Public Health Preparedness for Nuclear and Radiological Emergencies: What is New and What is Not

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Disclaimer

The findings and conclusions in this presentation are those of the author and do not necessarily represent the official position of the Centers for Disease Control and Prevention
Progression of Focus – Post WWII

Story based on report of Air Force General Henry H. Arnold to Secretary of War, Nov 1945

Life Magazine, November 19, 1945
Progression of Focus – Post TMI

The Nuclear Accident

Radiation Continues To Leak From Crippled Plant

Win big $$$ in new Post game

A-PLANT MISHAP LEAKS RADIATION

Contaminated steam escapes in Pa.
Progression of Focus – Post 9/11
Types of Nuclear/Radiological Emergencies

- Nuclear Emergencies
- Dirty Bomb or Radiological Dispersal Device (RDD)
- Radiological Exposure Device (RED)
- Nuclear Power Plant Accidents
- Transportation Accidents
- Occupational Accidents

https://emergency.cdc.gov/radiation/typesofemergencies.asp
## Trend in Regional and National Level Exercises (excluding NPP)

<table>
<thead>
<tr>
<th>Exercise</th>
<th>Year</th>
<th>Scenario</th>
</tr>
</thead>
<tbody>
<tr>
<td>TOPOFF 2</td>
<td>2003</td>
<td>RDD</td>
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<tr>
<td>Southern Crossing</td>
<td>2006</td>
<td>RDD</td>
</tr>
<tr>
<td>TOPOFF 4</td>
<td>2007</td>
<td>RDD</td>
</tr>
<tr>
<td>Empire ’09</td>
<td>2009</td>
<td>RDD</td>
</tr>
<tr>
<td>Liberty RadX</td>
<td>2010</td>
<td>RDD</td>
</tr>
<tr>
<td>Amber Waves</td>
<td>2012</td>
<td>RDD</td>
</tr>
<tr>
<td>Gotham Shield</td>
<td>2017</td>
<td>IND</td>
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The Science

- Health Effects of Exposure, Including Mental Health
- Assessment of Individual Exposures
- Medical Treatment
- Preparedness and Response Planning

Biodosimetry

Onset of Vomiting

Lymphocyte Depletion Kinetics

Dicentric Chromosome Assay
“the gold standard”


Biodosimetry (soon to come)
devolved by Biomedical Advanced Research and Development Authority (BARDA)

- **Point-of-Care Screening Tests**
  - Detects $\geq 2$ Gy
  - Based on Protein Expression immunoassay
  - 30-min turnaround time
  - Portable, designed for field use
  - Screen up to 1M survivors in 7 days

- **High Throughput Laboratory Tests**
  - Quantitative between 1-10 Gy
  - Requires specific instrumentation in a formal laboratory
  - 24-hour turnaround time
  - Likely to be used at distally located, large commercial laboratory settings
  - Test up to 400,000 survivors in 7 days

Photo from [http://www.onsitehealthdiagnostics.com](http://www.onsitehealthdiagnostics.com); Information about the test from Dr. Lynne Wathen, BARDA.
Need for POC Clinical Triage Tool CONOPS

Triaged Populations after an IND Detonation

OTHERS
GEO-EPIDEMIIOLOGY (No clinical signs, but potential for ARS)

ARS SUSPECTED
ARS CONFIRMED

INJURED
A Development Having Major Impact!

Concern for a different sort of “proliferation”!

Assessment of National Efforts in Emergency Preparedness for Nuclear Terrorism: Is There a Need for Realignment to Close Remaining Gaps?

March 6–7, 2017

Hyatt Regency Bethesda
One Bethesda Metro Center
7400 Wisconsin Avenue
Bethesda, MD 20814
Can We Pull Off the Unthinkable?

Shelter-in-Place!

Dangerous Fallout Zone

Moderate Damage

Light Damage

RTRs

Assembly Centers

Evacuation Centers

Field Medical
Local Hospitals

Home/Shelter

CRCs

Hospital

Home/Shelter
NCRP Annual Meeting 2017

... planning the program

- What are key gaps/challenges in our ability to mount an effective response?
- What are we doing now to address these gaps?
- Do we need to realign our current efforts?

Charge to each panel:
Suggest 3-5 specific, actionable priority initiatives

Panels
- Response Plans
- Emergency Responders
- First Receivers, Public Health
- Return, Recovery and Resilience
- Communication, Education, and Public Information
Are Existing Plans Sufficient for the Evolving Threat Environment?

- Integrate IND/RDD response capabilities & protective actions into existing state/local plans. Advocate for a strategic national approach.

- Leverage/transfer knowledge in IND preparedness planning through regional and national collaboration and link to existing plans for natural disasters.

- Create an Integrated Clinical Diagnostics System (ICDS) to enhance surge capacity and develop a national CONOPS for hematology surge (LDK), dicentrics, novel dosimetry methods and radiobioassay.
• Create and improve engagement mechanism at the state and local level to implement federal guidance and systematic preparedness process.

• Help local preparedness leaders and champions overcome institutional, political, and social barriers associated with preparing for nuclear/radiological events.

• Recognize and be prepared to take advantage of heightened concern after real-world events to advance preparedness guidance and public information.
• Advance preparedness for the whole country by developing “national” CONOPS including laboratory network for hematology, chemistry and dosimetry.

• Make response plans realistic by addressing hospital surge capacity and scarce resources at local level.

• Use a single set of terminology, a single set of radiological units, and a centralized source of information for medical and public health community.
Return, Recovery and Resilience

- Leverage all Hazards. Provide guidance to help states and communities improve resilience to nuclear/radiological incidents by leveraging existing local disaster plans and risk management efforts.

- Exercise the “Good Guidance”. Provide states and communities with user friendly tools for exercising community management of the late phase recovery of a nuclear/radiological incident.

- Strategize the Exit. Provide tools and guidance to help states and communities plan for and test the Community Advisory Panel and Technical Advisory Panel concepts to include an exit strategy.
• Have the experts agree on simplified explanations of what we do know about risks of radiation exposure.

• Create tools for the first responders to address their safety questions and concerns and empower them to amplify public health and safety messages for the public.

• Identify appropriate spokespeople and create tools for them to communicate early and often with evacuated individuals regarding long-term clean-up and risks related to returning.

• Increase the number of skilled radiation communicators by identifying and training risk communication experts outside of government and, likely, outside the field of radiation protection.

• Create a single location for the public to receive all information.
Emerging Themes and Path Forward

- Integrate N/R preparedness plans into existing local/state plans (this is more than adding an N/R appendix).
- Promote regional and national collaborations.
- Create user-friendly tools instead of voluminous PDFs.
- Foster consensus on terminology and radiation risk communication.

- Summary in HP News (April 2017 issue) http://hps.org/hpspublications/newsletter.html#
- Videos of lectures at Colorado State University website
- Full papers in Health Physics (later this year)
- NCRP commentary (later this year)
Communication &
Public Education
Post WWII
Oak Ridge National Laboratory
“Radioactivity & Shielding”

- Alpha
- Beta
- Gamma
- Neutron
1972
Defense Civil Preparedness Agency

- **Predecessor Agencies:**
  - Federal Civil Defense Administration (FCDA), Office for Emergency Management (OEM), Executive Office of the President (EOP, 1950-51)
  - FCDA (1951-58)
  - Office of Defense and Civilian Mobilization (ODCM), EOP (1958)
  - Office of Civil and Defense Mobilization (OCDM), EOP (1958-61)
  - Office of Civil Defense (OCD), DOD (1961-64)
  - OCD, Department of the Army, DOD (1964-72)

- **Established:**
  In the Department of Defense by DOD Directive 5105.43, May 5, 1972

- **Abolished:**
Defense Civil Preparedness Agency

- **Successor Agency:**
  - Federal Emergency Management Agency (FEMA)

- **Functions:**
  - Coordinated and directed federal, state, and local civil defense program activities, including fallout shelters; chemical, biological, and radiological warfare defense; emergency communications and warning systems; post-attack assistance and damage assessment; preparedness planning; and government continuity.
“A federal agency has issued this book as part of its responsibility for your safety, and for overall national preparedness and security.”

“The text, format, and illustrations of the book do not conform to the stereotyped image of a government publication.”

“You may even enjoy reading it!!”
Nuclear Disaster

The Alpha, Beta, Gamma Ladies appear again!
Health Effects of Radiation Exposure

If a 5-megaton bomb (5 million tons of TNT equivalent) were exploded in your living room, everything except specially designed structures in an area extending outward for 3 miles would be totally devastated. Look out your window and think what that means.

If the 5-megaton bomb were detonated 13 miles away, you could still receive first-degree burns. Think of something 13 miles away. That's quite a distance for heat to travel and still give you first-degree flash burns. The most serious initial nuclear radiation occurs within the 3-mile radius of the severe destruction. Everything here is subject to the blast and heat, so initial nuclear radiation is a hazard only if one is protected from these effects.

Damage Zones - 1966

- “Facts Make a Difference”
  - Training video
  - Office of the Secretary of the Army, Office of Civil Defense, 1966

https://archive.org/details/FactsMakeTheDifference
Damage Zones – 1989

- “Everybody’s Radiation Handbook”
  - AEON research publication

[Diagram showing effects of air burst with distance from ground zero varying from 0 to 30 miles and 0 to 48 kilometers.]

Damage Zones – 2010

- Planning Guidance for Response to a Nuclear Detonation, 2nd Edition

External Decontamination (videos)

The Office of Civil Defense, 1967

CDC, 2015

https://www.youtube.com/watch?v=OTItl_XVO-M

https://emergency.cdc.gov/radiation/index.asp
Keeping your head will help others keep theirs. Some brief rules for helping the psychologically distressed:

- Try to comfort them, without encouraging them to feel sorry for themselves.

- Try to get them involved in simple tasks, preferably as part of a group effort.
Community and Government Action

Unified National Response

Whole Community Approach


https://www.fema.gov/media-library/assets/documents/32230

Citizen Corps Partner Programs

- Hurricane Katrina and the terrorist attacks of September 11th, 2001 caused many Americans to rethink how they protect their communities. The Citizen Corps Partner Programs listed below give citizens the knowledge and skills needed to help their communities

- Expand All Sections

- Community Emergency Response Team (CERT) Program
- Fire Corps
- National Neighborhood Watch Program
- Medical Reserve Corps (MRC)
- Volunteers In Police Service (VIPS)
- Corporation For National And Community Service (CNCS)

https://www.ready.gov/citizen-corps-partner-programs
What Are Your Impressions?
1960’s information content and format
vs.
2010’s
Challenges and Progress Made

- Nuc/Rad preparedness amidst competing priorities
- Public health awareness of their role
- Interdisciplinary dialogue
  - Example: National Alliance for Radiation Readiness - NARR (http://www.radiationready.org)
- Risk Communication challenges
  - So-called LNT debate does not help.
- Radiation units
- “Graying” of the profession
Thank you!

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