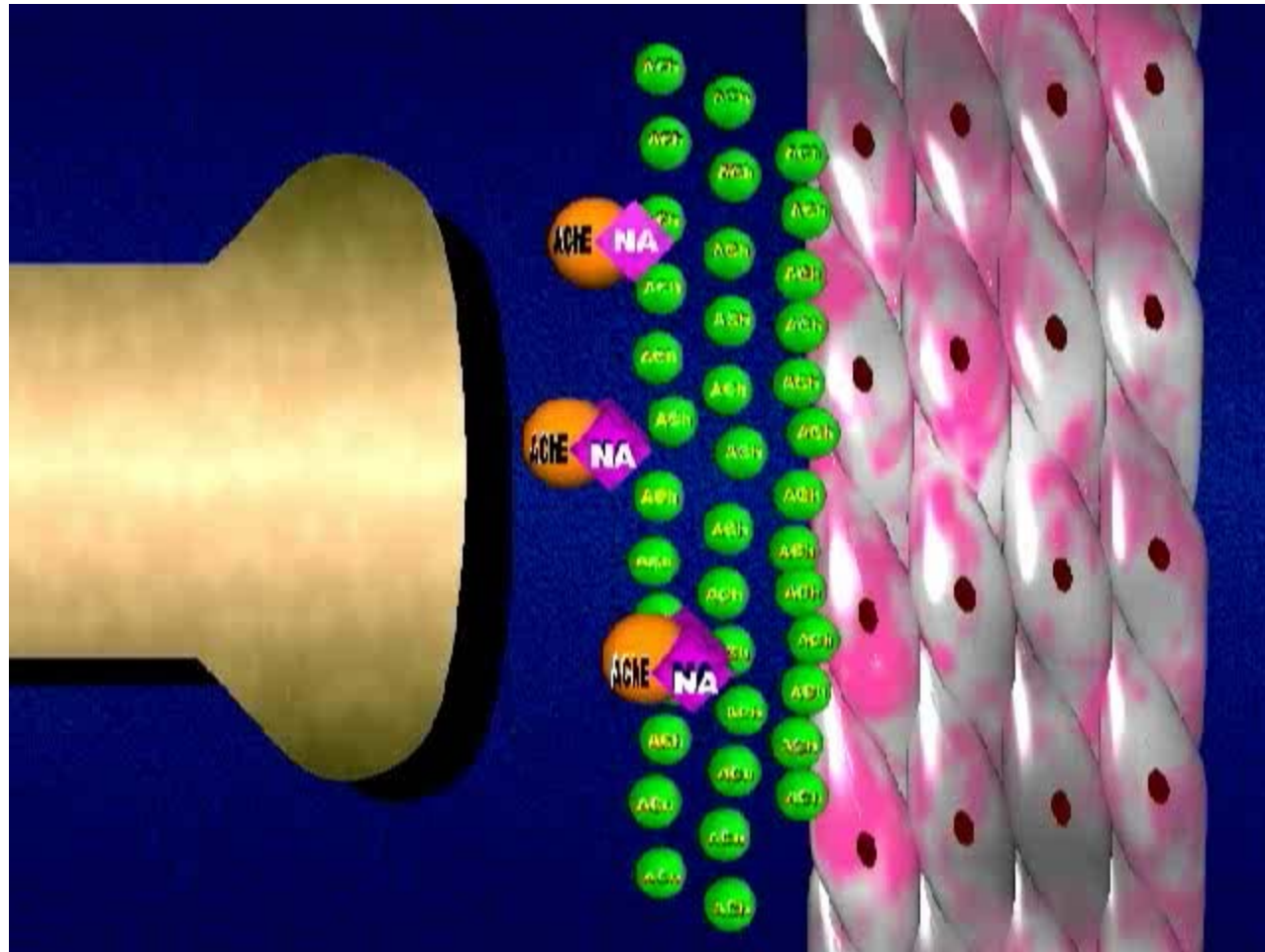
# Gland...



# Skeletal muscle...



# Smooth muscle...





# MARK I Kit

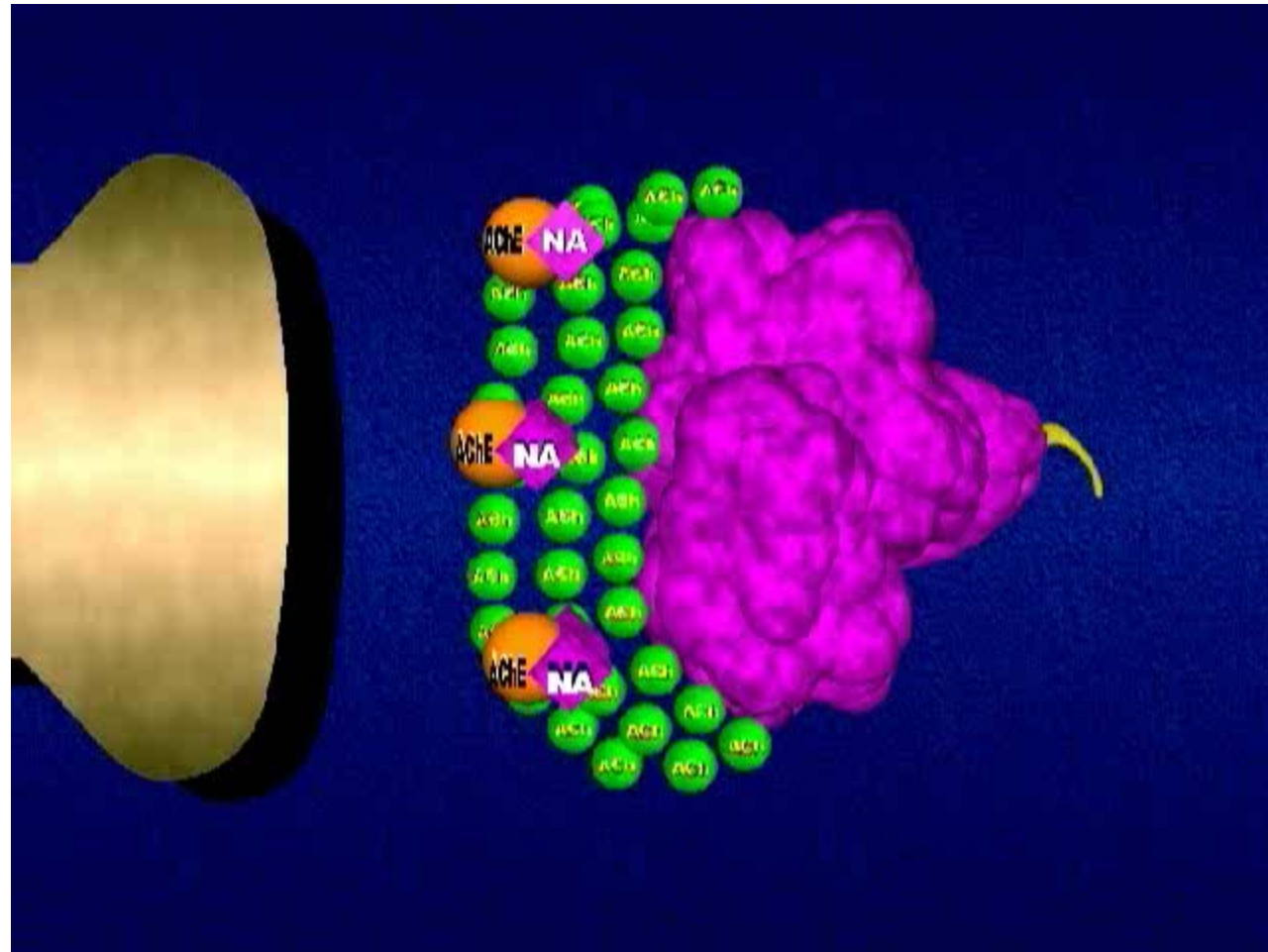


# MARK I Kit (atropine use)

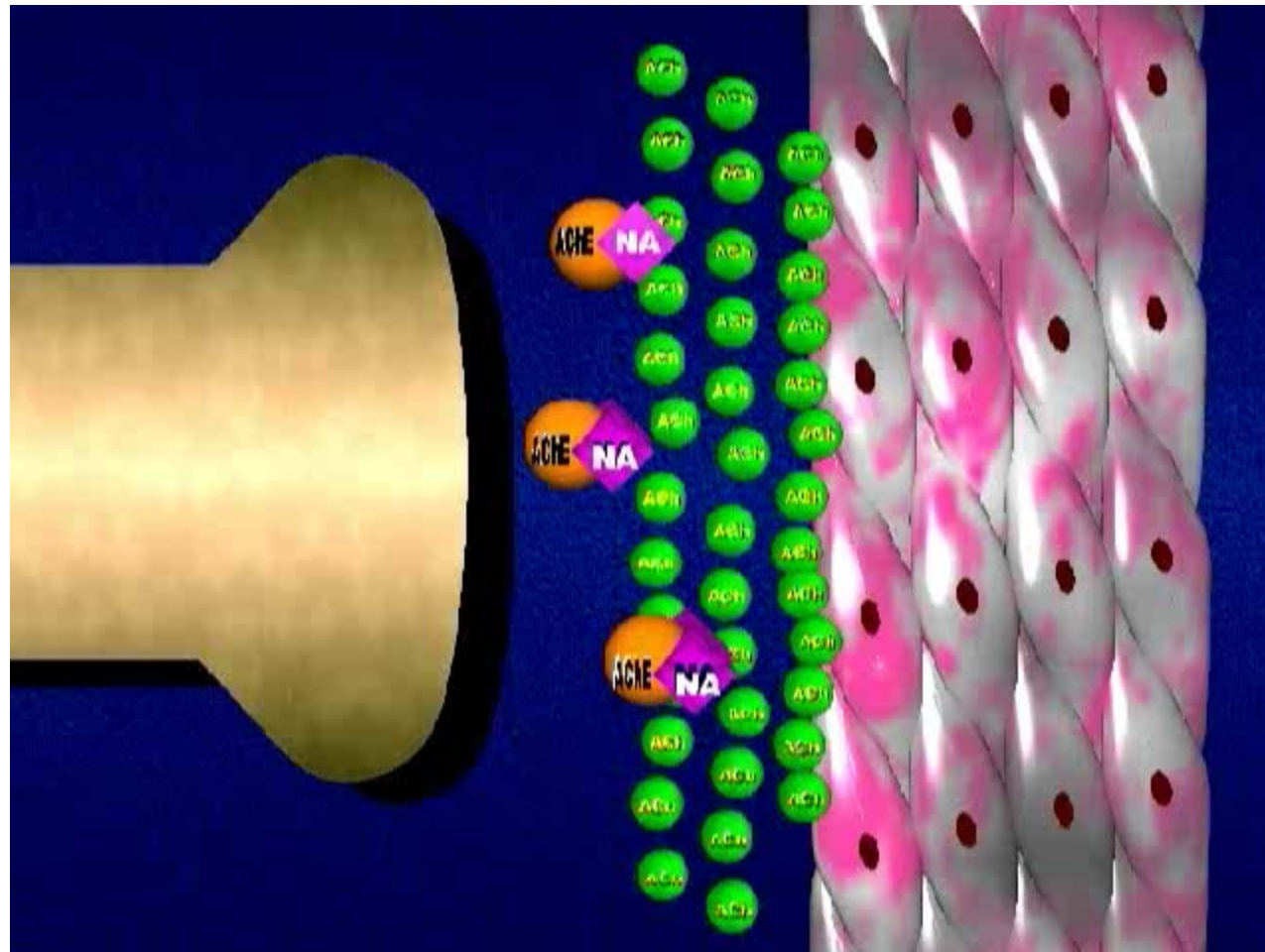




# Rx with atropine



# Rx with atropine...



# MARK I Kit (pralidoxime use)



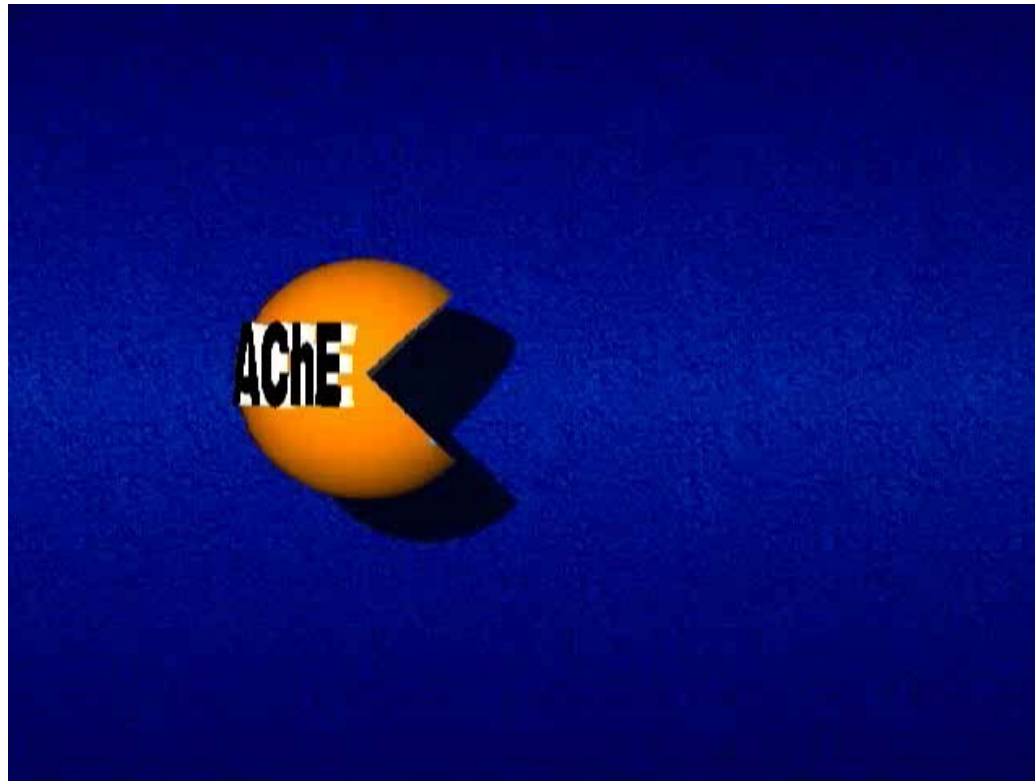


# How 2-Pam works



# Aging

- Permanent damage to Ache
- Onset varies with agent



# MARK I Kit

- Finish decontamination
- Observe for further symptoms
- If needed repeat with another kit
  
- Children
  - Will need size appropriate dosing
  - No auto-injectors at this time

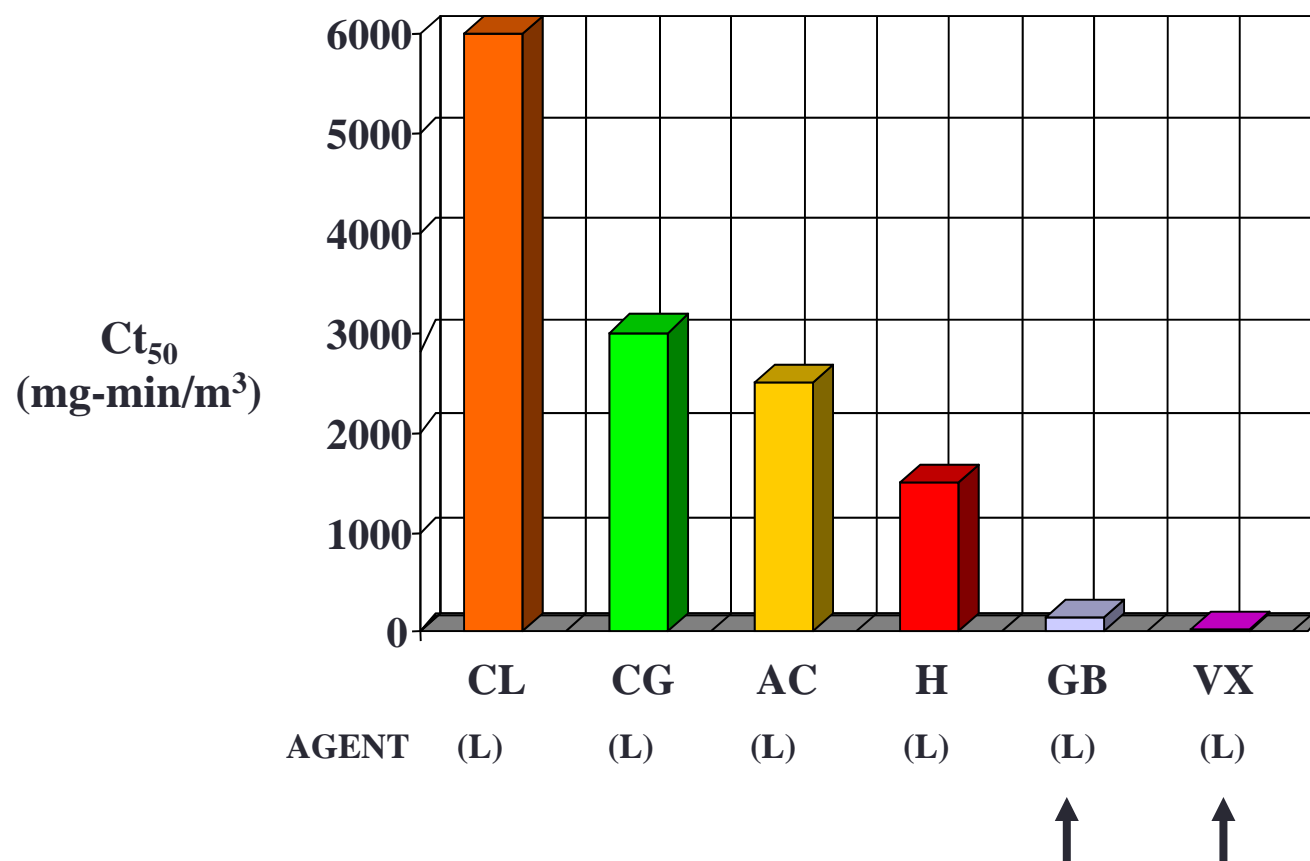
# Follow-up Care

- Notify Decon team leader
- Receiving team and rest of ED should be ready with:
  - IV
  - Atropine
  - Pralidoxime
  - Benzodiazepine
  - Airway

# Other Use

- IF YOU OR YOUR DECON TEAM LEADER SYMPTOMATIC:
  - Notify Decon team leader
  - Use MARK I kit
  - Assist member to decon
  - Assist member out of decon for further care

# COMPARATIVE TOXICITY OF AGENTS

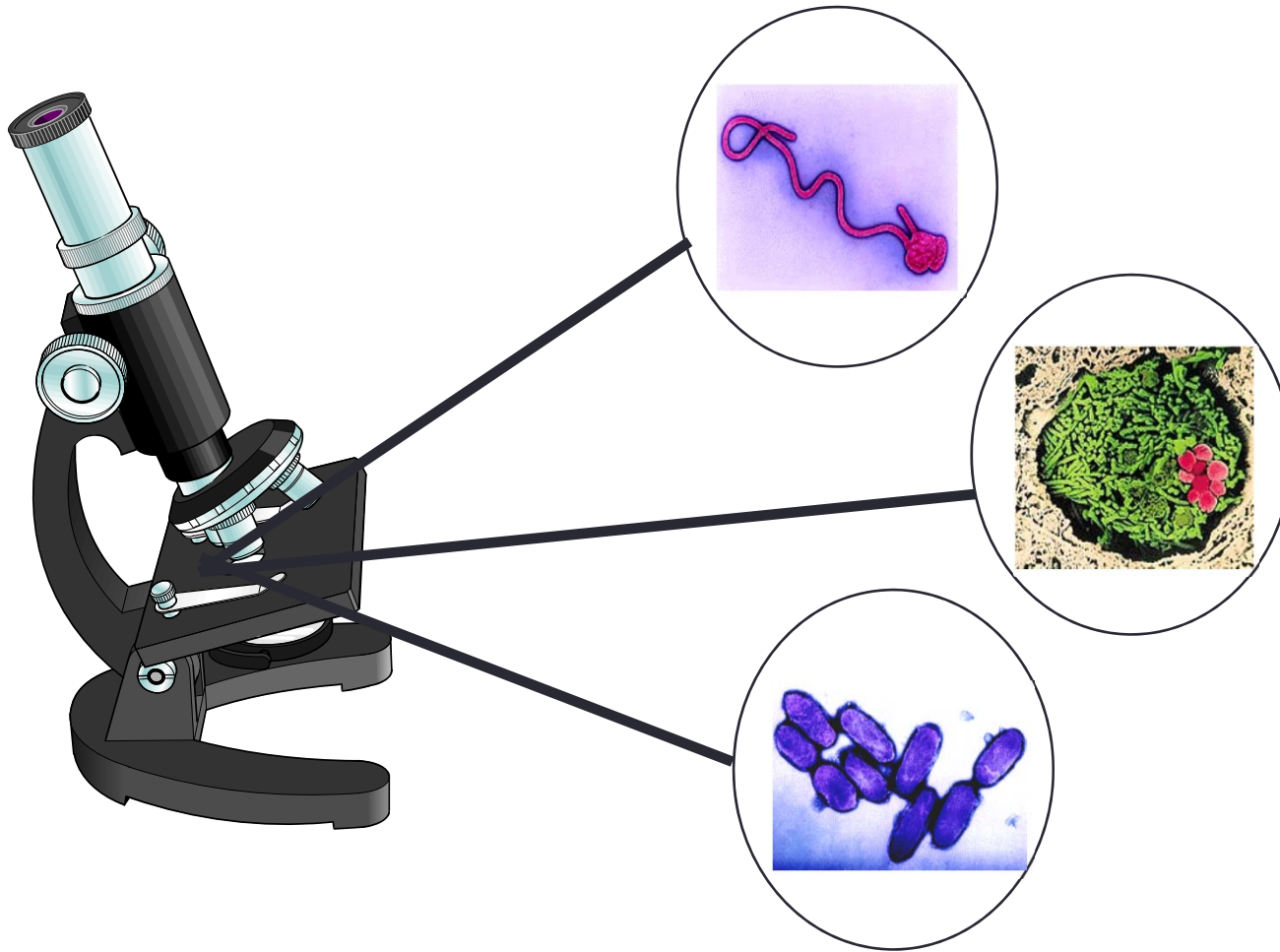




**BREAK**

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# Biological Agents







# Biological Agents

- General Information
- Bacterial Agents
- Viral Agents
- Toxin Agents

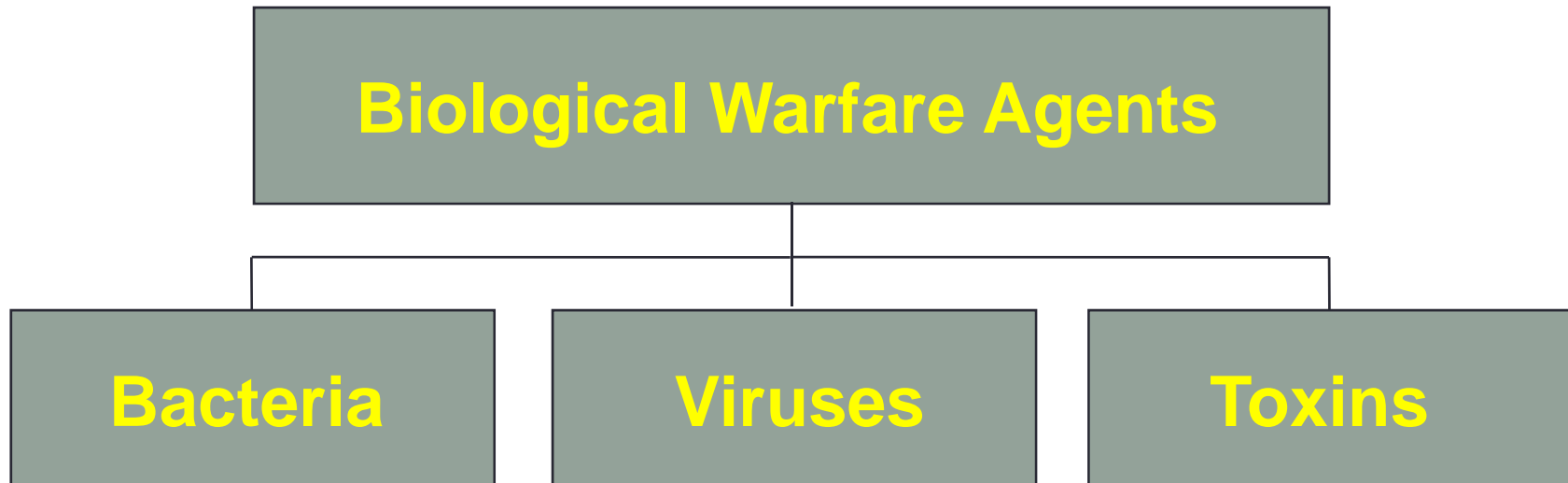
# Biological Agent Characteristics

- Produce delayed effects
- Do not penetrate unbroken skin
- Non-specific symptoms
- Undetectable by senses
- Difficult to detect in the field
- Do not evaporate
- Long incubation period

# Biological Agent Characteristics (continued)

- Most effectively disseminated as aerosols
- Range of effects
- Obtained from nature
- Multiple routes of entry
- Destroyed by environment
- Some are contagious

# Classes of Biological Agents



# Agents Considered for BW

- Bacteria and Rickettsiae  
Anthrax spores, Tularemia, Plague, Brucella, Q Fever
- Viruses:  
Smallpox, VEE, Hemorrhagic fevers
- Toxins:  
Botulinum toxin, SEB, Ricin, Saxitoxin

# Acquisition of Etiological Agents

- Multiple culture collections
- Universities
- Commercial biological supply houses,  
e.g. Iraq
- Foreign laboratories
- Field samples or clinical specimens,  
e.g. Ricin

# Biological Agents

- Most toxic per weight
- Production technology is easily accessible
- Inhalation threat – 1 to 5 micron aerosol
- Undetected until numerous casualties
- Incapacitating to lethal effects

# BW General Properties

- Not volatile, must be dispersed as an aerosol
- Silent, odorless, tasteless
- Relatively inexpensive to produce
- Simple delivery technology
  - Point source - aerosol generator
  - Line source - moving aerosol generator:  
auto, airplane, etc



# BW - General Properties 2

- Inhalation is the most significant route of transmission for BW
- Aerosol - 1 to 5 microns ideal size
- Other routes of entry: oral, dermal abrasion, or intentional percutaneous

# Biological Detection

- Mainly of clinical diagnosis
- Lab confirmation may be delayed
- Unusually bad cases

Beware of multiple healthy people  
with similar complaints

# Impact of a BW Release

- Extensive and prolonged need for medical services
- Increased need for PPE
- Possibility of a quarantine
- Handling remains/mortuary facilities
- Multiple jurisdictional challenges
- Responding to a “hoax” can be expensive

# Physical Protection (PPE)

- Only foolproof means of protection
- Present equipment is effective
- Problem is knowing when to put protective mask on
- No universal protection for civilian populations
- Limited education programs for civilian populations

# Possible Epidemic Syndromes in BW

- Influenza syndrome
- Pulmonary syndrome
- Jaundice syndrome
- Encephalitis syndrome
- Rash syndrome or cutaneous lesions
- Unexplained death or paralysis
- Septicemia/toxic shock

# Cutaneous Anthrax



# Anthrax - Prevention

- No documented cases of person-to-person transmission of inhalational anthrax has ever occurred
- Cutaneous transmissions are possible
- Universal precautions required

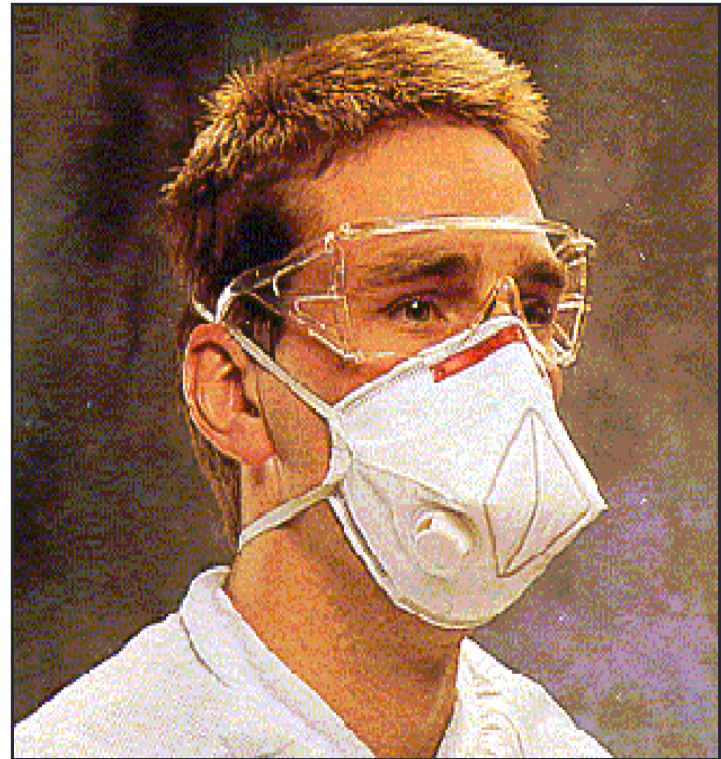
# Plague - Pathogenesis

- Humans develop disease from either the bite of an infected flea or by inhaling the organism
  - Bubonic - infection of a lymph node (usually lower legs)
  - Pneumonic - infection of the lungs
  - Septicemia - generalized infection from bacteria escaping from the lymph node: toxic shock
  - Oropharyngeal infections are rare, but reported



# Pneumonic Plague Prevention

- Secondary transmission is possible
- Standard, contact, and aerosol precautions for at least 48 hrs until sputum cultures are negative or pneumonic plague is excluded



# Tularemia - Pathogenesis

- Infectious via inhalation, ingestion, or absorption
- Inhaling only 10 to 50 organisms produces most lethal form of disease, typhoidal form
- Ingestion or absorption causes ulceroglandular form of disease
- Is not spread from person to person



# Q Fever - Pathogenesis

- Causes disease in animals (sheep, cattle, goats)
- Humans acquire disease by inhaling aerosols contaminated with the organism.



# Q Fever

- Single organism is able to cause infection
- 2 to 3 week incubation period
- Hepatitis, pneumonia, endocarditis
- Can be contagious
- May survive of surfaces up to 60 days

# Viruses as Biological Agents

- Smallpox
- Venezuelan Equine Encephalitis (VEE)
- Viral Hemorrhagic Fevers



# Smallpox - Clinical Course

- 7-17 day incubation period followed by myalgias, fever, rigors, vomiting, HA, and backache
- May have mental status changes
- Discrete rash with pustules develops over face and extremities and spreads to trunk
- Infectious until all scabs healed over
- All contacts quarantined for at least 17 days



# Smallpox



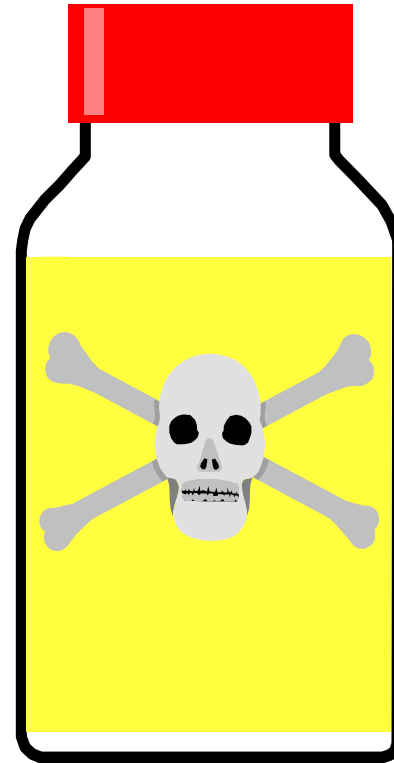
# Terrorist Use of Infectious BW Agents

- Provisional diagnosis needs to be made quickly
- High index of suspicion that BW agents have been used
- No time to wait on laboratory results to establish a definitive diagnosis
- The time course of the epidemic may aid in diagnosis



# Toxins as Biological Agents

- Think of them as chemicals!
  - Botulinum
  - Ricin
  - Staphylococcal Enterotoxin B



# Toxins General Characteristics

- Poisons produced by living organisms that cause effects in humans, animals or plants
- More toxic per weight than chemical agents
- Not volatile and minimal absorption in intact skin
- Not prone to person-to-person transmission
- Sudden onset of symptoms, prostration or death
- Effects: interfere with nerve conduction; interact with immune system; inhibit protein synthesis
- **THINK OF IT AS A CHEMICAL!!!!**

# Botulism Poisoning - Epidemiology

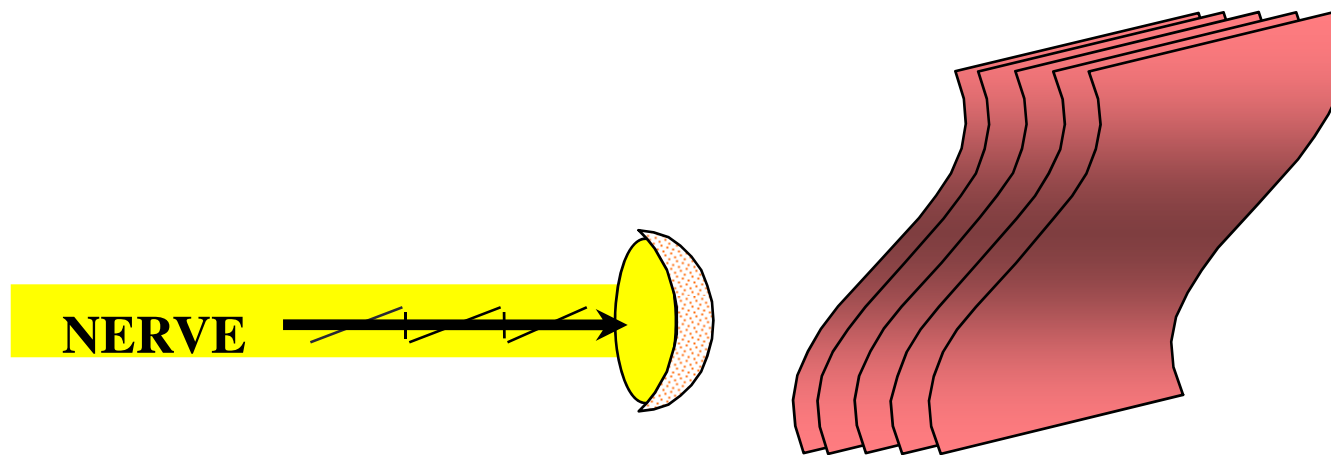
- Most outbreaks of foodborne botulism result from eating improperly preserved home-canned foods, with vegetables canned in oil being the most common source.
- 145 cases/year in the United States
  - 15% foodborne
  - 65% infantile botulism
  - 20% wound
- Toxin can be harvested and delivered as aerosol
- No person to person transmission

# Botulinum Toxin - Pathogenesis

- Neurotoxins produced by *Clostridium botulinum* - Botulism
- Most lethal compounds per weight - 15,000 times more toxic than VX
- Similar effects whether inhaled or ingested
- Onset of neurologic symptoms
  - After inhalation, 24-72 hours
  - After ingestion, 12-36 hours

## Botulism - Pathogenesis 2

- Blocks the release of ACh at the presynaptic terminal of the neuromuscular junction and autonomic nervous system
- Bulbar palsies and skeletal muscle weakness occur



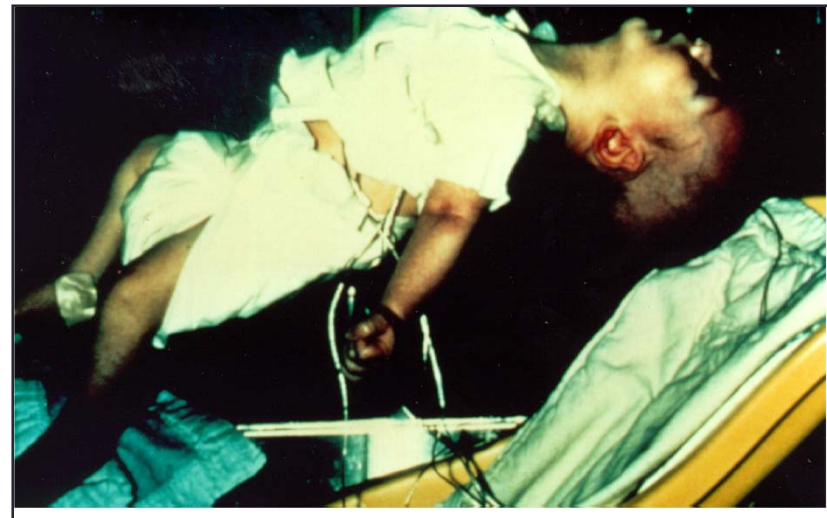
# Botulism - Signs & Symptoms

- Descending paralysis
- Bulbar palsies first
  - blurred vision
  - mydriasis
  - diplopia
  - ptosis
  - photophobia
  - dysphagia
  - dysarthria



## Botulism - Signs & Symptoms 2

- Soon skeletal muscles become weak, starting in the upper body and moving symmetrically downward
- Symptoms progress acutely to respiratory failure in 24 hours to 2 days (try to obtain antitoxin)
- Patients usually awake and alert



“Floppy” baby  
flaccid paralysis

# Ricin - Pathogenesis

- Potent cytotoxin - a by-product of castor oil production: 5% of mash after oil removed
- Over a million tons of castor beans are processed yearly into castor oil
- 200 times more toxic by weight than VX
- Blocks protein synthesis within the cell and thus tissue death
- Causes airway necrosis and edema when inhaled



# Ricin - Pathogenesis

- Toxic by multiple routes of exposure
- Can be dispersed as an aerosol
- Effective by inhalation, ingestion, injection



# Ricin - Signs & Symptoms

- Fever, chest tightness, cough, SOB, nausea, and joint pain 4 to 8 hours after inhalation  
Airway necrosis and edema leads to death in 36 to 72 hours
- Ingestion causes N,V, severe diarrhea, GI hemorrhage, and necrosis of the liver, spleen, and kidneys - shock and death within 3 days
- Injection causes necrosis of muscles and lymph nodes with multiple organ failure leading to death

# Ricin - Diagnosis & Treatment

- DIAGNOSIS

- Difficult
- Routine labs are nonspecific

- TREATMENT

- Supportive - oxygenation and hydration
- No antitoxin or vaccine available
- Not contagious

# Staphylococcal Enterotoxin B (SEB)

## Pathogenesis

- Fever producing exotoxin secreted by *Staphylococcus aureus* - has endotoxin effects
- Common cause of food poisoning in improperly handled foods
- Symptoms vary by route of exposure
- Causes proliferation of T-cells and massive production of various interleukins and cytokines, which mediate the toxic effects

# SEB - Pathogenesis 2

- Incapacitating - even at sublethal doses
- 80% of exposed develop symptoms
- May be aerosolized and inhaled
- May be introduced into the food supply and ingested

# SEB - Signs & Symptoms

- 3 to 12 hours after inhalation
  - Sudden onset of high fever, HA, chills, myalgias, and nonproductive cough
  - Severe SOB and chest pain with larger doses
  - Chest x-ray usually nonspecific - ARDS in severe cases
- Ingestion - Nausea, vomiting and diarrhea develops, which may be severe

# Defense Against BA – Self-Protection

- Treat every patient with respiratory complaints, a rash or open wounds as an “Infectious Source”
- Normal standard universal precautions for most biological agents
- HEPA filter mask upgrade for Pneumonic Plague/Smallpox/VHF
- Special protective garments are not necessary
- Precaution upgrades in areas of the hospital where aerosols could be generated: Lab centrifuges, autopsy facilities

# Defense Against BA - Triage

- Initial triage of all biological casualties is Immediate
- Highest priority will be allocating existing resources
  - Isolation rooms away from other patients
  - Mechanical ventilators
  - Personal protective equipment for staff
  - Medications

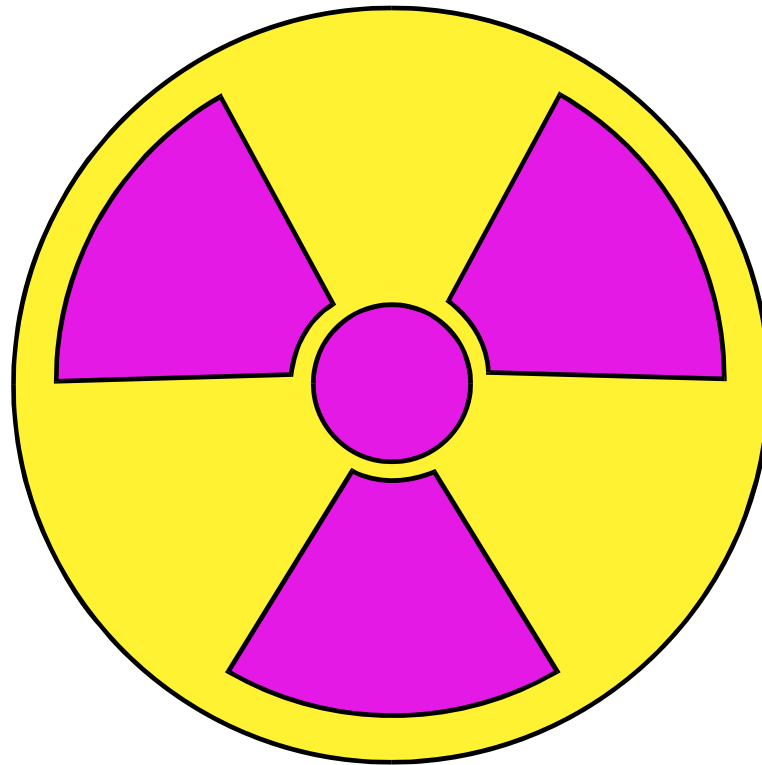


# Key Points

## Medical Approach to BA Attack

- Mandatory universal precautions with all infectious patients prevents spread of infection by containing all bodily fluids and utilizing barrier-protection nursing procedures
- Decontamination as appropriate (toxins)
- Initiate therapy for what is treatable, but do not delay for infectious identification
- Report concerns to HOSPITAL ICS (they will report to Public Health Officials, Law Enforcement, and FBI)

# Radiological Materials

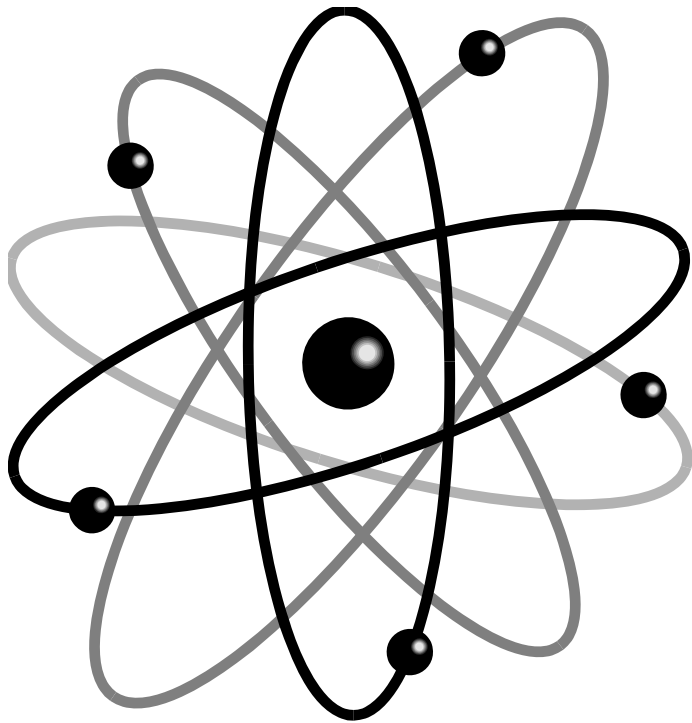




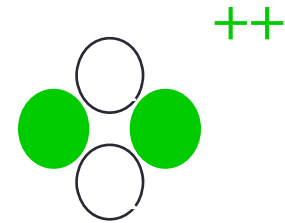
# Terms and Definitions

- Ionizing Radiation
- Protection
- Contamination vs. Exposed

# Ionizing Radiation



- Alpha particles



- Beta particles



- Gamma rays

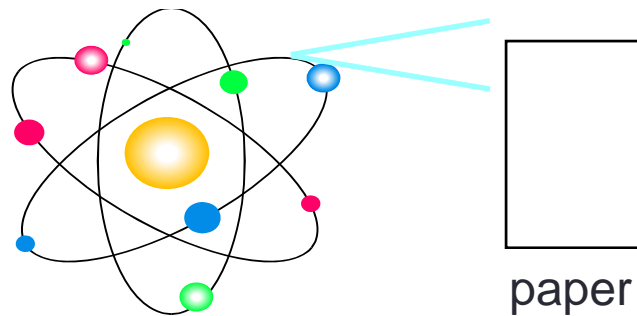


- Neutrons



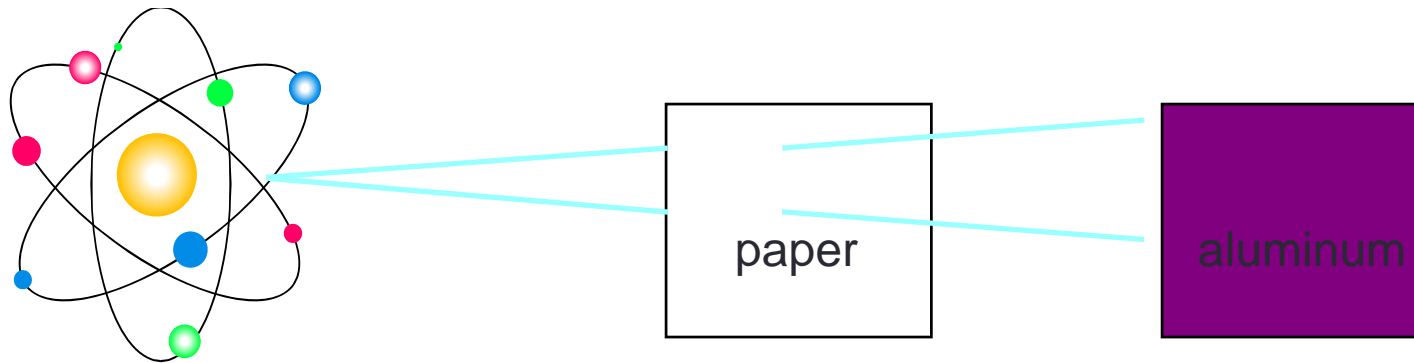
# Ionizing Radiation - Alpha

- Alpha particles only travel 1 to 2 inches in air and microns in tissues
- Cannot penetrate the dead layer of the skin
- Can be shielded by a sheet of paper
- Greatest danger is from inhalation or ingestion



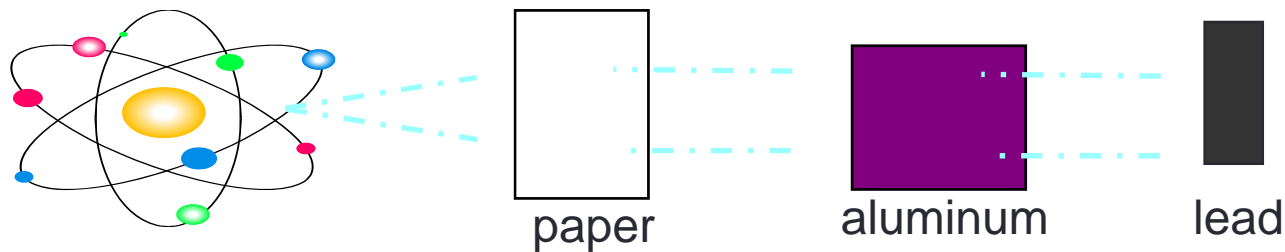
# Ionizing Radiation - Beta

- Free electrons
- Penetrate skin but not vital organs
- Shielded by thick clothing or aluminum
- Greatest danger is through inhalation or absorption of beta emitters



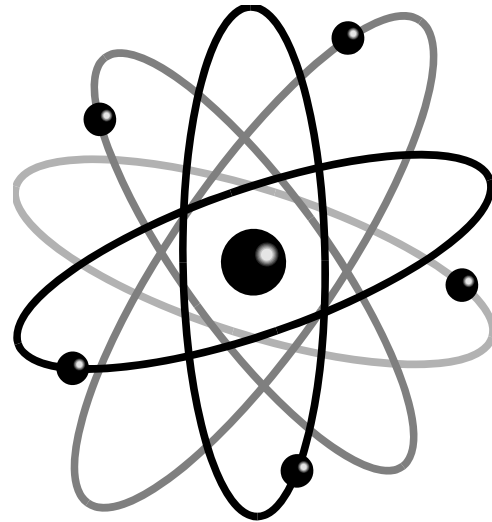
# Ionizing Radiation - Gamma Rays

- High energy rays
- Penetrate deep into tissue; require dense shielding
- Primary cause of radiation sickness
- Produced from radioactive decay and are a by-product of a nuclear weapon explosion or reactor accident



# Ionizing Radiation - Neutrons

- Uncharged particles
- **Can damage cells on contact**
- Can make material they strike radioactive
- Result of a nuclear weapon explosion
- Penetrates extensively; require special shielding





# Radiation Exposures

<b>Average Annual Exposure</b>	<b>360 mrem per year</b>	<b>Chronic</b>
<b>Chest x-ray</b>	<b>10 to 30 mrem</b>	
<b>Flight</b>	<b>0.5 mrem every hour</b>	
<b>Smoking 1.5 packs per day</b>	<b>16,000 mrem per year</b>	
<b>Mild radiation sickness*</b>	<b>200,000 mrem</b>	<b>Acute</b>
<b>Lethal Dose*</b>	<b>450,000 mrem</b>	
* single acute exposure		

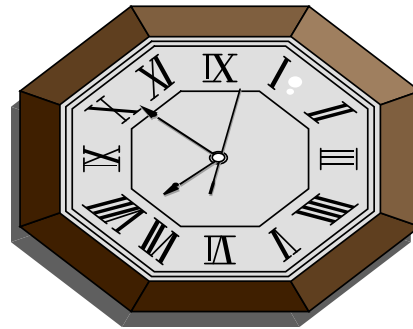
DOE maximum annual occupational limit = 5,000 mrem  
DOE maximum emergency dose = 10,000 mrem  
(for saving property)  
Maximum emergency dose (for saving life) = 25,000 mrem

# Health Risks

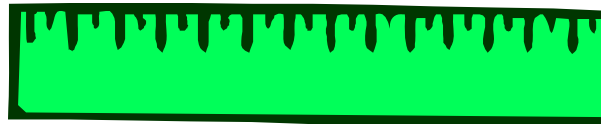
- Risks depend on:
  - Amount
  - Rate
- Categorized as:
  - Acute
  - Chronic

# Exposure Protection

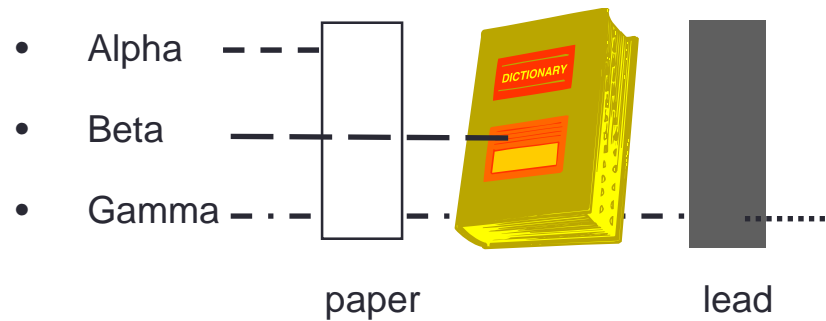
- Time



- Distance



- Shielding

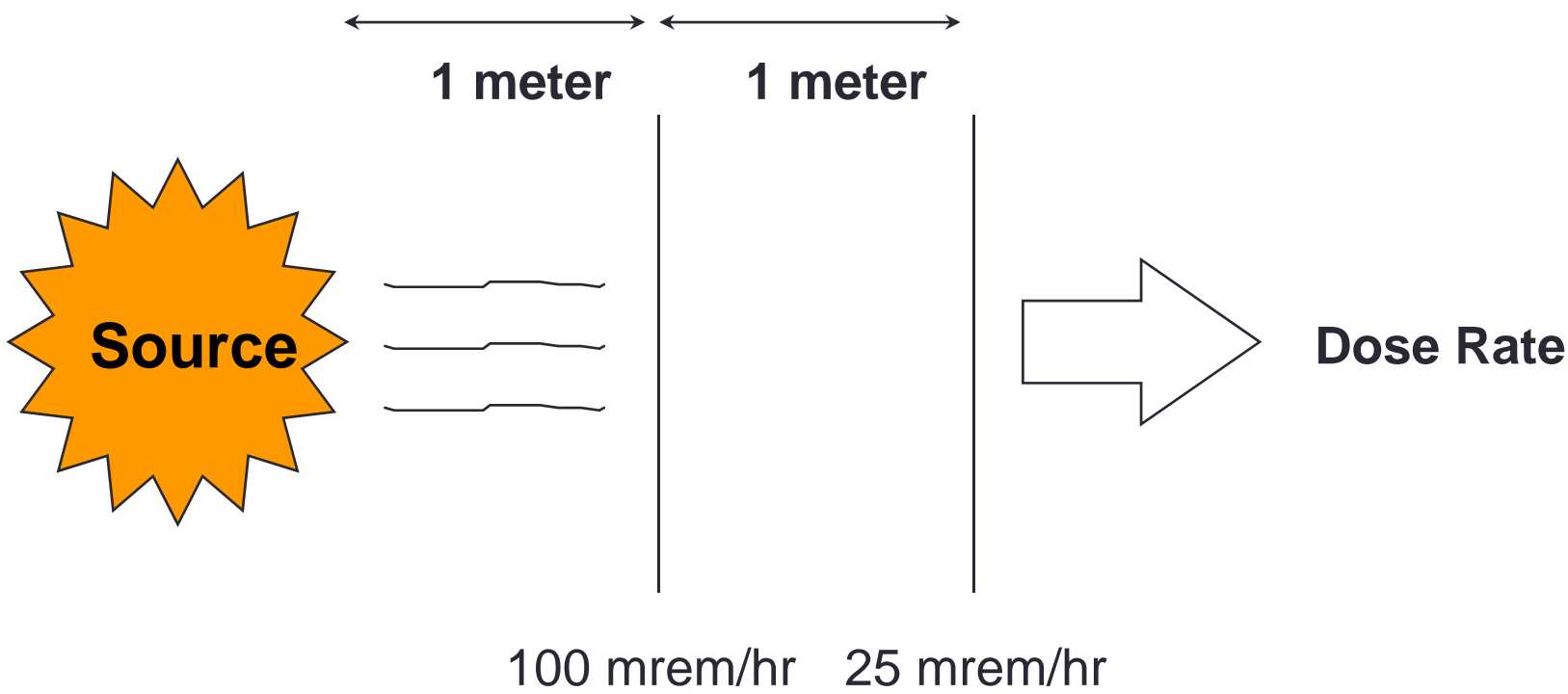


# Time

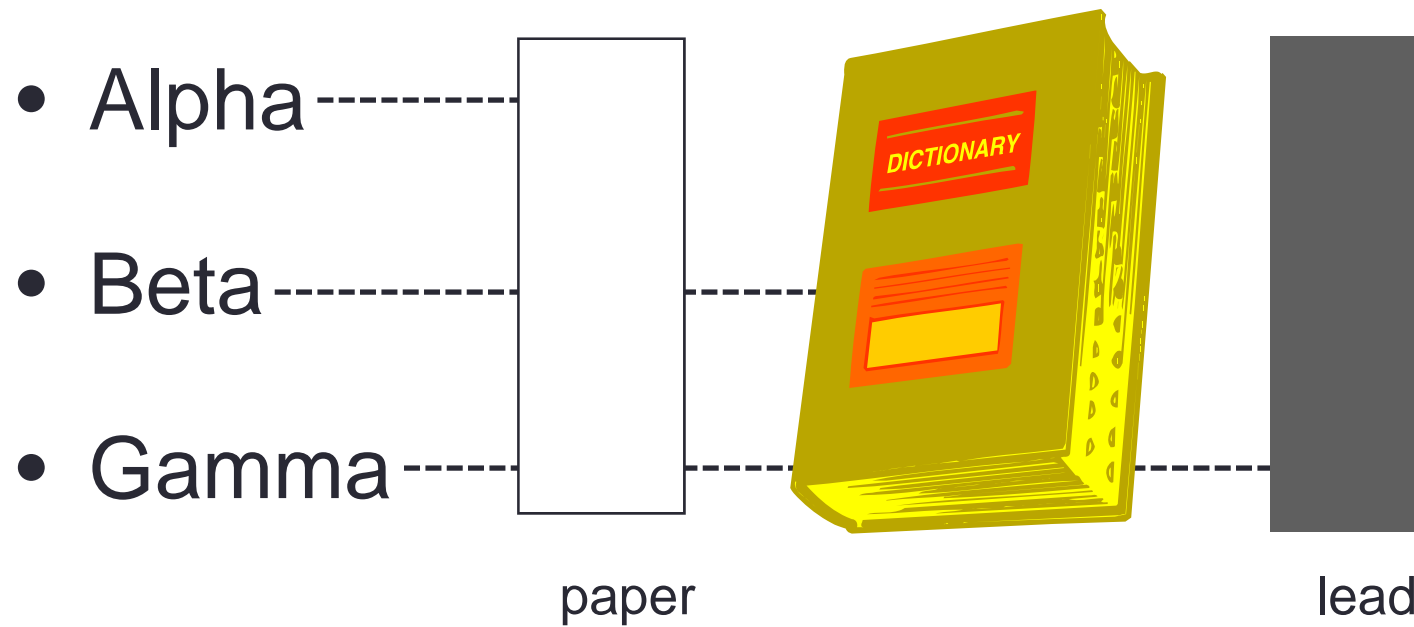


$$100 \text{ mrem per hour} \times 15 \text{ minutes } (.25 \text{ hour}) = 25 \text{ mrem}$$

# Distance



# Shielding



# Contaminated vs. Exposed

- Contaminated victims pose a risk to others
- If you are contaminated, you are also exposed
- Exposed victims are not necessarily contaminated
- Geiger counter to determine if victims are contaminated



# DECONTAMINATION TEAM

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Roles  
Chemical ID  
PPE  
Equipment  
Patient Flow



# Decon Team Duties

- Decon Team Leader
- Decon Operations Team (2, must have training)
- Suit/equipment Support Team (2-4, all must have training)

# Decon Team Leader

- Direct patient(s)
  - to staging area
  - remove clothes
- Brief Team
- Monitor team
  - Operations Team
  - Suit/equipment support
- Chemical ID (use poison center)
- Decon team member **ONLY** communicate with Team Leader!

## Decon Team Members (2)

- Pre-entry assessment
- Inspect equipment
- Don PPE
- Decontaminate as needed
- Provide BLS
- Clean self/room
- Doff PPE
- Post-entry assessment
- Shower
- Debrief

# Suit/equipment Support

- Utilize appropriate PPE (splash protection)
- Prepare PPE
- Assist donning/doffing PPE
- Monitor team
- Assist moving cleaned patients
- Assist in PPE removal and exit of Decon team

# Key Questions Prior to Decon

- Water compatibility of substance
  - Most OK
- Dry vs Wet Decon
- Level of PPE required
- Signs and symptoms of acute exposure
- Cleanup and disposal requirements

# Personal Protective Equipment



# Level A

Required when the highest potential for exposure to hazards exists and the highest level of skin, respiratory, and eye protection is called for



**VAPOR PROTECTION**

# Level B

Required when the highest level of respiratory protection but a lesser level of skin protection is needed

Can be encapsulating or non-encapsulating



**LIQUID SPLASH PROTECTION**



# Level C

Required under circumstances that call for lesser levels of respiratory and skin protection

Can be used with SCBA's or APR's



**DUST & SOLIDS PROTECTION**

# Level D

Appropriate when minimal skin protection and no respiratory protection is required



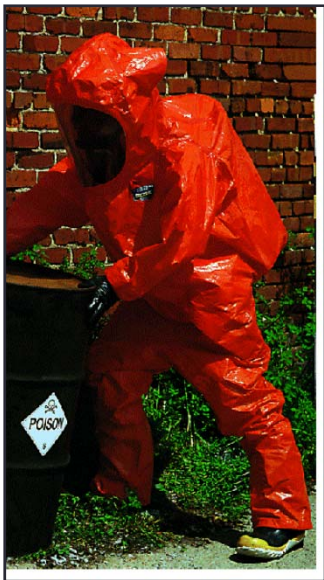
**SUPPORT PROTECTION**

# Levels of Protection

Greater Hazard



Level  
A



Level  
B



Level  
C



Level  
D



Higher Burden



# Equipment Needs

- Crash cart in hallway or near tent
  - Pass to clinical team member when needed
    - Medication
    - Intubation equipment
- Maintain personnel protection!

# Radios

- Must go on UNDER PPE
- Make sure all on ONE channel
- Test before putting on, after dressed
- Have backup procedures for communication should radios fail
  - Hand on top of head = OK
  - Hand(s) to neck = can't breathe

# Cautions

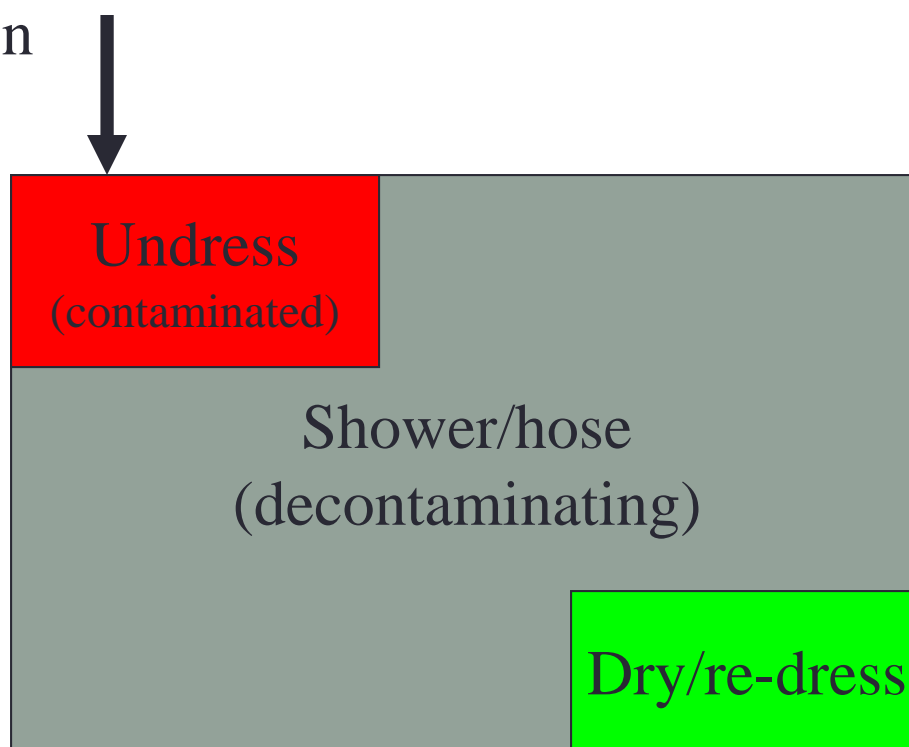
- Risks to person in decon room!
- PPE survey & exam
- Personnel: vital signs before & after!
- Risks:
  - Heat
  - Chemical
  - Equipment malfunction

# Patient Flow

- Special door from outside (ONLY!)
- “Hot” zone: by exterior door
  - Undress
  - Collect contaminated clothing
- “Warm” zone: under shower, on stretcher
  - Shower or wash
- “Cool” zone: by door to hallway
  - Pass to clean stretcher, etc
  - Assistants to help

# Patient Flow

Enter decon



Undress  
(contaminated)

Shower/hose  
(decontaminating)

Dry/re-dress

Exit to hospital



# Tent (if applicable)

- Additional training in setting up
- Know your facilities policy!



# Conclusion

- Keep yourself safe!
- Keep institution safe!
- Only in this manner can we take care of patients.
- What is appropriate PPE?
- What is our appropriate response?



QUESTIONS?