



## What About Right of Boom?: The Medical Surge Following a Radiological/Nuclear MCI

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Los Angeles County



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Source: Daily Herald

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## Determination & Perseverance



**Jeffrey Day and Tanya Ridgle,  
Los Angeles County  
Public Health**

- Types of incidents – probability vs. impact
- Scope of exposure
- Risk to responders/receivers



**Michelle Heckle,  
UCSF**

- Hospital and research sources of radiological material
- Cesium Irradiator Replacement Project (CIRP)



**Kenneth Luke,  
Mercy Redding**

- Medical surge Preparedness/ Response Concerns
- Staff training



**Mark Sutter, MD  
U.S. Dept. of  
Homeland Security**

- Hospital and Clinician Challenges
- Healthcare worker safety and Communication
- Resources for clinicians

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## Determination & Perseverance 2020's Lessons and 2021's Challenges



**Jeffrey Day and Tanya Ridgle,  
Los Angeles County Public Health**

- Radiologic Dispersal Devices (RDD) Overview
- Explosive RDD Hazards
- Hospital PPE and Planning



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## Radiologic Dispersal Device (RDD)

Any device that intentionally spreads radioactive material across an area with the intent to cause harm

### ***Can be explosive or non-explosive ...***

- Non-explosive – spread of material using common items such as fans, building ventilation system or spreading by hand
- Explosive – will not result in a nuclear detonation. AKA Dirty Bomb

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## Explosive RDD AKA Dirty Bomb

A dirty bomb is a “normal bomb that contains radioactive material as well as explosives.

Primary casualties would come from the explosion itself, not the radiation source.

Radioactive Material

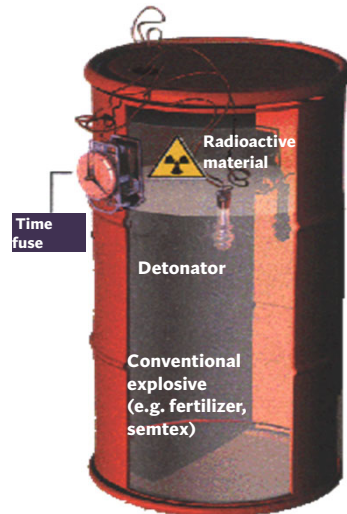


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## Explosive RDD AKA Dirty Bomb (cont.)

- Greater dispersal of radioactivity
- Associated traumatic injuries
- Presence of radiation will substantially complicate initial triage and treatment
- Major health hazard could exist for a few city blocks
- Monitoring and area control important



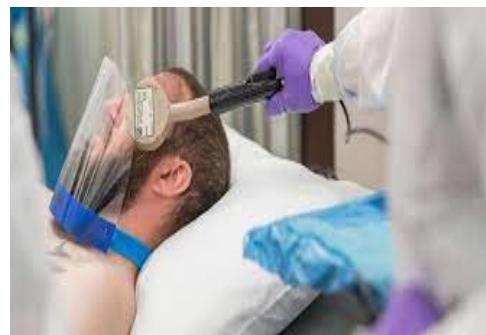
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## Explosive RDD AKA Dirty Bomb (cont.)

The radioactive material released in the blast may deposit on (contaminate) people, their clothing, and the ground surface.

***Do NOT delay medical treatment for victims with life or limb-threatening injuries to conduct decontamination!***



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## Contaminated Victims

- Contamination on victims is not immediately life threatening to hospital personnel (except imbedded radioactive shrapnel)
- Removing a patient's clothes, removes 80% to 90% of the contamination

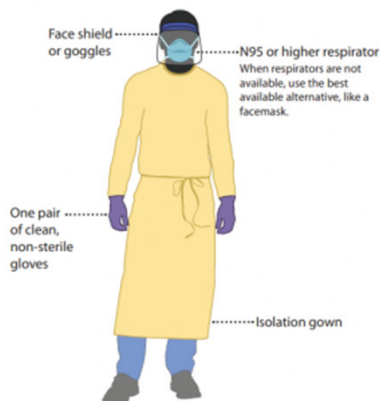
***Do NOT delay medical treatment for victims with life or limb-threatening injuries to conduct decontamination!***

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## COVID-19 Personal Protective Equipment (PPE) for Healthcare Personnel

Preferred PPE – Use N95 or Higher Respirator



ORISE.ORAU.GOV

[cdc.gov/COVID19](https://cdc.gov/COVID19)

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## Goiania Brazil Accident

- Cesium-137 powder from abandoned radiotherapy source
- 112,000 people screened
- 249 people contaminated
- 28 people w/serious radiation burns
- 4 deaths



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## Your Plan Should Include:

- Training
- Performing a radiological survey on people. (i.e. Partial or Full)
- Survey Instruments (i.e. Nuc Med)
- PPE – Universal Precautions
- Triage of worried well



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2020's Lessons and 2021's Challenges



**Michelle Heckle,**  
**University of California**  
**San Francisco**



- Hospital and research sources of radiological material
- Cesium Irradiator Replacement Project (CIRP)



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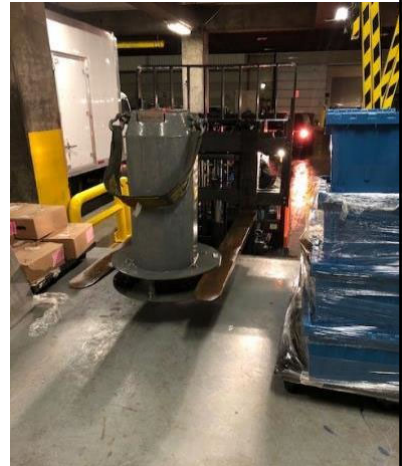
**Isotopic  
Irradiators**

Definition	Types
<ul style="list-style-type: none"><li>• Self-shielded device to expose samples to radiation (tissues, cells, small animals)</li><li>• When operating correctly, radiation exposure to the operator is low and rarely above background</li><li>• Contains radioactive materials that range from hundreds of millicuries to thousands of Curies</li></ul>	<p>Sealed Radioactive Source Irradiator</p> <ul style="list-style-type: none"><li>• Cesium 137</li><li>• Cobalt 60</li></ul>

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## Cesium Irradiators



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## Irradiator Functions at the University of California

- Studying radiation effects to cells and animals
- Senescence-induction (aging)
- Cancer therapy research
- Irradiation of blood before transfusion to TA-GVHD (transfusion associated graft versus host disease) for immune-compromised patients
- Irradiating Cannabis to eliminate mold (aspergillus)
- Sterilize cadaver teeth for dental students
- Calibration of radiation detecting meters and monitors



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## Extensive Security for All Irradiators

- Cameras in all irradiator rooms and all access points
- Motion detectors
- Door alarms
- 24/7 Monitoring in UC Police Dispatch
- Radiation detectors
- Cable removal alarms
- Periodic alarm checks
- Access Steps
- University of California ID badge scanned
- Personalized Identification Number
- Biometric entrance clearance (Iris scans)



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## Extensive Security Clearance for Users



✓ Federal Bureau of Investigation (FBI) fingerprint clearances

✓ Re-fingerprint every 10 years



✓ Seven years of background checks

✓ Annual documented education of security concerns



✓ Education Verification

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## Safety and Security: Training and Collaboration



- ✓ Training: Workshops, Tabletops (TTX), Functional Exercises (FE), Full Scale Exercises (FSE)
- ✓ Annual Inservice



- ✓ Equipment testing
- ✓ Annual documented education



- ✓ Regional Collaboration
- ✓ Y12 and local resourcing



## Why are we concerned?

- ! Since 9-11 terrorist attacks in New York City, it was recognized that Cesium-137 could be a target and be used in a Radiological Dispersal Device (RDD) or 'dirty bomb'
- ! Cesium-137 irradiators present the highest risk
- ! Cesium-chloride is highly dispersible
- ! 20 grams could contaminate a 40-block radius
- ! Cesium-137 has a thirty (30) year half-life
- ! University of California possessed almost 50% of all the irradiators in California

## What is the size of a source?

**SMALL**



The source weighs 20-120 grams



Compare to the size of a small Reese's Peanut Butter Cup



The source is inside a double stainless-steel rod with a diameter of 1/2 -1" and a length of 6-12"

2,000 -7,000 lbs.

The lead shielding weight

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Office of Radiological Security (ORS)

works to enhance security domestically and globally by educating the operating community and providing funding for removal and financial incentive to replace radioisotopic irradiators.

## Cesium Irradiator Replacement Project (CIRP)

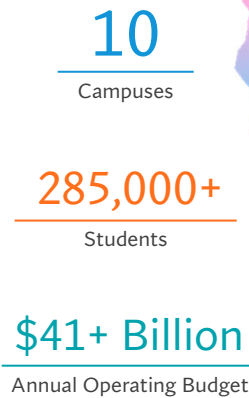
Protect	Remove and Dispose	Reduce
<b>PROTECT</b> large radioactive sources being used daily for vital medical, research and commercial purposes	<b>REMOVE</b> and <b>DISPOSE</b> disused radioactive sources	<b>REDUCE</b> domestic and global reliance on high activity sources by encouraging the transition to non-isotopic alternative technology

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- Ten campuses with more than 285,000 students
- Operating budget of more than \$41 billion annually
- Largest public university system in the entire world
- Third largest employer in the state
- Awarded more grants from the National Institute of Health (NIH) and National Science Foundation (NSF) than any other institution

## University of California



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*Why did the UC President and the Governor of California care enough about this problem to proceed with the CIRP Program and create a separate office to oversee the project?*

## Rationale for Enrolling in the CIRP Program

- Safety for our communities
- Removal of large sources of radioactive material supported by CIRP (up to \$300,000 per project)
- Reduce need for extensive security measures
- Replace radioactive sources with X-Ray irradiators partially supported by CIRP

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## Advantages of X-Ray Irradiators

- + They do not require the constant level of security that radioisotopic irradiators necessitate
- + They do not require users to have rigid security clearances
- + Accurate radiation exposure can be directed and more easily calculated
- + Most procedures can be performed using the X-Ray Irradiator and provide equivalent exposures
- + Procedures can be programmed to provide consistent exposures

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## X-Ray Irradiators



Blood Irradiators



Animal and Cell Irradiators

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## Planning for Removals at UC

- Arrangements with National Labs and removal companies to determine dates of removals
- Extensive checklist designed for each campus
- Contact the Campus Police Department and Homeland Security Division, all local Law Enforcement Agencies, First Responders, PIOs, FBI WMD, UC and local Dispatch, local HazMat Response, University Leadership and essential Stakeholders (CDPH, DOE, Regional Intelligence Center) when a removal is planned
- Multiple meetings to determine security plans, multiple walk-throughs, and conferences to assure the removal is well rehearsed, including tabletop discussion scenarios
- Education to assure the level of seriousness is shared: just-in-time training, Y12—Oakridge, TN
- Final briefing prior to the mission and review each entity's role



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## Removal Team



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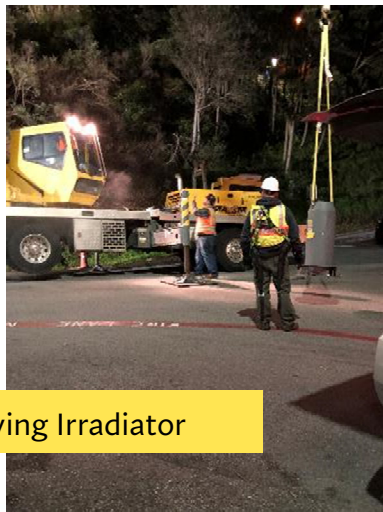
## Example of Removal Cask



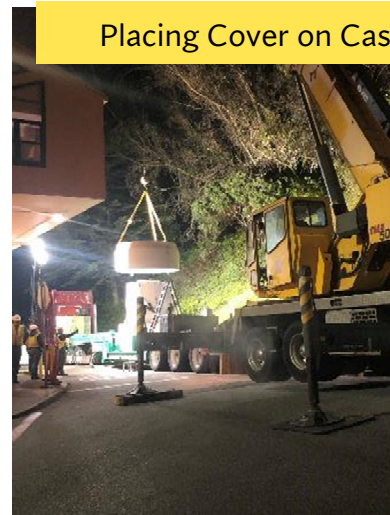
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## Typical Removal Process



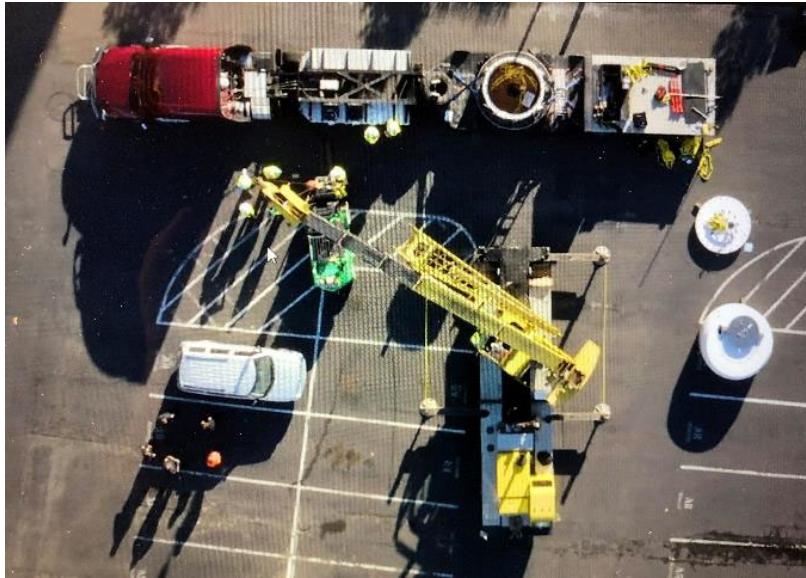
Moving Irradiator



Placing Cover on Cask

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## Determination & Perseverance



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## Determination & Perseverance

### Status of Removals and Replacements

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Twenty-one Cesium-137 or Cobalt-60 radioisotopic irradiators have been removed from the University of California campuses



Delays have occurred in the last eighteen months due to the global pandemic and recent changes to the removal process were necessitated due to an [inadvertent release of radioactive material during a removal at the University of Washington](#)

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There are plans to remove nineteen more irradiators



University of California is prepared to resume removals once all issues have been resolved

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Twenty-six X-Ray Irradiators have been purchased as replacements through the CIRP program

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2020's Lessons and 2021's Challenges



**Kenneth Luke,**  
**Mercy Redding**



- Medical surge
- Preparedness and Response Concerns
- Staff training

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**Determination & Perseverance**



## **Mercy Medical Center Redding (MMCR)**



- 267 Bed Facility
- Level II Trauma Center
- Stroke Receiving Center
- STEMI Receiving Center
- Neonatal Intensive Care Unit
- Home Health & Hospice Services
- Company Owned EMS Service Line
- Oncology Service with Satellite Clinics

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### Cover Eight Counties

- 24,900 square miles
- Roughly the size of West Virginia
- Approx. Population = 442,329

### Surrounded by three mountain ranges

- Northern Coastal
- Klamath
- Sierra Nevada

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### Surge capacity and challenges for a rural hospital

- We are the central hub for all of Northern California and provide many services that no other facility in our area provide. Most all other facilities in our area are not only either critical access or community hospitals (20-50 bed facilities), but are also geographically spread out.
- Surge from an event here or from a larger Metropolitan area would drastically overrun not only our facility, but all the other smaller facilities in our area  
✓ (Sacramento – 2.5 hours away and SF is 3.5 hours away)

### Shortages of staff and supplies for response

- It is important to provide wide-spread training with your staff as some may not respond to assist out of fear from RAD event. Also, with security measures that area may be implements, ensure staff are aware to use their hospital issued ID badge and passcode to get through roadblocks.
- Geographical concerns for supply delivery. In many prior events, we have had supply issues due to inability to deliver.

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## Determination & Perseverance



### **Where we are currently:**

- The past few years, we have been involved in a number of real-life events to include a multitude of wildfires, extreme weather events, active shooter, MCI, and pandemics. When not responding to real-life events, as the largest acute care facility in northern California, we continue to build strong relationships with other community and rural hospitals in our area. We work closely with our HPP partners to plan facility drills and community and region wide drills.

### **What our gaps are:**

- Due to the heavy burden of dealing with many of these real-like events, the annual training/drills are lacking. In the last four years, every first-receiver HERT training (one each year) was cancelled due to funding or other higher priorities (such as the pandemic).
- Another gap is the lack of funding for EP products and what it will take to maintain a facility during a disaster. One benefit of the pandemic is that it allowed us to acquire some needed equipment. One key aspect we are still lacking is all the equipment needed for decon. Ours is old and wearing out.
  - ✓ HPP funds have helped buffer these cost, however, these funds have disappeared in past four years.

### **Where are we going:**

- The next couple years, we will be working to do first-receiver HERT training with our staff and also conduct a full-scale drill.
- We will be conducting a region-wide Chem-Pack full scale exercise this spring including a full-scale haz-mat drill.

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## Determination & Perseverance

2020's Lessons and 2021's Challenges



**Mark Sutter, MD**  
**Medical Operations Directorate**  
**(CW-1), Countering Weapons of**  
**Mass Destruction Office**  
**Department of Homeland Security**



- Hospital and Clinician Challenges
- Healthcare worker safety and Communication
- Resources for clinicians

### Disclosures:

- I am a full-time employee of the Department of Homeland Security.
- I retained volunteer appointments at U.C. Davis Medical Center in the Department of Emergency Medicine and the California Poison Control System.

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## Hospital and Clinician Challenges

The biggest challenge early on will be operating in the setting of incomplete information

- Is radiation involved, was there an explosion, or both?
- Real-time communication with front line staff

Trauma and Non-trauma scenarios

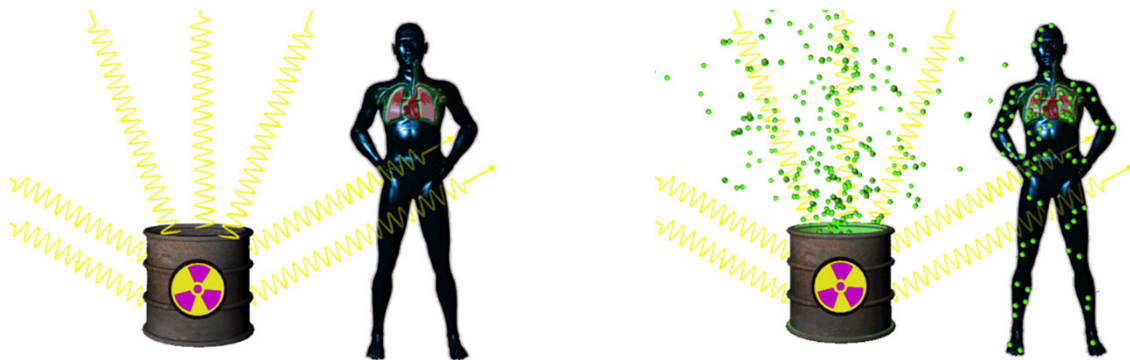
- Trauma kills immediately, radiation effects usually delayed

Hospital systems usually have radiation expertise, but often they are disconnected from front-line providers.

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## Exposure vs. Contamination



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## Communication and Crowd Control

Controlling the communication narrative will be paramount

- “Just-in-Time” training for all hospital employees/volunteers
- Outward-facing public affairs messaging needs to be early and often

There will be large surges of patients who will ask to be evaluated despite no exposure

- Remember this event may expand typical jurisdictions and consider using alternative resources such as law enforcement

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## Health Care Resources



<https://orise.orau.gov/reacts/index.html>

- Pocket guides
- Pre-hospital / hospital algorithms
- PPE
- Monitoring
- And many more already developed tools for hospitals and providers
- Think poison center for radiation incidents- 24/7 assistance



<https://www.cdc.gov/nceh/radiation/emergencies/index.htm>

- Radiation basic for public messaging
- Resources for policy/public health
- Fact sheets for providers

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## Health Care Resources (cont.)



- Major programs include the Hospital Preparedness Program (HPP) and Emergency Care Coordination Center (ECCC)

<https://www.phe.gov/Preparedness/planning/hpp/Pages/default.aspx>

American Association of  
Poison Control Centers



- Atypical partner for a radiation emergency
- However, they are integrated within the public health system with access to all local health care systems

<https://www.aapcc.org/>

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## Summary and Tips

- Drill
- Prepare “Just-in-Time” messaging before the event
- Bring diverse hospital resources together (health physicist/radiation oncology and emergency medicine) before an event
- Participate in community/regional multi-agency meetings
- Turn down the volume on your radiation detectors 😊

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## Your Turn – Q & A



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## Contact

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## Additional CDPH Resources

### **Resources at the Center for Environmental Health, California Department of Public Health**

Radiologic Health Branch – Radiologic emergency response for non-nuclear power plant incidents

Radiochemistry Laboratory – Analytical services (environmental samples)

Environmental Management Branch – Nuclear Emergency Response Program for nuclear power plant emergencies

### **Contacts**

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# Thank you!



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