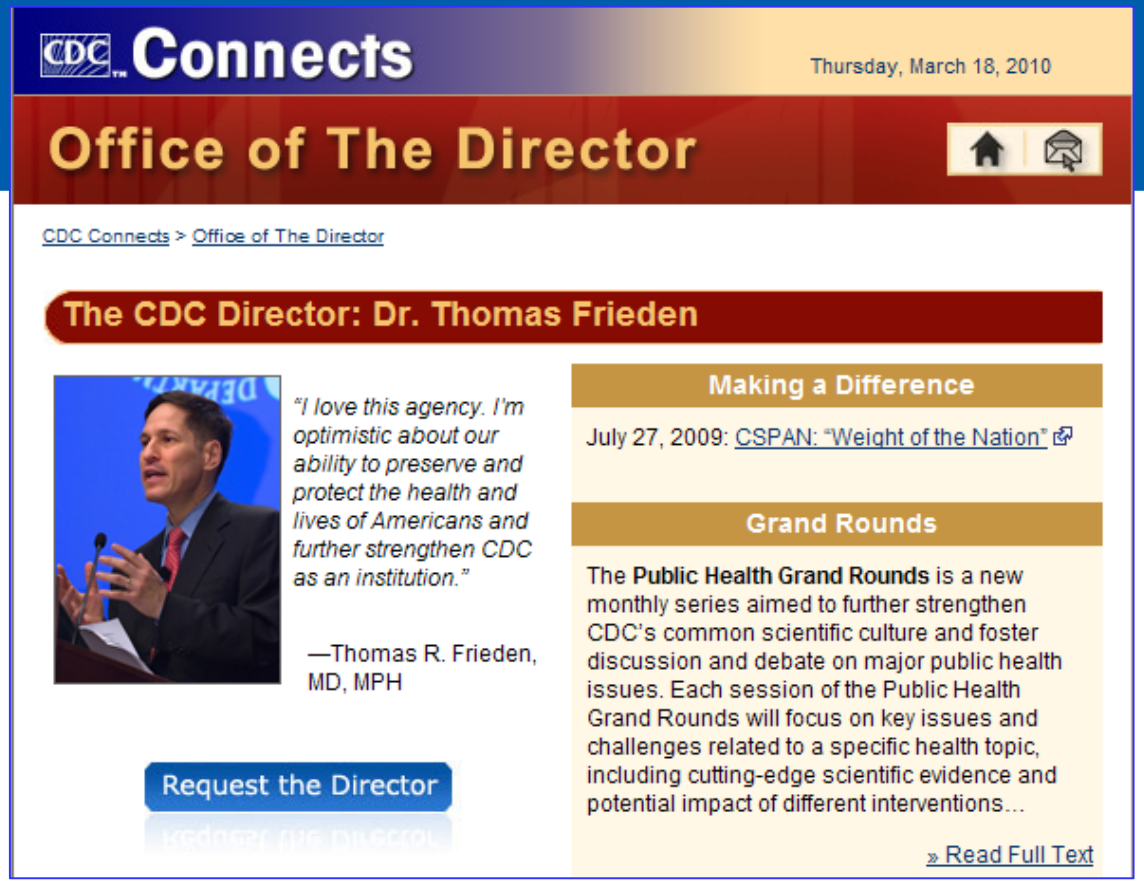
PUBLIC HEALTH GRAND ROUNDS

Office of the Director

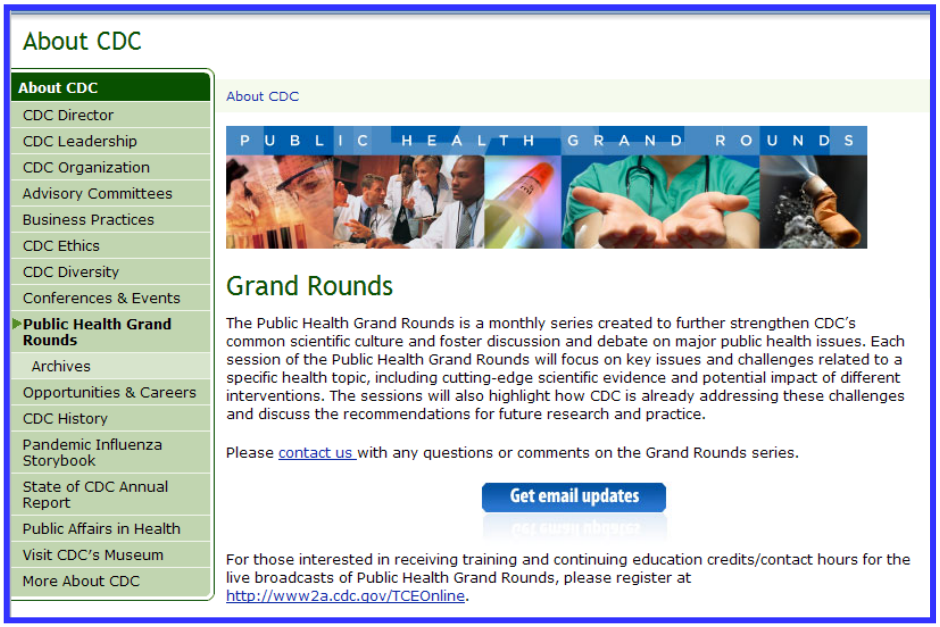
March 18, 2010

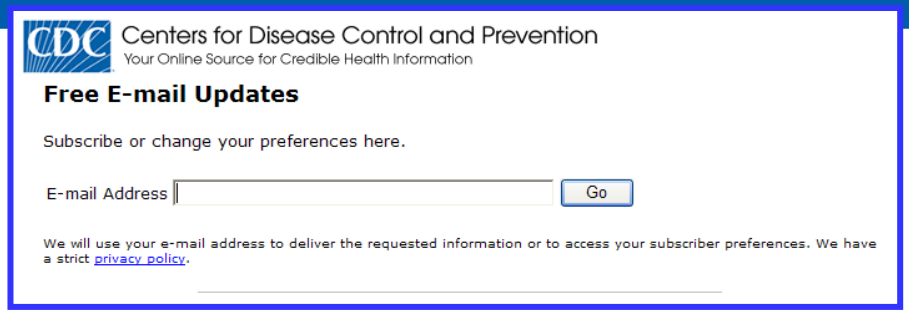


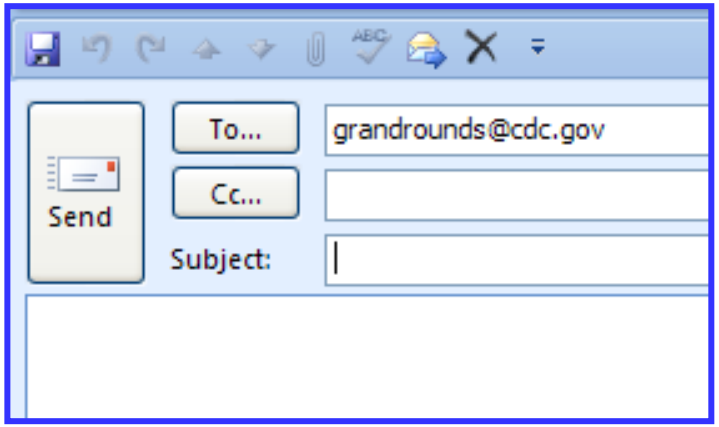
Available on IPTV : http://intra-apps.cdc.gov/itso/iptv/iptvschedule.asp

IPTV link also available on Grand Rounds intranet site:

http://intranet.cdc.gov/od/odweb/about/directorGrandRounds.htm







For those outside of CDC, a broadband link is available at:
http://www.cdc.gov/about/grand-rounds (Grand Rounds **internet** site)

About CDC

Grand Rounds Archives

2010

February

Every year, approximately 300,000 children around the world are born with neural tube defects (NTD), a failure of closure of the neural tube either in the cranial region or along the spine that result in anencephaly and spina bifida respectively. Infants born with anencephaly usually die within a few days of birth, and those with spina bifida typically live with various life-long disabilities and often experience mobility limitations. (Read more)

January

The polio crisis of the early 20th century has been largely forgotten in the U.S. due to the creation of the Salk vaccine and the effective immunization campaigns of the 1950s. Unfortunately, the wild poliovirus (WPV) still remains a real public health threat in many corners of the world. (Read more)

2009

December

On Thursday, December 17, CDC's National Center for Zoonotic, Vector-Borne, and Enteric Diseases (NCZVED) presented the fourth Public Grand Rounds session entitled "Foodborne Diseases: Better Prevention with Better Public Health Information." (Read more)

November

On Wednesday, November 18, CDC's Office of Smoking and Health presented the third session of Public Health Grand Rounds entitled "The Public Health Impact of Tobacco Product and Advertising Regulation." (Read more)

October

On Thursday, October 15, Dr. Frieden introduced the second session of the Public Health Grand Rounds entitled "Eliminating HAIs: A Primer", a presentation on healthcare-associated infections presented by Chesley Richards, MD, Deputy Director DHQP. (Read more)

September

On Thursday, September 17, Dr. Frieden kicked off the first session of the Public Health Grand Rounds entitled "Getting to Zero Traffic-related Deaths", a presentation on motor vehicle safety sponsored by the Division of Unintentional Injury Prevention (DUIP), National Center for Injury Prevention and Control (NCIPC). (Read more)

February, 2010

"Folic Acid in the Prevention of Birth Defects"

Thursday, February 18, 2010
9:00 a.m. – 10:15 a.m. E.S.T.

- Video (283mb, total time: 1:07:35)
- PDF version of the PowerPoint presentation (5mb, 85 pages)

March, 2010:

"Radiological and Nuclear Disaster Preparedness"

Thursday, March 18, 2010
9:00 a.m. – 10:15 a.m. E.S.T.

Presented by:
Dr. Charles W. Miller, Chief, Radiation Studies Branch, National Center for Environmental Health | Dr. Robert L. Jones, Chief, Inorganic and Radiation Analytical Toxicology Branch, National Center for Environmental Health

Focused Discussion led by:
RADM Scott Deitchman, Associate Director for Emergency Response, National Center for Environmental Health and Agency for Toxic Substances and Disease Registry | **Discussants:** Dr. John Halpin, Medical Officer, Emergency Preparedness and Response Office National Institute for Occupational Safety and Health | Dr. Katherine Uraneck, Senior Medical Coordinator, Healthcare Emergency Preparedness Program, New York City Department of Health and Mental Hygiene | Dr. Daniel M. Sosin, Captain, U.S. Public Health Service, Acting Director, Office of Public Health Preparedness and Response

Facilitated by:
Dr. Tanja Popovic, Scientific Director, Public Health Grand Rounds

Live video will be available at the time of the event:

- Broadband: http://cdc.wl.miisolutions.net/live/cdc/6
- Dial-up or slower connection: http://cdc.wl.miisolutions.net/live/cdc/7

Useful Resources for Radiological/Nuclear Planning, Training, and Response

- **CDC**
  - Radiation Emergencies http://www.bt.cdc.gov/radiation/
- **REAC/TS**
  - Guidance for Radiation Accident Management http://orise.orau.gov/reacts/guide/index.htm
- **DHHS**
  - Radiation Event Medial Management http://www.remm.nlm.gov/
  - Strategic National Stockpile http://www.remm.nlm.gov/sns.htm
- **CRCPD**
  - Radiological Dispersal Device First Responder's Guide http://www.crcpd.org/RDD.htm
- **National Council on Radiation Protection (NCRP)**
  - Commentary No. 19 Key Elements of Preparing for Emergency Responders for Nuclear and Radiological Terrorism http://www.ncrppublications.org/index.cfm?fm=Product.AddToCart&pid=9004494622
- **New York City Department of Health and Mental Hygiene**
  - Healthcare Emergency Radiation Preparedness Focus Area http://www.nyc.gov/html/doh/html/bhpp/bhpp-focus-rad.shtml

Continuing Education Credits

As of January 2010

Credit Hours are available for:

- **Physicians (CME)**
- **Non-Physicians (CME)**
- **Nurses (CNE)**
- **Certified Health Education Specialists (CECH)**
- **Pharmacist (CPE)**
- **Other Professionals (CEU)**

ALL Continuing Education credits/contact hours for PHGR are issued online through the CDC/ATSDR Training & Continuing Education Online system, http://www2a.cdc.gov/TCEOnline.

CDC *Knowledge to Action Science Clips: March 8 - March 12, 2010*

Vol. 2, Issue: 11

Environmental Health - Radiation

The medical examiner/coroner's guide for contaminated deceased body management.
Hanzlick R, Nolte K, deJong J.
Am J Forensic Med Pathol. 2009 Dec;30(4):327-38.

The RABIT: a rapid automated biodosimetry tool for radiological triage.
Garty G, Chen Y, Salerno A, Turner H, Zhang J, Lyulko O, Bertucci A, et al.
Health Phys. 2010 Feb;98(2):209-17.

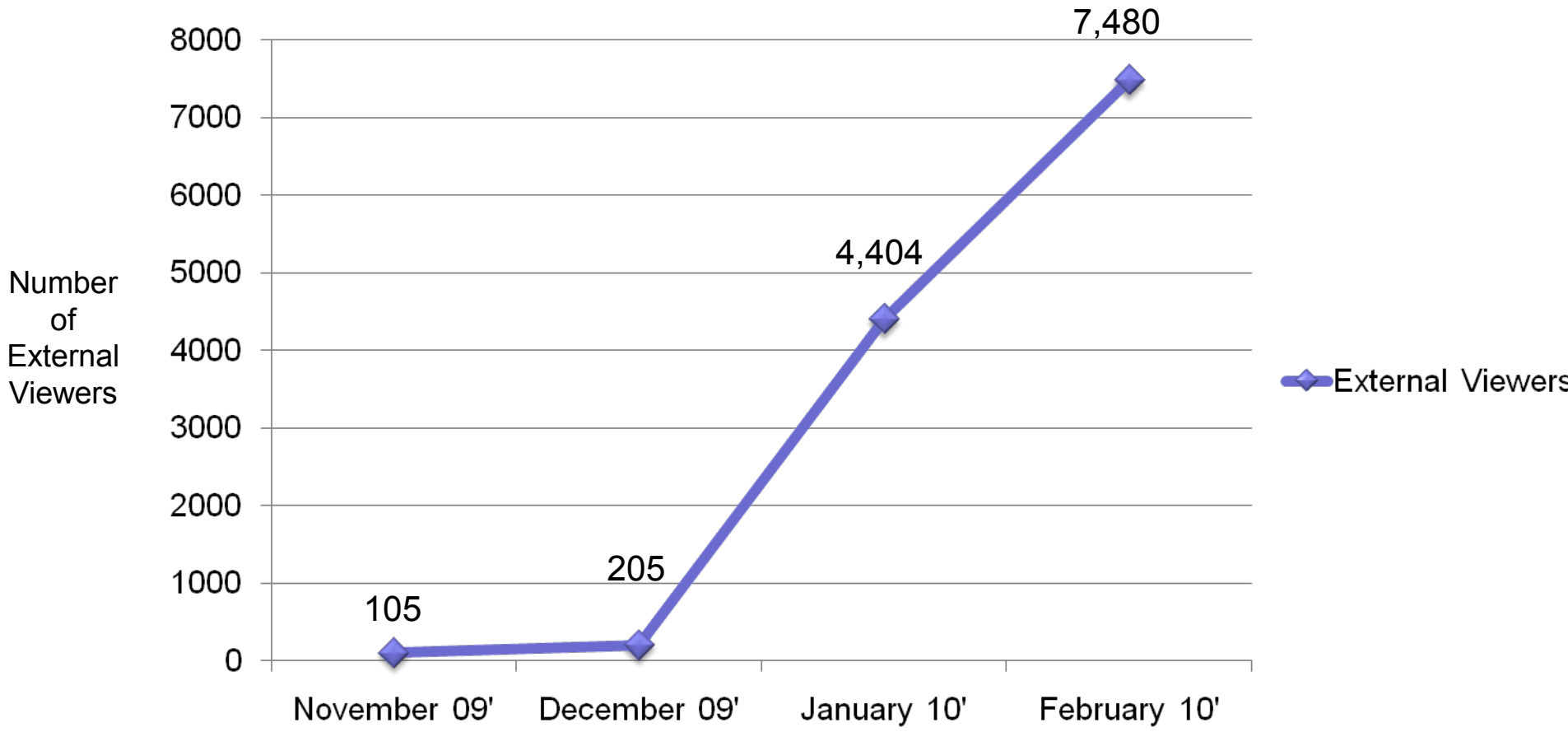
The view from the trenches: part 1-emergency medical response plans and the need for EPR screening.
Gougelet RM, Rea ME, Nicolalde RJ, Geiling JA, Swartz HM.
Health Phys. 2010 Feb;98(2):118-27.

Triage dose assessment for partial-body exposure: dicentric analysis.
Prasanna PG, Moroni M, Pellmar TC.
Health Phys. 2010 Feb;98(2):244-51.

A critical assessment of biodosimetry methods for large-scale incidents.
Swartz HM, Flood AB, Gougelet RM, Rea ME, Nicolalde RJ, Williams BB.
Health Phys. 2010 Feb;98(2):95-108.

Selection by Dr. Armin Ansari
Radiation Studies Branch,
Division of Environmental
Hazards and Health Effects,
NCEH

External Viewers of CDC Grand Rounds



PHGR January 21: Almost 5,000 Viewers!

PHGR February 18: 7,480 Viewers!

Stay Tuned

3RD THURSDAYS

Apr 15	Preventing Health Effects from Nanotechnology
May 20	Chlamydia Prevention and Control
June 17	Obesity

DEPARTMENT OF HEALTH & HUMAN SERVICES · USA

CDC
CENTERS FOR DISEASE CONTROL AND PREVENTION

PUBLIC HEALTH GRAND ROUNDS

Office of the Director

March 18, 2010

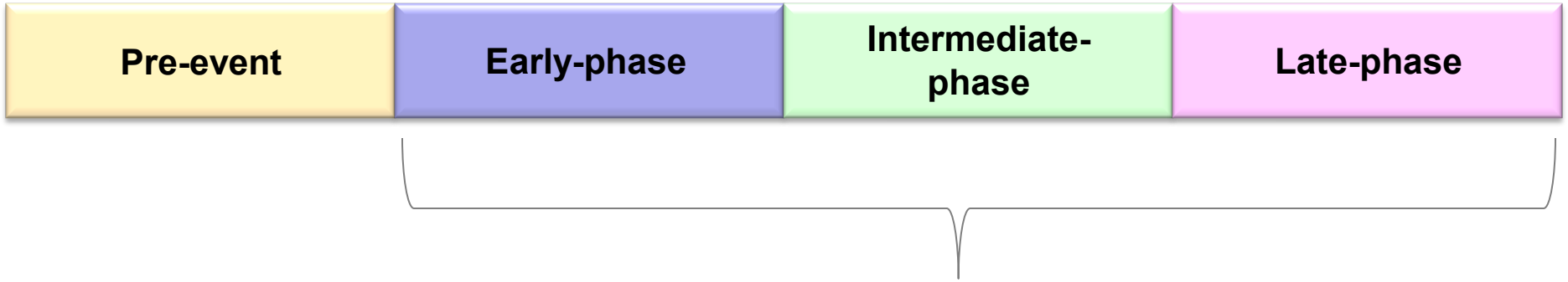
RADIOLOGICAL AND NUCLEAR DISASTER PREPAREDNESS

RADM Scott Deitchman, MD, MPH
Associate Director for Emergency Response
National Center for Environmental Health and
Agency for Toxic Substances and Disease Registry

Why is Radiation a Concern?

- **Loss/misuse of radiation sources**
- **Accident in radiation industry**
- **Terrorism threat – procurement and use of**
  - Radiological dispersal device (RDD)
  - Improvised nuclear device (IND)

Public Health Functions in Preparedness and Response to Radiological Incidents



- Early-phase: initial hours
- Intermediate phase: hours to days
- Late phase: days to months

Adapted from IOM, 2008, DHS, 2008, and RAND, 2009

Pre-event

- Identify pre-existing radiation sources/baseline
- Conduct training and exercises
- Coordinate with response partners

Pre-event	Early-phase	Intermediate-phase	Late-phase

Adapted from IOM, 2008, DHS, 2008, and RAND, 2009

Early-phase

- Monitor indicators of a release
- Identify likely areas of contamination
- Provide public guidance

Pre-event	**Early-phase**	Intermediate-phase	Late-phase

Adapted from IOM, 2008, DHS, 2008, and RAND, 2009

Intermediate-phase

- Identify agent and characterize contaminated area
- Assess victim decontamination and medical needs
- Conduct epidemiologic investigation
- Provide emergency laboratory support
- Establish victim registry
- Monitor shelter and mass care conditions
- Ensure food and water safety
- Monitor responder exposures and health

Pre-event	Early-phase	**Intermediate-phase**	Late-phase

Adapted from IOM, 2008, DHS, 2008, and RAND, 2009

Late-phase

- Manage contaminated fatalities
- Define re-occupancy criteria
- Decontaminate facilities and resources

Pre-event	Early-phase	Intermediate-phase	**Late-phase**

RADIOLOGICAL AND NUCLEAR DISASTER PREPAREDNESS

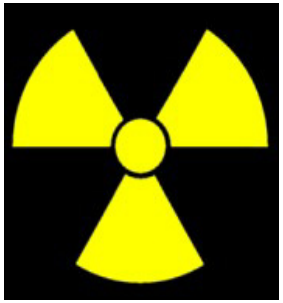
- **Katherine Uraneck, MD**
  - *State and Local Perspective*
- **Charles W. Miller, PhD**
  - *Challenges and Opportunities*
- **Robert Jones, PhD**
  - *Detecting and Identifying Radiation Exposures and Contamination*
- **John Halpin, MD, MPH**
  - *Worker Safety and Health Issues*
- **Daniel Sosin, MD, MPH, FACP**
  - *How Public Health Preparedness and Response Resources can Support Radiologic and Nuclear Preparedness*

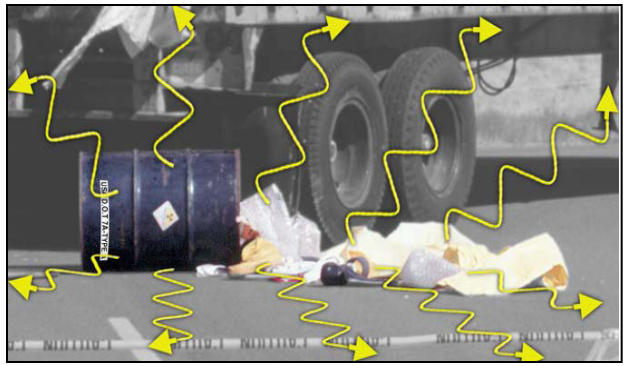
STATE AND LOCAL PERSPECTIVE

Katherine Uraneck, MD
Senior Medical Coordinator
Healthcare Emergency Preparedness Program
New York City Department of Health and Mental Hygiene

Why Should State and Local Health Agencies Plan for Radiation Incidents?

- **1 known terrorist incident involving radioactive materials**
  - Explosive Radiological Dispersal Device planted in Moscow park 1995
- **Radiation accidents, including transportation accidents, are rare but not uncommon**
- **All public health agencies, state, local, tribal and territorial are potential responders to a radiation incident**





2004 Industrial Radiography Malfunction at U.S. Postal Office Midtown Manhattan

- **29 August – Industrial radiographic equipment malfunctions at U.S. Post Office**
  - Occupants evacuated from building
  - Multiple streets closed
  - Multiple federal, state, and local agencies respond
- **30 August – Removal of source completed**
- **DOHMH response:**
  - Shielded source and areas in Post Office
  - Conducted extensive environmental surveys
  - Communicated to public and press
  - Canvassed area with > 2,000 fact sheets
  - Conducted dose estimates for employees of U.S. Postal Service, contractor, and public

2006 United Kingdom Polonium-210 Poisoning

- **2 November: Alexander Litvinenko has tea with "persons of interest" in London**
- **6 November: Litvinenko admitted to hospital**
- **23 November: Litvinenko dies**
- **Cause of illness: Radioactive Polonium-210**
- **738 tested in UK for internal contamination**

- **160 U.S. citizens identified and notified of potential contamination**
- **>20 U.S. state and local public health agencies involved**
  - Notification
  - Communication
  - Bioassay coordination

Potential Public Health Roles In a Radiological/Nuclear Emergency

- Identify ***radiological*** agent or cause
- Determine ***radiological exposure and contamination***
- Provide medical/public guidance ***radiological protective actions and medical management***
- Conduct environmental and human surveillance for potential ***radiological contamination or exposure***
- Conduct epidemiologic investigations, if needed
- Coordinate ***radiological*** sampling and laboratory testing
- Coordinate requests, receipt, and distribution of Strategic National Stockpile if needed
- Coordinate ***radiological monitoring/screening*** (environment and people)
- Mitigation and recovery

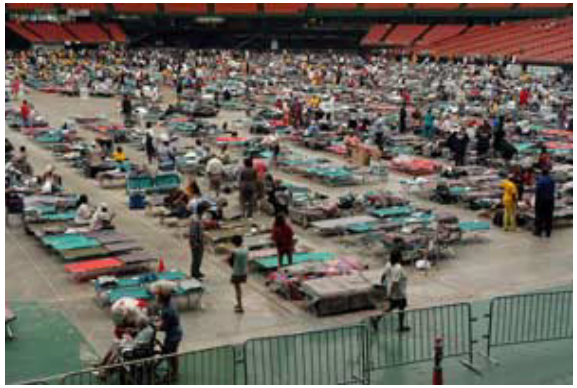
Pre-event	Early-phase	Intermediate-phase	Late-phase

State and Local Public Health Capability and Capacity to Respond to a Radiological/Nuclear Incident

- **Response capability and capacity varies across state and local jurisdictions**
  - States with nuclear power plants: 31 states
  - States with high risk metropolitan areas
- **Inconsistent integration of radiation control programs with public health agencies**
  - State radiation control programs reside in state public health agencies in 35 states
  - Radiation control/expertise is found elsewhere with state government in remaining 15 states

Challenges to Planning & Response for State, Local, Tribal, and Territorial Jurisdictions

- Lack of awareness public health responsibilities in radiological/nuclear emergencies
- Lack of funding
- Lack of subject matter expertise
- Lack of human resources for planning, exercises, and response



Meeting the Challenge: Finding Funding

- **Increase priority of radiological/nuclear planning**
- **Utilize multiple grant lines**
- **Participate in regional planning efforts**
- **Examples of funding sources**
  - **Department of Homeland Security**
    - ✓ Urban Areas Security Initiative Grants (UASI)
  - **CDC**
    - ✓ Public Health Preparedness Grants
  - **Department of Health and Human Services**
    - ✓ Office of the Assistant Secretary for Preparedness and Response (ASPR) – Health Preparedness Program
  - **Other**
    - ✓ Conference of Radiation Control Program Directors (CRCPD)

Example of Utilizing Multiple Funding Sources: NYC Radiation Equipment Detection Project

- **57 NYC hospitals provided with radiation detection equipment – UASI grant 2006-08**
  - Area radiation detectors
  - Survey meters and probes
  - Personal dosimeters
- **>900 Non-fire Department ambulances provided with dosimeters– UASI grant 2007**
- **~ 1000 EMS & hospital staff trained on radiation detection equipment – UASI & ASPR grants 2007-08**
- **Radiation Safety Officer Symposium on Radiological Terrorism – ASPR and CDC grants 2009**
- **17 NYC hospitals to drill radiation detection –UASI grant 2010**

Meeting the Challenge: Finding Subject Matter Expertise

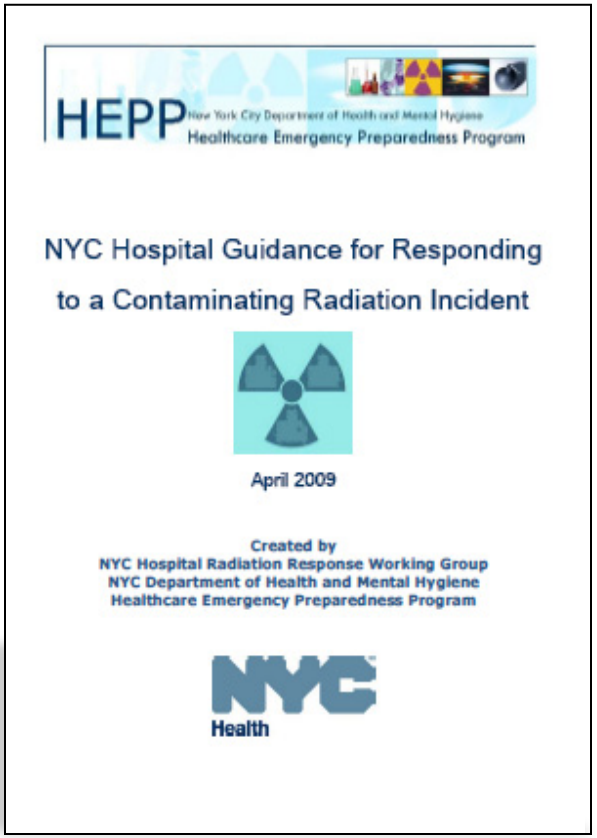
- **Identify and partner with federal agencies and state organizations**
  - Centers for Disease Control and Prevention (CDC)
  - U.S. Department of Energy (DOE)
  - U.S. Environmental Protection Agency (EPA)
  - State radiation control programs
  - Conference of Radiation Control Program Directors (CRCPD)
  - Radiation Emergency Assistance Center/Training Site (REAC/TS)
- **Identify and partner with state and local experts**
  - Nuclear power plant safety and response personnel
  - University and research radiation safety personnel
  - Hospital radiation safety and nuclear medicine personnel
  - State and local chapters of professional radiation safety organizations

Example of Partnering: NYC Radiation Materials Security Audits

- **2005: Nuclear Regulatory Commission issues Increased Controls Regulations**
- **2006: NYC DOHMH partners with non-regulatory agencies to conduct security audits of 32 hospitals**
  - New York Police Department (NYPD)
  - Private and public hospitals
  - Department of Energy (DOE) Brookhaven National Laboratories
- **2009: 48 additional hospitals, research, and academic licensees audited**
- **Result: Best Practice Guidelines, Self-Audit Checklists, better inventory of radiological materials, better security at hospitals**

Meeting the Challenge: Augmenting Human Resources

- Hiring new staff may not be an option; hence current staff need to find expeditious methods for creating plans
- Utilize and modify plans and protocols created by federal, state, and other localities



Upcoming Conference on Radiological and Nuclear Emergency Preparedness

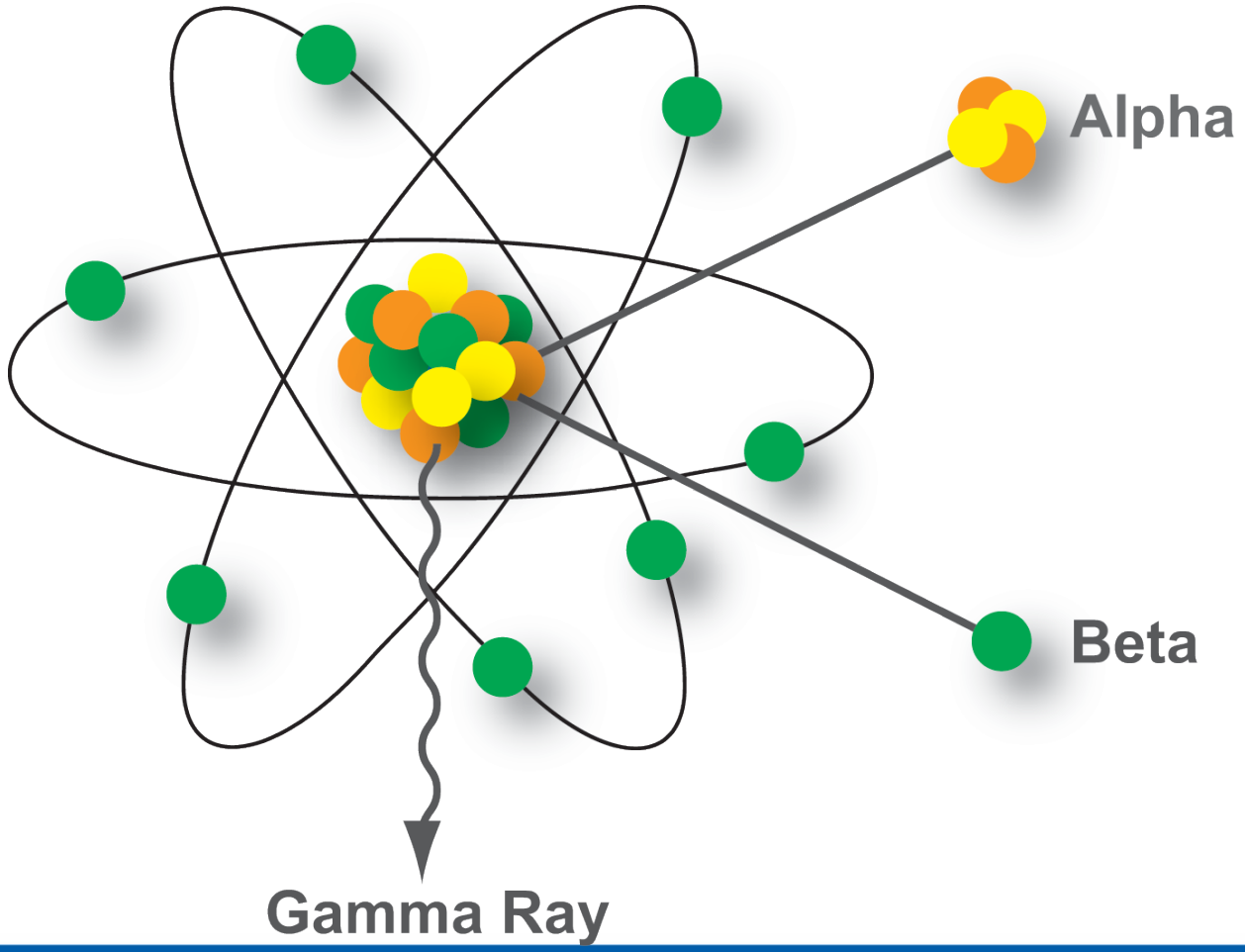
Spring 2011

- **Multi-day conference**
- **Optional radiation training to be offered**
- **Multiple tracts daily**
  - Medical response
  - Risk communication and training
  - Public health operations
- **Promising practices and past lessons to be shared**

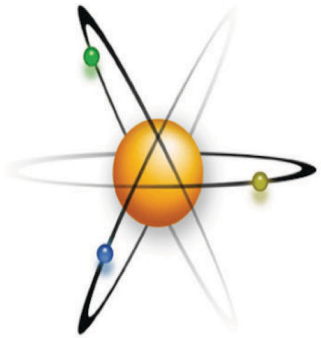
CHALLENGES AND OPPORTUNITIES

Charles W. Miller, PhD
Chief, Radiation Studies Branch
National Center for Environmental Health

What is Radiation?

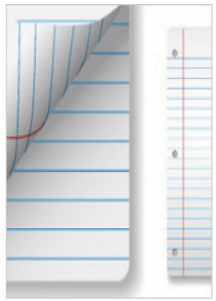


Penetration Abilities of Different Types of Radiation



Radiation

Alpha Particles
Stopped by a sheet of paper



Especially damaging to internal tissues if inhaled or swallowed

Beta Particles
Stopped by a layer of clothing or less than an inch of a substance (e.g. plastic)

Damaging to internal tissues if inhaled or swallowed and can cause external skin burns

Gamma Rays
Stopped by inches to feet of concrete
or less than an inch of lead

Damaging to tissues externally and internally

Contamination vs. Exposure

- **Exposure: coming in contact with radioactive waves or particles, e.g., having a chest x-ray**
- **Contamination: deposition of radioactive material in undesired locations**

A person can be exposed but not contaminated – think x-ray exams!

Health Effects of Radiation Exposure

- **In general, the amount and duration of radiation exposure affects the severity or type of health effect**
  - Lethal: in high doses
  - Mutagenic: damage to the genes
  - Carcinogenic

People on Earth Are Exposed to Radiation Every Day of Their Life

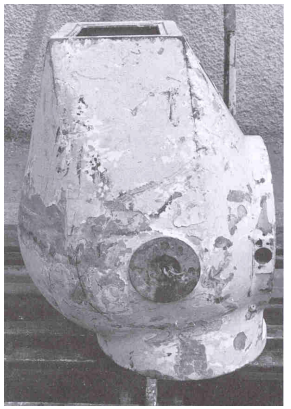
In 2006, the average person in the United States received an annual radiation dose of 6.2 milliSieverts

Source of Radiation	Percent Contribution to Total
Radon & thoron (Background)	37
Space (Background)	5
Internal body (Background)	5
Terrestrial (Background)	5
Medical procedures	48
Consumer products	2
Industrial releases	< 1
Occupational	< 1

Source: National Council on Radiation Protection and Measurements Report No. 160 (2009)

Radiological Dispersal Example
Goiânia, Brazil - September, 1987

- Source capsule removed from abandoned radiotherapy machine
- "Glowing" powder distributed to family and friends
- Six year-old girl ate sandwich with contaminated hands
- Physician diagnoses acute radiation sickness in exposed woman; "glowing" powder was Cesium-137



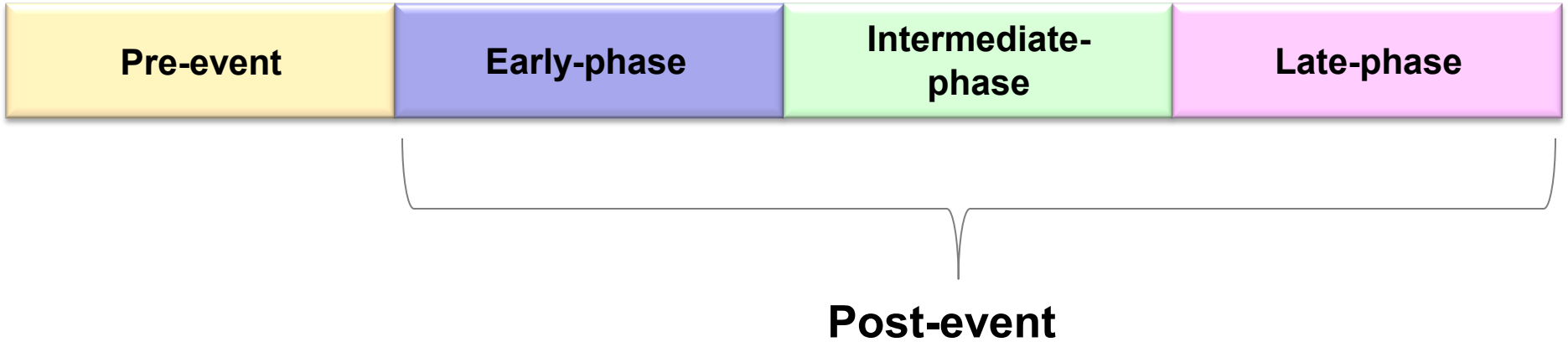
Nuclear Detonation
Example: Hiroshima, August 1945

- August 6, 1945 – 8:15 am
- Detonation height – 600 meters (2,000 ft)
- Blast yield equivalent to 15,000 tons of TNT
- 4.7 square miles (12 km^2) of the city were destroyed

Comparison of the Impact of the Goiânia and Hiroshima Events

People Affected	Goiânia 1987	Hiroshima 1945
Deaths	4	100,000
Treated	54 (46 given Prussian Blue)	37,000 injured 177,000 survivors
Contaminated	249	Unknown
Monitored (for contamination)	112,000 (took 3 months to complete)	None available

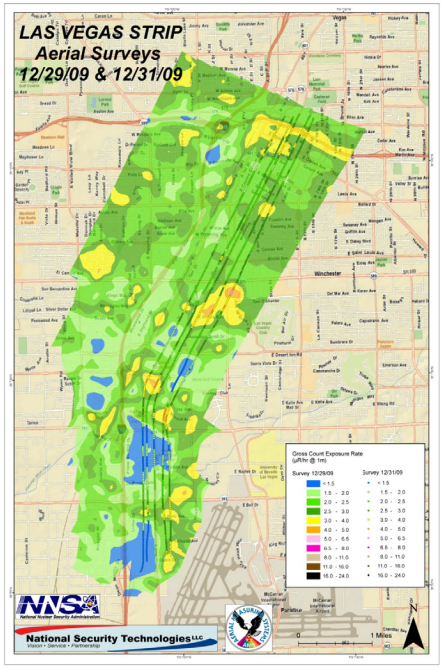
Public Health Functions in Preparedness and Response to Radiological Incidents



Adapted from IOM, 2008, DHS, 2008, and RAND, 2009

Pre-event

- **Pre-existing radiation sources (baseline) generally unknown**
  - Environmental **surveillance**: informs decisions during the event
  - Human **surveillance**: provides baseline urine concentrations



- **Training and realistic exercises lacking**
  - Increase awareness of public health roles/responsibilities
- **Coordination among partners minimal**
  - Form alliances between public health and radiation control programs

Source: Figure courtesy of the National Nuclear Security Administration

Early-phase

- **Communications**
- **Environmental characterization**
  - **Underuse of modeling resources**
    - Integrated Modeling and Atmospheric Assessment Center capabilities
    - Identify people and places likely to be contaminated
    - Drive protective actions
    - **Lawrence Livermore National Laboratory:** Any sheltering in the first few hours following a nuclear detonation in an urban environment can save on the order of 200,000 people from significant radiation exposure
  - **Environmental surveillance**

Intermediate-phase

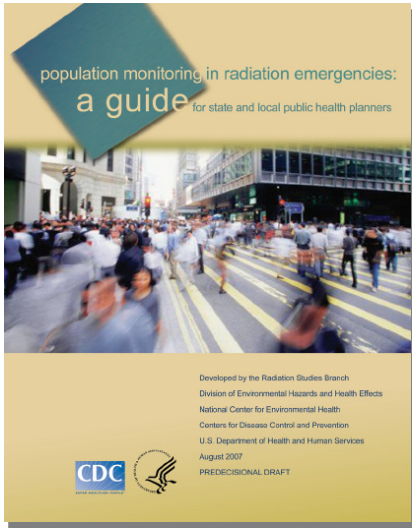
- Identify agent and characterize contaminated area
- Assess victim decontamination and medical needs
- Conduct epidemiologic investigation
- Provide emergency laboratory support
- Establish victim registry
- Monitor shelter and mass care conditions
- Ensure food and water safety
- Monitor responder exposures and health

} Population monitoring

Federal, State, and local public health authorities do not have capacity to perform epidemiologic, laboratory, and health physics functions related to <u>population monitoring</u> following a nuclear or radiological emergency

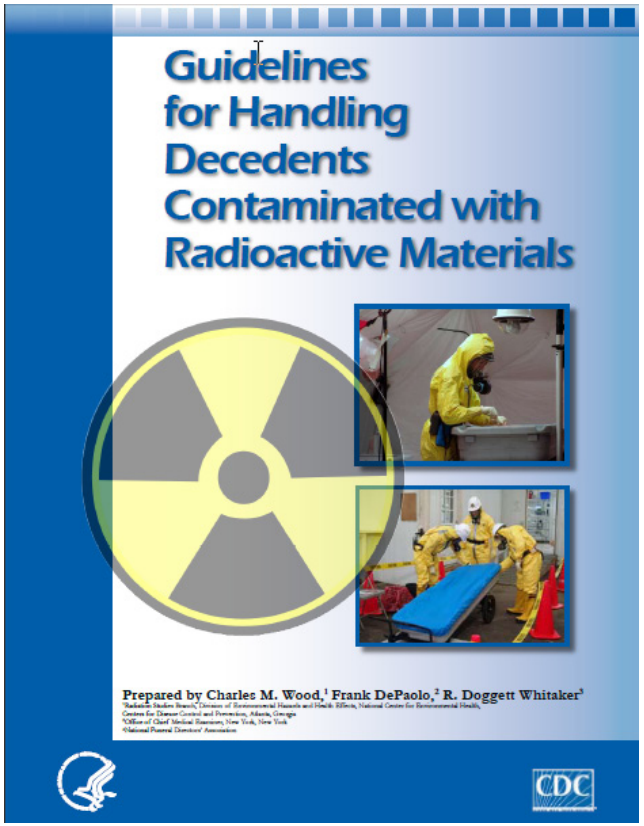
CDC's Addressing the Population Monitoring Challenge

- **Developed**
  - Guide for state and local public health planners
- **Developing**
  - Data collection and reporting tools for radiation-related epidemiologic investigations
  - Guidance for using hand-held instruments for emergency purposes
  - Innovative bioassay techniques for internal monitoring
- **Working with partners to expand the radiation workforce available to state and local agencies through the Medical Reserve Corps**



Late-phase

- **Gaps in**
  - Managing contaminated fatalities
  - Managing cleanup and recovery of impacted land and facilities
  - Defining re-occupancy criteria
- **Coordination required between numerous partners and stakeholders, including public health authorities**



Remedial Actions and Defining Re-occupancy Criteria

- **Issues to be addressed**
  - Types and levels of contamination present: chemical, biological, and/or radioactive
  - Intended use of the restored area: residential, school, industrial, tourism, etc.
  - Remedial action most cost effective and acceptable to the community
  - Acceptable level of residual radioactivity

Looking Forward

Hiroshima, 1945

Hiroshima, 2010

DETECTING AND IDENTIFYING RADIATION EXPOSURE AND CONTAMINATION

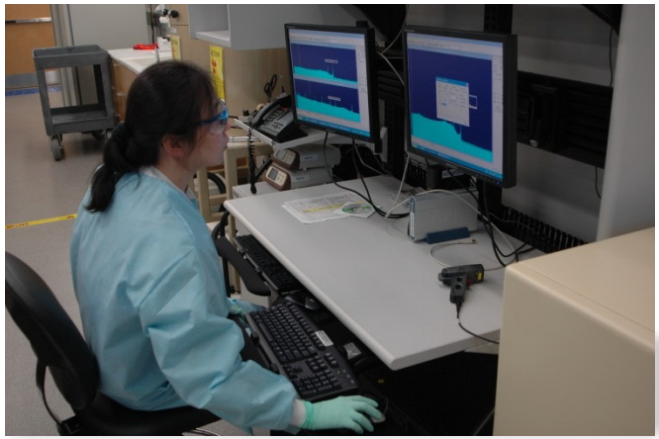
Robert L. Jones, PhD

Chief, Inorganic and Radiation Analytical Toxicology Branch

National Center for Environmental Health

DETECTING AND IDENTIFYING RADIATION EXPOSURE AND CONTAMINATION

- Assessment of exposure versus contamination
- Assessment of internal contamination
  - Radionuclide detection technologies
  - Importance of radionuclide testing
  - CDC's Urine Radionuclide Screen
  - CDC and state capabilities and needs



Assessment of Radiation Exposure and Contamination

Radiation Exposure **NO contamination** on clothes or body	External Radionuclide Contamination **ON** clothes or body	Internal Radionuclide Contamination **INSIDE** the body
Lymphocyte depletion **Chromosome analysis**	**Radiation meter**	**Urine bioassay** **Whole body counter** **Radiation meter**

Detection of Internal Radionuclide Contamination

Radionuclides	Urine bioassay detection	Primary radiation emission
Uranium (^{235}U, ^{238}U), Thorium	yes	alpha and beta particles
Strontium, Plutonium (^{238}Pu, ^{239}Pu)	yes	
Americium, Californium, Neptunium,	yes	
Phosphorus, Curium, Polonium	yes	
Cesium, Cobalt (^{57}Co, ^{60}Co), Radium	yes	Gamma rays
Iodine (^{125}I, ^{131}I), Technetium-99m	yes	
Selenium, Molybdenum, Iridium	yes	

Radionuclides of concern can be found at:
www-pub.iaea.org/MTCD/publications/PDF/Pub1309_web.pdf
www.energy.gov/media/RDDRPTF14MAYa.pdfc

CDC's Urine Radionuclide Screen

Step 1: Screen for the presence of any radionuclides

- Identifies presence of alpha, beta or gamma emitting radionuclides
- Results for the first 100 samples in 8 hours
- Throughput: alpha or beta - 250 samples/day, gamma - 3,000 samples/day

Step 2: Identify and quantify specific radionuclides

- Goal - 22 radionuclides (current capability – 7)
- Specific radionuclide assays:
- Throughput: 250 samples/day

Sample requirement: 70 mL of urine (spot sample). All methods CLIA certified.

CLIA, Clinical Laboratory Improvement Amendments

Why Rapid Urine Bioassay Is Important

- **Define baseline contamination**
- **Identify persons with post-event internal contamination**
  - Estimate radiation dose
  - Assist in short and long term medical care decisions
- **Identify contaminated versus non-contaminated persons**
  - Reduce the “stress” on the public health system
  - Provide psychological assurances to the un-exposed
- **Provide support to epidemiological investigations**

Laboratory Goals and Needs for Effective Response

CDC

- **Develop rapid CLIA-approved methods for 22 priority radionuclides, and increase sample throughput**

State and local

- **Establish Laboratory Response Network-Radiologic**
  - Participation: 10 or more state laboratories
  - Training and technology transfer
  - Performance evaluation

WORKER SAFETY AND HEALTH ISSUES

John Halpin, MD, MPH
Medical Officer
Emergency Preparedness and Response Office
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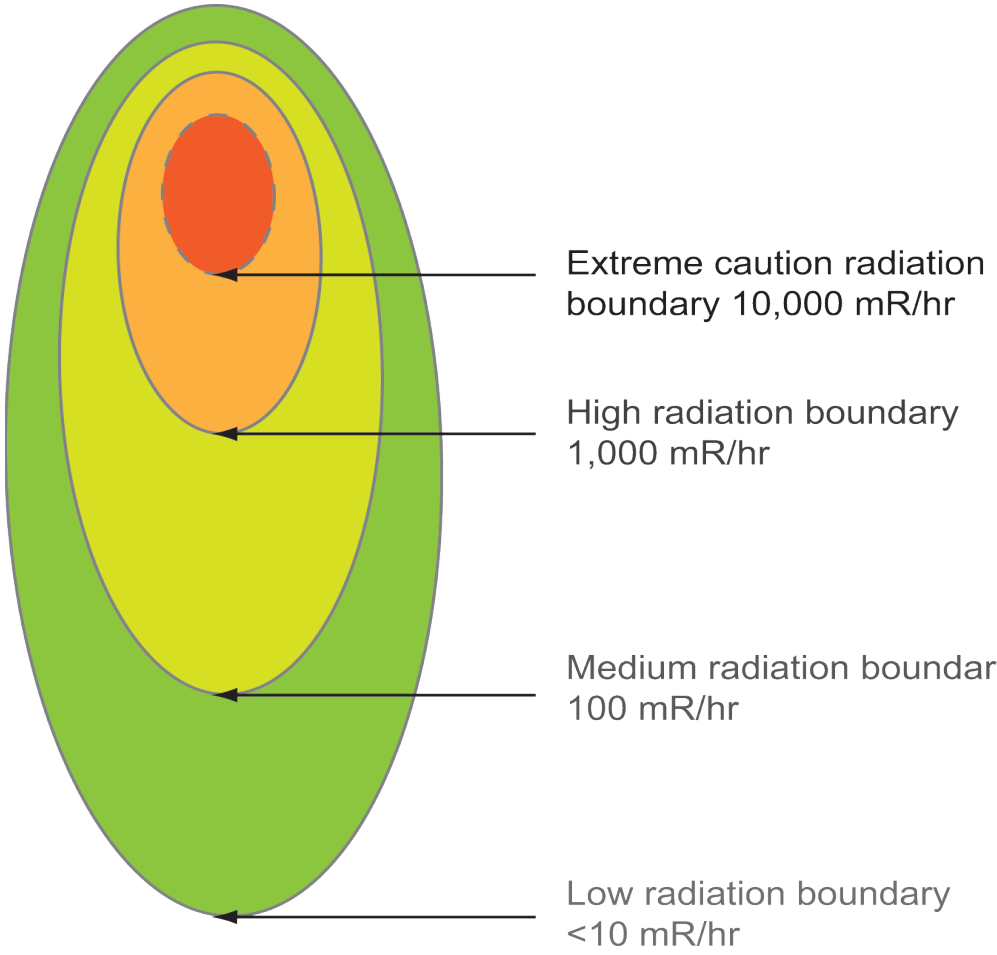
Education and Training

Workers should have a basic understanding of

- **Health risks**:
  Acute vs. long-term effects of exposure
- **Radiation protection**:
  Time, distance and shielding
- **Radiation response zones**:
  Restrict responder access



Radiation Monitoring Equipment

- Personal dosimetry
- Radiation survey meters

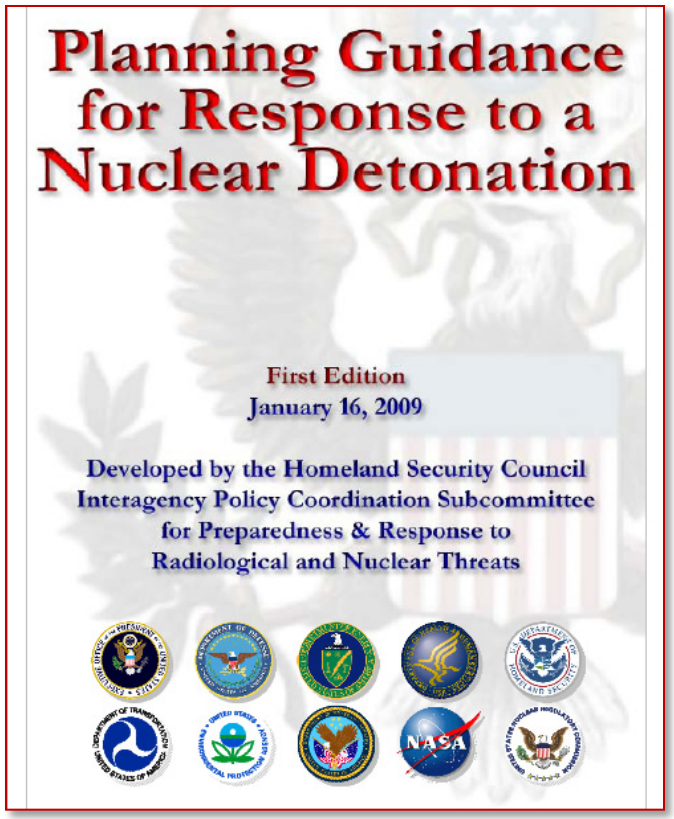
Radiation Exposure Limits

- **Safe response requires well defined limits for exposure to radiation**
  - OSHA: Sets occupational limit for radiation workers
    - 50 milliSievert/yr
    - Enforceable by law
  - Other organizations provide recommendations for emergency responders
    - EPA recommendation: 250 milliSievert total exposure
    - Balances risk of exposure with opportunity to perform life-saving activities

Personal Protective Equipment

- **Affords protection from**
  - Internal contamination: radioactive material entering the body via inhalation, ingestion, or open wounds
  - External contamination: radioactive dust deposited on ones body

Existing Guidance



HOW PUBLIC HEALTH PREPAREDNESS AND RESPONSE RESOURCES CAN SUPPORT RADIOLOGICAL AND NUCLEAR PREPAREDNESS

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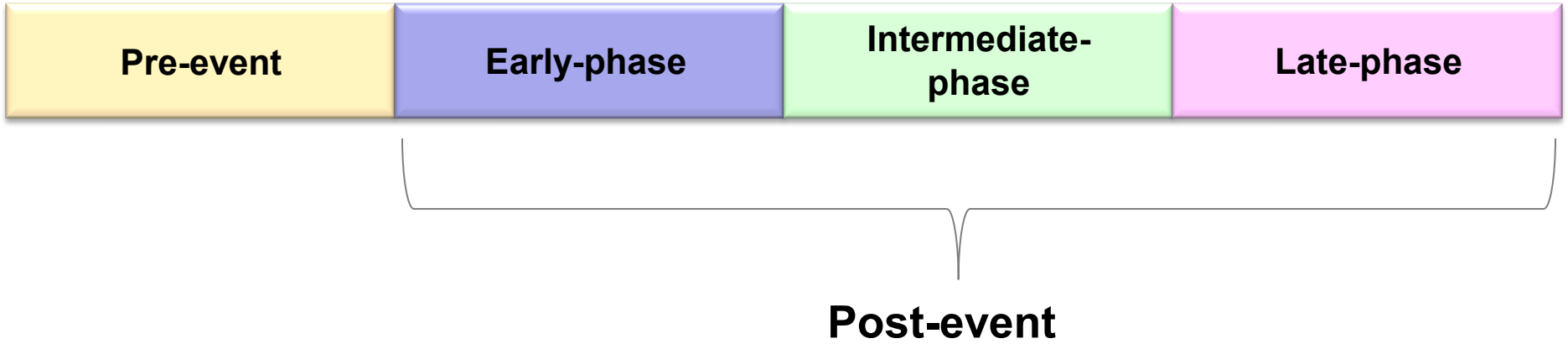
HOW PUBLIC HEALTH PREPAREDNESS AND RESPONSE RESOURCES CAN SUPPORT RADIOLOGICAL AND NUCLEAR PREPAREDNESS

- Support All-hazards Preparedness
- Focus on Public Health Strength
- Commit to Planning and Exercises



PUBLIC HEALTH GRAND ROUNDS

Office of the Director

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