CDC’s Response to an accidental release at the WIPP nuclear waste site: implications for a public health response

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Mention of company or product names does not constitute endorsement by the National Center for Environmental Health (NCEH), Centers for Disease Control (CDC), or the Public Health Service.
Background

DOE Carlsbad, NM, WIPP site

“Radiological Dispersal Incident”

• 2/14/2014 a fire in the WIPP underground facility may have contaminated 13+ workers
• Am-241 and Pu-239 were thought to be the main contaminates released
CDC's Initial Involvement

2/26/2014: A DOE notification to WIPP employees shared with CDC

3/1/2014: DOE request for CDC assistance – bioassay for 14 samples of workers possibly contaminated

3/4/2014: “Official” request from DOE arrives for the bioassay analysis of worker samples
CDC Radiation Laboratory Contacted

• DOE asked CDC Bioassay Laboratory for assistance in Worker contamination assessment
• DOE requested bioassay analysis for Am-241 and Pu-239 in workers’ urine samples (split aliquot)
• CDC requested that no Private identifying Information (PII) [e.g. names] be sent to CDC
• DOE will aliquot a subsample and send to CDC
• DOE 24 hour sample was acidified, so no creatinine adjustment possible
Actions and Timelines

- CDC/DLS Project approval entered into the DLS LIMS system on 3/3/2014
- DOE shipped urine samples on 3/3/2014
- CDC received the samples on 3/4/2014
- CDC Bioassay lab analyzes the samples for Am-241 on 3/5/2014
- CDC Bioassay lab analyzes the samples for Pu-239 on 3/5/2014
- CDC reports analytical results to the DOE on 3/6/2014
CDC’s Urine Radionuclide Screen

Urine “Spot” Sample

- Gamma Radionuclide Screen
- Alpha/Beta Radionuclide Screen/Quantification
- Alpha (Long Lived) ICP-MS Screen

Quantification

- Gamma Spectrometry Quantification
- Alpha Spectrometry Quantification
- Mass Spectroscopy Quantification
- High Resolution Mass Spectroscopy Quantification
Techniques for the determination of Am-241

- High Purity Germanium (HPGe) gamma spectrometry: directly determine Bq/g or higher levels
- Alpha spectrometry is most commonly applied
- ICP-MS has substantial advantages over conventional radiometric techniques

Am-241 half life = 432.6 years
Sector Field – High Resolution ICP-MS
Pu-239 Method

- 2 mL of urine with a Pu-242 tracer
- 1 mL TEVA, solid phase extraction column isolation
- 1 mL of eluent used for the ICP-MS
- High Resolution ICP-MS (Element XR)
- Aridus II desolvation unit
- LOD of 0.75 pg/L (less than 1/3 of the NCRP 161 CDG for a child or pregnant woman)
- Throughput of ~100 samples per day per instrument

NCRP = National Council on Radiation Protection & Measurements
CDG = Clinical Decision Guide
Am-241 Method

- 10mL of urine with a Am-243 tracer
- 1 mL DGA, solid phase extraction column isolation
- 2 mL of eluent used for the ICP-MS
- High Resolution ICP-MS (Element XR)
- Aridus II desolvation unit
- LOD of 0.22 pg/L (less than 1/3 of the NCRP i61 CDG for a child or pregnant woman)
- Throughput of ~120 samples per day per instrument
Summary

- WIPP Facility had a possible radionuclide contamination (exposure) incident
- DOE wanted an “outside” confirmation of possible exposure
- DOE requested “Technical Assistance” from the CDC
- CDC used their Emergency Response Radiation Bioassay analytical methods and processes to assess possible contamination of workers
- Samples received, processed, analyzed and reported in less than 48 hours
- No contamination of the workers observed above CDC LODs for Pu-239 and Am-241
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Questions?
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