Radiological Emergency Preparedness

Glynn Willard
REP Program Manager
WV Division of Homeland Security & Emergency Management
Radiation Basics

- Radiation comes from many sources
  - Sunlight, cosmic, microwaves, internal, medical, terrestrial
- We are concerned with four main types of ionizing radiation- (has enough energy interact with/change the atom of material it passes through)
  - Alpha Particles
  - Beta Particles
  - Gamma/X-Rays
  - Neutron Particles
Alpha Particles

- High energy, high mass
  - Causes particle to be stopped by a few inches of open air or thin material (shirt, dead skin cells, paper)
- Mainly dangerous if inhaled or ingested
- Uranium-238, Radium-226, Americium-241
Beta Particles

• High energy, low mass
  • Can travel several feet in open air, stopped by protective clothing, thin plastic or metal
• Can cause burns on skin like a severe sunburn
• Damage through inhalation and ingestion
• Lead-210, Strontium-90, Cesium-137
Gamma and X-Ray

• High energy waves
  • Travel at the speed of light, several hundred meters
  • Can be stopped/slowed by dense material such as lead and concrete
• Extremely damaging to cells from an acute dose
• Potassium-40, carbon-14, Cesium-137, Cobalt-60
Neutron Particles

- No energy particle, occurring through atomic reaction (fission/fusion)
  - Can be stopped/slowed by hydrogen-rich sources, such as water or concrete
- Reacts with other atoms to create radioactive material
- Usually seen in NuclearReactors and Nuclear Weapons
Exposure vs Contamination

**Exposure (Irradiation)**
- Energy penetrates the body, with an associated dose
- Gamma/X-Rays
- Exposure **does not** mean someone is contaminated

**Contamination**
- Radioactive material is attached to the skin or clothing, ingested, inhaled, enters through open wound
- Typically particulates and physical material
- Contamination **does not** equal exposure
- Exposure can occur if not protected from contaminants
Measuring Radiation & Impact on Health

- Biological Impact of Radiation is measured in Roentgen Equivalent Man (REM)
- Negative impacts of radiation are usually seen around 100+ REM in a short amount of time
- This amount as a chronic dose may not have immediate symptoms
How are we exposed to radiation?
Emergency Response Decisions

- Can be adjusted by agency
- Depends on response operation
- Must be preidentified and understood to be effective
- Requires constant monitoring
- Make sure to keep track of total dose and dose rates, even if responders have dosimeters
Radiological Emergencies

- Transportation
- Nuclear Power
- Medical
- Nuclear Weapons
Transportation

- Packaging specifically designed to mitigate against release/exposure
- Risk to responders and public depend on type of material and damage to package
  - R-1 = .5 mREM/hr
  - R-2 = >.5 – 50 mREM/hr
  - R-3 = >50 – 200 mREM/hr

- Activity is on outer package (Bq / Cu)
- TI is dose rate at 1 meter from package (mREM/hr)
Nuclear Weapons

- Most likely from transportation accident, rather than nuclear detonation
- May be widespread contamination
- Most injuries occur due to blast/heat, rather than radiation
- Long-term hazard, clean up
Nuclear Power Plants
Beaver Valley Power Station
Shippingport, PA

- Radioactive material creates heat through fission
- Heat generates steam from clean water supply to turn large turbines, generating electricity
- Multiple safety/containment features to ensure no radiological release to public
Training & Education

- **FEMA Independent Study Courses**
  - IS-3
  - IS-301 (under revision)
  - IS-302
  - IS-303
- **Local Partners**
  - Civil Support Teams
  - Fire Departments
  - Emergency Management Agencies

- **FEMA Center for Domestic Preparedness**
  - AWR-317
  - PER-904
  - PER-905

- **CTOS at the Nevada National Security Site**
  - PER-354
  - PER-243/245/246
  - AWR-140 (online prerequisite)
QUESTIONS?

Glynn.r.Willard@wv.gov