

ICLN RADIOLOGICAL/NUCLEAR LABORATORY WORKGROUP:
BACKGROUND, EMERGENCY RESPONSE ISSUES, INTERAGENCY COORDINATION,
PRODUCTS AND PATH FORWARD

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The Department of Homeland Security (DHS) Integrated Consortium of Laboratory Networks (ICLN) is a group representing 10 federal agencies with a mission to provide:

“A U.S. homeland security infrastructure with a coordinated and operational system of laboratory networks that provides timely, high-quality, and interpretable results for early detection and effective consequence management of acts of terrorism and other events, such as natural disasters and disease outbreaks, requiring an integrated laboratory response.”

The establishment of an integrated laboratory response capability could significantly reduce vulnerabilities to infectious diseases, and chemical, biological, and radiological/nuclear contamination incidents, and reduce the adverse consequences of these events on the public health, food supply, and agriculture sectors. As part of these overall networks, the DHS ICLN established the Radiological/Nuclear Laboratory Workgroup to address various radiological specific issues among the federal and state radiological labs and networks. This workgroup has been very successful in sharing laboratory contacts, methods, information on many issues, developing radiation lab specific documents and products as well leading the development of table top exercises and full exercises as well as the participation in full scale exercises. This workgroup has created an inclusive forum for federal and state radiological laboratories to share ideas, work collaboratively, and build relationships that support a more effective integrated response during emergencies.

This workshop will address the following topics:

- Description of the Federal Radiological and Nuclear (CBRN) threat issues and how the federal partners are involved from a laboratory point of view.
- Background and historical info on the ICLN Rad Lab Workgroup and where the Federal Radiological laboratories fit into the structure and possible incident response.
- A description of the priority radionuclides of concern from a radiological dispersive device (RDD) incident from the outcome of the Federal Interagency Workgroup.
- Description of the Rad lab networks: ERLN, FERN, NAMP, DLN and the LRN
- Past ICLN Radiological Laboratory Exercises – tabletop and full exercises.
- The Laboratory Limiting Issues Document – covers radiological as well as chemical and biological issues that would greatly limit a laboratory’s ability to respond to a major incident.
- The Radiological Screening guidance for the receipt of “unknown samples” for non-Radiation laboratories – this guidance is intended for laboratories that do not routinely measure radiological samples.
- Radiological Workgroup products: documents, reference materials, PT issues
- Current and future activities of the Radiological Laboratory Workgroup

ICLN Radiological Laboratory Workgroup

**Integrated Consortium of Laboratory Networks
(ICLN)**

Radiological Laboratory Workgroup Workshop

Workgroup Co-Chairs

John Griggs, EPA

Robert Jones, CDC

RRMC, October 28, 2015

Acknowledgements

Berta Oates

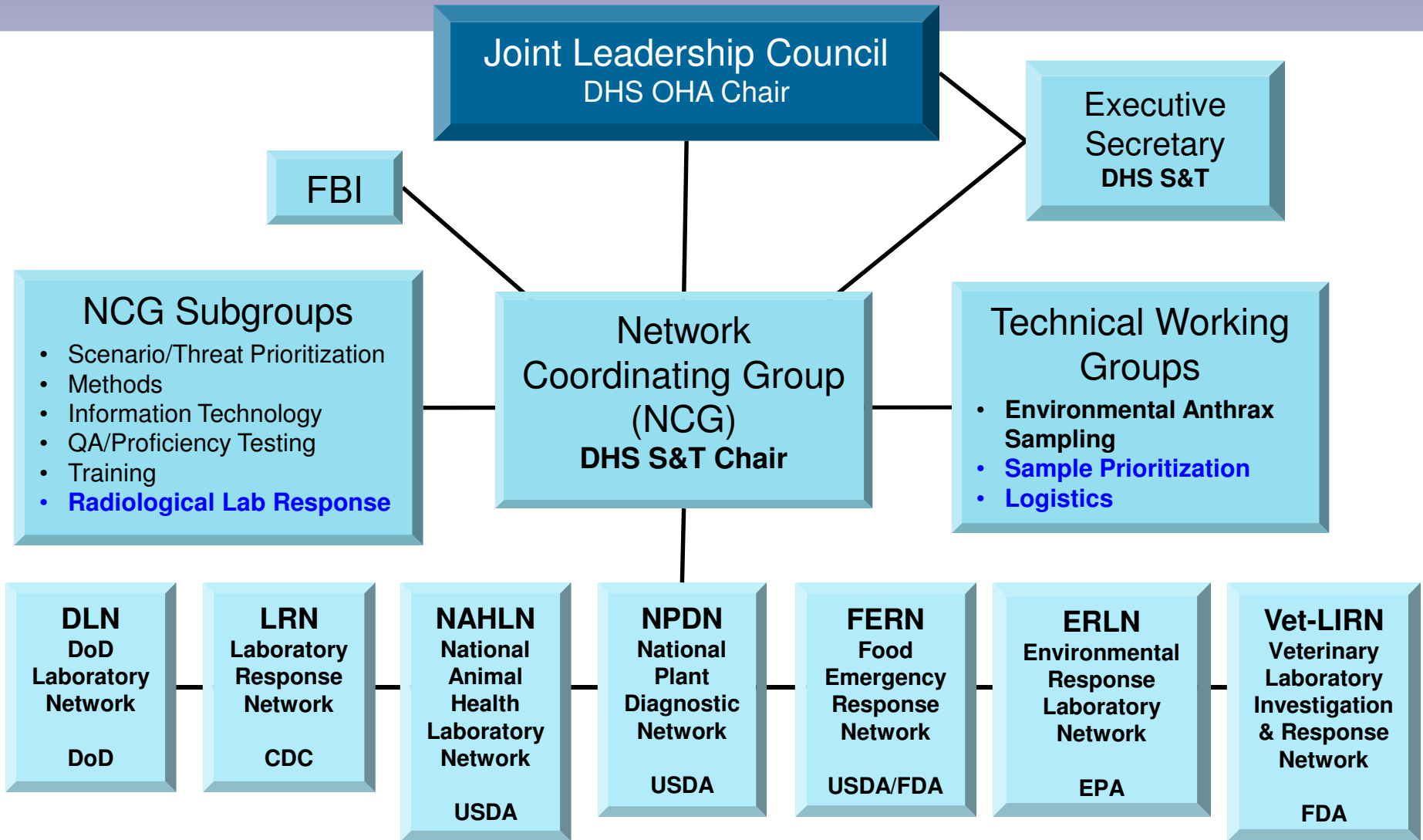
Marie Socha

Kristin Pasternak

Early Stages of the ICLN Radiological Laboratory Workgroup 2006

- Background/Formation: An ICLN capacity assessment identified radiochemistry as one of two major gaps in a national response laboratory capacity
- Participants: representatives from DHS, EPA, CDC, DOE, FDA and NIST, Subject Matter Expert (SME) from DoD
- Charge: develop a proposal for a coordinated and adequate national radioanalytical laboratory response to a major radiological or nuclear attack

ICLN Organization (October, 2015)



More than 450 distinct labs represented in member response networks

ICLN Designated Responsible Federal Agencies 2006

ICLN Designated Responsible Federal Agencies	Radiological			
	Lab Support to Phase of Response			
	Monitoring/ Surveillance	Incident Response	Remediation	Forensics
Clinical	HHS/CDC	HHS/CDC	HHS/CDC	FBI
Environmental	EPA	DOE/ EPA	EPA	FBI
Food	USDA/ HHS/FDA	USDA/ HHS/FDA	USDA/ HHS/FDA	FBI
Animal	USDA	USDA	USDA	FBI
Plant	USDA	USDA	USDA	FBI
Drinking Water	EPA	EPA	EPA	FBI

RDD Scenario: Sample Demand vs Laboratory Capacity Gaps

- White House Homeland Security Council's National Planning Scenario #11 – Radiological Dispersion Device (RDD) in urban business district
- Estimated number of samples due to RDD:
 - more than 350,000 environmental samples over 12 months
 - more than 100,000 human clinical samples in first few days
- Analysis of nation's radioanalytical laboratory capacity relative to RDD scenario sample load reveals significant gap^{1,2}

¹ US EPA *Assessment of Nationwide Laboratory Surge Capacity Required to Support Decontamination of Chemical, Biological and Radiochemical-nuclear Agents*

² Homeland Security Institute Data Fusion Workshop

Scenario Sample Demand/Laboratory Gap

- Limited analysis of improvised nuclear device (IND) scenario
 - 10-kiloton bomb detonated in Washington, DC
 - Contamination zone of approximately 3,000 square miles
 - Laboratory analysis requirements estimated – tens to hundreds of thousands of analyses per week
- Sample load from IND would be **orders of magnitude** greater than RDD

Competency Gap

- In addition to capacity gap a competency gap exists due to:
 - Lack of laboratory analytical methods **specific for emergency response needs**
 - Reduction in radiochemistry expertise due to retirements without adequate replacements
 - Lack of formal training programs for radioanalytical labs
 - Reduction in federal radiological proficiency testing (PT) programs

ICLN Radiological Laboratory Workgroup

- ICLN Radiological Laboratory Workgroup collaboratively works to address the current capacity / competency gaps by:
 - Enhancing select state radioanalytical laboratories
 - Providing laboratories with emergency response “tools” – [rapid methods](#), training, etc.
 - Identifying radiological reference material needs and implementing proficiency testing (PT) studies for emergency response competency and capabilities
 - Establishing common data management infrastructure and transfer protocols (coordinate with ICLN Information Technology and Communications Coordination (ITCC) Subgroup)

Coordinated Response Framework for Radioanalytical Laboratory Networks

- Laboratory Networks plan and prepare for a coordinated national response across federal (and state) agencies for the analysis of clinical, environmental, food and agricultural samples
- Laboratory Networks address all phases of a response: immediately following the incident through cleanup and recovery phases
- Supports laboratory readiness and surge capacity needs related
 - Human exposure and contamination
 - Environmental contamination
 - Food and agricultural contamination
 - Clearance, recovery and monitoring
 - Re-occupancy and long-term monitoring
- Laboratory Networks supported by Standard Reference Materials (SRMs) from National Institute of Standards and Technology (NIST):
Data results must be defensible

ICLN Scenario-Based Capability Assessment

Homeland Security Institute

Integrated Consortium of Laboratory Networks (ICLN) Capability Assessment

Final Report
30 April 2007



2900 South Quincy Street • Suite 800 • Arlington, VA 22206-2233

FOR OFFICIAL USE ONLY

Primary objectives included:

- **Characterize each network** in terms of component agencies & laboratories.
- **Assess the capabilities, capacities & coordination of the networks** and laboratories working together in response to nine selected homeland security scenarios.
- **Identify policy or regulatory barriers** which inhibit optimal responses to the selected homeland security scenarios.
- **Determine gaps** in the laboratory networks' collective capabilities & capacities to respond to the selected homeland security scenarios.

Summary

Developing and maintaining a coordinated set of “Radiological Laboratory Response Networks” would result in a **drastically reduced response time** for providing local and federal decision makers with high-quality, interpretable results.

ICLN Workgroup Representation

The Radiological Laboratory Workgroup has made efforts to have representation on all other ICLN Subgroups so that radiological laboratory issues are addressed appropriately.

Radiological Lab Updates

- FDA Radiological Laboratory Network:
 - Awarded cooperative agreements to 5 State Labs – 2006
- USDA Food Safety Inspection Service awarded one Cooperative Agreement lab in 2011 and will add 6 labs in 2016
- EPA Radiological Laboratory Network
 - Awarded cooperative agreements to 4 State Laboratories - 2007
- NIST Emergency Response Standard Reference Material
 - CDC, DHS, EPA, FDA, NIST Collaboration in 2007-2009

Radiological Lab Workgroup

- NIST Emergency Response SRMs
 - Ensuring analytical results comparability between Radiological Lab Networks
 - SRMs that contain 8 Priority radionuclides
 - To be utilized in multiple Network PT programs
 - To be utilized for “across network” standardization
 - Progress
 - Materials prepared in 2008
 - SRM Certification in 2009
 - Completion in 2009
- CDC, DHS, EPA, FDA, NIST Collaboration

Radiological Lab Workgroup

- Congressional Testimony:
 - Radiological Dispersal Devices (RDD) and Lab Capacity - 2007
- Congressional Testimony follow-up questions
 - CDC, EPA, DHS and DOE all had follow-up questions
 - How are you going to close the “gap”
 - Plans to establish a Network (time frame)
 - Agency specific issues
 - All agencies have responded

New Members to the Workgroup

- New agencies and members have joined the Radiological Laboratory Workgroup
 - USDA - 2006
 - USGS – 2006
 - DOD (officially) - 2007
- Continuing to recruit other agencies as needed

Radiological Laboratory Workgroup 2012

- Radiological Screening for “Unknown Samples” Guidance Document on the APHL web site (APHL members only)
- Sent out to all APHL members on the April 19th, 2012 “eUpdate” Weekly Posting
- Radiological Screening for “Unknown Samples” Document presented or referenced at the APHL National Meetings – [2012](#), [2013](#), [2014](#), [2015](#)

Radiological Laboratory TTX Exercise 2012

- **Objectives:**
- Use a variant of National planning scenario #11 (multiple RDD's)
 - including Sr-90 and Pu-239 (point out gaps in lab capacity, forces lab participation vs. simple field adjudication)
 - Use geographically separated and economically different cities
 - engage more labs and information management capabilities
 - Drive agricultural, urban, human clinical and food sampling/lab analysis

Radiological Laboratory IND Vignette TTX 2013

- **Objectives:**

- The Radiological *Improvised Nuclear Device (Rad IND)* Vignette Tabletop Exercise (RAD IND Vignette TTX) focused on a notional detonation of a 10 kiloton device in downtown Seattle and the associated impact to human clinical, animal, food, and environmental lab networks which are required to analyze these samples.
 - Assessing which networks have sufficient capacity to analyze human clinical, environmental, food, and agricultural items still in the field (to include livestock and plant crops);
 - Determining which labs have the capacity to analyze high activity samples;
 - Request for guidance from Incident Command Team on how to best prioritize samples;
 - Uploading of data reports to the ICLN Portal using the Data Exchange Utility;
 - Submittal of a notional NRC radioactive material license addendum to NRC.

Radiological Laboratory Exercise 2014

- Request from the ICLN Network Coordinating Group (NCG) to sponsor a Full Scale Interagency / Inter-network Radiological exercise with:
 - Real spiked samples (100-300 from each category below):
 - Environmental – e.g. water, soil, air filters
 - Clinical – urine
 - Food – e.g. apple juice
 - Agricultural (plant/animal) – e.g. water
- Test: shipping, receiving, COC, analysis, time to first report, sample throughput, accuracy, precision, prioritization (within a group), data reporting ([Minimum Data Elements](#) - MDE) to the ICLN Portal

Radiological Laboratory Exercise 2014

- **Objectives:**

- Scenario based from previous ICLN **Radiological Dispersive Device (RDD)** TTX (**Sr-90 and Pu-239**)
- Test the **Early** and **Recovery** phases of an incident response
- Determine how DOE, EPA, CDC and FDA could coordinate the laboratory demands after a national radiological incident
- Analysis of **820 samples using 24 labs** (DOE, EPA, CDC & FDA).
- Assess Sample Lab Throughput, Laboratory Quality Objectives, Sample Tracking, Reporting (to networks and the ICLN Portal), on real spiked samples in various matrices.
- Assess the ability to request and receive surge capacity.
- Extensive use and testing of the ICLN Portal [Situation Reports (SITREPs)], Request for surge capacity, data uploading and testing of the Minimum Data Elements format.

Radiological Laboratory TTX Exercise 2015

- **Objectives:**
 - Scenario based on Nuclear Power Plant (**NPP**) **incident** in the U.S.
 - Test the **Early** and **Recovery** phases of an incident response
 - Determine how DOE, EPA, CDC and FDA could coordinate the laboratory demands after a national NPP incident
 - Extensive use and testing of the ICLN Portal (SITREPs, Request for surge capacity, data uploading and testing of the Minimum Data Elements format)

Collaborations

- Laboratory Networks
 - Environmental (ERLN) Network Established - 2007
 - FDA (FERN) Network Established - 2006
 - DOD (DLN) Network Established - 2011
 - CDC (LRN-R) and DOE Networks in the proof-of-concept stages
- Congressional Testimony 2007
- NIST Radiological Emergency Response SRMs 2009
- Sharing of analytical methods ([rapid methods](#)) ongoing
- ICLN Data Reporting and Exchange (Portal) ongoing (TTX and exercise tested)

Accomplishments

- Workshops and Presentations
 - RRMC ICLN Radiological Laboratory Workshops 2011, 2013, 2014
 - RRMC Workshop on Lab Limiting Documents 2011, 2012, 2013 and 2014
 - RRMC TTX Poster Presentation (Ft Collins) 2013
 - RRMC Workshop on ICLN Full Scale Rad Lab Exercise 2014
 - RRMC Workshop on CLIA 2014
 - RRMC Workshop on PT providers (ICLN updates) ongoing...

Accomplishments

- Workshops and Presentations
 - NIST Consequence Management Workgroup - 2013
 - APHL National Meeting 2012 and 2015
 - Federal Radiological Preparedness Coordinating Committee (FRPCC) 2008 and 2009
 - National Radiological Emergency Preparedness Meeting 2015
 - National Analytical Management Program (NAMP) 2013, 2014 and 2015

Accomplishments

Rad Lab Workgroup Exercises

- Radiological TTX 2012
- IND Vignette TTX 2013
- Full Scale National radiological exercise conducted in 2014
- NPP Table Top Exercise 2015

Accomplishments

- Documents (links at end of presentation)
 - Radiological Lab Limiting Document - [2009](#)
 - Laboratory Logistics Limiting Document (Rad is a component) (ICLN NCG request) - [2011](#)
 - Screening unknown samples for radiation (Non-rad labs) APHL request - [2012](#)
 - Sample Prioritization Document (Rad/IND components) (In review) – [Early 2016](#)

Current/Future Work

- Joint ICLN/NAMP New Radiological Reference Materials Workgroup (in progress)
- White paper and PowerPoint on “The Need for Radiochemists and Radioanalytical scientists in the next 20 years”
- Exercises (TTX and Sample/Lab Based)
- RRMC Workshops (PT, ICLN, Job Opportunities, Lab inter-comparisons)

Future Work

- Collaboration with Radiological and Environmental Sciences Laboratory (RESL) and the Mixed Analyte Performance Evaluation Program (MAPEP) (providing input)
- Contributing to the DOE/Radiological Response Laboratory Network (RRLN) strategy
- DoD Laboratory Network (DLN) collaboration
- Continue Improvements in the ICLN Portal Data Exchange Utility

Radioanalytical Laboratory Original Subgroup Members 2006

➤ Original members of the NCG Radiological Laboratory Response Workgroup

- Allan Antley, EPA
- Ed Baratta, FDA
- Anna Berne, DHS
- Lindsey Bender, EPA
- David Bowman, DOE
- Brooke Buddemeier, DHS
- James Cherniak, FDA
- Wayne Ziemer, USDA
- John Griggs, EPA, Co-Chair
- Robert Jones, CDC, Co-Chair
- Ken Inn, NIST
- Pamela Mackill, FDA
- Terri McConnell, FDA
- David Musick, EPA
- Erik Nielson, DOE
- Ann Mullin, USGS

Ron Swatski, SME from DoD participated in workgroup meetings

Names in red reflect people who have since retired (41%)

Radioanalytical Laboratory Workgroup Members 2015

Co-Chairs:

- John Griggs EPA
- Robert Jones CDC

Members

- Berta Oates DOE
- Carolyn Wong DOE
- Sonoya Shanks DOE
- Ceci DiPrete DOE
- Phil Torretto DOE
- Dan Blumenthal DOE
- Marty Johnson DOD
- Dan Harms DOD
- Cong Wei FDA
- Stephanie Healey FDA
- Susanne Brooks FDA
- Ken Inn NIST (retired)
- Jacqueline Mann NIST
- Ann Mullin USGS
- George Mills VT

Laboratory Logistics Limiting Issues

Version 1: Oct. 26, 2011

An updated 2016 version is in the works

Laboratory Logistics Workgroup

John Griggs (EPA) and Robert Jones (CDC),
Co-Chairs

Integrated Consortium of Laboratory Networks

www.wipp.energy.gov/namp/docs/LabLimitingIssues.pdf

Contents

- **Executive Summary**
- **General Issues**
- **“Bio” Specific Issues**
- **“Chem” Specific Issues**
- **“Rad” Specific Issues**

**Limiting Issues
Potential Solutions**

Sections

- **Pre-Analytical**
- **Sample Receiving & Screening**
- **Analytical Processing**
- **Data Processing & Reporting**
- **Sample Storage & Waste Disposition**
- **Sustaining Operations**

[A]-Agency [N]-Network [L]-Lab

Sample Receiving & Screening

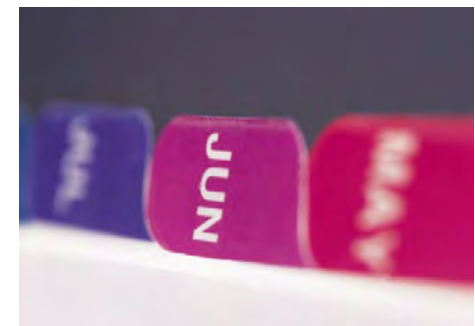
Limiting Issues	Potential Solutions
<ul style="list-style-type: none"> Lack of a process for accepting or rejecting samples. 	<ul style="list-style-type: none"> Develop sample acceptance and rejection policy/protocols. [N,L] Establish criteria for minimum screening needed to safely handle samples. [L] Establish procedures to evaluate the adequacy of field screening results. [L]
<ul style="list-style-type: none"> Inadequate and/or inconsistent sample screening at the laboratory's sample receipt area(s). 	<ul style="list-style-type: none"> Develop a more robust sample screening protocol. [N,L] Train lab personnel receiving samples on appropriate screening of unknown samples. [N,L] Ensure that sample screening is consistent with laboratory's equipment and training. [L] Ensure an adequate supply of personal protective equipment (PPE) is available for sample screening. [L]



[A]-Agency [N]-Network [L]-Lab

Analytical Processing

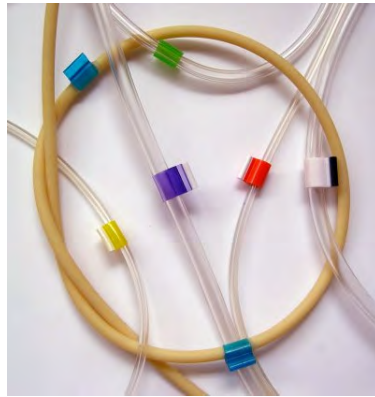
Limiting Issues	Potential Solution
<ul style="list-style-type: none">Insufficient number of available and trained personnel to perform the pre-analytical and analytical processes, as well as insufficient number of expert instrument operators available to run the more complex analytical instruments.	<ul style="list-style-type: none">Use modular pre-analytical and analytical processes to reduce individual training needs. [L]Cross-train personnel to improve flexibility and coverage. [L]Use of refresher training and exercises to keep training current. [L]



[A]-Agency [N]-Network [L]-Lab

Sustaining Operations

Limiting Issues	Potential Solution
<ul style="list-style-type: none">Unavailability of supplies such as vials, bottles, sample containers, hot plates, PPE, gases, waste containers, and other items.	<ul style="list-style-type: none">In advance, determine the laboratory's total capabilities and capacity based on an inventory of supplies and the need to obtain additional specialized reagents for a predetermined period. [L]Determine whether inventory will meet organizational or agency requirements. [N,L]Develop either a plan to inventory essential analytical supplies or a just-in-time inventory system. [N,L]Develop a list of alternate vendors. [N,L]Consider establishing laboratory and/or network contracts with suppliers for the provision of required supplies where the vendor stores/maintains additional inventory that is guaranteed to be available on request. [N,L]Maintain 24/7 contact information for all suppliers. [N,L]



[A]-Agency [N]-Network [L]-Lab

Threats

Priority Radionuclides of Concern

RADIOLOGICAL DISPERSAL DEVICES:

AN INITIAL STUDY TO IDENTIFY RADIOACTIVE MATERIALS OF GREATEST CONCERN AND APPROACHES TO THEIR TRACKING, TAGGING, AND DISPOSITION

**Report to the
Nuclear Regulatory Commission
and the
Secretary of Energy**



May 2003



Prepared by

**The DOE/NRC Interagency Working Group on
Radiological Dispersal Devices**

Threats

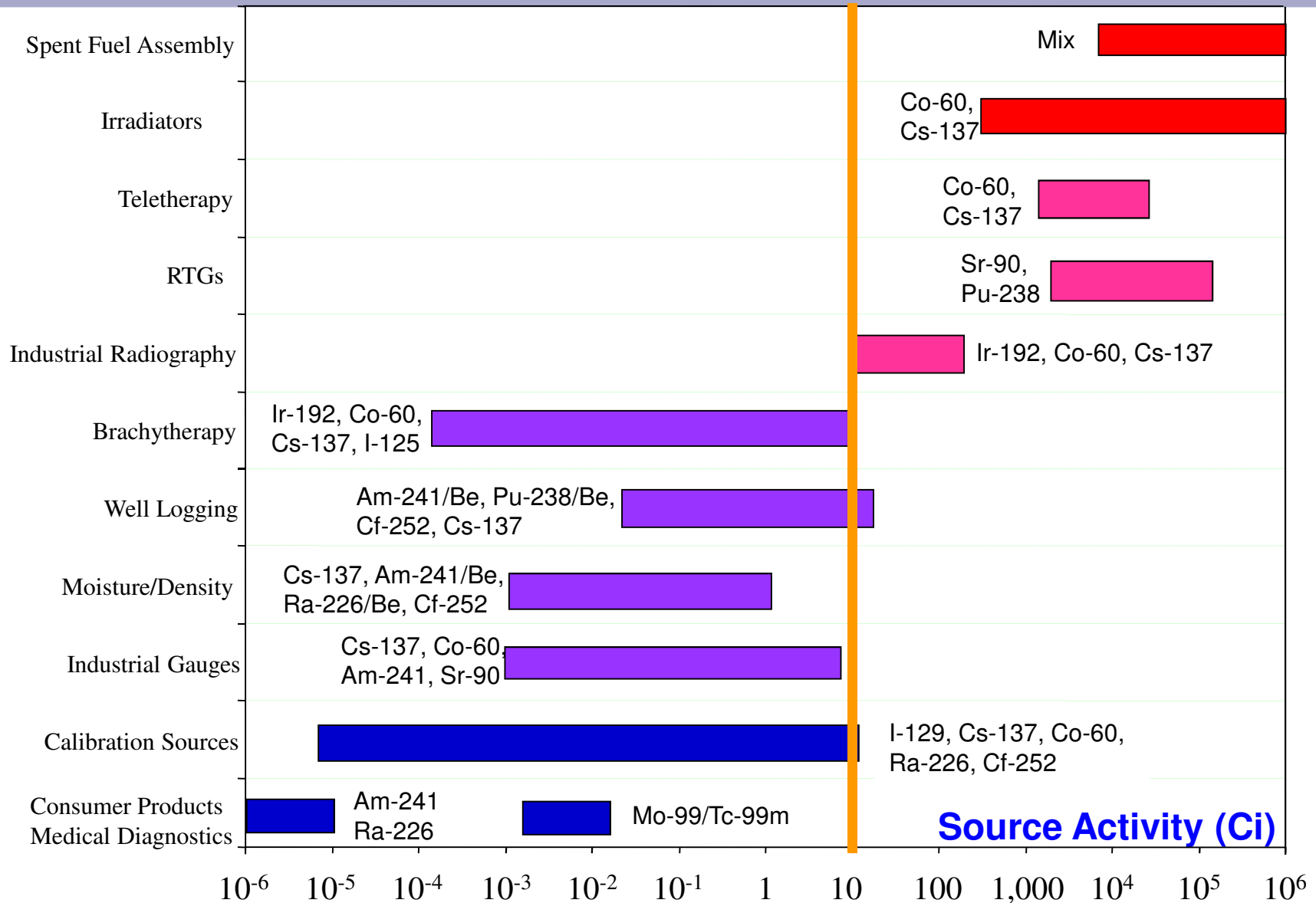
Ad Hoc Threat Prioritization
Working Group
of the
HHS Weapons of Mass
Destruction Medical
Countermeasures Subcommittee

2005-2006

Interagency Workgroup

- Department of Homeland Security
- Health and Human Services
- Centers for Disease Control
- Environmental Protection Agency
- Food and Drug Administration
- Department of Defense
- Federal Bureau of Investigation
- Department of Energy
- Other SMEs

Defining Availability: Quantities that Matter



Priority Radionuclides of Concern

Radionuclides	Primary radiation detection
Uranium, Thorium	alpha and beta
Strontium, Plutonium	
Americium, Californium, Neptunium,	
Phosphorus, Curium, Polonium	
Cesium, Cobalt, Radium	Gamma rays
Iodine, Technetium-99m	
Selenium, Molybdenum, Iridium	

Radionuclides of concern can be found at:
www-pub.iaea.org/MTCD/publications/PDF/Pub1309_web.pdf
<http://www.energy.gov/sites/prod/files/edg/media/RDDRPTF14MAYa.pdf>

Priority Radionuclides of Concern

- Information publically available
- No priority with order of listing
- Significant portion are alpha or low energy beta emitters
- Incident specifics will drive radiochemistry
- “Clean up” phase will drive detection limits that will rely on “rapid” radiochemistry techniques
- Difficulty in rapidly generating accurate and precise data that are defensible

Acknowledgements

**Thanks to all past and
current ICLN Rad Lab
Workgroup members**

Disclaimer

“The findings and conclusions in this study are those of the authors and do not necessarily represent the views of the U.S. Department of Health and Human Services, or the U.S. Centers for Disease Control and Prevention. Use of trade names and commercial sources is for identification only and does not constitute endorsement by the U.S. Department of Health and Human Services, or the U.S. Centers for Disease Control and Prevention.”

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Questions

Questions?

Panel Discussion

- **Questions**
- **Answers**
- **Issues**
- **Comments**
- **Suggestions**

Participating Laboratories

Panel Discussion

- **CDC**
- **DOE – CM/FRMAC**
- **DOE – NAMP**
- **FDA**
- **USGS**

Information and Useful Links

www.icln.org

www.wipp.energy.gov/namp

www.wipp.energy.gov/namp/docs/LabLimitingIssues.pdf

www.wipp.energy.gov/namp/docs/RadScreeningforUnknownSamples.pdf

www.cdc.gov/about/grand-rounds/archives/2010/03-March.htm

www-pub.iaea.org/MTCD/publications/PDF/Pub1309_web.pdf

www.energy.gov/sites/prod/files/edg/media/RDDRPTF14MAYa.pdf

www.aphl.org