



Hospital Decontamination Briefing



Introductions

- Introduce yourself
- Any experience in HAZMAT training?



Introductions

- LTC Leon Wright
 - PA-C for 20 years, 12 with the 62nd CST
 - Experience in ER, Cardiology, Ortho, Urgent Care
 - HAZMAT Technician
 - Air Crew Medic qualified
 - Specialized training in Advanced Radiation medicine
 - 32 years military service



Agenda

- Who we are
- Overview of Hazardous Materials
- Personal Protective Equipment (PPE)
- Basic Decon Awareness & Techniques
- Donning / Doffing Demonstration
- Buddy Team Donning / Doffing Practical Ex.



References

- OSHA 29 CFR 1910.120
- OSHA Best Practices for Hospital Based First Receivers
- CDC Guidance on PPE
- California EMS Patient Decon recommendations for Hospitals
- Hospital Incident Command System (HICS)



What is a CST?

- The WMD Civil Support Teams were established to deploy rapidly to assist a local incident commander:
 - in determining the nature and extent of an attack or incident;
 - To provide expert technical advice on WMD response operations;
 - To help identify and support the arrival of follow-on state and federal military response assets.



Mission Statement

- Deploy to support civil authorities at domestic chemical, biological, radiological, nuclear, or high yield explosives (CBRNE) incidents.

Key Tasks:

- Identify CBRNE agents and substances
- Assess current and projected consequences
- Advise on response measures
- Assist with appropriate requests for federal and state support



Fact Sheet

- Weapons of Mass Destruction – Civil Support Teams
- 22 person Full time active Army / Air Force National Guard
- 57 teams nationwide on call 24/7
- Trained specifically to respond to incidents involving WMD
- Advanced detection and identification capabilities
- Mobile Analytical Lab (GC/MS, PLM, PCR, ECL, FTIR)
- Mobile Communication Suite (HF, UHF, VHF, ACU1000, SAT)
- Considered subject matter experts on WMD response
- Provide guidance to local on scene incident commander
- Can serve as link between local authorities and DOD resources



CERF-P

- DOD directed build-up of homeland defense forces using National Guard resources.
- CERFP: **C**BRNE **E**nhanced **R**esponse **F**orce **P**ackage
- Search and Rescue – 50 personnel
- Mass Decontamination – 75 personnel
- Mass Casualty Medical Triage – 47 personnel
 - MD's, Nurses, PA's, NP's, EMT/Medics, Pharmacists, etc.





What are Hazardous Materials?

- A material (as radioactive, flammable, explosive, or poisonous material) that would be a danger to life or to the environment if released without necessary precautions being taken



Order of Likelihood

- What exposures would hospital personnel most likely see and need to take action on?
 - Chemical
 - Biological
 - Radiological
 - Nuclear



Chemical

- Toxic Industrial Chemicals (TIC's)
 - Industrial chemicals that are manufactured, stored, transported, and used throughout the world. Toxic industrial chemicals can be in the gas, liquid, or solid state. They can be chemical hazards (e.g., carcinogens, reproductive hazards, corrosives, or agents that affect the lungs or blood) or physical hazards (e.g., flammable, combustible, explosive, or reactive).



Chemical

- Toxic Industrial Materials (TIM's)
 - Any toxic industrial material manufactured, stored, transported, or used in industrial or commercial processes. It includes toxic industrial chemicals, toxic industrial radiologicals, and toxic industrial biologicals.



Chemical

- Chemical Warfare Agents
 - Lethal and incapacitating munitions and agents, typically poisons, contaminants, and irritants
 - Examples: GA – Tabun, GB – Sarin, GD – Soman
CG – Phosgene, VX, AC – Hydrogen Cyanide



Real World Example

- Aum Shinrikyo puncture bags containing Sarin in Tokyo subway
 - 12 deaths
 - 5,500 people went to 280 hospitals
 - 1,046 patients admitted to 98 hospitals
 - Only 30% pure
 - Sarin is cholinesterase inhibitor, which is an organophosphate – think pesticides



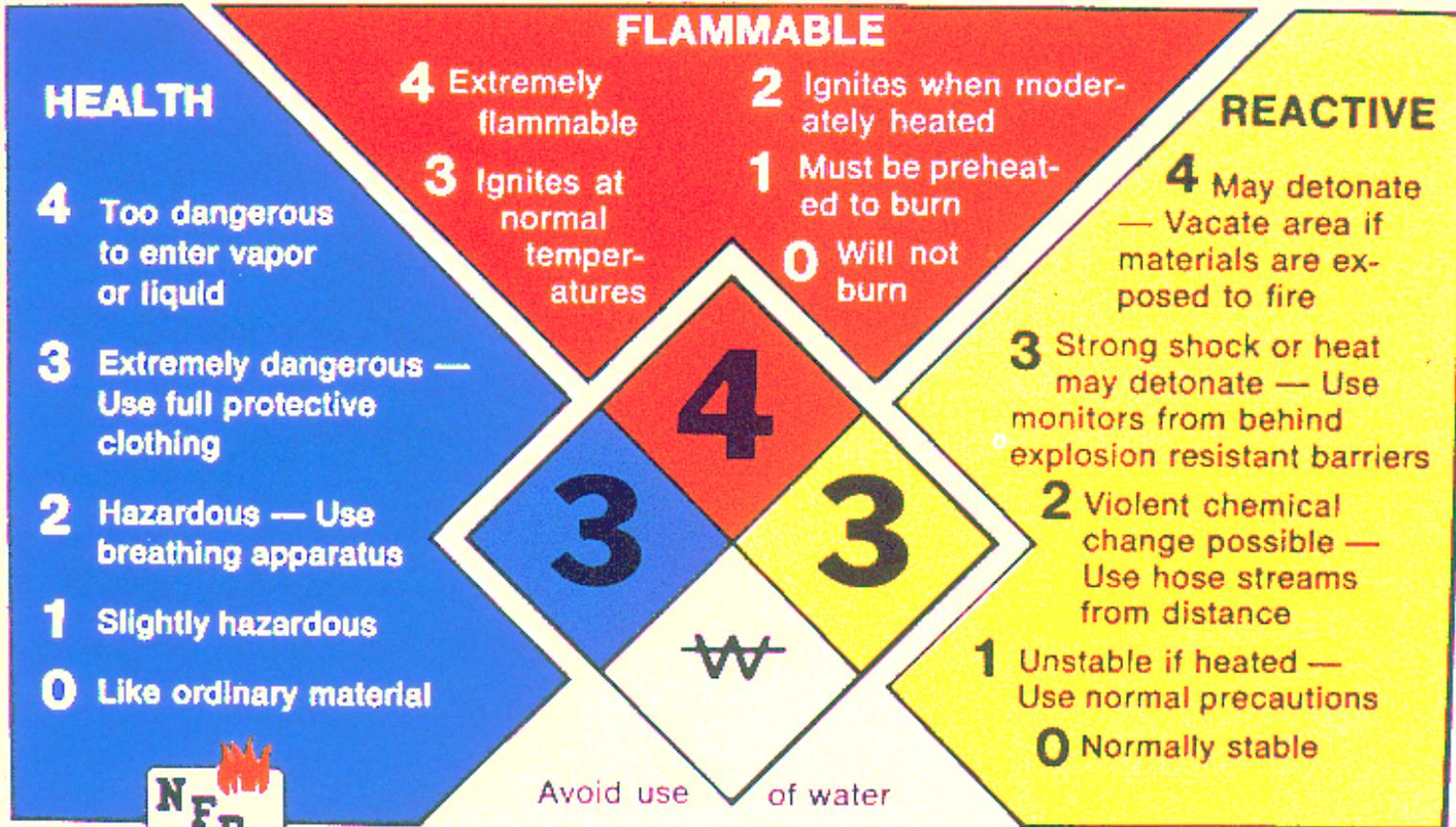
Resources Available

- NFPA 704 Diamond
- Emergency Response Guidebook (ERG)
- National Institute of Occupational Health and Safety (NIOSH)



NFPA 704

EMERGENCY GUIDE FOR HAZARDOUS MATERIALS



NATIONAL FIRE PROTECTION ASSOCIATION

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ERG

- Emergency Response Guidebook
 - Provides first responders with a go-to manual to help deal with hazmat accidents during the critical first 30 minutes.
 - Every first responder vehicle should have one
 - New version comes out every 4 years
 - There is an APP for that!



ERG

The main sections are:

- Table of placards (pages 6-7)
- Railcar and Road Trailer Identification charts (pages 8-9)
- **YELLOW** section (ID numbers)
- **BLUE** section (names of material)
- **ORANGE** section (guide pages)
- **GREEN** section (initial isolation and protective action distances for highlighted substances)



Hazard Assessment

- A patient has just walked into your ER stating he was exposed to Parathion after the wind shifted while spraying his field. He is exhibiting excessive salivation, pinpointed pupils, has a headache, and feels nauseous.
- What are the hazards associated with Parathion?



Hazard Assessment

- Local EMS is transporting two victims from a traffic crash involving a vehicle and a tanker truck to your ER. The tanker was breached and both drivers were exposed. EMS advised the UN ID number on the truck was 1758. They stated they did not decontaminate and are 20 minutes out.
- What are the hazards associated with 1758?



NIOSH

- National Institute of Occupational Safety and Health – NIOSH Pocket Guide to Chemical Hazards
- Industrial hygiene information for 677 chemicals or substance groupings commonly found in the work environment
- Think about the chemical plants in your area



Hazard Assessment

- A patient self reported to ER and stated that he burned himself and was exposed after an unlabeled bottle of a substance spilled into his container of pool shock. He is reporting burning of eyes, nose, and throat.
- Determine what the 2nd hazard could be. What is incompatible with chlorine?



NIOSH Tips

- The lower the IDLH the worse the chemical toxicity is to you
- Air has a Molecular Weight of app. 29, so any chemical with a MW over 29 is heavier than air and will sink while lighter than 29 will rise
- Can easily determine MW based on Formula only
 - Ex: Chlorine: Formula is Cl₂ (2 Chlorine molecules)
 - Atomic Weight for Chlorine is 35.45 (35.45 x 2 = 70.9)
- Think of the Chemical Abstract Number (CAS#) as a chemical's SSN and a way to find out more info.



Biological Agents

- Include bacteria, viruses, fungi, other microorganisms and their associated toxins.
- Divided into 3 categories based on risk
 - Category A
 - Category B
 - Category C



Category A

- The U.S. public health system and primary healthcare providers must be prepared to address various biological agents, including pathogens that are rarely seen in the United States. High-priority agents include organisms that pose a risk to national security because they:
 - can be easily disseminated or transmitted from person to person;
 - result in high mortality rates and have the potential for major public health impact;
 - might cause public panic and social disruption; and
 - require special action for public health preparedness.



Category A Examples

- Anthrax (*Bacillus anthracis*)
- Botulism (*Clostridium botulinum* toxin)
- Plague (*Yersinia pestis*)
- Smallpox (variola major)
- Tularemia (*Francisella tularensis*)
- Viral hemorrhagic fevers (filoviruses [e.g., Ebola, Marburg] and arenaviruses [e.g., Lassa, Machupo])



Category B

- Second highest priority agents include those that
 - are moderately easy to disseminate;
 - result in moderate morbidity rates and low mortality rates; and
 - require specific enhancements of CDC's diagnostic capacity and enhanced disease surveillance.



Category B Examples

- [Brucellosis](#) (*Brucella* species)
- Epsilon toxin of *Clostridium perfringens*
- [Food safety threats](#) (e.g., *Salmonella* species, *Escherichia coli* O157:H7, *Shigella*)
- [Glanders](#) (*Burkholderia mallei*)
- [Melioidosis](#) (*Burkholderia pseudomallei*)
- Psittacosis (*Chlamydia psittaci*)
- [Q fever](#) (*Coxiella burnetii*)
- [Ricin toxin](#) from *Ricinus communis* (castor beans)
- Staphylococcal enterotoxin B
- Typhus fever (*Rickettsia prowazekii*)
- Viral encephalitis (alphaviruses [e.g., Venezuelan equine encephalitis, eastern equine encephalitis, western equine encephalitis])
- Water safety threats (e.g., *Vibrio cholerae*, *Cryptosporidium parvum*)



Category C

- Third highest priority agents include emerging pathogens that could be engineered for mass dissemination in the future because of
 - availability;
 - ease of production and dissemination; and
 - potential for high morbidity and mortality rates and major health impact.
- Examples: Emerging infectious diseases such as Nipah virus and hantavirus



Bioterrorism

- Rajneeshee Cult uses Salmonella on salad bars in Dalles, Oregon (1984)
 - Attempted to influence local election
 - 751 people poisoned, no deaths
- Anthrax attacks of 2001
 - 22 confirmed cases – 11 inhalational, 11 cutaneous
 - 5 deaths resulted
 - Subsequent hoax letters still plague responders

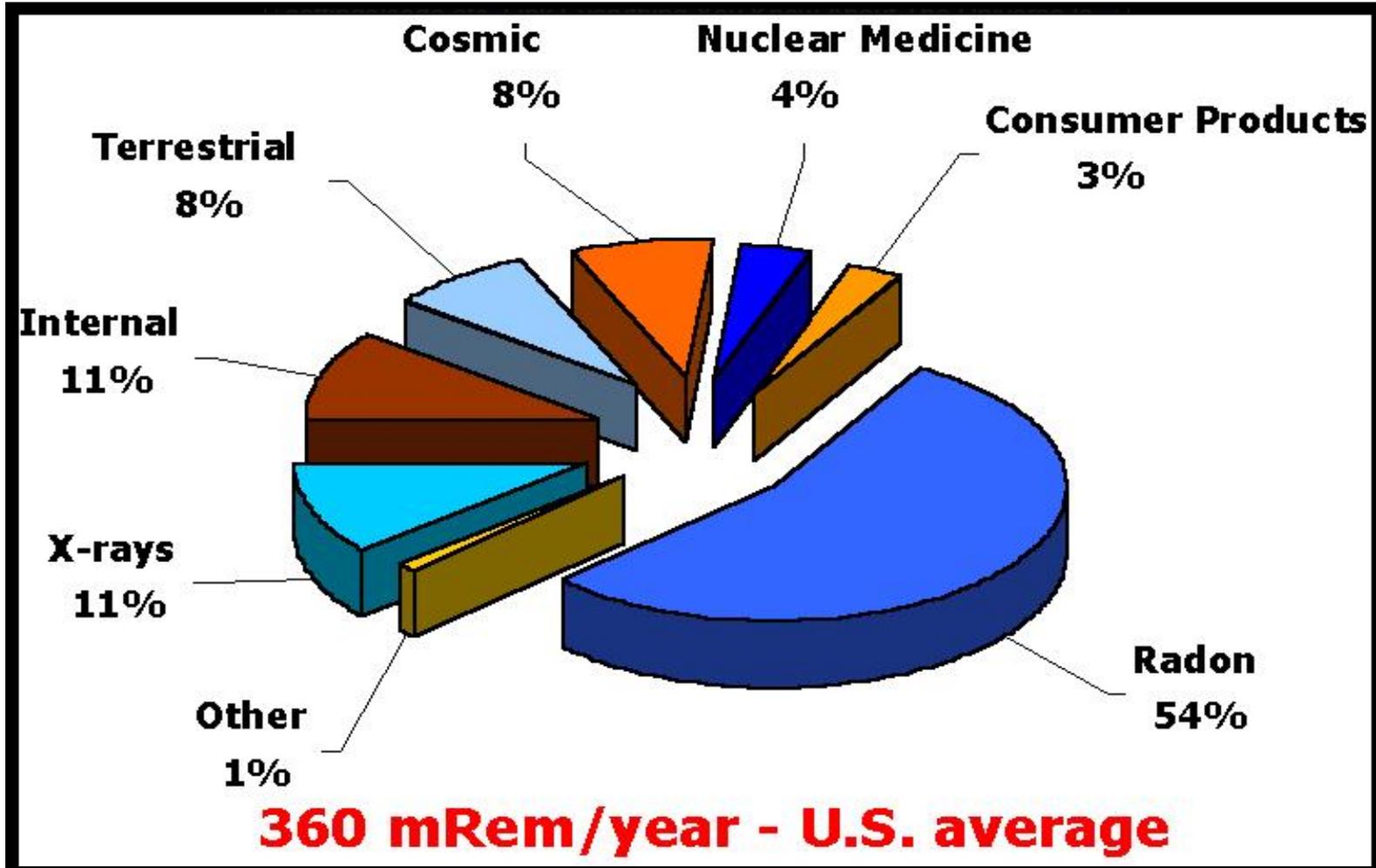


Radiation

- Radiation
 - Energy transmitted through space in the form of particles or waves/rays.
- Non-ionizing Radiation
 - any type of electromagnetic radiation that does not carry enough energy per quantum to ionize atoms or molecules—that is, to completely remove an electron from an atom or molecule.
- Ionizing Radiation
 - Particulate or electromagnetic radiation that has enough energy to strip one or more bound electrons from an atom or molecule.



Background Radiation





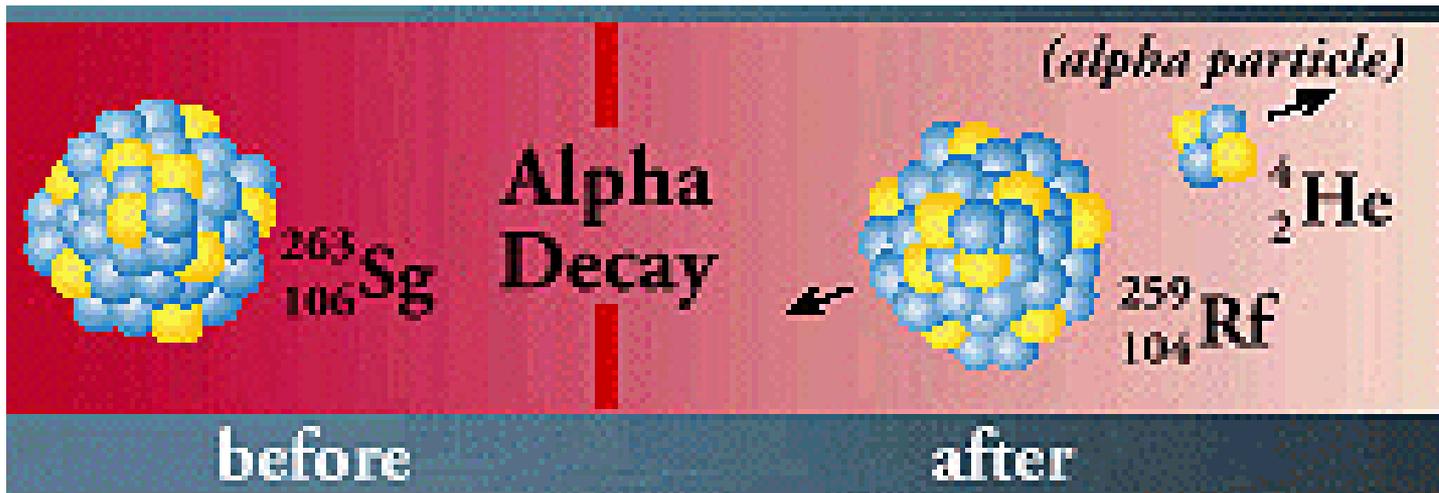
Types of Ionizing Radiation

- Alpha Particles
 - positively charged particle ejected spontaneously from the nuclei of some radioactive elements
- Beta Particles
 - In general, beta particles are lighter than alpha particles, and they generally have a greater ability to penetrate other materials. As a result, these particles can travel a few feet in the air, and can penetrate skin.
- Gamma / X-Rays
 - high-energy waves that can travel great distances at the speed of light and generally have a great ability to penetrate other materials
- Neutrons
 - high-speed nuclear particles that have an exceptional ability to penetrate other materials. Of the five types of ionizing radiation discussed here, neutrons are the only one that can make objects radioactive



Alpha Radiation

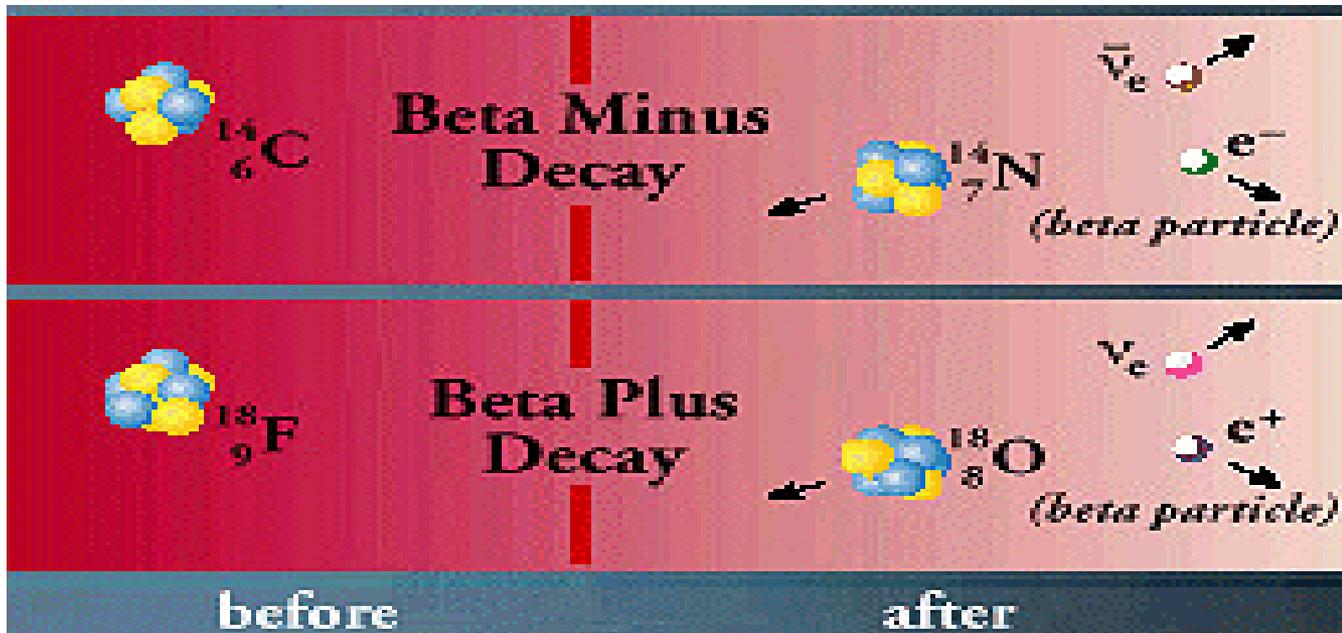
- Essentially a Helium Nucleus: 2 neutrons and 2 protons
- They travel short distances, have large mass
- Only a hazard when inhaled
- N95 mask and gloves will protect you





Beta Radiation

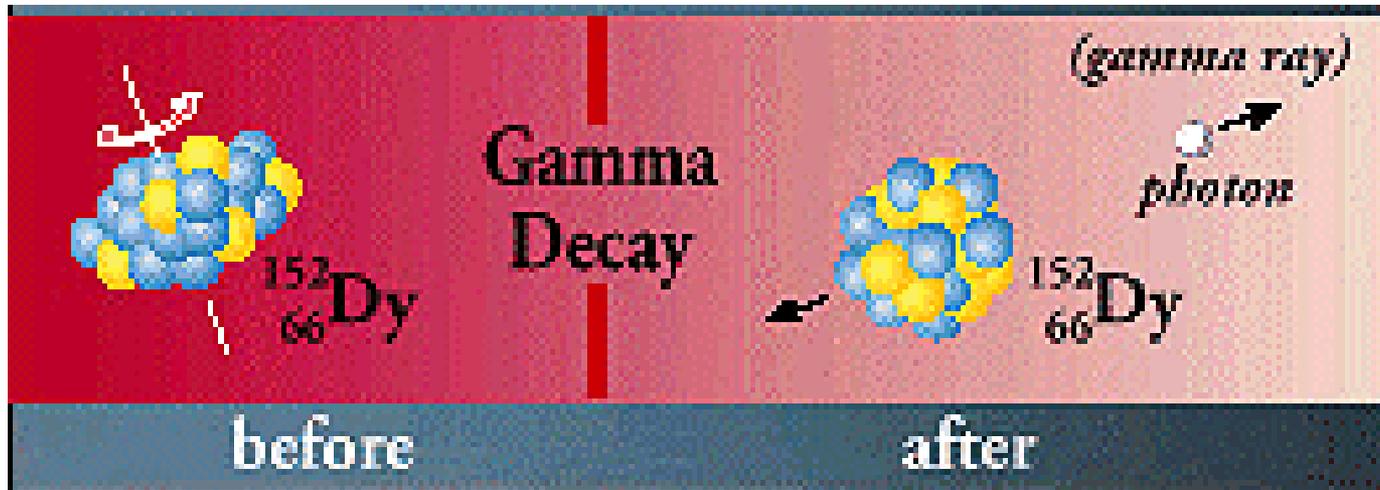
- Electrons or positrons having small mass and variable energy. Electrons form when a neutron transforms into a proton and an electron or:





Gamma/X-Ray Radiation

- Gamma Rays (or photons): Result when the nucleus releases energy, usually after an alpha, beta or positron transition
- Gamma rays originate in the nucleus. X-rays originate in the electron fields surrounding the nucleus or are machine-produced



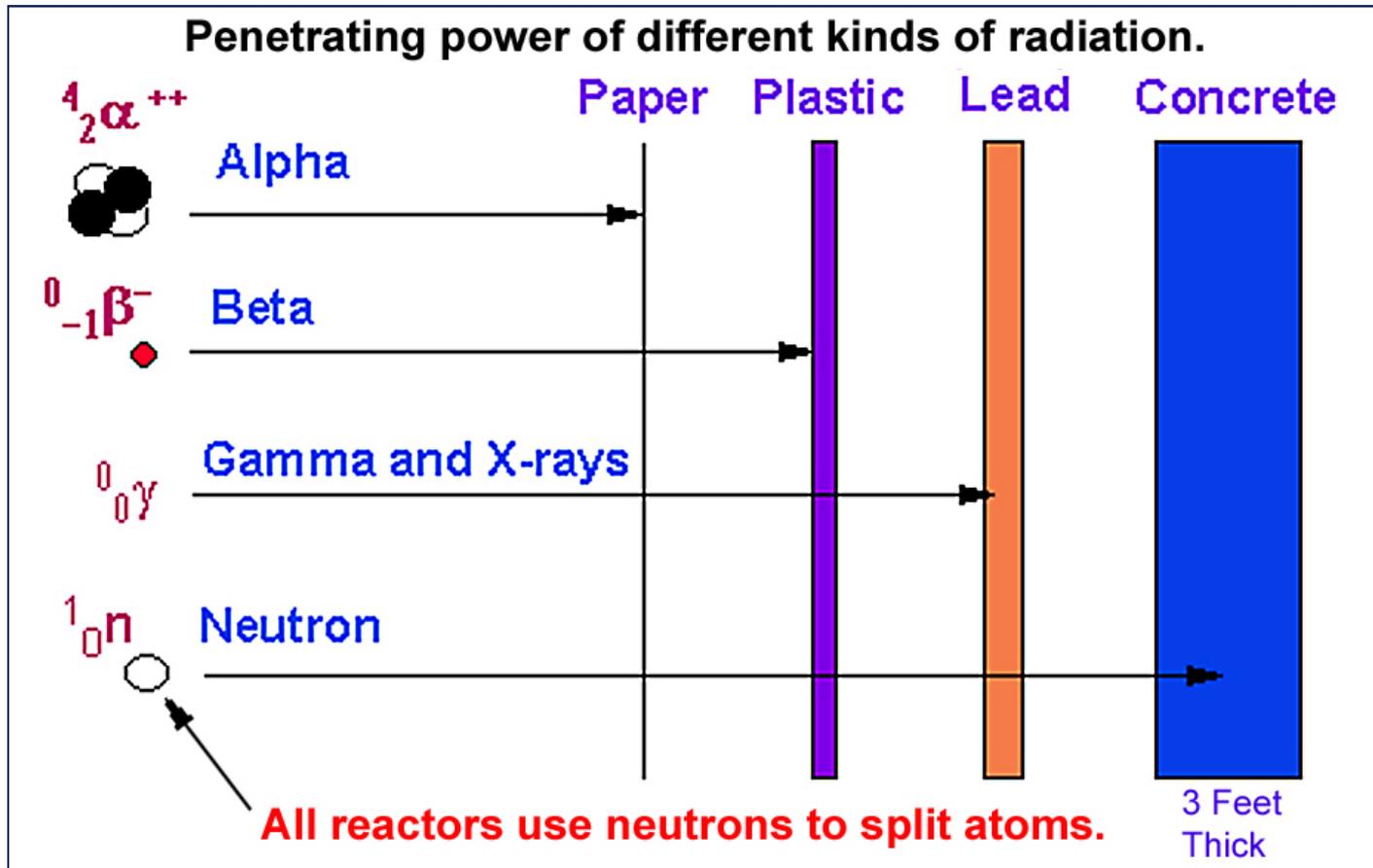


Radioactive Decay

- The activity of any sample of radioactive material decreases or decays at a predictable rate that is characteristic of that radionuclide
- No known physical or chemical agents (temp, pressure, etc) can be made to influence this rate
- Ex – a single Radium nucleus may disintegrate all at once or wait years before emitting an alpha particle. All that can be predicted with certainty is that half of all Radium 226 nuclei present will disintegrate in 1,622 years.

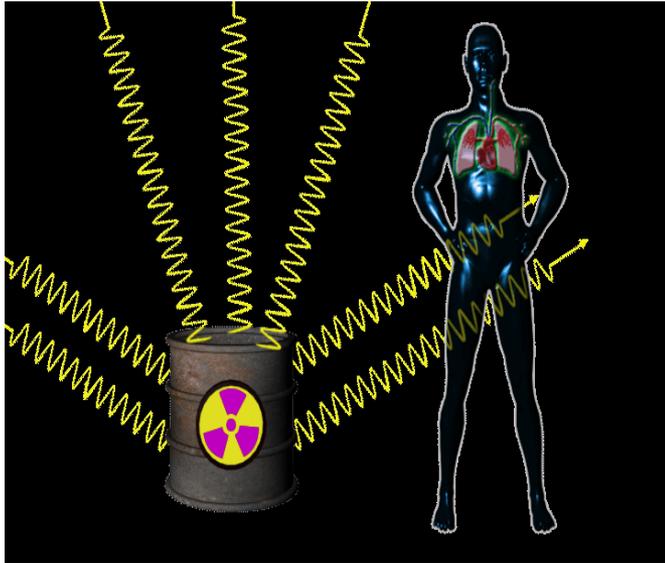


Shielding



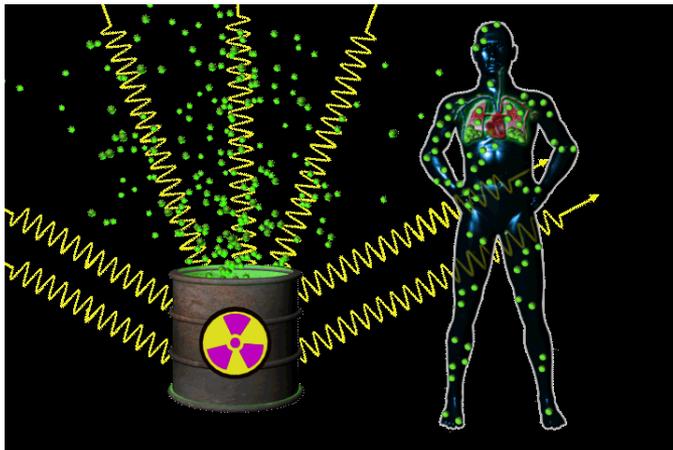


Exposure vs. Contamination



- Exposure – Subjected to radiation exposure but not a secondary threat to populace

- Contamination – Means a person has radioactive material on them and can pose a threat to others



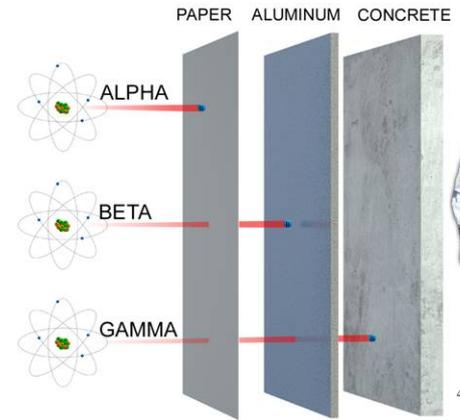
- **Cow patty analogy**
 - If you smell it – you're being exposed
 - If you smell it and step in it – you're being exposed and you're now contaminated



Protect Yourself



- **Time:** Limit the time spent in an areas of high radiation
- **Distance:** Exposure decreases dramatically as you increase your distance from the source.
- **Shielding:** Radiation is blocked by mass. When practical, operate behind objects (fire trucks, buildings, etc..)

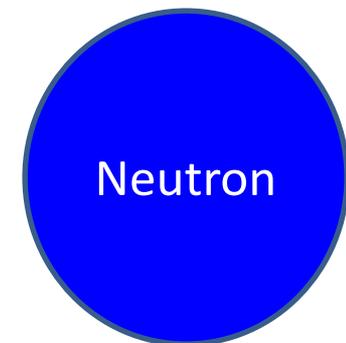
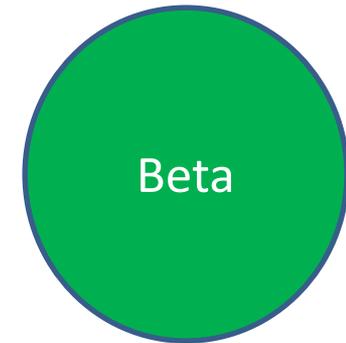
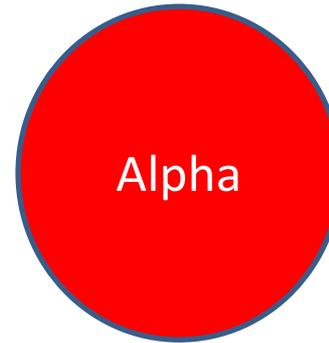




Cookie Quiz

- Goal – Minimize Exposure

1. Hold in fist
2. Put in pocket
3. Eat
4. Throw away





Cookie Answer

1. Alpha – Will be stopped by outer layer of skin
2. Beta – Will be shielded in your pocket
3. Gamma – You've already been exposed so you might as well eat it
4. Neutron – Throw away



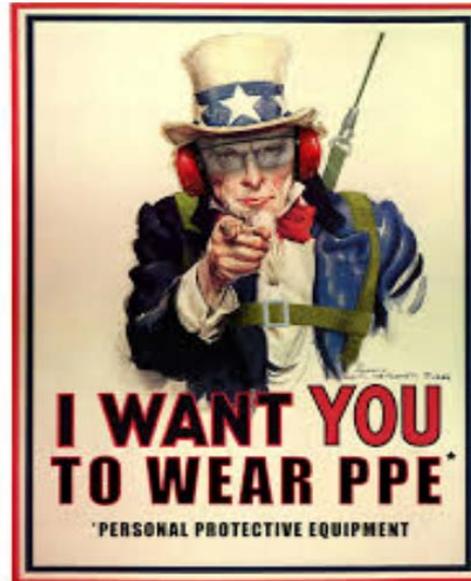
Do not worry

- The most significant dose a healthcare worker ever received from a patient was during the aftermath of Chernobyl, and the dose was 1 Rem. The annual occupational limit is 5 Rem.
- There is no record of a single U.S. health care worker's suffering radiation injury from rendering emergency medical care to a contaminated patient.
- The highest recorded radiation dose to a U.S. emergency care provider is 14 mRem, roughly equivalent to a chest x ray.
- Medical or surgical treatment should not be delayed because of possible contamination.



What is PPE?

- **Personal protective equipment (PPE)** refers to protective clothing, helmets, goggles, or other garments or equipment designed to protect the wearer's body from injury.





Levels of PPE

Level A – To be selected when the greatest level of skin, respiratory, and eye protection is required (Big suit, big tank)

Level B – The highest level of respiratory protection is necessary but a lesser level of skin protection is needed (Little suit, big tank)

Level C – The concentration(s) and type(s) of airborne substance(s) is known and the criteria for using air purifying respirators are met (Little suit, little mask)

Level D – A work uniform affording minimal protection: used for nuisance contamination only (No suit, no mask)



APR

- Air Purifying Respirator
 - Respirator with an air-purifying filter, cartridge, or canister that removes specific air contaminants by passing ambient air through the air-purifying element





PAPR

- Powered Air Purifying Respirator (PAPR)
 - respirator with an air-purifying filter, cartridge, or canister that removes specific air contaminants by passing ambient air through the air-purifying element.





SCBA

- Self Contained Breathing Apparatus (SCBA)
 - provides breathable air in an IDLH (immediate danger to life and health) atmosphere.





Level A Requirements

1. The hazardous substance has been identified and requires the highest level of protection for skin, eyes, and the respiratory system based on either the measured (or potential for) high concentration of atmospheric vapors, gases, or particulates; or the site operations and work functions involve a high potential for splash, immersion, or exposure to unexpected vapors, gases, or particulates of materials that are harmful to skin or capable of being absorbed through the skin,
2. Substances with a high degree of hazard to the skin are known or suspected to be present, and skin contact is possible; or
3. Operations must be conducted in confined, poorly ventilated areas, and the absence of conditions requiring Level A have not yet been determined.



Level A Equipment

1. Positive pressure, full face-piece self-contained breathing apparatus (SCBA), or positive pressure supplied air respirator with escape SCBA, approved by the National Institute for Occupational Safety and Health (NIOSH).
2. Totally-encapsulating chemical-protective suit.
3. Coveralls.
4. Long underwear.
5. Gloves, outer, chemical-resistant.
6. Gloves, inner, chemical-resistant.
7. Boots, chemical-resistant, steel toe and shank.
8. Hard hat (under suit).
9. Disposable protective suit, gloves and boots (depending on suit construction, may be worn over totally-encapsulating suit).





Level B Requirements

1. The type and atmospheric concentration of substances have been identified and require a high level of respiratory protection, but less skin protection.
2. The atmosphere contains less than 19.5 percent oxygen; or
3. The presence of incompletely identified vapors or gases is indicated by a direct-reading organic vapor detection instrument, but vapors and gases are not suspected of containing high levels of chemicals harmful to skin or capable of being absorbed through the skin.

Note: This involves atmospheres with IDLH concentrations of specific substances that present severe inhalation hazards and that do not represent a severe skin hazard; or that do not meet the criteria for use of air-purifying respirators.



Level B Equipment

1. Positive pressure, full face-piece self-contained breathing apparatus (SCBA), or positive pressure supplied air respirator with escape SCBA (NIOSH approved).
2. Hooded chemical-resistant clothing (overalls and long-sleeved jacket; coveralls; one or two-piece chemical-splash suit; disposable chemical-resistant overalls).
3. Coveralls.
4. Gloves, outer, chemical-resistant.
5. Gloves, inner, chemical-resistant.
6. Boots, outer, chemical-resistant steel toe and shank.
7. Boot-covers, outer, chemical-resistant (disposable).
8. Hard hat.
9. Face shield.





Level C Requirements

- The atmospheric contaminants, liquid splashes, or other direct contact will not adversely affect or be absorbed through any exposed skin;
- The types of air contaminants have been identified, concentrations measured, and an air-purifying respirator is available that can remove the contaminants; and
- All criteria for the use of air-purifying respirators are met.



Level C Equipment

1. Full-face or half-mask, air purifying respirators (NIOSH approved).
2. Hooded chemical-resistant clothing (overalls; two-piece chemical-splash suit; disposable chemical-resistant overalls).
3. Coveralls.
4. Gloves, outer, chemical-resistant.
5. Gloves, inner, chemical-resistant.
6. Boots (outer), chemical-resistant steel toe and shank.
7. Boot-covers, outer, chemical-resistant (disposable).
8. Hard hat.
9. Escape mask.
10. Face shield.





Level D Requirements

1. The atmosphere contains no known hazard;
and
2. Work functions preclude splashes, immersion, or the potential for unexpected inhalation of or contact with hazardous levels of any chemicals



Level D Equipment

1. Coveralls.
2. Gloves.(1)
3. Boots/shoes, chemical-resistant steel toe and shank.
4. Boots, outer, chemical-resistant (disposable).(1)
5. Safety glasses or chemical splash goggles.(1)
6. Hard hat.(1)
7. Escape mask.(1)
8. Face shield.(1)





Control Recommendations

- Standard precautions
- Transmission Based precautions
 - Airborne precautions
 - Droplet precautions
 - Contact precautions



Standard Precautions

- Includes the use of: hand washing, appropriate personal protective equipment such as gloves, gowns, masks, whenever touching or exposure to patients' body fluids is anticipated
- Apply to 1) blood; 2) all body fluids, secretions, and excretions, *except sweat*, regardless of whether or not they contain visible blood; 3) non-intact skin; and 4) mucous membranes. Standard precautions are designed to reduce the risk of transmission of microorganisms from both recognized and unrecognized sources of infection in hospitals.



Transmission Based Precautions

- Can be used for patients with known or suspected to be infected or colonized with epidemiologically important pathogens that can be transmitted by airborne or droplet transmission or by contact with dry skin or contaminated surfaces. These precautions should be used in addition to standard precautions.



Transmission Based Precautions

- Recommended to provide additional precautions beyond Standard Precautions to interrupt transmission of pathogens in hospitals.
- **Airborne Precautions** used for infections spread in small particles in the air such as chicken pox.
- **Droplet Precautions** used for infections spread in large droplets by coughing, talking, or sneezing such as influenza.
- **Contact Precautions** used for infections spread by skin to skin contact or contact with other surfaces such as herpes simplex virus.
- Airborne Precautions, Droplet Precautions, and Contact Precautions may be combined for diseases that have multiple routes of transmission. When used either singularly or in combination, they are to be used in addition to Standard Precautions.



Standard Precautions Equipment

- Gloves / Shoe Covers
- Gowns / Aprons / Suits
- Masks and/or Respirators
- Goggles
- Face shields



What is Decontamination

The process of removing or neutralizing contaminants that have accumulated on personnel, property, and equipment





Mass Decontamination

- The decontamination of large numbers of people, in the event of industrial, accidental, or intentional contamination by toxic, infective, caustic, polluted, or otherwise unhealthful or damaging substances.





Technical Decontamination

- The process subsequent to gross decontamination designed to remove contaminants from responders and their equipment, minimize the spread of contamination, and ensure responder safety.



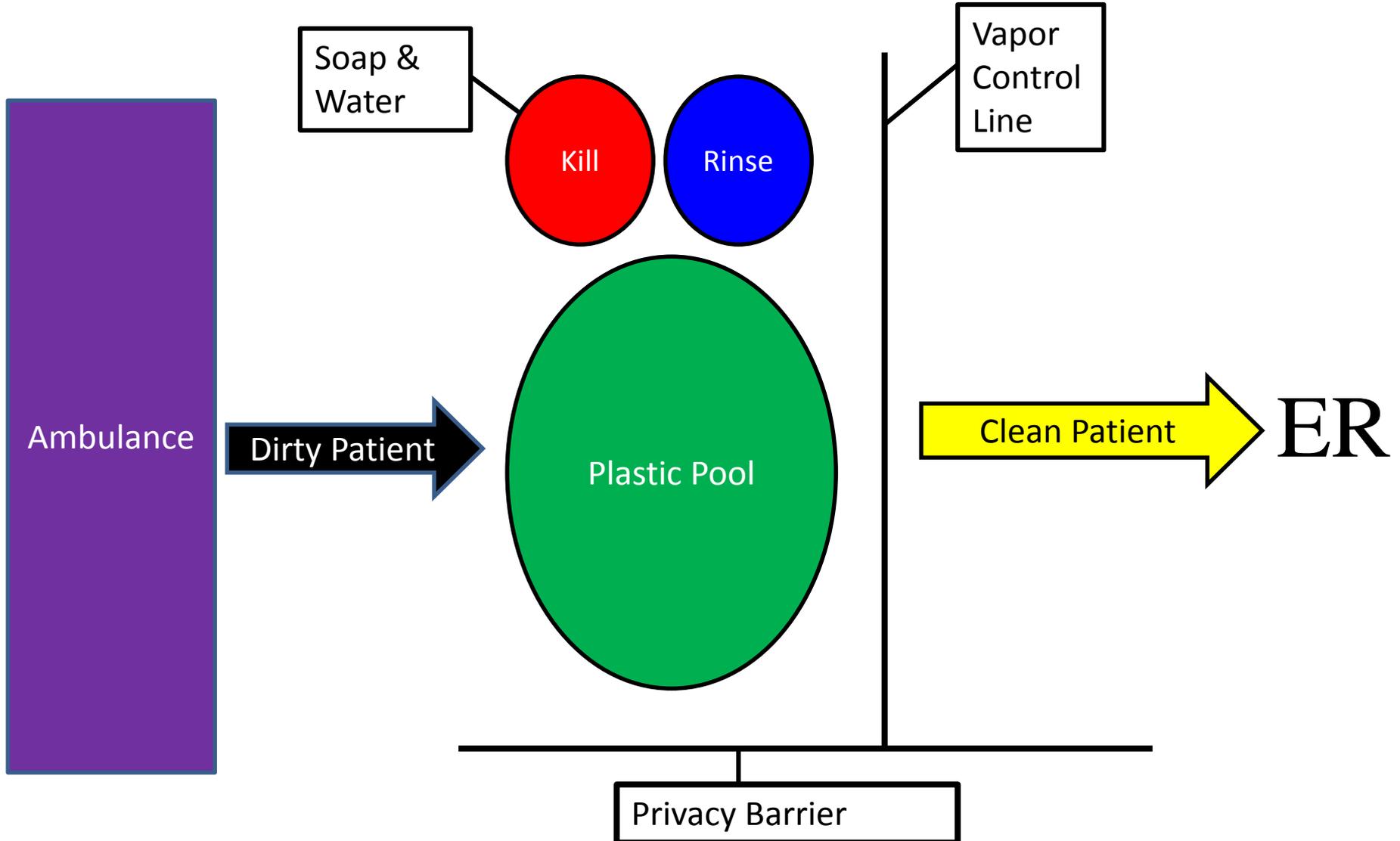


Emergency Decontamination

- Emergency decontamination is performed when there is a severe threat to life and if the victim does not get immediate medical attention they may die.
- Emergency decontamination is accomplished by flushing the victim with copious amounts of water usually from a hose line.
- With emergency decontamination you do not have to worry about containing runoff but can be accomplished quickly with a looped hose line and salvage cover. It may be necessary after the victim is stabilized to perform a more thorough decontamination.



Simple Decon Line





What Do I Need?

- Bare minimum decon line
 - Trash Bags
 - Kill, Rinse buckets
 - Scrub brush and/or large sponge
 - Small plastic pool
 - Water source
 - Privacy barrier
 - Clean gowns



Health Care Considerations

- 85-90% of all contaminants are on the clothing, a casualty is not decontaminated until they are in hospital clothing.
- Contaminated Water Runoff
- SOLUTION TO POLLUTION IS DILUTION
- OSHA/EPA regulations state that treatment is NEVER delayed in order to arrange for collection of runoff.



Health Care Considerations

- Health care facility-based decontamination is markedly different from field operations
- Health care workers are faced with medical emergencies in potentially contaminated patients
- Ambulatory patients are unlikely to wait for hazardous materials teams for transport



Health Care Considerations

- Patient **should be** fully decontaminated prior to transportation to a medical facility
- Receiving medical staff should be notified when handling a contaminated patient
- Patient should be wrapped in disposable fabric bags to prevent spread of any remaining contaminants
- Fatalities should be handled with same decon procedures



What About?

- Privacy
- Language barrier
- Handicapped / Service Animals
- Law Enforcement / Weapons
- Communication
- Patient Tracking
- Waste Products
- Personal Belongings



Likely Scenarios

- EMS Transport
 - Ambulatory vs. Non Ambulatory
- Contaminated patient self presents to ER
- Depending on resources, victim will either take personal shower or will be physically decontaminated by hospital staff



EMS Transport

- Notification of incoming contaminated patient(s)
- Alert decon team and supervisor
- Small window to set up decon
- Determine as much information as possible about hazard
- Don appropriate PPE
- Receive patient and decontaminate
- Put patient in clean gown and treat



Decon Ambulatory Patient

- Ensure privacy screen in place if possible
- Get clothing off immediately and bag
- Patient will take shower with soap
 - If facilities for this aren't available, perform following:
 - Use brush / sponge to decontaminate patient
 - Begin at the head and work down
 - “Kill” and “Rinse” regularly
- Rinse patient with copious amount of water
- Change patient into clean gown
- Walk patient into ER and treat



Decon Non Ambulatory Patient

- Ensure privacy screen in place if possible
- Get clothing off immediately and bag
- Use brush / sponge to decontaminate patient
 - Begin at the head and work down
 - “Kill” and “Rinse” regularly
- Rinse patient with copious amount of water
- Transfer patient to “clean” stretcher
- Cover with gown / blanket
- Move patient into ER and treat



Patient Self Presents

- Patient walks into ER and states _____
- Recognize the patient is contaminated
- Quickly determine a need for decontamination
- Get the patient out of the ER and to decon area
- Get the clothing off the patient immediately
- Rinse the patient with copious amounts of water
- Have patient put on gown
- Walk patient into ER and treat



Donning by the Numbers

1. Inspect PPE prior to donning
2. Put on inner gloves
3. Put on gown or coveralls
4. Put on Boots
5. Turn on Respirator and put on
6. Put on outer gloves
7. Tape all joints and ensure a buddy checks you



Donning Tips

- Record the time “on air”
- Label the healthcare worker with tape
 - Smith, RN
- Be cognizant of your surroundings
- Know the exposure plan
- Realize the limitations of your equipment
 - Susceptible to tears, breaches



Doffing by the Numbers

1. Perform self decontamination of hands
2. Remove boots
3. Remove tape and outer gloves
4. Remove respiratory protection
5. Remove coveralls
6. Remove outer gloves



Limitations of PPE

- Susceptible to rips, tears, contamination
- Must be used properly
- Dexterity issues
- Dependent on batteries (PAPR)
- Limited time on air
- Potential mobility, visibility, psychological, and communication issues



Buddy Team Don / Doff Practical Exercise

- Pair up into buddy teams
- One person don / doff with Level C Ensemble



Contact Information

Need US?

- Major William Saint, Commander / 225 – 315-0411 / william.w.saint.mil@mail.mil
- Major Brian Stevens, Deputy Commander / 225-303-2700 / brian.m.stevens.mil@mail.mil

Medical Questions?

- LTC Leon Wright, PA-C / 225-241-9741 / leon.b.wright.mil@mail.mil
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PPE / Equipment Questions?

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