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Developing a Radiation-Savvy Public Health Workforce

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Abstract

In 2016 the United States Centers for Disease Control and Prevention (CDC) established a Nuclear/Radiological Training and Exercise Preparedness (TEP) Program to better prepare its workforce to respond to a nuclear/radiological incident. The TEP program is comprised of staff across CDC programs with a variety of specialties such as epidemiologists, clinicians, data managers, communicators, environmental health specialists, at risk population specialists and health physicists.

Key TEP activities include the preparation of the CDC Nuclear/Radiological Incident Response and Recovery Annex that describes CDC's roles and responsibilities in the event of a nuclear/radiological incident; establishment of an Incident Management System (IMS) structure to reflect an agency-wide response consistent with CDC's All Hazards Plan; and completion of nuclear/radiological public health preparedness and response training and exercises. In addition to training sessions on the various radiation topics, the TEP program includes seminars on the various roles and responsibilities of the task forces defined in IMS during a response. The TEP program includes a range of discussion-based (seminars, workshops, tabletop exercises) and operations-based (drills and functional exercises) activities aimed at enhancing IMS staff capabilities and capacity to be prepared to respond to a nuclear/radiological incident.

In summary, the CDC's Nuclear/Radiological TEP Program prepares knowledgeable, well-trained staff, or a radiation-savvy workforce, ready for a robust response to a nuclear/radiological emergency.

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Introduction

The need for nuclear/radiological preparedness cannot be overstated as a nuclear/radiological incident could happen anytime, anywhere, and will likely impact all sectors (DHS 2006, DHS 2016, EOP 2010, RPD 2018). The key challenge is that unlike an infectious disease response which may unfold relatively slow thus allowing the medical and public health response to ramp up, after a nuclear/radiological incident public health must be ready to respond at scale immediately. That means staff must be ready to go, have processes tried and true in place, etc. to launch into action immediately. A well-coordinated and effective response will involve more than health physicists and other radiation protection specialists, of whom only a decreasingly small number is available. The number of available health physicists or other radiation safety professionals across the country and throughout the world is very small and diminishing (NCRP 2013, NCRP 2015). Public health staff need to know the basic radiological emergency response concepts as well as how to adapt and leverage the knowledge gained by their previous response roles in other emergencies (such as natural disasters and infectious disease outbreaks) to a nuclear/radiological incident.

The United States Centers for Disease Control and Prevention (CDC) leadership identified the need to have radiation-savvy staff across the agency that could step up to fulfill their roles and responsibilities quickly in response to a nuclear/radiological incident, as well as the importance of devoted resources for the preparation of such workforce. CDC established the Nuclear/Radiological Training and Exercise Preparedness (TEP) Program in 2016. At that time the majority of CDC programs were not aware that they would have a key role in the response to a nuclear/radiological incident.

There are many reasons to have a radiation-savvy workforce:

- To be ready, as a nuclear/radiological incident could happen anytime, anywhere, and will likely impact all sectors.
- To support nuclear/radiological response when availability of radiation subject matter experts (SME) is limited.
- To allow the limited number of radiation SMEs to focus on more technical or complex questions likely to arise during the response.
- To be a “force multiplier”, i.e., increase the response capabilities of non-radiation SMEs to minimize taxing the already limited number of radiation experts.
- To help team members understand their roles and responsibilities during a nuclear/radiological incident.
- To help create a common understanding of key concepts and terminology, resulting in a more streamlined response during real events.

- To have a knowledgeable workforce that is ready to act when needed.

The TEP Program defined a radiation-savvy workforce as one that is familiar with:

- Basic radiation protection concepts and principles. Examples include description of alpha, beta, gamma radiation; exposure vs. contamination; radiation protection principles of time, distance shielding; etc.
- Basic radiation emergency preparedness concepts. Examples include types of radiation emergencies; protective action guidelines; introduction to relevant emergency preparedness documents in the U.S. such as the National Response Framework, Nuclear Radiological Incident Response and Recovery Annex, etc.
- Their roles and responsibilities during a nuclear/radiological emergency. Here we discuss how many of the traditional public/environmental health roles and responsibilities such as providing shelter, ensuring safe food and water, etc. would be impacted during a nuclear/radiological incident.
- Resources available to address initial/basic radiation-related questions. Here we provide an extensive list of training, guidance and other resources available on the CDC and other websites.
- Comfortably conveying basic radiation protection information to members of their Incident Management System (IMS) task force.

To develop a radiation-savvy workforce, the TEP Program trained staff across CDC programs using multiple approaches including in-person, webinars, and self-study materials from CDC's online training modules (Radiation Emergencies | NCEH | CDC) and other available online trainings.

In addition to the "traditional" didactic training, the TEP Program utilized various formats: seminars, workshops, tabletop exercises, task force mini-drills, agency-wide drills, and functional exercises. Gaps and corrective actions were identified from information gathered in After Action Reports from these exercises. These corrective actions were then followed up and more targeted trainings were developed to address remaining gaps. This process continues to date as a key element of the preparedness cycle.

To classify the radiation-savvy levels, the TEP Program established a simple three-tiered system that indicates the individual's level of knowledge of radiation concepts and principles and their applicability to a response to a nuclear/radiological incident. Three levels (I, II, and III) were defined based on the level of radiation knowledge and expertise, where Level I was the lowest level:

- Level I – Staff member had:
  - "Just-in-time" training in radiation basics and familiarity with the Emergency Operations Center (EOC) or
  - No radiation response experience but experience working in the EOC during other agency responses
- Level II – Staff member had:

  - Some radiation training (beyond awareness level) or
  - Some experience in radiation preparedness and response
- Level III – Staff member had:
  - Advanced radiation training or
  - Subject Matter Expertise (SME) in radiation preparedness and response

Health Physics staff in the Radiation Studies Section, Emergency Management, Radiation and Chemical Branch, Division of Environmental Health Science and Practice, National Center for Environmental Health, CDC, as well as several physicians with advanced training in radiation protection, were classified as Level III.

TEP training focused on basic radiation protection topics including radiation basics, description of the types of nuclear and radiological incidents, and presentations on the various planning and response documents available that form the basis for the CDC Nuclear/Radiological Incident Response and Recovery Annex. Additional content included the types of decisions that public health agencies will have to make to protect the public, as well as response actions during the early phase of the response; available federal assets; and a list of available tools and other resources for self-study. The topics covered are listed in Table 1.

Ongoing education efforts through TEP enabled increasing knowledge of radiological emergency preparedness for participants. The IMS task forces gained a better understanding of their roles and responsibilities during a nuclear/radiological incident and more complex topics were addressed in the trainings and during exercises. The increased knowledge of radiological emergency preparedness by the participants is evident through continuous training and exercises. For the TEP Program, challenges center on staff turn-over, unavailability of staff due to their engagement in the ongoing response to the COVID-19 pandemic, workload and competing priorities. Despite those challenges, the TEP Program advanced staff knowledge of nuclear/radiological emergency preparedness and response to the point that they are more comfortable with the subject matter, want to learn more on the subject, and continue to be engaged in the TEP. The CDC task forces in the Incident Management System (IMS) that have benefitted from this program are listed in Table 2.

The TEP Program continues to meet its objectives of training a radiation-savvy workforce with a steady number of participants (approximately 250) from various CDC programs who continue to attend the trainings and participate in exercises with various degrees of availability because of ongoing activations for other emergencies.

Moving forward, the TEP Program will continue basic training targeting new staff; offering and delivering more advanced training topics; designing an in-depth (2–3 day) radiation training course focused on public health response with the possibility of providing continuing education credits and supervisory training credit. The TEP Program will also continue engaging the community of interest by planning and executing tabletop exercises, drills, and functional exercises, and fully participating in upcoming National Level Exercises focused on or related to nuclear/radiological emergencies.

Discussion and Conclusions

The CDC's need for training in nuclear/radiological emergency preparedness and response is not unique as many other public health organizations may have similar challenges. The CDC TEP model can be used to prepare staff across multiple public health sectors to streamline a response. A public health response to a nuclear/radiological incident will be similar in many ways to a response to other natural and man-made emergencies. It is important to leverage the experience gained during those prior emergencies to build on the radiation-specific knowledge for a more effective response.

Radiation subject matter experts play a key role in a response to such incidents; but to be successful, they must partner with planners, exercise designers, and other response officials, to build a radiation-savvy workforce able to respond. Management support and senior leadership buy-in are essential as this will require time commitment and availability of staff. It is important to recognize that it takes more than just radiation experts to have a successful response to a nuclear/radiological incident.

In conclusion, the CDC staff participating in the TEP Program acquired basic and advanced knowledge in radiation concepts and through trainings, seminars, drills, and exercises. They are in a better position to support a public health response to a nuclear or radiological incident in the country.

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Table 1 –

Radiation-Savvy Training Outline

What is Radiation-Savvy
Radiation Basics • Exposure vs Contamination • Principles of Radiation Protection
Types of Nuclear/Radiological Emergencies
Planning Documents for Radiological Emergency Preparedness and Response
Early Decisions in a Nuclear/Radiological Emergency
Response Actions for Public Health
Overview of Radiological Response Federal Assets
Public Health Responsibilities During a Nuclear/Radiological Emergency
Tools and Resources for Becoming Radiation-Savvy

Table 2 –

CDC Task Forces[a] Participating in the TEP Program

Task Force
• Health Physics Cell[b]
• Joint Information Center
• Epidemiology and Surveillance
• Laboratory and Testing
• Data Science
• Environmental Health
• Medical Care and Countermeasures
• Infectious Disease
• At-Risk Populations
• Worker Safety and Health
• State Coordination

[a]Task Forces are elements of the Incident Management System that support specific aspects of the response as part of the Scientific Support Section.

[b]Cell members also support the Interagency Advisory Team for Environment, Food and Health.