ICLN's 2014 Full Scale Radiological Laboratory Exercise

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Background

After a major RDD, how will the federal, state and private radiation laboratories coordinate their analytical processes, implement surge capacity, request lab capacity from other lab networks and have a common reporting platform to have a better and more efficient and effective overall incident response to support critical decision making?

ICLN Full Scale Radiological Lab Exercise

- **Radiological Laboratory Full Scale Exercise:**
  - Assess Analytical Throughput, Laboratory Quality Objectives, Sample Tracking, Reporting (to networks and ICLN Portal) on real spiked samples in various matrices.
  - Assess the ability to request and receive surge capacity samples
  - Extensive use and testing of the **ICLN Portal** (SITREPs, requests for surge capacity, data uploading and testing of the **Minimum Data Elements format**)

CDC'S ICLN Exercise 2014 GOALS

Test the CDC's ability, for 200 spot urine samples, to:

- receive, login, and process
- analyze (screen, identify and quantify)
- perform analytical quality control
- report analytical results
- use the new Division database to:
- order tests
- manage sample test and result information
- produce QC charts/validating analytical run QC
- produce standard CLIA compliant reports
- generate ICLN MDE format output files
- upload MDE data files to the ICLN Data Exchange Portal

Results - Gross α/β

Spike values: Pu-239 low = 9.2x10-3 Bq/L and high = 4.6x10-2 Bq/L
Sr-90 low = 200Bq/L and high = 1000 Bq/L

Gross α (CPS/L)	Mean	SD	
Low Pu-239 α	-0.14	1.28	n=15
High Pu-239 α	0.16	1.24	n=15
Low Sr-90 crosstalk β to α	10	14	n=15
High Sr-90 crosstalk β to α	41	51	n=15
Blank pool α	0.19	1.13	n=30
No Sr-90/Pu-239 α	0.50	1.47	n=140
Gross β (CPS/L)			
Low Sr-90 β	443	34	n=15
High Sr-90 β	2097	53	n=15
Blank pool β	37.7	7.2	n=30
No Sr-90/Pu-239 β	36.3	19.2	n=140

Results – Pu-239 and Sr-90

Spike values: Pu-239 low = 9.2x10-3 Bq/L and high = 4.6x10-2 Bq/L

Sr-90 low = 200Bq/L and high = 1000 Bq/L

Pu-239, Bq/L		Mean	SD	
	Low Spike	9.04E-03	4.16E-04	n=15
	High Spike	4.51E-02	1.07E-03	n=15
	No Pu Spike	4.46E-06	3.71E-04	n=170
	Blank pool	4.84E-05	3.62E-04	n=30

Sr-90, Bq/L		Mean	SD	
	Low Spike	199.5	15.4	n=15
	High Spike	979.9	39.9	n=15

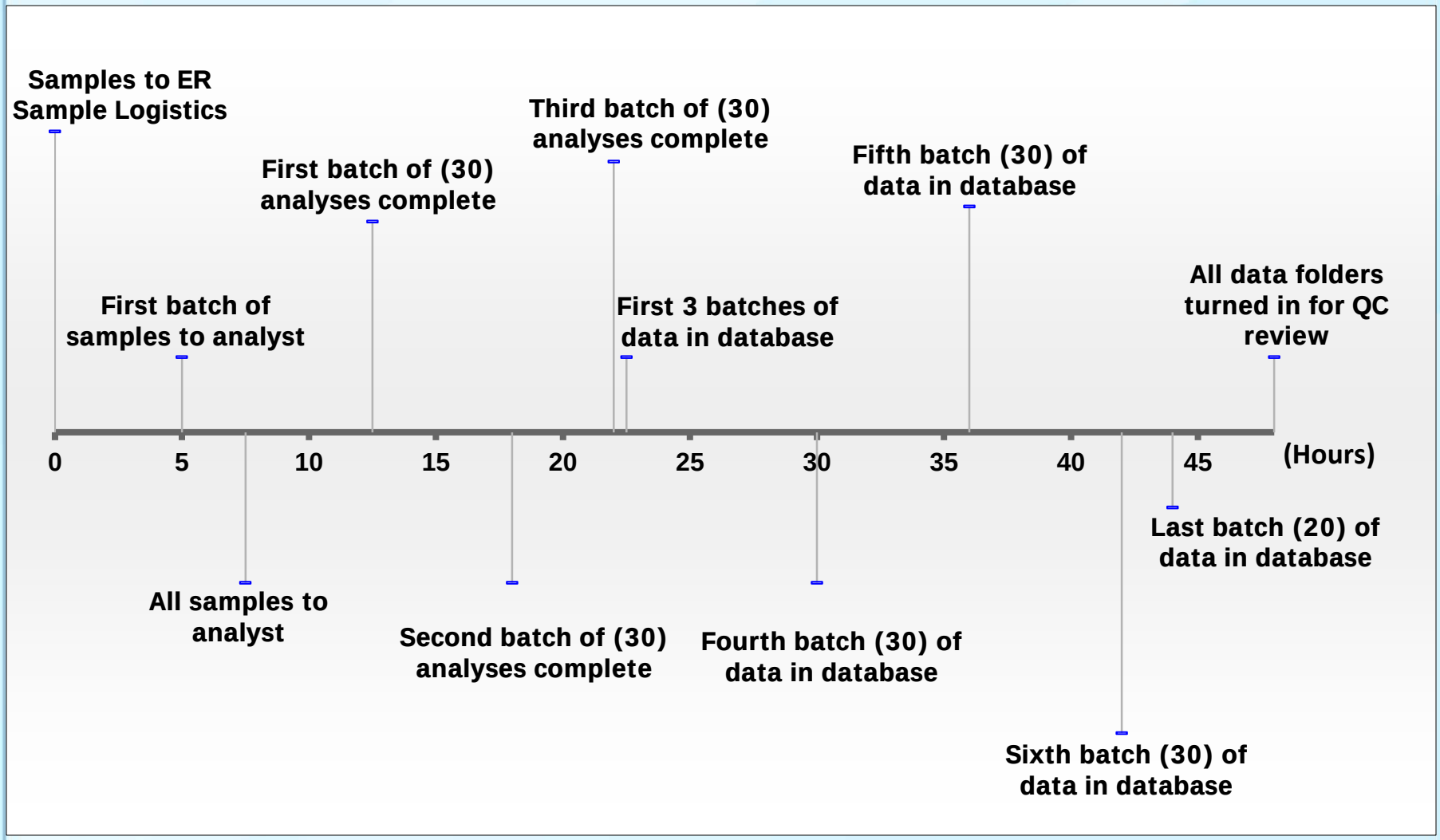
Issues/Lessons Identified

- Spikes thawed in Rad Team Sink water bath – cups bulged and tipped.
- Pu-239 analyte was not checked in the database analysis panel screen.
- Aliquot ID for "DLS Creatinine" was assigned during sample setup/login, but the ID for "Rad Creatinine" should have been assigned.
- "Sample login mismatch error" occurred due to use of a sample login spreadsheet that our database required be completely filled in to work. Switched to use of the "generic long form" .
- Autosampler for the Pu-239 analysis stalled.
- Pu-239 autosampler got worse and worse. Replaced it after the 5th batch.

Issues/Lessons Identified (continued)

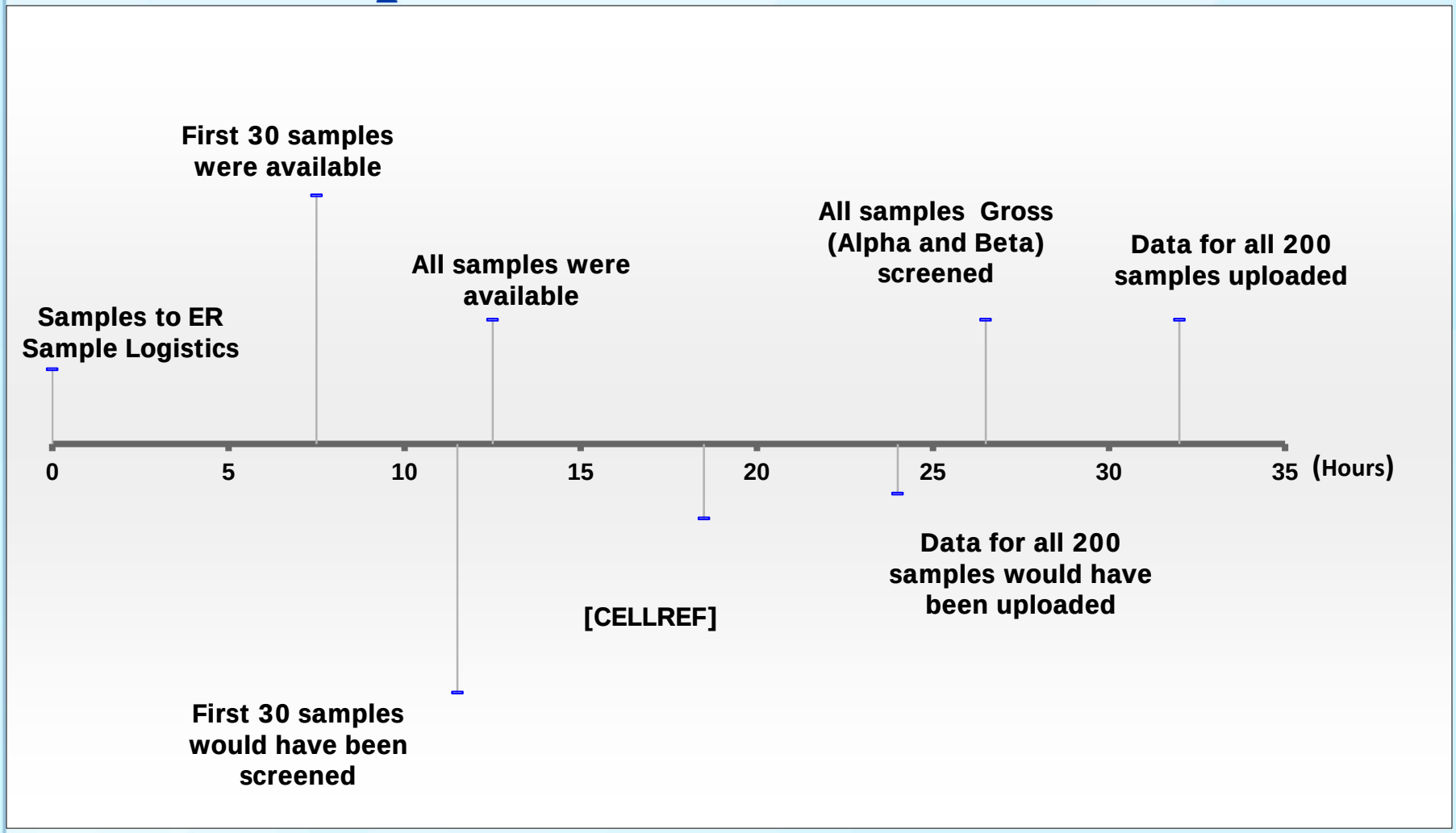
- Data for the 6th batch of Pu-239 samples included the wrong sample IDs. Analyst corrected this before uploading to the database.
- Gross Beta Screen and Sr-90 analysis results were processed by hand entry of raw output to pre-configured calculation spreadsheets, and there were problems uploading the data.
- Gross Beta and Sr-90 final reports and folders were initially in the wrong format.
- Creatinine QC drifted and failed at the end of an early batch. Analyst decided to run groups of 50 instead of 100.

Pu-239 Timeline



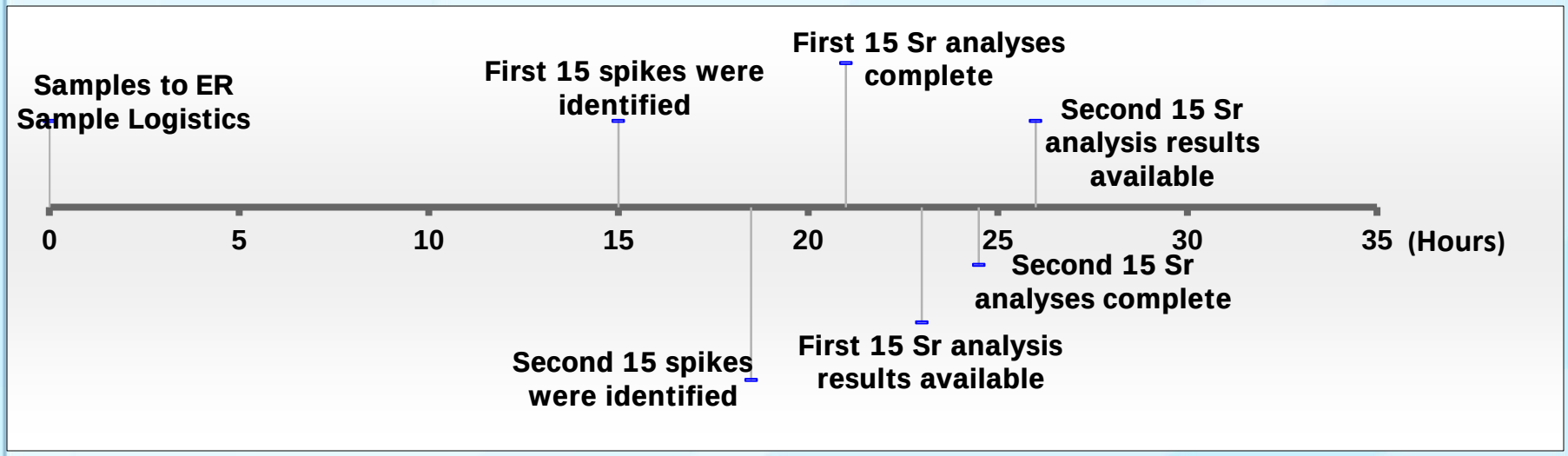
ABOUT 48 HOURS PER 200 SAMPLES

Gross Alpha/Beta Screen Timeline



ABOUT 24 HOURS FOR 200 SAMPLES

Sr-90 Timeline



- Available data was not in the database, but could have been manually transferred to a report. It was imported to the database much later.
- If we had not used Gross Alpha/Beta Screening, all Sr data for complete Sr analysis of 200 samples would have been available at T_0 + 79 hours (if analyzed serially).
- Cost of columns for 200 analyses would be $4400, vs $660 for 30.

ABOUT 26 HOURS FOR 200 SAMPLES

Exercise Timeline "Take-aways"

- Manual aliquoting took a significant amount of time (7.5 to 12.5 hours) with just two people.
- We can Gross Alpha/Beta screen 200 urine samples in 24 hours (one instrument / one analyst).
- We can identify and quantify Pu-239 in 200 urine samples in 48 hours (one instrument / one analyst).
- In conjunction with Gross Alpha/Beta screening, we can identify and quantify Sr-90 in 200 urine samples (at a 15% positive Gross Alpha/Beta rate) in 26 hours.
- Gross screening prior to Sr-90 analysis can save a significant number of personnel hours and significantly reduce supply costs.

True Emergency Timeline Modifiers

- In a real emergency we will have access to at least 40 sample logistics staff, rather than just 2, and would use an automated aliquoting system.
- Additional analysts and 4 more high capacity instruments should allow 400-500 Gross Alpha/Beta analyses in 24 hours.
- Additional analysts and 2 more Thermo Element SF-ICP-MS instruments should allow 300 Pu-239 analyses in 24 hours.
- Additional analysts, 6 more SPE processing stations, and 4 more high capacity beta analysis (LSC and GFPC) instruments should allow Sr analyses of 400-500 Gross Alpha/Beta screened samples in 24 hours.

Summary (all)

- The Exercise has been considered a success by all the Networks since all objectives were completed.
- This is the first ICLN radiation laboratory full scale exercise evaluating surge capacity issues.
- This is the first ICLN radiation laboratory full scale exercise evaluating multiple phases of a response.
- This provided valuable Lessons Identified/Learned through the exercise process.
- This will allow for the evaluation of several ICLN Portal improvements (SitReps, data reporting, downloading, etc.) that have been recently implemented.

Summary (CDC)

- CDC realized most of its stated goals for participating in this "Confidence Building Competency Test" (CBCT).
- CDC's methods were effective in identifying and quantifying the radionuclides of interest.
- CDC determined that it can perform these analyses on 200 samples in 1 to 2 days.
- A number of issues were identified that can be used to improve performance in these and other methods and future exercises or responses.

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Questions?

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