

The Role of Public Health in a Nuclear or Radiological Terrorist Incident

Centers for Disease Control and Prevention Atlanta, Georgia, USA
February 3, 2005

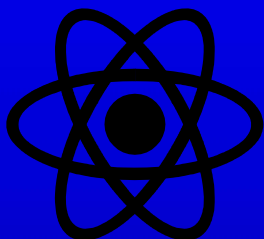
James M. Smith, PhD,
Associate Director for Radiation, EHHE, NCEH

Charles W. Miller, PhD,
Chief of the Radiation Studies Branch, EHHE, NCEH

Debra McBaugh, CHP,
Head of Environmental Radiation Section,
Dept. of Health, Washington

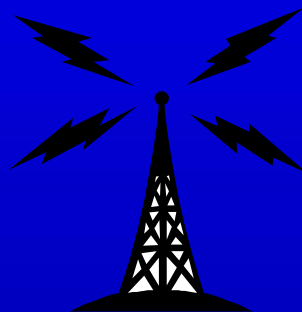


What Is Radiation?

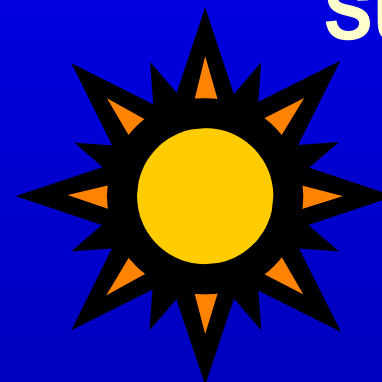


Nuclear

Radio/TV

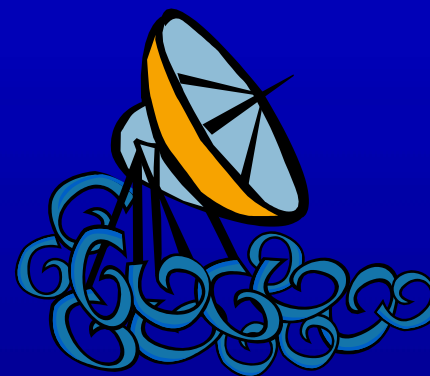


Sun



**Ligh
t**

Heat

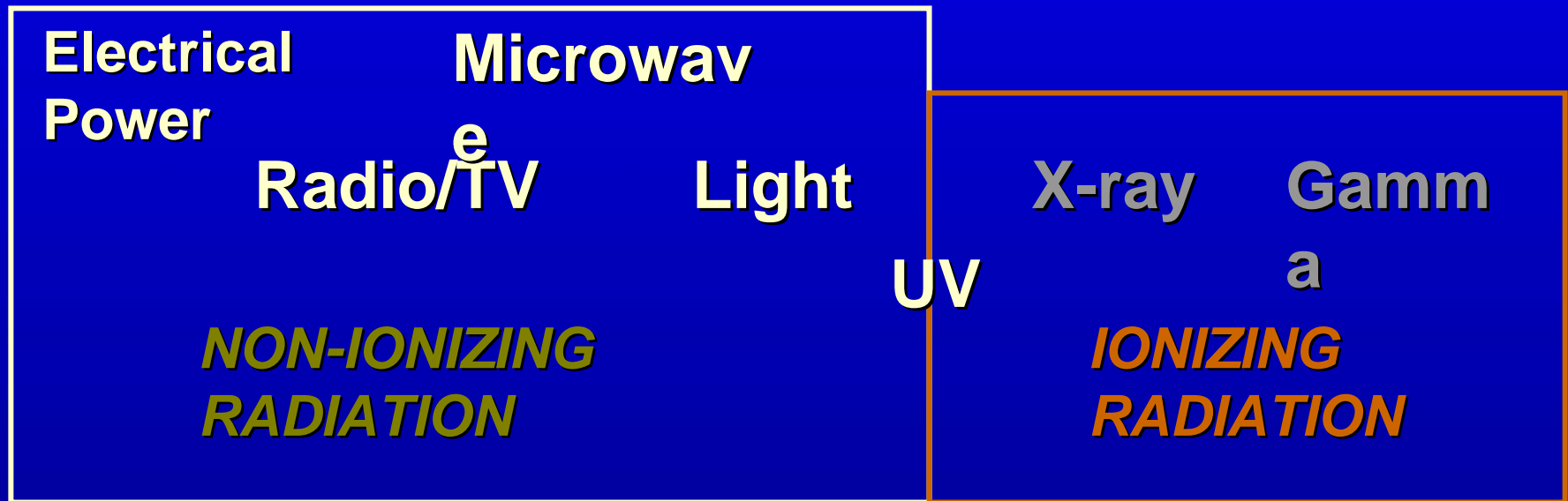


Microwave



Electromagnetic Spectrum

Energy



Frequency



Common Radioactive Nuclides or Isotopes

- Natural

e.g., ^{14}C , ^{40}K , ^{238}U

- Medical

e.g., $^{99\text{m}}\text{Tc}$, ^{131}I , ^{201}Tl ,

- Fallout

e.g., ^{60}Co , Cs-137, ^{239}Pu



Radiation Measurement

- Absorbed dose

Energy absorbed per unit mass of tissue

Rad (USA) or **Gray** (international)

1 Gray (Gy) = 100 rads

- Biologically effective dose

Risk of suffering from health effects following exposure to radiation

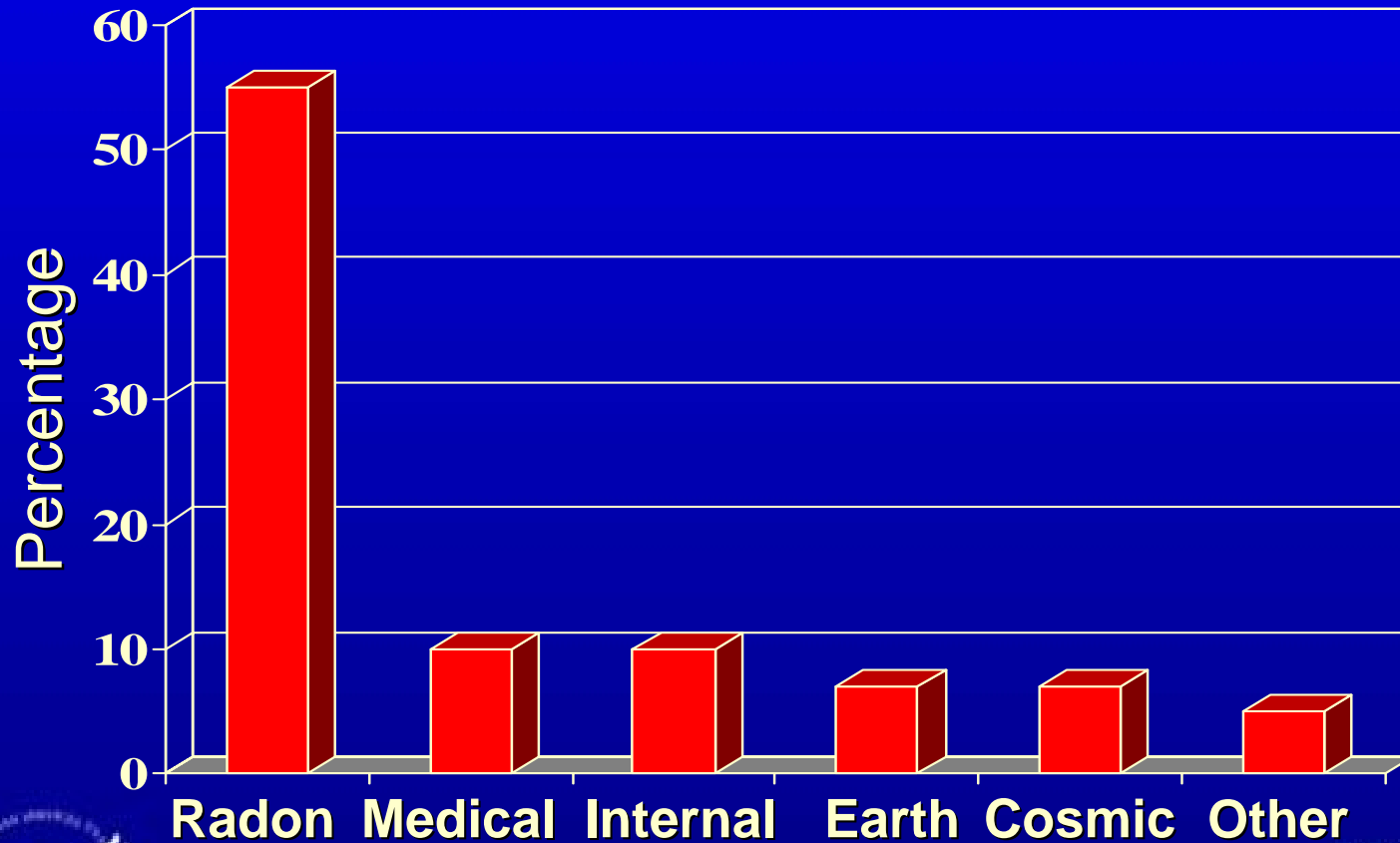
rem (USA) or **Sievert** (International)

1 Sievert (Sv) = 100 rem



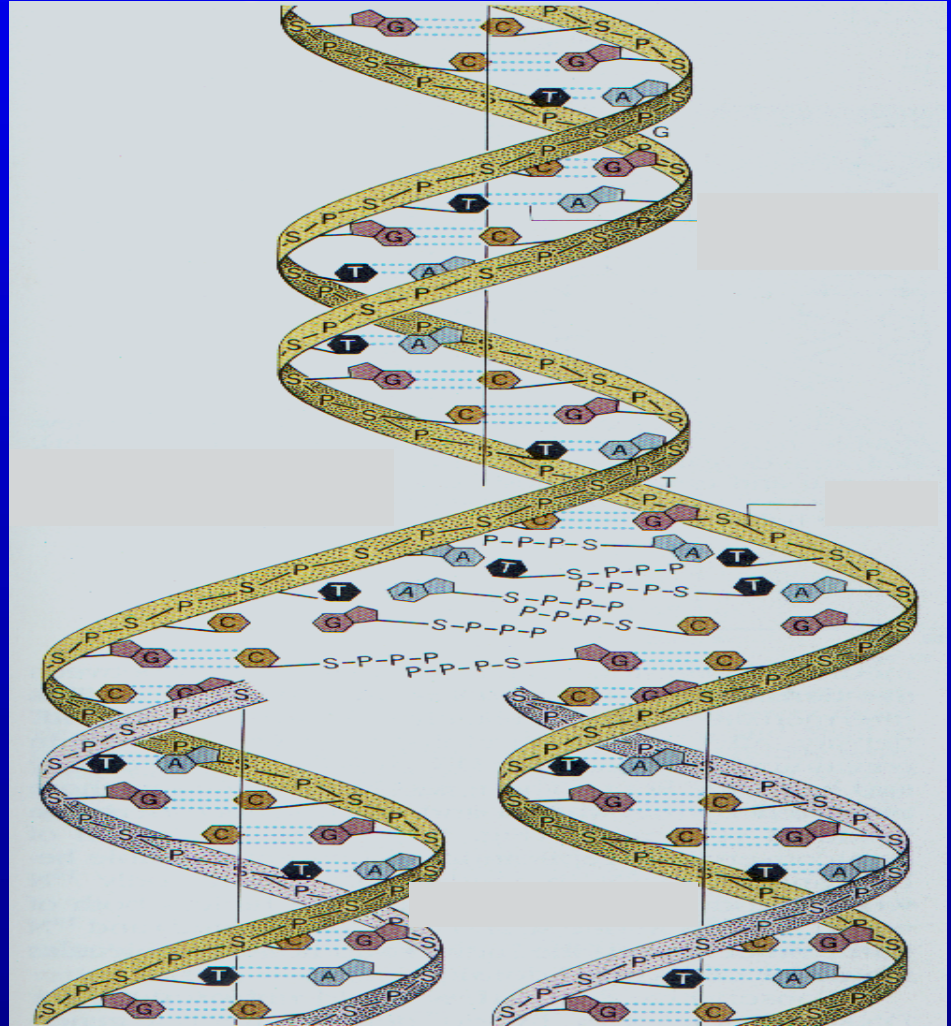
Annual Radiation Dose

0.35 rem/year average dose



Basic Mechanism

DNA is the primary target for biological effects



Health Effects of Radiation Exposure

- Lethal at high doses
- Mutagenic
- Carcinogenic
- Other biological effects, especially at high doses



Acute Effects of Radiation Exposure

- 100-400 rem Nausea and vomiting, fatigue, loss of appetite, malaise; recovery likely within 3 months
- 400-600 rem: All of the above, plus diarrhea, fever, hemorrhage, inflammation of mouth/throat, emaciation;
50% of those exposed will die



Late Effects of Radiation Exposure

- Radiation can transform cells, leading to:
 - Late effects, primarily cancer
 - Years (decades) may pass between exposure and the effect
- Health effects highly influenced by variety of factors
 - radiation type
 - age and gender person exposed
 - organ or tissue irradiated



Time: *Decrease time spent near the radioactive source*

Distance: *Increase distance between you and the source*

Shielding: *Increase the physical shielding between you and the source*



Common Shelters

Structure	Dose Reduction Factors
Wood Frame (1 st floor)	10%
Wood Frame (Basement)	40%
Masonry	40%
Large building	80%

From the Environmental Protection Agency's Manual of Protective Action Guides and Protective Actions for Nuclear Incidents, Appendix C

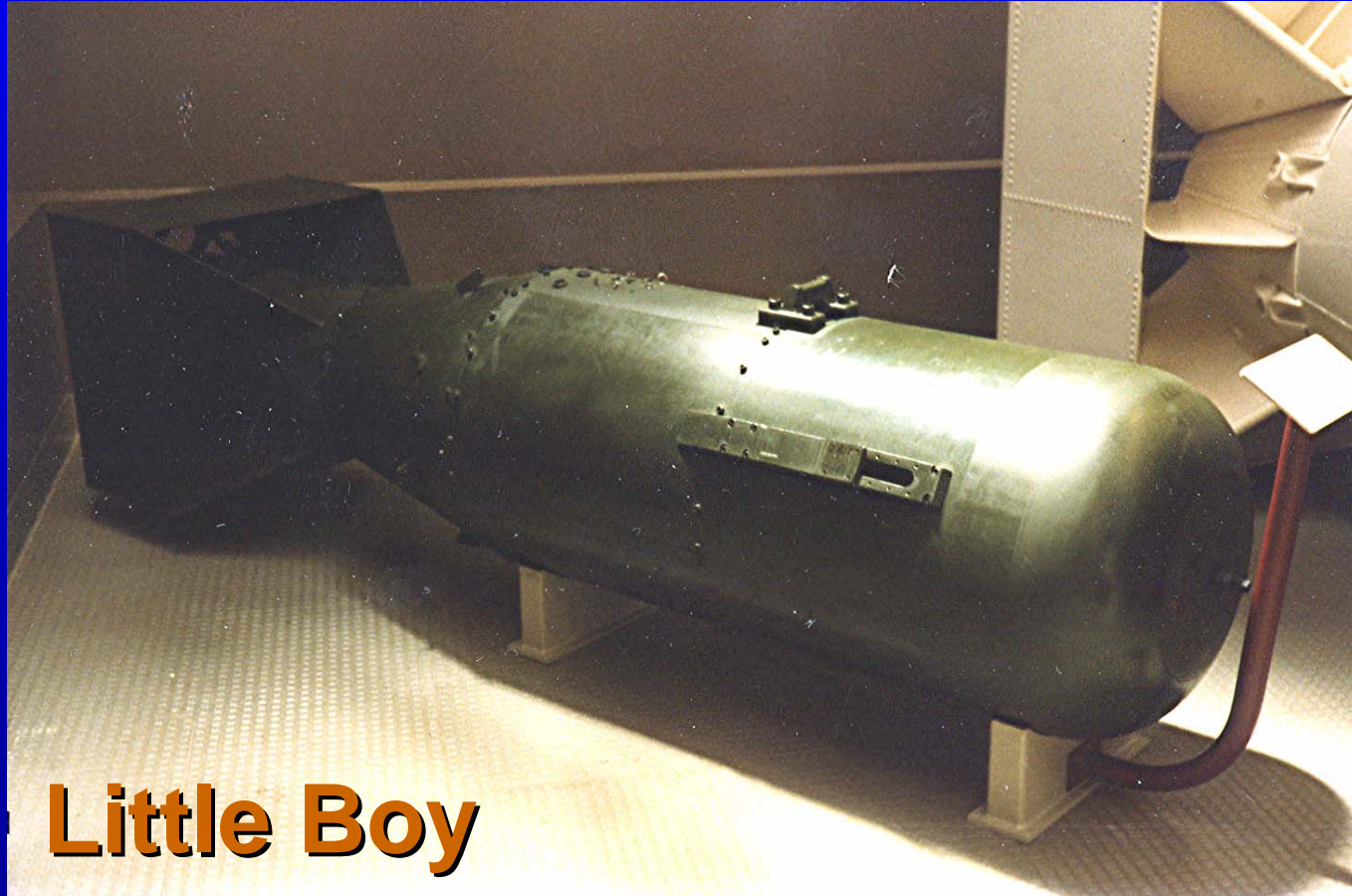


Potential Terrorist Scenarios

- Radiological
 - Radiological dispersion device; e.g., “dirty bomb”
 - Malicious use of radioactive substances
- Nuclear
 - Attack on nuclear facility
 - Nuclear weapon
 - Improvised nuclear device (IND)



Improvised Nuclear Device



Little Boy



Mass Radiological Casualties

**“For an improvised nuclear device
>100,000 patients could require
evaluation and treatment.”**

**Department of Homeland Security Working Group on
Radiological Dispersal Device (RDD) Preparedness, Medical
Preparedness and Response Sub-Group Report (May, 2003)**



Radioactive Sources

- 157,000 licensed users in U.S.
- 2,000,000 devices containing radioactive sources
- Approximately 400 sources lost or stolen in U.S. every year



Sources Around the World



**Recovered
transport container**



**Sources used in mobile cesium
irradiators in the former Soviet Union**



*Photos courtesy of the International
Atomic Energy Agency (IAEA)*

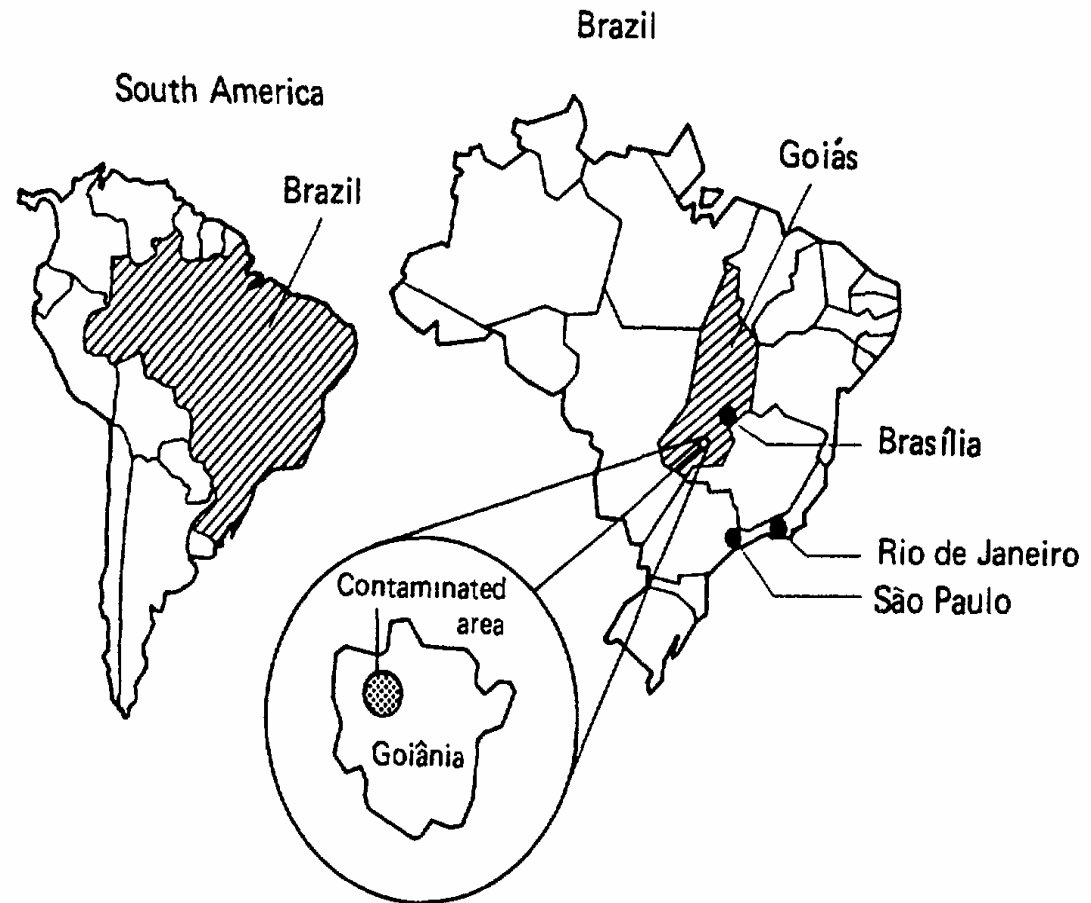


Goiânia, Brazil

The Radiological Accident in Goiânia



INTERNATIONAL ATOMIC ENERGY AGENCY, VIENNA, 1988



Goiânia Radiological Release

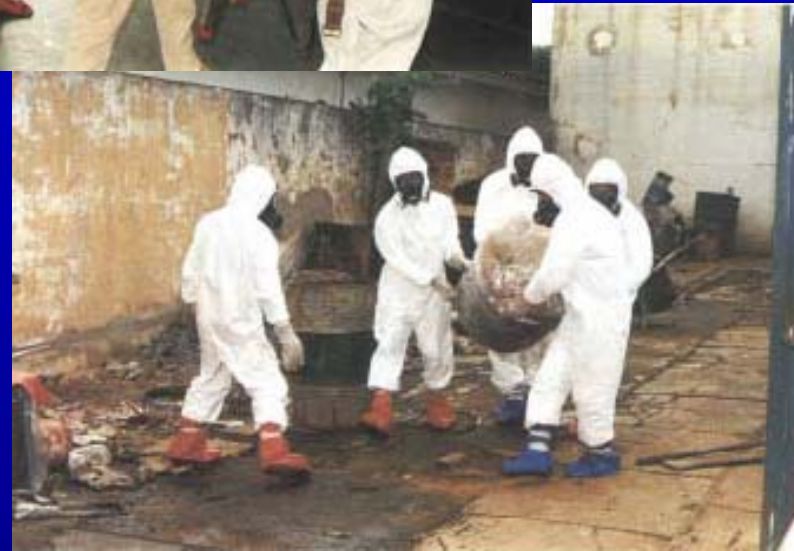


*Photos courtesy of the International
Atomic Energy Agency (IAEA)*



Goiânia Morbidity

- 249 exposed; 54 hospitalized
- Eight with radiation sickness
- Four people died
- 112,000 people monitored (>10% of total population)



Photos courtesy of the International Atomic Energy Agency (IAEA)



The Role of CDC in a Nuclear or Radiological Terrorist Incident



All Emergencies Are Local

Terrorist Attack

Local Public Health Response Organizations

State Public Health Response Organizations

Federal Public Health Response Organizations



National Response Plan

9230.1-PL
Supersedes FEMA 229
(April 1999)

~~FEDERAL
RESPONSE
PLAN~~

~~INTERIM~~

JANUARY 2005

National Response Plan

December 2004



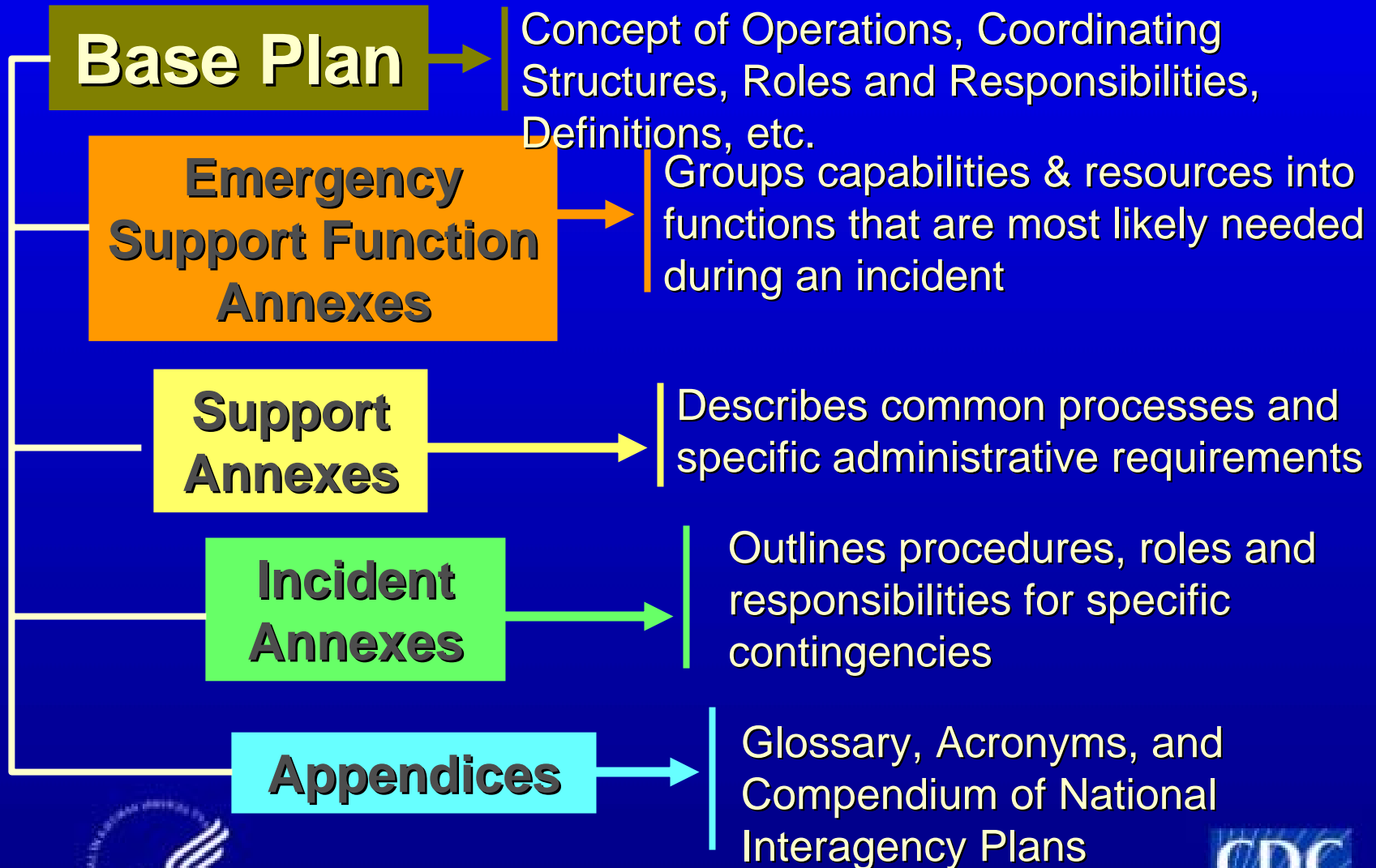
Homeland
Security



www.dhs.gov



NRP Structure



Emergency Support Function #8

- HHS is Coordinating Agency
- CDC is tasked with:
 - Health surveillance
 - Worker health and safety
 - Public health information
 - Vector control
 - All hazard public health and medical consultation, technical assistance, and support



Nuclear/Radiological Incident Annex

- Department of Homeland Security coordinates the Federal response to radiological Incidents of National Significance
- Department of Justice has lead responsibility for criminal investigations
- Coordinating Agency is determined by the type of emergency
- **HHS is a Cooperating Agency**



HHS Responsibilities

- Inspect production, processing, storage, and distribution facilities for human food and animal feeds
- Collect samples of agricultural products to monitor and assess the extent of contamination
- Provide advice on proper medical treatment
- Provide advice and guidance in assessing the impact of the effects of radiological incidents



CDC Responsibilities

- Manage long-term public monitoring, collecting and processing blood samples, bodily fluids/matter samples, and advice concerning medical assessment and triage of victims
- Track victims' treatments and long-term health effects
- Provide assessment and treatment teams for those exposed to radiation, or contaminated with radioactive materials



Focus Group Research from the Associated Schools of Public Health

**“I haven’t heard that I am involved
and I don’t want to be involved.”**

**“Right now, the lab has no plans,
and is not directly involved. We are
more involved if there is a biological
attack.”**



Preparing to Respond

- Partner with other state and local agencies
- Identify team roles and people to fill these
- Determine public health roles in incident command structure
- Develop communications messages



Preparing to Respond

- Determine responsibilities of state partners and establish contact information
- Develop a list of resources
 - Web sites
 - Local fire departments
 - EPA regional offices
 - HAZMAT teams
 - Local nuclear medicine staff
 - Radioactive materials licensees
 - State Radiation Control Program Director



Requesting Federal Assistance

- Governor can request federal assistance when state resources and capabilities are overwhelmed
- Federal officials will provide assistance and recommendations
- Local public health will still have responsibilities



Local Government Responsibilities

- Local Chief Executive Officer (i.e., mayor, city or county manager)
 - Coordinates local resources
 - Suspends local laws or ordinances
 - Communicates with the public
- Tribal Chief Executive Officer
 - All of the above
 - May communicate directly with federal officials



State and Local Public Health Response

- Monitor workers' health and safety
- Assure safe shelters and healthy food and water supplies
- Coordinate sampling and laboratory analysis of samples



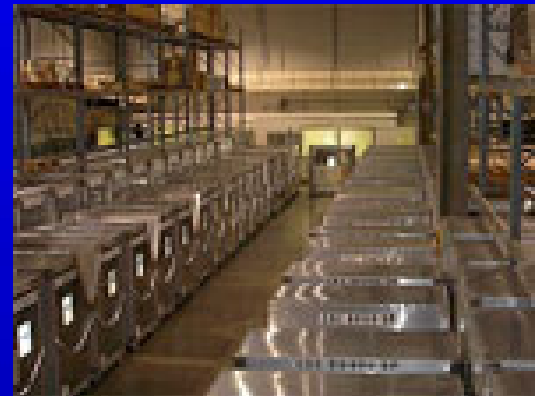
State and Local Public Health Response

- Field investigations and monitoring of people
- Criteria for entry and operations at the incident site
- Disease control and prevention measures



Medical Support

- Evaluate health and medical impacts on the public and emergency personnel
- Develop medical intervention recommendations
- Treat impacted citizens
- Request Strategic National Stockpile (formerly National Pharmaceutical Stockpile)



Protective Action Guides

- Sheltering
- Evacuation
- Relocation
- Decontamination
- Worker PPE



Protective Actions

- If you are inside, shelter in place
 - Stay indoors
 - Turn off ventilation systems
 - Close and lock windows and doors
- If you are outside,
 - Cover your nose and mouth with a cloth
 - Leave the area and go inside



Protective Actions

- If you think you may be contaminated,
 - Remove outer layer of clothing and seal it in a plastic bag
 - Shower or wash your hands and face
- Listen for further instructions
- Seek medical attention only for severe injuries



Long-term Response Issues

- Application of EPA and FDA Protective Action Guides
 - Food and water
 - Non-food use of agricultural products
 - Recovery operations
- Develop plans for decontamination, re-entry, and recovery of affected areas



Long-term Response Issues

- Surveillance and epidemiological studies
- Establish exposure registry and monitor long-term impacts
- Provide information to public and responders on long-term health effects



More Information

- CDC Radiation Emergencies
www.bt.cdc.gov/radiation
- Department of Homeland Security
www.dhs.gov
- Environmental Protection Agency
www.epa.gov/radiation
- Nuclear Regulatory Commission
www.nrc.gov/what-we-do/radiation.html

