



Update on Lawrence Berkeley National Laboratory Site Profile Review

Megan Lobaugh, PhD, CHP

Research Health Physicist

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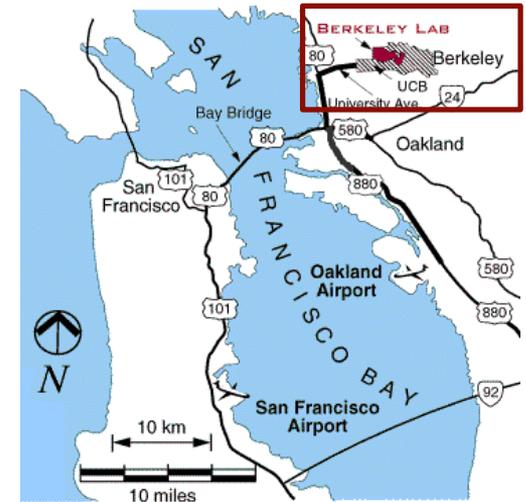
December 11, 2019

Overview

- Overview of the LBNL Site
- Summary of LBNL Site Profile Issues
 - Review of “In Progress” Site Profile Issues
- Overview of Current NIOSH Work Underway
- Current Responses to SC&A Review of the NIOSH White Paper: “Method to Assess Internal Dose Using Gross Alpha, Beta, and Gamma Bioassay and Air Sampling at the Lawrence Berkeley National Laboratory”

Lawrence Berkeley National Laboratory

- Founded by E.O. Lawrence in 1931 as the Radiation Laboratory
 - **EEOICPA Covered Period:** August 13, 1942 through present
- Multiprogram Science Lab
 - 88-inch Cyclotron, ALS
 - Molecular Foundry
 - Biosciences and Biomedical Isotope Facility
 - DOE Joint Genome Institute
 - Energy, Environment
- 13 Nobel Prizes



LBNL and EEOICPA Part B

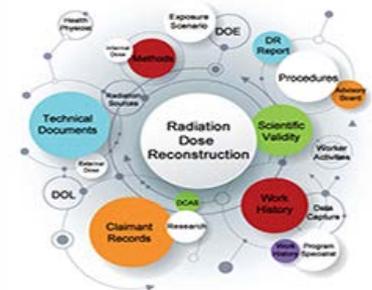
■ Special Exposure Cohort Class:

- All employees working from August 13, 1942 through December 31, 1961
- Due to infeasibilities with:
 - External Dose prior to 1948
 - Internal Dose prior to 1962



■ Dose Reconstruction Claims:

- 217 Completed (43 \geq 50% PoC; 174 $<$ 50% PoC)
- 8 Active
- 36 Pulled



Summary of LBNL Site Profile Issues

- **13 Findings**

- 3 Closed
- 2 Addressed in Finding
- 8 In Progress

- **8 Observations**

- 2 Closed
- 3 Addressed in Finding
- 3 In Progress

Next we will review the “In Progress” Issues

Finding 1: Inadequate documentation of historical operations and sources of radiological exposures

- Facility Information
- Related Issue
 - Observation 5: Lack of information on isotopes, facilities, and handling methods (additional facility information)
- Action Items
 - NIOSH update Site Profile with additional information that has been captured since the last revision

Finding 2: Insufficient Information for Internal Dose Reconstruction, especially during the Early Years

- Internal Dose
- Related Issues
 - Finding 4: Bioassay Data Completeness and Adequacy have not been Verified
 - Finding 11: Inadequacy of Bioassay Analyses Presentation
- Action Items
 - NIOSH respond to the SC&A February 2014 Memo with specific references to where we have provided this information in the past, as well as how the recent Internal Dose Methodology would affect answers to the questions put forward in the memo.
 - Interviews and data capture

Finding 5: Insufficient Justification for Selection of IREP Energy Range Fractions for Photon Exposures

- External Dose
- Related Issue
 - Observation 8: Overuse of Generalizations and Assumptions (IREP photon energy fractions)
- Action Items
 - NIOSH update Table 6-5 for all years and all major accelerator operations
 - Interviews and data capture

Finding 6: Insufficiency of Neutron Dosimetry Treatment

- External Dose
- Related Issue
 - Observation 8: Overuse of Generalizations and Assumptions (neutron-to-gamma dose ratios)
- Action Items
 - NIOSH revise the external dose discussion to direct use of the N:P ratio, determine if NTA correction factors (energy response, angular dependence, and fading) are required, clarify low energy NTA correction factor discussion, and clarify the uncertainties listed in Table 6-11
 - Interviews and data capture

Finding 7: Failure to Justify the Shallow Dose to Deep Dose Assumption

- External Dose
- Related Issues
 - Observation 5: Lack of Information on Isotopes, Facilities, and Handling Methods (additional information specific to shallow and extremity doses)
 - Observation 6: Extremity Dosimetry needs Revisiting
 - Observation 8: Overuse of Generalizations and Assumptions (shallow-to-deep dose ratios)

Finding 7: Failure to Justify the Shallow Dose to Deep Dose Assumption *(continued)*

■ Action Items

- NIOSH review NOCTS claim data to determine if it supports the shallow to deep dose ratios and extremity dose ratios
- NIOSH compile list of pure beta emitters in use
- NIOSH research whether there is area monitoring available for pure beta emitters in use
- NIOSH determine if unmonitored approach is needed for pure beta emitters
- NIOSH review extremity dose ratio and provide specific response to SC&A comment of 3 vs 5 times
- Interviews and data capture

Finding 8: Uncertainty in Beta-Gamma Dosimeter Response to Radiation Types and Energies

- External Dose
- Action Items
 - NIOSH update external dose discussion in Site Profile with specific direction regarding not using the electroscope data after 1948 because there is film and other dosimetry data available
 - NIOSH review Attachment A of Site Profile and provide summary of what is included to address the specific information requested in SC&A review

Finding 12: Failure to Provide Sufficient Guidance for Unmonitored Workers

- Internal Dose
- Action Items
 - NIOSH respond to the SC&A February 2014 Memo with specific references to where we have provided this information in the past, as well as how the recent Internal Dose Methodology would affect answers to the questions put forward in the memo.
 - Interviews and data capture

Finding 13: Inadequate Coverage of Occupational Environmental Dose

- Environmental Dose
- **Action Items**
 - NIOSH add information to Site Profile about the Co-60 accelerator, flesh out accelerator background (environmental) exposures, and change guidance for radionuclide assignment for internal dose from beta contributors

Observation 3: Lack of Discussion of Radiological Incidents

- Radiological Incidents
- **Action Items**
 - NIOSH will identify and research major radiological incidents at LBNL, then revise the Site Profile to incorporate a summary of these incidents

Observation 4: Need to provide information on Metallurgical Laboratory [dosimetry services]

- External Dose
- Action Items
 - NIOSH will perform additional research for information on the MetLab Dosimetry services and include any additional information in the Site Profile

Observation 7: Lack of Sufficient Information for External Dose Evaluation

- External Dose
- Action Items
 - NIOSH commits to improving the discussion of the post-1947 External Dosimetry program, including historical dosimeter information

Overview of Current NIOSH Work Underway

Interviews and Data Capture Timeline

- [June 11, 2019](#)- NIOSH sent Data Request (LBNL-FY19-001)
- [July 2, 2019](#)- NIOSH requested interviews through LBNL Point of Contact
- [August 15, 2019](#)- NIOSH began reaching out to potential interviewees
- [September 3, 2019](#)- Interview #1 (SRDB Ref ID 178601)
 - Interviewee provided several additional names
 - Sent 4 requests for additional interviews
- [September 6, 2019](#)- Interview #2 (SRDB Ref ID 178602)
- [November 15, 2019](#)- LBNL provided NIOSH with selected UCRL and numbered technical documents
- [January 13, 2020](#)- Data Capture Tentatively Scheduled

Data Request (LBNL-FY19-001): Information Specific to Site Profile Issues

Data Requested	Applicable Issues
Whole Body Counter peak searches and calibration	Findings 2, 4, and 11
Neutron and other radiation energy spectra from cyclotrons/accelerators	Findings 1, 5, 6, and 8
Extremity dosimetry	Finding 7; Observations 5, 6, and 8
Neutron exposures measured by NTA film	Findings 6 and Observation 8
Shallow/Beta Dose	Finding 7; Observations 5, 6, and 8

Data Request (LBNL-FY19-001): Information Specific to Internal Dose Methodology Issues

Note: Internal Dose Methodology was written in response to Site Profile Findings 2, 4, 11, and 12 & Observation 2

Data Requested	Applicable Issues
Gross alpha, gross beta, gross gamma bioassay in-house detector systems	Finding 2
Breathing zone alpha and beta/gamma in-house detector systems	Finding 2
Air sampling policies, procedures, and practices including specific information about Breathing Zone samples	Finding 1

**Responses to SC&A Review of the NIOSH
White Paper: “Method to Assess Internal
Dose Using Gross Alpha, Beta, and Gamma
Bioassay and Air Sampling at the Lawrence
Berkeley National Laboratory”**

Summary of Issues from Method to Assess Internal Dose Using Gross Alpha, Beta, and Gamma Bioassay and Air Sampling at Lawrence Berkeley National Laboratory

- **2 Findings**

- 2 In Progress

- **3 Observations**

- 1 Closed
- 1 In Abeyance
- 1 In Progress

Finding 1: Air Samples May Not Represent Concentrations Breathed by Workers

- [October 2018](#): Initial response provided information as to why NIOSH believes, given current day standards for breathing zone (BZ) samples and the LBNL policies and documentation available, that the samples used in the Methodology are BZ samples and therefore representative of the air concentrations breathed by the worker
- [April 2019](#): WG discussed the issue and requested additional information such as air flow studies, pictures documenting the placement of air samplers, and information relating to implementation of policies
- **Interviews (SRDB Ref ID 178601 and 178602) and data capture request** regarding additional air sampling program policies and procedures

Finding 2: Technical Issues and Uncertainties with Gross Counting Data Conversion to Concentration/Intake for Use in Dose Reconstruction

- [October 2018](#): NIOSH committed to researching and subsequently reviewing detector technical information (e.g., efficiency calibrations) to determine if specific radionuclides may be underestimated by the gross measurement methods
- **Interviews (SRDB Ref ID 178601 and 178602) and data capture request** for specific information on in-house detector systems used to measure these samples

Observation 1: Potentially Missed Radionuclides

- Radioiodines- not included, measured on separate charcoal samples
- Erbium-165- not included, below short half-life cutoff
- Erbium-169- will be added in final DR Methodology Implementation
- Fermium-237
 - Typo in SC&A Methodology Review, intent likely was Fm-257, which is in the Site Profile and not included in the Methodology
 - Fm-257 will be added in the final DR Methodology Implementation

Observation 1: Potentially Missed Radionuclides

(continued)

- Rhodium-102- will be added in final DR Methodology Implementation
- Scandium-93
 - Typo carried over from the Site Environmental reports
 - Interviewees provided additional contacts who prepared the environmental reports, NIOSH continuing to investigate and will report back

Observation 2: Bioassays in Claimant DOE Files May Not Be Indicative of Exposure Potential

- 2010 NIOSH began receiving the entire medical file
- NIOSH made a mass re-request of the complete medical file for LBNL claims received prior to 2010
- 168 claims
 - 53 no medical records
 - 1 claim submitted that had a PoC over 50%
 - 109 claims no new bioassay information
 - 3 claims with new bioassay information from DOE, but NIOSH had information via other documents
 - 2 claims with new bioassay information

Observation 2: Bioassays in Claimant DOE Files May Not Be Indicative of Exposure Potential *(continued)*

- 5 claims with new bioassay information were reviewed for impact

# of Claims	Bioassay Results Available at Time of DR	New Bioassay Results Available after Mass Re-request	Potential Effect on the Application of Internal Dose Methodology
2	No	Yes	Yes
2	Yes	Yes	Yes
1	Yes	No	No

Observation 2: Bioassays in Claimant DOE Files May Not Be Indicative of Exposure Potential *(continued)*

Note: Unmonitored approach using air sampling results doesn't necessarily rely on existence of bioassay data

- **4 of the 168 claims (~2.4%)** potentially affected by existence of bioassay
- Placed In Abeyance by the WG at 11/25/2019 Teleconference
 - Awaiting NIOSH update to the Methodology including clear and explicit guidance on the application of the Methodology

Observation 3: Bioassays in Claimant DOE Files May Not Be Complete Compared to LBNL Documents

- 2010 NIOSH began receiving the entire medical file
- NIOSH made a mass re-request of the complete medical file for LBNL claims received prior to 2010
 - 2 claims (~1.2%) with new bioassay information
- Closed by the WG at 11/25/2019 Teleconference